

**ANALELE UNIVERSITĂȚII DIN CRAIOVA**

**AGRICULTURĂ  
MONTANOLOGIE  
CADASTRU**

**VOL. XXXVIII/B 2008**



**LUCRĂRI ȘTIINȚIFICE**

**ANALES OF THE UNIVERSTY OF CRAIOVA  
ANALES DE L'UNIVÉRSITÉ DE CRAIOVA**

**ISSN 1841-8317**

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**EDITURA UNIVERSITARIA  
CRAIOVA  
2008**

**ISSN 1841-8317**

**ANALELE UNIVERSITĂȚII DIN CRAIOVA**

13 A.I. Cuza street, Craiova

**ROMANIA**

**ANALES OF THE UNIVERSTY OF CRAIOVA  
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## SECȚIUNEA 3: DISCIPLINE FUNDAMENTALE ȘI PROTECȚIA PLANTELOR ȘI A MEDIULUI

### WORKING GROUP 3: FUNDAMENTALLY DISCIPLINES AND ENVIRONMENT AND PLANT MANAGEMENT

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### PLANTE STRĂINE NOI ÎN ROMÂNIA

### NEW ALIEN PLANTS TO ROMANIA

*Paulina Anastasiu, Gavril Negrean*

**Cuvinte cheie:** plante străine, noi înregistrări, naturalizat, ocazional, Poaceae, Euphorbiaceae, Asteraceae, România.

**Keywords:** alien plants, new records, naturalized, casual, Poaceae, Euphorbiaceae, Asteraceae, Romania.

#### ABSTRACT

*Bromus madritensis, Bromus wildenowii, Senecio inaequidens and Euphorbia prostrata sunt prezentate ca specii străine noi pentru România. Bromus wildenowii a fost colectat în portul Constanța, Euphorbia prostrata și Senecio inaequidens au fost colectate în București, în timp ce Bromus madritensis a fost colectat atât în București, cât și în Constanța. Modul de introducere a acestora a fost accidental, favorizat probabil de transporturi. Răspândirea este limitată în prezent la câteva localizări (București și Constanța), pe terasamentul căilor ferate sau în locuri ruderales. Toate speciile se află depozitate în Herbarul Universității din București [BUC].*

*Bromus madritensis, Bromus willdenowii, Senecio inaequidens and Euphorbia prostrata are reported as new alien species to Romania. Bromus wildenowii was collected in Constanța Harbour, Euphorbia prostrata and Senecio inaequidens were collected in București, while Bromus madritensis was collected in both București and Constanța. Their mode of introduction is accidental, perhaps favoured by transportation. At this moment occurrence is still limited to few locations, on railway ground and ruderal places. All the specimens are deposited in Herbarium of University of Bucharest [BUC].*

#### INTRODUCTION

The alien flora of Romania currently includes 435 species, 384 of which are neophytes introduced after the discovery of America (Anastasiu & Negrean 2005). Species of alien origin make up about 11.5 % of the total flora of the country (Ciocârlan 2000). New alien species are continuously reported (Ciocârlan & Costea 2004, Sîrbu & Oprea 2008) further increasing the number of non-native taxa in the national flora.

According to Illustrated Flora of Romania (Ciocârlan 2000) genus *Bromus* is represented in our country by 15 native species: *B. arvensis*, *B. benekenii*, *B. commutatus*, *B. erectus*, *B. hordeaceus*, *B. inermis*, *B. japonicus*, *B. pannonicus*, *B. ramosus*, *B. riparius*, *B. scoparius*, *B. secalinus*, *B. squarrosus*, *B. sterilis* and *B. tectorum*. Any alien species of *Bromus* was reported for Romania before 2005 (Anastasiu & Negrean 2005). *Senecio* genus has 25 spontaneous species in Romania: *S. aquaticus*, *S. cacaliaster*, *S. capitatus*, *S. carniolicus*, *S. carpaticus*, *S. doria*, *S. erraticus*, *S. erucifolius*, *S. germanicus*, *S. glaberrimus*, *S. grandidentatus*, *S. integrifolius*, *S. jacobaea*, *S. ovatus*, *S. paludosus*, *S. papposus*, *S. rivularis*, *S. sarracenicus*, *S. squalidus*, *S. subalpinus*, *S. sylvaticus*, *S. umbrosus*, *S. vernalis*, *S. viscosus* and *S. vulgaris* (Ciocârlan 2000). Subsection Chamaesyce of genus *Euphorbia* has five representatives in our flora, two of them native – *E. peplis* and *E. canescens*, and three of them alien – *E. humifusa*, *E. maculata* and *E. nutans* (Ciocârlan 2000).

In this paper, short descriptions based on literary data and examined herbarium specimens, information about occurrence, mode of introduction and ecology of the new alien plant species to Romania (*Bromus madritensis*, *Bromus willdenowii*, *Senecio inaequidens* and *Euphorbia prostrata*) are presented.

## MATERIAL AND METHODS

In the period 2004-2008, during field work on invasive plants done in different places from Romania, we recorded new alien taxa such as: *Bromus madritensis*, *Bromus willdenowii*, *Senecio inaequidens* and *Euphorbia prostrata*. Geographic coordinates using WGS 84 system, some ecological features and plant species associated were registered for each taxon. Digital photographs were taken in field. Voucher specimens are deposited in Herbarium of University of Bucharest [BUC]. The taxonomy and nomenclature of species follow Tutin et al. (1964-1980; 1993) and the definition of invasive status is that used by Richardson et al. (2000) and Pyšek et al. (2004).

## RESULTS AND DISCUSSION

***Bromus madritensis*** L., *Cent. Pl.* 1: 5(1755) (Fig. 1) Synonyms: *Anisantha madritensis* (L.) Nevski, *Zerna madritensis* (L.) Panz., *Bromus villosus* Forssk. Family: Poaceae (Gramineae)



Fig. 1 *Bromus madritensis* L. in București Triaj, June 2005

*Bromus madritensis* belongs to section GENEAE Dumort that includes annuals or rarely biennials species of *Bromus*, with lanceolate spikelets only when young, then becoming cuneate, wider at the top, having lower glume 1-veined, the upper 3-veined and awn longer than the lemma, usually flattened and scabrid (Smith 1980). The stems of *Bromus madritensis* is up to 60 cm, erect or ascending, glabrous except sometimes near the panicle. Leaves are up to 20 cm × 2-4 mm, linear, acute, flat, glabrous or pubescent, the lower with hairy sheaths and the upper often with glabrous sheaths. Panicle is erect when young, with branches shorter than spikelets; the spikelets are cuneate, wider at the top, lax, with 6-10 florets. Lower glume is 5-10 mm, while the upper is 10-15 mm. Lemma is narrowly oblong-lanceolate, with apical teeth of 2-3 mm and margins somewhat inrolled at maturity. Awn is 12-20 mm, straight or weakly divaricate. Palea is shorter than lemma (Smith 1980).

In Romania two species of section GENEAE Dumort are native: *Bromus sterilis* and *Bromus tectorum*. These are characterized by a drooping panicle, usually lax, with branches as long as or longer than the spikelets.

According to USDA, ARS, National Genetic Resources Program (2008), the native distribution range of *Bromus madritensis* covers Northern Africa (Algeria, Egypt, Libya, Morocco, Tunisia), Macaronesia (Azores, Madeira Islands, Canary Islands), Western Asia (Afghanistan, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey) and Europe (Ukraine – Krym, Albania, Bulgaria, Former Yugoslavia, Greece, Italy, France, Portugal, Spain). As alien it was reported from Switzerland (Lauber & Wagner 2000), but could be found as naturalized elsewhere (USDA, ARS, National Genetic Resources Program, 2008).

Occurrence in Romania: București Triaj, railways embankment, 4 VI 2005, leg. G. Negrean; București Triaj, railways, 44°29'01"N, 26°00'37"E, 19 VI 2005, leg. P. Anastasiu & G. Negrean; Constanța Harbour, railways, 44°10'08"N, 28°39'33"E and 44°10'01"N, 28°38'33"E, leg. G. Negrean & P. Anastasiu.

The mode of introduction is not sure. It is possible that it happened accidentally, with containers transport.

In its native distribution *Bromus madritensis* grows in sunny and dry places. We found it on the embankment of railways, to București Triaj associated with *Acer negundo*, *Ambrosia artemisiifolia*, *Ambrosia trifida*, *Antirrhinum majus*, *Apera spica-venti* s. l., *Artemisia austriaca*, *Bromus tectorum*, *Capsella bursa-pastoris*, *Cardaria draba* subsp. *draba*, *Carex hirta*, *Celtis australis*, *Clematis vitalba*, *Crepis nicaeensis*, *Cynodon dactylon*, *Dactylis glomerata* subsp. *glomerata*, *Echium vulgare*, *Erigeron annuus* subsp. *annuus*, *Erysimum diffusum*, *Erysimum repandum*, *Festuca valesiaca*, *Fraxinus pennsylvanica*, *Galium aparine*, *Galium album* subsp. *pycnotrichum*, *Hordeum distichon*, *Lappula squarrosa* subsp. *squarrosa*, *Lepidium densiflorum*, *Lepidium virginicum*, *Lolium perenne*, *Misopates orontium*, *Papaver rhoeas*, *Papaver somniferum*, *Plantago lanceolata*, *Prunus cerasifera*, *Prunus spinosa*, *Raphanus raphanistrum*, *Rapistrum perenne*, *Rumex patientia* s. l., *Sambucus ebulus*, *Senecio vernalis*, *Sonchus oleraceus* subsp. *oleraceus*, *Triticum aestivum*, *Ulmus pumila*, *Vulpia myuros*. At Constanța *Bromus madritensis* is associated with *Ambrosia artemisiifolia*, *Ailanthus altissima*, *Artemisia vulgaris*, *Capsella bursa-pastoris*, *Celtis australis*, *Galium album* subsp. *pycnotrichum*, *Lepidium perfoliatum* and *Sonchus oleraceus*.

***Bromus willdenowii*** Kunth, Révis. Gram. 134 (1829) (Fig. 2, 3)

Synonyms: *Zerna uniolooides* (Kunth) Lindm., *Bromus uniolooides* Kunth, *Bromus schraderi* Kunth, *Ceratochloa uniolooides* (Willd.) P.Beauv., *Serrafalcus uniolooides* (Kunth) Samp., *Bromus catharticus* Vahl, *Ceratochloa haenkeana* C.Presl.

Family: Poaceae (Gramineae)

*Bromus willdenowii* belongs to section CERATOCHLOA (Beauv.) Griseb. that includes perennial species of *Bromus* with ovate or ovate-lanceolate spikelets, strongly compressed, having lower glume 3- to 5-veined, the upper 5- to 7-veined, lemma and

glumes strongly keeled on the back and awn much shorter than lemma or often absent (Smith 1980). *Bromus willdenowii* is a laxly caespitose plant, with erect or ascending stem, up to 100-150 cm high. Leaves, 10-20 cm × 3-12 mm, are glabrous or thinly hairy. The sheaths of upper leaves are glabrous, while those of lower leaves are shortly hairy. The spikelets are grouped in large panicles, with patent or nodding branches, often longer than spikelets. The spikelets have 20-40 × 5-10 mm, are lanceolate to ovate, very strongly compressed, glabrous or scabrid, with 6-12 closely imbricate florets. Glumes are acuminate, unequal, sharply keeled on the back. Lemma has 14-18 × 5-7 mm, is broadly lanceolate, keeled on the back, rather corneous, with awn usually absent or up to 1 mm and weak. Palea is about half as long as lemma. Anthers are up to 4 mm, shorter in cleistogamous florets (Smith 1980).

No representative of the section CERATOCHLOA (Beauv.) Griseb. is spontaneous in our country and *Bromus willdenowii* cannot be confused with other species of *Bromus* from Romanian flora.



**Fig. 2 *Bromus willdenowii* Kunth in Constanța Harbour, May 2008.**

The native distribution range is South America, but it can be found widely naturalized elsewhere (USDA, ARS, National Genetic Resources Program, 2008). Smith (1980) indicates *Bromus willdenowii* as occasionally cultivated for fodder and locally naturalized in Southern Europe (Azores, France, Portugal, C,W and E Russia).

Occurrence in Romania: For first time we recorded this plant to Constanța Harbour, on 23 of September, 2004. This year we found it in the same place: Constanța Harbour, ruderal, near a wall, 12 V 2008, 44°10'12"N 28°39'08"E, leg. G. Negrean & P. Anastasiu.

Mode of introduction: possible with cereals, its location being very close of the berth for cereals.

*Bromus willdenowii* grows in ruderal places. Only three species we recorded around: *Echinochloa crus-galli*, *Sonchus oleraceus* and *Taraxacum officinale*.



**Fig. 3** *Bromus willdenowii* Kunth, detail on spikelets

***Senecio inaequidens*** DC., *Prodromus Systematis naturalis Regni vegetabilis. Parisiis*, **6**: 401 (1838) (Fig. 4, 5)

Synonyms: *Senecio burchellii* DC.

Family: Asteraceae (Compositae)

*Senecio inaequidens* belongs to section Fruticulosi DC. that includes perennial plants with narrow leaves, simple, not divided. It is up to 110 cm high, spherically shaped, with erect stems, more or less glabrous, often numerous branched from the woody base. Leaves are alternate, bright green, simple, slightly thick, usually with clasping stems at the base (occasionally petiolate), becoming reduced in size from the base, very variable, from 3 to 14 cm long and 0.3 to 1 cm wide, with margins denticulate to coarsely and irregularly-toothed. Upper leaves are occasionally pinnately-lobed, shortly petiolate, subsessile or sessile (EPPO 2006). Capitula range from 18 to up to 25 mm diameter, with 12 to 14 bright yellow ligules and numerous disc florets. A single plant could have about 100 capitula. Achenes are 2 mm long, cylindrical, pubescent, with a white pappus, 2 to 3 times as long as achenes, readily detached. They are produced in large numbers.

The native distribution of *Senecio inaequidens* is to South Africa (Heger & Böhmer 2006), but this species occurs widely as naturalized or invasive: Europe, America, Australia (EPPO 2006, Heger & Böhmer 2006). In Europe *Senecio inaequidens* occurs throughout: Belgium, France and Italy (Chater & Walters 1976), Switzerland (Lauber & Wagner 2000), Germany (Haeupler & Muer 2000), Austria (Negrean 2003, 2004, pers. comm., EPPO 2006), Czech Republic, Denmark, Finland, Hungary, Netherlands, Norway, Poland, Spain, Sweden, United Kingdom (EPPO 2006).

Occurrence in Romania: București Triaj, railways ground, 4 VI 2005, leg. G. Negrean; București Triaj, railways ground, 44°28'57"N, 26°00'41"E, 19 VI 2005, leg. P. Anastasiu & G. Negrean.



**Fig. 4 *Senecio inaequidens* DC. in București Triaj, June 2005**



**Fig. 5 *Senecio inaequidens* DC., detail of inflorescences**

*Senecio inaequidens* was introduced into Europe with imports of wool from South Africa. Its presence was first recorded in 1889 in Germany (EPPO 2006). In Romania its introduction was accidental, possibly carried by rail vehicles.

Considering the ecology, *Senecio inaequidens* adapts to a wide range of environments (EPPO 2006), but prefers well-drained and disturbed soils. It can be found from coastal to mountain areas (up to 1900 m altitude). It grows along roads and railways, river banks, wastelands. It is also found in forests (in open places after logging or a fire), in crops (particularly grapevine), fallows, pastures. It can survive in most soils (even salty), it can stand hot and dry summers and overwinter in areas where temperatures reach - 15°C. To București Triaj, *Senecio inaequidens* grows vigorously on railway embankment. Around its location we recorded the following plants: *Acer negundo*, *Ambrosia artemisiifolia*, *Apera spica-venti* s. l., *Artemisia austriaca*, *Bromus tectorum*, *Calamagrostis epigejos*, *Capsella bursa-pastoris*, *Cardaria draba* subsp. *draba*, *Carduus nutans* s. l., *Carex hirta*, *Clematis vitalba*, *Crepis nicaeensis*, *Cynodon dactylon*, *Dactylis glomerata* subsp. *glomerata*, *Echium vulgare*, *Erigeron annuus* subsp. *annuus*, *Erysimum diffusum*, *Erysimum repandum*, *Festuca valesiaca*, *Fraxinus pennsylvanica*, *Galium aparine*, *Hordeum distichon*, *Lappula squarrosa* subsp. *squarrosa*, *Lepidium densiflorum*, *Lolium perenne*, *Misopates orontium*, *Parthenocissus inserta*, *Plantago lanceolata*, *Prunus cerasifera*, *Prunus spinosa*, *Raphanus raphanistrum*, *Rapistrum perenne*, *Rubus caesius*, *Rubus canescens*, *Rumex patientia* s. l., *Sambucus ebulus*, *Senecio vernalis*, *Sonchus oleraceus* subsp. *oleraceus*, *Verbascum speciosum* subsp. *speciosum* etc.

*Senecio inaequidens* has a high reproductive potential. It is estimated that up to 29,000 achenes are produced per plant and per year, and seeds may remain viable in the soil for 30-40 years (Ernst 1998 cf. Heger & Böhmer 2006). Achenes are mainly transported by wind, but also by water, animals and human activities (especially railways). In addition, vegetative propagation can occur by rooting of stems that touch the ground (Ernst 1998 cf. Heger & Böhmer 2006). Germination is rapid and massive, and can take place during most of the year. Germination is also favoured by compacted soils.

According to EPPO (2006), *Senecio inaequidens* is a poisonous plant containing pyrrolizidine alkaloides. It is also considered to be the most invasive in Europe.

***Euphorbia prostrata*** Aiton, Hort. Kew. 2: 139 (1789) (Fig. 6, 7)

Synonyms: *Chamaesyce prostrata* (Aiton) Small, *Tithymalus prostratus* (Aiton)

Samp.

Family: Euphorbiaceae

According to Smith & Tutin (1968), *Euphorbia prostrata* belongs to subgenus *Chamaesyce*. It is a procumbent annual plant, with branches up to 20 cm. Stem is usually glabrous below, pubescent above, but to the material collected in București the stem is all over pubescent. Leaves are 6-10×4-6 mm, ovate, obtuse, with asymmetrical base, serrulate to subentire, sparsely pubescent on both surfaces. Petiole is shorter than 1 mm, Stipules are also shorter than 1 mm, triangular, the upper free, the lower connate. Glands are transversely ovate, with small appendages. Capsule are 1.5×1.2-1.5 mm, shallowly sulcate, sharply keeled, smooth, glabrous except the keels that are ciliate. Seeds are about 1 mm, ovoid-quadrangular, deeply transversely furrowed, grayish.

*Euphorbia prostrata* is a Northern American species. According to Flora Europaea (Smith & Tutin 1968), in Europe is naturalized as a weed and ruderal, occurring in Portugal, Spain, Italy, Sicily and Greece.

Occurrence in Romania: București, Ionel Budișteanu Str., ruderal, near a wall, 44°26'36"N, 26°05'23"E, alt. 82 m, 18 X 2008, leg. G. Negrean.

The mode of introduction is unknown, possible accidentally with some ornamental plants.



**Fig. 6 *Euphorbia prostrata* Aiton, București, October 2008**



**Fig. 7 *Euphorbia prostrata* Aiton, detail of branches with leaves and capsules**

Ecology: It grows in ruderal places, with *Digitaria sanguinalis* subsp. *sanguinalis* in the site from București.

For *Euphorbia* species, subgenus *Chamaesyce*, occurring in Romania, a dichotomous key is presented below:

- 1a Seeds smooth ..... 2  
1b Seeds rugulose ..... 3
- 2a Seeds 3 mm; leaves entire or almost so ..... 1. *Euphorbia peplis* L.  
2b Seeds less than 1.5 mm; leaves serrulate ..... 2. *Euphorbia humifusa* Willd.
- 3a Capsule glabrous or patent pubescent ..... 4  
3b Capsule hairy ..... 5
- 4a Capsule glabrous; leaves 10-30 mm, serrate ..... 3. *Euphorbia nutans* Lag.  
4b Capsule patent-pubescent; leaves 3-7 mm, entire or obscurely serrate .....  
..... 4. *Euphorbia chamaesyce* L.
- 5a Capsule hairy all over; hairs closely appressed ..... 5. *Euphorbia maculata* L.  
5b Capsule hairy on the keels only ..... 6. *Euphorbia prostrata* Aiton

## CONCLUSIONS

Four new alien plants are reported from Romania: *Bromus madritensis* – Mediterranean element, *Bromus willdenowii* – native in South America, *Senecio inaequidens* – native in South Africa, and *Euphorbia prostrata* – native in North America. Their occurrence is limited to few locations in București and Constanța cities, growing in ruderal places or on railway ground. The species of *Bromus* and *Senecio inaequidens* are naturalized, but the last one could become invasive. This species is known from different European countries as one of the most invasive alien plants penetrating even the natural and seminatural habitats. *Euphorbia prostrata* is a casual species.

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# CONSIDERAȚII PRIVIND PAJIȘTILE DINTRE VALEA SĂRĂȚELULUI ȘI VALEA SLĂNICULUI, JUDEȚUL BUZĂU

## REGARDING GRASSLANDS BETWEEN SĂRĂȚELULUI VALLEY AND SLĂNICULUI VALLEY, BUZĂU COUNTY

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Cuvinte cheie: pajiști, habitate Natura 2000, plante rare, stare de conservare, Orchidaceae noi, Vulcanii Noroioși, Buzău, România

Keywords: grasslands, Natura 2000 habitats, rare plants, conservation condition, new Orchidaceae, Mud Volcanoes, Buzău, România

### ABSTRACT

*Cercetările a avut drept scop identificarea habitatelor și speciilor de plante de interes comunitar și național în pajiștile dintre Valea Sărățelului și Valea Slănicului, județul Buzău, precum și a factorilor de amenințare. Aceste cercetări au fost efectuate în cadrul proiectului PN II NARDUS. Rezultatele obținute susțin importanța conservativă a acestei zone și necesitatea includerii ei în rețeaua Natura 2000. De asemenea, pot fi bază pentru planul de management al sitului „Vulcanii Noroioși de la Pâclele Mari și Pâclele Mici”.*

*The main aim of the research was the identification of habitats and plant species of community and national interest from grasslands between Sărățel Valley and Slănic Valley, Buzău County, as well as of the main threats for these. The research was done in frame of PN II NARDUS project. The results emphasise the conservative value of this area and the necessity to include it in the Natura 2000 network. It could also be the base of a management plan for the site „Vulcanii Noroioși de la Pâclele Mari și Pâclele Mici”.*

### INTRODUCTION

The investigated area is bordered by Golul Grabicina Peak and Pelinului Hill to North, Slănic River to East, Buzău River to South and Sărățel River to West. The relief is represented by hills (Pâclelor Hills) axised on the anticlinal Berca-Arbănași, with about 20 km length, Northern-Southern orientation, fragmented in Pâclele Mari region of a transversal rift. The maximum altitude is 598 m on Tocilei Hill (Posea & Ielenicz 1971). The soils are much degraded, mainly represented by levigated chernozem and, on small surfaces, by salt soil. Because of the general aspect, this area is known as “bad earth” (Posea & Ielenicz 1971). The climate is temperate continental, with the annual average temperature of 10.6 °C and the annual average quantity of atmospheric precipitation of 570 mm/year. The winds are mainly from North and North-East, with maximum speed of 6.6 m/s.

The area between Slănic and Sărățel Valleys became of interest for scientists about 140 years ago, when the French petrologist prospector H. Cognad discovered the Mud Volcanoes from Berca, Buzău County (Mititelu et al. 1980). Consequently, this area has been intensely studied by geologists as well as by botanists. Thus, Șerbanescu (1936), Moșneagă (1958), Ciocârlan (1965, 1966a, 1966b, 1968, 1969, 1970, 1972), Mititelu et al. (1980) and Popova et al. (1981) carried out floristic research on this area, focusing on flora and vegetation from Slănic Valley and strictly around the Mud Volcanoes from Pâclele Mari and Pâclele Mici, without extending their studies to Northern and Eastern of area bordered by Slănic and Sărățel rivers.

A small area covering Pâclele Mari and Pâclele Mici (Mud Volcanoes), spreading over 25 hectares, was declared Natural Reserve in 1924. Not only the geologic phenomenon represented by the mud volcanoes, but also *Nitraria schoberi*, an Asiatic

species at their western limit, is protected in this reserve. This plant was identified by Dimitrie Brândză, based on a material collected by Marcel Brândză (Brândză 1889).

96 hectares covering the region with mud volcanoes were included in the Natura 2000 network as Site of Community Interest (SCI) (ANPM 2006). According to the standard fact sheet for this site, the habitat 1530 (Pannonic salt-steppes and salt-marshes) and *Crambe tataria* occur here, as well as a few other important plants such as *Artemisia santonicum*, *Atriplex tatarica*, *Camphorosma annua*, *Ephedra distachya*, *Hordeum hystrix*, *Lepidium ruderales*, *Nitraria schoberi*, *Taraxacum bessarabicum*, *Aster tripolium*, *Bupleurum tenuissimum*, *Dianthus guttatus*, *Halimione verrucifera*, *Lepidium latifolium*, *Limonium gmelinii*, *Puccinellia distans* subsp. *limosa* (ANPM 2006).

A study carried out between 2002-2004 revealed the presence of 37 rare species and three types of habitats in this protected area: salty grasslands, steppes grasslands and Ponto-Balkan forests (Sârbu et al. 2007). Two of the rare plants are species of community interest: *Echium russicum* and *Crambe tataria* (Sârbu et al. 2007).

All these habitats and species do not occur only in the declared SCI, but also on wider areas around. They must be protected not only inside the Natura 2000 sites. For this reason the purpose of our study was to identify the Natura 2000 habitats and species, as well as other important plants, their status of conservation, and the main threats for these. We have to mention that our research was limited to the grasslands.

The results of our study upgrade the information about this important area and represent a valuable tool for management plans.

## MATERIALS AND METHOD

The field work was carried out between May and September 2008, using transects method. Transects were outlined so as to cover the maximum area. For rare plants the number of individuals was counted and the coordinates were registered in WGS 84 system, using a GPS Garmin eTrex Legend C. Digital photos were taken.

The nomenclature of taxa is according to Flora Europaea (Tutin et al. 1968-1980, Tutin et al. 1993) and Illustrated Flora of Romania (Ciocârlan 2000). Rare and threatened species are according to Romanian Red List (Oltean et al. 1994), Romanian legislation (OUG 57/2007), European legislation (Council Directive 92/43/EEC, Bern Convention), and IUCN Red List.

## RESULTS AND DISCUSSION

Two Natura 2000 habitats were identified in the investigated area: 1530 Pannonic salt-steppes and salt-marshes and 62C0 Ponto-Sarmatic Steppes, both of them priorities for conservation (OUG 57/2007).

Pannonic salt steppes are limited to small surfaces around the Mud Volcanoes from Pâclele Mari and Pâclele Mici, as well as at western of Beciu village and on the valleys of Pâclele, Murătoarea and Manciu rivulets. We have to mention that around the Mud Volcanoes from north-eastern of Beciu the soil is nude and characteristic vegetation for salt steppes is absent. Among plant species recorded in this habitat we mention: *Nitraria schoberi*, *Halimione verrucifera*, *Puccinellia distans* s.l., *Scorzonera cana*, *Limonium gmelinii*, *Artemisia santonicum*, *Aster tripolium* subsp. *pannonicus*, *Elymus elongatus*, *Camphorosma annua*, *Suaeda maritima*, *Spergularia media*. However, *Nitraria schoberi* occurs only to Pâclele Mari and Pâclele Mici, forming phytocoenoses with *Artemisia santonicum*: *Nitrario-Artemisietum maritimae* (Fig. 1). The other salt micro-stations are characterized by phytocoenoses with *Limonium gmelinii* and *Artemisia santonicum* belonging to association *Limonio gmelini* – *Artemisietum monogynae*. The plant richness of the salt phytocoenoses has acceptable limits, being at least 10 taxa for *Nitrario* –

*Artemisietum maritimae* association and 20 taxa for *Limonio gmelini* – *Artemisietum monogynae* association. No negative indicator species was identified in researched salt grasslands. The bare ground is above 50% around the Mud Volcanoes from Pâclele Mari and Pâclele Mici, but this is a normal situation.

Assessing the main attributes of the salt phytocoenoses we can conclude that the salt steppes from the investigated area are in a favourable conservation condition.



Fig. 1 Aspect of vegetation with *Nitraria shoberi* at Pâclele Mici

Ponto-Sarmatic Steppes (Fig. 2) occur on wide surfaces situated between Slânic and Sârâţel Valleys, but only about 27 hectares are included as “pastures” in the SCI “Vulcanii Noroioşi de la Pâclele Mari și Pâclele Mici” (ANPM 2006). Data about vegetal associations are limited to the Mud Volcanoes and Slânic Valley. Thus, for this area are reported: *Stipetum capillatae*, *Stipetum stenophyllae*, *Chrysopogonetum gryllii*, *Medicagini – Festucetum valesiaca* (Mititelu et al. 1980). Among the characteristic species for Ponto-Sarmatic Steppes, we recorded: *Festuca valesiaca*, *Chrysopogon gryllus*, *Dichanthium ischaemum*, *Stipa capillata*, *Stipa tirsia*, *Stipa pulcherrima*, *Carex humilis*, *Teucrium polium* subsp. *capitatum*, *Taraxacum serotinum*. Negative indicator species are also present: *Elaeagnus angustifolia*, *Pinus nigra* s.l., *Phragmites australis*. The bare ground is over 5% only on the degraded surfaces, especially those overgrazed.

Taking into account the presence of invasive species and the degraded surfaces we can conclude that the Ponto-Sarmatic Steppes occurring between Slânic and Sârâţel Valley are not in favourable conservation condition. This habitat requires special management measures.

The investigated grasslands are very rich in plant species. In a preliminary study done in 2008 we recorded over 400 taxa. In regard to rare species, according to literary data (Mititelu & al. 1980) and our field research, in the region between Slânic and Sârâţel Valley there are 39 taxa (Table 1). Some of them were probably erroneously indicated by Mititelu et al. (1980): *Lathyrus pannonicus* subsp. *asphodeloides*, *Lotus angustissimus*, *Rhinanthus alectorolophus*. These species do not occur in this part of the country (Ciocârlan 2000).



**Fig. 2 Aspect with Ponto-Sarmatic Steppes on Pâclelor Hills**

Among the recorded rare species there are three of community interest: *Echium russicum* (Fig. 3), *Crambe tataria* (Fig. 4) and *Iris aphylla* subsp. *hungarica*. Taking into account the limits of their attributes (Goriup 2008), we appreciate that their conservation condition is favourable. Their chorology is presented below:

*Echium russicum* – Joseni NE, 45°19'41"N, 026°39'52"E, 16/05/2008, 49 specimens; Policiori SE, 45°20'12"N, 026°40'42"E, 15/06/2008, 104 specimens; Pâclele Village SW, 45°19'24"N, 026°41'38"E, 15/06/2008, 89 specimens; Pâclele Village SE, 45°19'34"N, 026°42'35"E, 14/06/2008, 4 specimens; Pâclele Mari N, 45°20'34"N, 026°42'24"E, 11/11/2008, 3 specimens; Pâclele Mici SW, 45°21'24"N, 026°42'51"E, 16/05/2008, 2 specimens; Măgura peak (Pâclele Mici NW), 45°21'40"N, 026°42'03"E, 17/05/2008, 5 specimens; Muchea Leoaicei, 45°22'07"N, 026°41'56"E, 15/06/2008, 50 specimens; Beciu NW, 45°22'43"N, 026°41'24"E, 30/07/2008; 6 specimens; Golul Grabicina N, 45°25'47"N, 026°41'46"E, 30/07/2008; 2 specimens.

*Crambe tataria* - Pâclele Mici SW, 45°21'01"N, 026°41'52"E, 16/05/2008, 3 flowering specimens; Măgura peak (Pâclele Mici NW), 45°21'39"N, 026°41'58"E, 17/05/2008, 6 flowering specimens; Muchea Leoaicei, 45°22'07"N, 026°41'56"E, 15/06/2008, 10 flowering specimens; Grabicina N, 45°25'37"N, 026°41'44"E, 30/07/2008, 389 non-flowering specimens.

*Iris aphylla* subsp. *hungarica* - Pâclele Mici S-SW, 45°20'53"N, 026°41'55"E, 16/05/2008, 3 specimens; Dealul Pâclele Mici, 45°21'38"N, 026°42'14"E, 17/05/2008, 5 specimens.

Beside these species, orchids make valuable the grasslands from investigated area. We identified the next taxa, not recorded here previously:

*Gymnadenia conopsea* – Cănești N, 45°24'20"N, 026°35'55"E 16/06/2008, one specimen.

*Epipactis helleborine* - Cănești N, 45°24'21"N, 026°35'58"E 16/06/2008, one specimen.

*Listera ovata* – Pâclele Mici SW, 45°21'02"N, 026°41'52"E, 16/05/2008, one specimen.

*Ophrys scolopax* subsp. *cornuta* (Fig. 5a) – Cănești N, 45°24'21"N, 026°36'07"E, 16/06/2008, 27 specimens.

*Orchis coriophora* – Pâclele Village SW, 45°19'23"N, 026°41'39"E, 14/06/2008, 5 specimens; Cănești NE, 45°24'16"N, 026°36'02"E, 16/06/2008, 5 specimens.

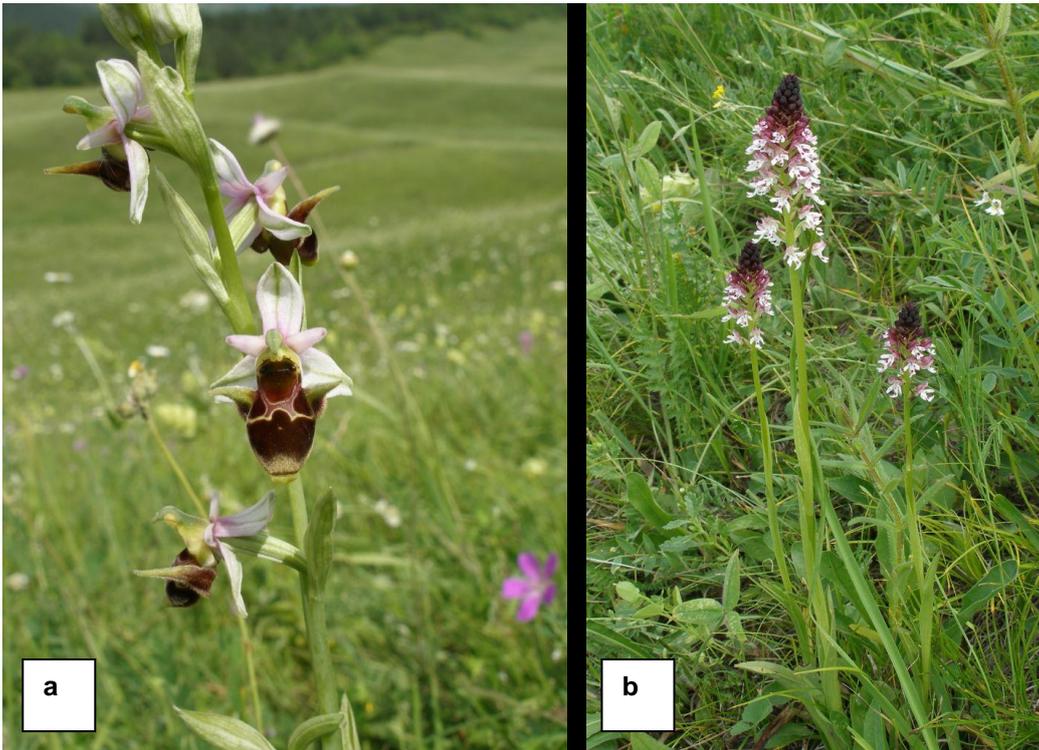
*Orchis ustulata* (Fig. 5b) – Pâclele Village W, 14/06/2008, 7 specimens; Cănești N, 45°24'18"N, 026°36'08"E, 16/06/2008, 26 specimens; Măgura peak (Pâclele Mici NW), 45°21'40"N, 026°41'57"E, 17/05/2008, 2 specimens; Muchea Leoaicei, 45°22'08"N, 026°41'57"E, 15/06/2008, 5 specimens.



**Fig. 3 *Echium russicum* on Pâclelor Hills, June 2008**



**Fig. 4** *Crambe tataria* on Pâclelor Hills, June 2008



**Fig. 5** *Ophrys scolopax* subsp. *cornuta* (a) and *Orchis ustulata* (b) to Cănești, June 2008

Table 1 *Rare plant species in grasslands between Slănic and Sărățel Valleys*

No.	Taxa	RRL	Other lists
1.	<i>Adonis vernalis</i>	R	
2.	<i>Agrostis moldavica</i>	R	IUCN-R
3.	<i>Allium atroviolaceum</i>	R	
4.	<i>Astragalus dasyanthus</i>	R	
5.	<i>Buglossoides glandulosa</i>	R	IUCN-I
6.	<i>Carex liparocarpos</i> subsp. <i>liparocarpos</i>	R	
7.	<i>Centaurea atropurpurea</i>	R	
8.	<i>Centaurea neiceffii</i>	R	
9.	<i>Centaurea scabiosa</i> subsp. <i>adpressa</i>	R	
10.	<i>Cirsium boujarti</i>	R	IUCN-R
11.	<i>Crambe tataria</i>	R	HD&OUG57/2007
12.	<i>Dianthus guttatus</i>	R	
13.	<i>Echinops ritro</i> subsp. <i>ruthenicus</i>	R	
14.	<i>Echium russicum</i>	-	HD&OUG57/2007
15.	<i>Ephedra distachya</i>	R	
16.	<i>Epipactis helleborine</i>	R	
17.	<i>Gymnadenia conopsea</i>	R	
18.	<i>Iris aphylla</i> subsp. <i>hungarica</i>	-	HD&OUG57/2007
19.	<i>Iris brandzae</i>	V/R	
20.	<i>Lathyrus pannonicus</i> subsp. <i>asphodeloides</i>	R	
21.	<i>Linaria bessarabica</i>	R	
22.	<i>Listera ovata</i>	R	
23.	<i>Lotus angustissimus</i>	R	
24.	<i>Mercurialis ovata</i>	R	
25.	<i>Nitraria schoberi</i>	R	
26.	<i>Ophrys scolopax</i> subsp. <i>cornuta</i>	R	
27.	<i>Orchis coriophora</i>	R	
28.	<i>Orchis ustulata</i>	R	
29.	<i>Plantago cornuti</i>	R	
30.	<i>Platanthera bifolia</i>	R	
31.	<i>Rhinanthus alectorolophus</i>	R	
32.	<i>Sagina apetala</i> subsp. <i>apetala</i>	R	
33.	<i>Salvia aethiopsis</i>	R	
34.	<i>Salvia transilvanica</i>	R	IUCN-R
35.	<i>Scorzonera parviflora</i>	R	
36.	<i>Serratula radiata</i>	R	
37.	<i>Silene viscosa</i>	R	
38.	<i>Stipa pulcherrima</i>	R	
39.	<i>Viola kitaibeliana</i>	R	

Abbreviations: RRL=Romanian Red List (Oltean et al. 1994), R= rare, V=vulnerable, I=indeterminate, HD= Habitat Directive, IUCN=International Union for Conservation of Nature, OUG=Urgency Ordinance of the Government.

We identified as threats for habitat and plant species in the area between Slănic and Sărățel Valleys the following: overgrazing, forestation, presence of invasive species, developing of infrastructure, tourist activities and garbage deposition. Some grasslands are mowed, while others are grazed by sheep, goats or oxen. Between Pâcle and Policiori villages, as well as to the West of Beciu village, the pressure on the grasslands is high because the number of cattle. Numerous paths and patches without vegetation could be seen in these areas. At Pâclele Mari sheep graze *Nitraria shoberi*.

In the last years the Mud Volcanoes have become more and more interesting for tourists. As a result, a special road for tourists and a pension with small capacity was built to Pâclele Mici. Their direct impact on habitats and rare species is minor. This year the construction of a new pension started not far from Pâclele Mari. An increase in the number of tourists is expected, which is likely to put pressure on the environment. These places are seen as suitable for different events such as car, motorbike and ATV races.

Landslide is a natural phenomenon occurring here frequently. For this reason some surfaces were forested with *Pinus nigra* s.l., *Pinus sylvestris* and *Elaeagnus angustifolia*.

At present all of them could be recorded as sub-spontaneous in grasslands. Moreover, *Elaeagnus angustifolia* is very spread at west of Pâclele Mari and Pâclele Mici where it forms dense thickets (Fig. 6).



**Fig. 6 Grasslands covered with *Elaeagnus angustifolia* at eastern of Pâclele Mari, June 2008**

In Southern of the investigated area we identified a large surface of grassland covered with abandoned tankers and other materials of the oil industry which have a negative impact on landscape. Furthermore, the garbage deposit of Berca village could be a source of environment contamination and degradation.

For plan management of Natura 2000 habitats and species occurring on area between Slânic and Sârățel Valleys we propose:

- maintenance of the traditional grazing regime, on special areas, all the vegetation season;
- decrease of the number of cattle in overgrazed areas, especially between Pâclele and Policiori villages;
- traditional cutting of hay, after maturation and dissemination of the majority of plants;
- control of invasive species, not only alien ones (e.g. *Elaeagnus angustifolia*), but native too (e.g. *Phragmites australis*). For *Elaeagnus angustifolia* it is necessary that smaller trees be removed, larger plants be cut at ground level and stumps buried or treated with an herbicide (Weber 2005); the local practice consisting of shrubs cutting from the grassland must be maintained;
- limit the forestation to very degraded surfaces, but only with native shrubs or trees.

## **CONCLUSIONS**

In investigated area situated between Slânicului and Sârățelului Valleys, we identified two grassland habitats of community interest: Pannonic salt-steppes and salt-marshes (1530\*) and Ponto-Sarmatic steppes (62C0\*). The first habitat occupies limited surfaces near the Mud Volcanoes from Pâclele Mari and Pâclele Mici, as well as to West of Beciu village and on the valleys of Pâclele, Murătoarea and Manciu rivulets. Instead, the

second habitat occupies wider surfaces in this area, dominated by vegetal associations with *Festuca valesiaca*, *Chrysopogon gryllus*, *Dichanthium ischaemum*, *Stipa capillata*, *Stipa tirsia*. We have to mention that these surfaces are mainly outside of the SCI „Vulcanii Noroioși de la Pâclele Mari și Pâclele Mici”. We underline that the first habitat is in favourable conservation condition, while the second one requires some management measures.

The researched grasslands shelter three plant species of community interest: *Crambe tataria*, *Echium russicum* and *Iris aphylla* subsp. *hungarica*. The last two were not included in the standard list of the mentioned SCI, even though they are present in this area and were previously reported by Ciocârlan (1968) and Mititelu et al. (1980). Among the species of national interest mentioned in OUG 57/2007 we only identified *Nitraria schoberi* in the researched area. All of these species are in favourable conservation condition.

Some orchids not previously reported from this region were identified: *Epipactis helleborine*, *Gymnadenia conopsea*, *Listera ovata*, *Orchis coriophora*, *Orchis ustulata* and *Ophrys scolopax* subsp. *cornuta*.

Among threats with high negative impact we can mention the overgrazing and the presence of the invasive plant *Elaeagnus angustifolia*. Related to these threats, few management measures are proposed to keep the habitat and species at favourable conservation condition.

Taking into account the high plants diversity of these grasslands and the number of rare elements, we propose to extend the site of community interest „Vulcanii Noroioși de la Pâclele Mari și Pâclele Mici” to all area between Sărățel Valley and Slănic Valley. This SCI could be named Pâclelor Hills (Dealurile Pâclelor).

#### **Acknowledgements:**

This field research was supported by the grant PN II NARDUS (No. 31033/2007).

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# THE STUDY AND EVALUATION OF SEVERAL VARIETIES OF HOT PEPPER

## STUDIUL ȘI EVALUAREA UNOR VARIETĂȚI DE ARDEI IUTE

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**Key words:** hot pepper, spicy, capsaicin.

### ABSTRACT

*Au fost luate în studiu 8 varietăți de ardei iute de origini diferite, s-au evidențiat câteva caractere morfologice ale plantelor și fructelor precum și capacitatea de producție a acestora.*

*Soiul de Cayenne (1.05 kg/mp) a fost folosit ca variantă martor pentru celelalte 7 varietăți: Proveniența de Ișalnița (2,12 kg/mp), proveniența de Almăj (2,11 kg/mp), Proveniența de Corabia (2,04 kg/mp), Șapte Frați (1,44 kg/mp), SCDL -1 (1,51 kg/mp), SCDL-2 (1,2 kg/mp) și Proveniența de Italia (1,25 kg/mp).*

*We have studied 8 varieties of hot pepper of different origins by correlating several plant and fruit morphological characters and the different capacity of production.*

*The De Cayenne (1.05 kg/mp) variety was used as control in order to achieve the proposed objectives and was compared to 7 varieties of chili pepper: from Ișalnița (2,12 kg/mp), from Almăj (2,11 kg/mp), from Corabia (2,04 kg/mp), Seven brothers (1,44 kg/mp), SCDL -1 (1,51 kg/mp), SCDL-2 (1,2 kg/mp) and from Italia (1,25 kg/mp).*

### INTRODUCTION

Chili pepper (*Capsicum annuum* L. *spp. annuum*, conv. *microcarpum* Filov) has a widespread use, both as spice in food industry and as counterirritant in treating rheumatism. Latest research in the pharmaceutical industry indicates that capsaicin activates the metabolism and increases body immunity.

The chili pepper varieties cultivated in Romania are limited. Only 5 varieties are present in "The Official Catalogue of Romanian Cultivars and Hybrids": Arădean, De Arad, lute delicios, Picant and lute portocaliu. However, many local populations and varieties, as well as foreign ones (especially Hungarian) are cultivated on farms and households.

We have studied 8 varieties of chili pepper of different origins by correlating several plant and fruit morphological characters and the different capacity of production.

### BIOLOGICAL MATERIAL AND METHOD

The De Cayenne variety was used as control in order to achieve the proposed objectives and was compared to 7 varieties of chili pepper that SCDL Isalnita had collected from farms in Oltenia.

The experiment took place at SDE Banu Mărăcine, in the didactic field, on a red brown soil with 2m depth phreatic water.

The planting set-up was modified according the drip irrigation system: 90 cm between strips, 70 cm between rows in a strip and 30 cm between plants in a row, thus obtaining a 4-5 plants/row ratio.

Specific chili pepper technology was applied.

V1 – the control is the De Cayenne variety from ZORZI Italy. The plant has a 50-60 cm length, the bush is roughly spread, with long, base corrugated fruits, dark green at technical maturity and red at physiological maturity. The average fruit weigh is 3.4 g. The potential production is 1.05 kg/mp.

V2 – from Isalnita, Dolj has a 50-60 cm length, a spread bush, dark green at technical maturity and red at physiological maturity fruits and an average fruit weigh of 11.1 g. The potential production is 2.12 kg/mp.

V3 – from Almaj, Dolj has a 50-60 cm length, a spread bush, light green at technical maturity and red at physiological maturity fruits and an average fruit weigh of 8.8 g. The potential production is 2.11 kg/mp.

V4 – from Corabia, Olt has a 40-50 cm length, a spread bush, yellow at technical maturity and red at physiological maturity fruits and an average fruit weigh of 9.0 g. The potential production is 2.04 kg/mp.

V5 – Seven Brothers is widely spread all over Oltenia. The bush is compact, spread from the base, with cluster fructification. The fruits are small, very spicy, erectly set on the plant, dark green at technical maturity and red at physiological maturity. The average fruit weigh is 2.8 g. The potential production is 1.44 kg/mp.

V6 – SCDL 1 is the result of a hybrid population selection. The plant is spread and 45-55 cm in length. The fruits are small, very spicy, erectly set on the plant, light green at technical maturity and orange at physiological maturity. The average fruit weigh is 2.9 g. The potential production is 1.51 kg/mp.

V7 – SCDL 2 is the result of a hybrid population selection. The plant is spread and 45-55 cm in length. The fruits are small, very spicy, erectly set on the plant, yellow at technical maturity and orange at physiological maturity. The average fruit weigh is 3.1 g. The potential production is 1.2 kg/mp.

V7 – from Italy. The plant is 45-55 cm in length, with a spread bush. The fruits are small, bell shaped, spicy, erectly set on the plant, dark green at technical maturity and dark red at physiological maturity. The average fruit weigh is 9.9 g. The potential production is 1.25 kg/mp.

Biometric observations and determinations were taken during the vegetation period; the obtained data was statistically analysed by variable analysis.

## RESULTS AND DISCUSSION

Partial results from chili pepper varieties studied in 2008 at SDE Banu Mărăcine are rendered in table 1.

Table 1

Production Capacity of Chili Pepper Varieties

Variety	Production		± kg/m <sup>2</sup>	Significance
	Total kg/mp	Relative %		
V <sub>1</sub> (mt) - De Cayenne	1,05	100,0	-	
V <sub>2</sub> – Proveniență de Ișalnița	2,12	201,9	+1,07	***
V <sub>3</sub> - Proveniență de Almăj	2,11	200,9	+1,06	***
V <sub>4</sub> - Proveniență de Corabia	2,04	194,3	+0,99	**
V <sub>5</sub> – Șapte frați	1,44	137,1	+0,39	
V <sub>6</sub> – SCDL 1	1,51	143,8	+0,46	
V <sub>7</sub> – SCDL 2	1,20	114,3	+0,15	
V <sub>8</sub> - Proveniență de Italia	1,25	119,0	+0,20	

DI 5=0,55 kg/m<sup>2</sup>; DL1%=0,75 kg/m<sup>2</sup>; DL0,1%=1,01 kg/m<sup>2</sup>

Total production ( $\text{kg/m}^2$ ) ranges from  $1,05 \text{ kg/m}^2$  (De Cayenne control variety) to  $2,12 \text{ kg/m}^2$  (Proveniență de Ișalnița), with a relative production of 201,9% of the control and a high statistical significance ( $+1,07 \text{ kg/m}^2$ ).  $V_3$  variety, Proveniență de Almăj, differs from  $V_2$  only by fruit color at technical maturity and also has a high statistical significance ( $+1,06 \text{ kg/m}^2$ ).  $V_4$ , variety, Proveniență de Corabia, has a total production of  $2,04 \text{ kg/m}^2$ , also statistically significant.  $V_5$ ,  $V_6$ ,  $V_7$  and  $V_8$  varieties have total productions that are superior to the control without being statistically significant.

**Table 2**

**Main Plant Morphological Traits**

Variety	Stem length to first ramification (cm)	Plant height (cm)	Bush shape
$V_1$ (mt) - De Cayenne	14,2	48,2	roughly spread
$V_2$ – Proveniență de Ișalnița	17,6	52,6	spread
$V_3$ - Proveniență de Almăj	18,4	51,6	spread
$V_4$ - Proveniență de Corabia	21,0	48,2	roughly spread
$V_5$ – Șapte frați	-	38,6	compact
$V_6$ – SCDL 1	16,6	48,2	spread
$V_7$ – SCDL 2	16,2	51,0	spread
$V_8$ - Proveniență de Italia	17,8	54,6	spread

The stem length to first ramification ranges from 14,2cm to 21,0cm, except for the  $V_5$  variety, Șapte frați, which branches out from soil surface, with a compact bush and cluster fructification.

Plant height is highly variable (from 35-40 cm to over 50 cm).

Bush shape is compact for  $V_5$  – Șapte frați, roughly spread for  $V_1$  (mt) - De Cayenne and  $V_4$  - Proveniență de Corabia and spread for the other varieties.

Higher production could be obtained by increasing the plants/surface unit ratio, especially for the compact bush variety  $V_5$  – Șapte frați (beyond 10 plants/ $\text{m}^2$ ).

**Table 3**

**Main Fruit Morphological Traits**

Variety	Length (cm)	Diameter (cm)	IF L/D	Weight (g)	Fruits per plant	Fruit color at maturity	
						Technical	Physiological
De Cayenne	8,5	1,1	7,7	3,4	62	Dark green	Red
Proveniență de Ișalnița	10,1	1,7	5,9	11,1	39	Green – dark green	Red
Proveniență de Almăj	9,4	1,6	5,9	8,8	52	Light green	Red
Prov. de Corabia	9,5	1,5	6,3	9	47	Yellow	Red
Șapte frați	5,6	1,1	5,1	2,8	104	Dark green	Red
SCDL 1	5,3	1,4	3,8	2,9	107	Light green	Orange
SCDL 2	6,2	1,3	4,8	3,1	80	Yellow	Orange
Proveniență de Italia	2,2	3,5	0,6	9,9	26	Dark green	Deep red

The main fruit morphological traits and some productivity elements are highly variable.

Fruit length ranges from 2,2cm to 10,1cm. Fruit diameter presents low values, from 1,1 cm to 1,6 cm, excepting V<sub>8</sub> – Proveniență de Italia with 3,5 cm.

The shape index is the fruit length to fruit diameter ratio and roughly indicates the fruit shape. A ratio below 1 suggests a globular fruit (V<sub>8</sub> – Proveniență), while ratios of 3,8, 4,8 and 5,1 indicate shorter or longer fruits.

The fruit mean weight has lower values for Șapte frați (2,8g), SCDL 1(2,9g), SCDL 2(3,1g) and De Cayenne (3,4g) and higher values for the other varieties (8,8g for Proveniență de Almăj, 9,0g for Proveniență de Corabia and 11,1g for Proveniență de Ișalnița).

The average fruit per plant number is negatively correlated to fruit size and weight. Varieties with small fruits have a higher fruit/plant number: 107 fruits/plant for SCDL 1, 104 fruits/plant for “Șapte frați”, 26 fruits/plant for Proveniență de Italia, 39 fruits/plant for Proveniență de Ișalnița and 62 fruits/plant for De Cayenne.

Fruit color at technical maturity is generally green or dark green, except for the Proveniență de Corabia and SCDL 2 varieties, which present the rare, color yellow. The predominant physiological maturity color is red, except for orange for the SCDL 1 and SCDL 2 varieties.

In the future we intend to measure the ascorbic acid and capsaicin content of the studied chili pepper varieties fruits in order to establish their use (food or pharmaceutical industry).

Considering chili pepper prices on the free market, all studied varieties are important from the economical point of view.

## CONCLUSIONS

The most valuable varieties from the productive point of view are Proveniență de Ișalnița (2,12 kg/m<sup>2</sup>), Proveniență de Almăj (2,04 kg/m<sup>2</sup>) and Proveniență de Corabia (2,04 kg/m<sup>2</sup>);

- Proveniență de Ișalnița, Proveniență de Almăj and Proveniență de Corabia varieties have the largest fruits;
- Proveniență de Corabia and SCDL 2 varieties have yellow fruits;
- Șapte frați, SCDL 1 and SCDL 2 varieties have a distinct, decorative aspect.

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De Cayenne



Proveniența de Almăj



Proveniența de Ișalnița

Pro



Proveniența de Corabia



Şapte frați



SCDL 1



SCDL 2



Proveniența de Italia

# INSUSIRI EREDITARE IMPORTANTE ALE LINIILOR DE PORUMB CONSANGVINIZATE

## IMPORTANT GENOMIC FEATURES WITH FEW INBRED CORN LINES

*H. Badescu, C. Salceanu*

**Keywords:** corn, hybrids, features, inbred lines

### **ABSTRACT**

*Variabilitatea fenotipică a unor linii consangvinizate de porumb poate fi interpretată ca factor de bază în realizarea unui heterozis performant la hibridii în care sunt incluse liniile respective.*

*Liniile consangvinizate se caracterizează prin existența plantelor mai puțin viguroase, mai scunde cu o capacitate de producție mai redusă, ritm de creștere și dezvoltare încetinite, o capacitate de adaptare mai scăzute, ca urmare a consangvinizării.*

*Prin consangvinizare nu se produce întotdeauna o degenerare ci favorizând segregarea și exprimarea genelor cu efecte negative și favorabile, selecția devine mai eficientă.*

*The phenotypical variability of inbred lines can be interpreted as basis factor in the achieving of a high heterosis with the hybrids that are those inbred lines included in. The inbred lines are characterized by the presence of less developed plants, shorter, with a lower yielding capacity, reduced growing rhythm, lower adapting capacity as a result of inbreeding process. By inbreeding is not always produced the degeneration yet the segregation and expression of the negative or unfavorable genes. In such conditions the selection become more difficult. Our research has identified the way these characters can be avoided.*

### **INTRODUCTION**

The researches have been carried out at the Research Station of Simnic, on a brown-reddish luvisc soil within the Plant Breeding Laboratory, Seed Production and Plant Protection. The material was represented by 13 inbred lines (7 romanian and 6 foreign). The methodology for the evaluation of the studied material represented by inbred lines have consisted of experimenting these lines in comparative trials of two rows in three replications. The planting was performed by the planter, 2-3 seeds in a place. The eliminating of the exceeding plants was made at 4-6 leaves phase ensuring a density of 50,000 plants/hectare. The experiment was set up using the randomized block method.

### **MATERIAL AND METHOD**

There have been made measurements of the plants during the milk – wax phase of the corn for each variant measuring 30 plants in order to get an average value. For every line of the two there was used as control the values of the normal inbred line. The variability degree of the two studied factors was established by analysis of the variation chain taking account of  $\bar{x} \pm s_x$  and  $s\%$ . As we can see, in the case of the plant height the crossing of Ic 349 with the androsterile source has conducted to a more pronounced heterosis in comparison with the one achieved with Ic 85206, the plant height being at Ic 349 T with 10.8% and with Ic 349 ES with 8.6% more than Ic normal. As regard the height of the main cob insertion, the values of the androsterile lines are similar with the ones of the androfertile analogues.

## RESULTS

The results are about the following aspects:

- plant features: the total height (including the panicle), the insertion height of the main cob, the number of cobs per plant, nr. of leaves per plant, foliar surface, nr. of branches per panicle.

- cobs features: the length, the number of rows, number of grains in a row, the cob diameter, the rachis diameter, the grain depth.

- performance features: the grain yield, the dry matter, the grain randament, the mass of a thousand grains and the mark of cob tilth.

The amplitude of the variation of the values that represent the height of the plants as s% show a higher uniformity of the normal lines in comparison with the androsterile ones and of the two, more uniform is lc 85206. Regarding the insertion height there are not significant differences in all 6 cases that are the variants of the two analysed inbred lines. Overall, it can be appreciated that the uniformity of the insertion height show that the selection works applied during the crossings with the androsterile source have been properly conducted and the androfertile analogues obtained both with the T type ms and ES ms have phenotypical uniformity that is indispensable for the obtaining of performant hybrids.

**Table 1**

**The analysis of the calculated variation with 6 characters of the plant with the studied inbred lines**

Genotype	Total height (cm)	Cob insertion height (cm)	Number of cobs to 100 pl. (prolificit.)	Foliar surface (dm <sup>2</sup> )	Branches/panicle	SGUT Emerg-bloom
F 408	243*	88*	1.39**	39.52	5.0 <sup>000</sup>	759.9
F 406	208	55 <sup>00</sup>	1.10	47.26	9.2	750.8
F 403	175	60 <sup>0</sup>	1.17	33.97	13.6***	750.8
§ 235	233	83	1.30*	40.65	9.4	750.8
§ 151	220	95**	1.34**	48.42	15.0***	750.8
§ 64	233	93*	1.35**	58.24**	10.6	769.6
§ 13	175	83	1.03	44.87	13.4***	780.2
K 5361	188	75	1.14	27.37 <sup>00</sup>	4.2 <sup>000</sup>	659.3
K 8112	170 <sup>0</sup>	60 <sup>0</sup>	1.11	34.32	4.6 <sup>000</sup>	740.3
K 9340	215	73	1.15	47.23	4.6 <sup>000</sup>	793.5
K 7448	193	68	1.20	37.38	4.8 <sup>000</sup>	787.8
K 4432	205	90*	1.03	47.72	4.6 <sup>000</sup>	838.3
K 7619	165 <sup>0</sup>	68	1.17	42.28	4.4 <sup>000</sup>	838.3
Media	205	75	1.12	42.15	9.30	766.95
S2E	439.5	69.86	0.01	21.89	0.83	7682.1
DL 5%	37	15	0.13	8.33	1.62	156
DL 1%	52	21	0.18	11.69	2.28	219
DL 0.1%	74	29	0.25	16.50	3.22	309

Table 2

The analysis of the calculated variation with 6 characters of the cob with the studied inbred lines

Genotype	Cob length (cm)	Nr. of grains rows on a cob	Nr. of grains in a row	Average mass of a cob (g)	Average diam.	Average diam of the rahis (cm)
F 408	17.8	14.3	35.3	134.3	3.7	2.4
F 406	16.7	15.6	35.0	146.6	3.8	2.4
F 403	13.6	14.7	28.8	154.3	4.0	2.9*
§ 235	15.7	16.8	37.4	128.7	3.9	2.8
§ 151	13.0	14.5	32.5	146.0	4.2	2.6
§ 64	18.3	12.9	45.0***	150.8	3.2*	2.1
§ 13	18.8*	15.8	37.8	115.8	3.5	2.4
K 5361	13.8	12.4	20.8 <sup>00</sup>	93.4 <sup>00</sup>	3.8	2.4
K 8112	14.7	17.3*	29.5	134.8	32.9	2.3
K 9340	16.0	16.6	30.5	140.9	4.0	2.6
K 7448	18.3	13.2	31.3	96.5 <sup>00</sup>	3.6	1.9*
K 4432	16.1	15.1	33.5	128.0	3.9	2.5
K 7619	15.3	14.0	30.8	120.2	3.9	2.3
Media	15.9	14.9	32.7	134.6	3.9	2.4
S2E	3.56	2.60	13.40	173.62	0.17	0.06
DL 5%	3.4	2.9	6.5	23.5	0.7	0.4
DL 1%	4.7	4.0	9.1	32.9	1.0	0.6
DL 0.1%	6.7	5.7	12.9	46.5	1.5	0.9

Table 3

The analysis of the calculated variation for 4 characters of performance with the studied inbred lines

Genotype	Average grain yield (q/ha)	Dry matter (%)	Grain randam. (%)	MMB
F 408	46.1	78.1	79	328**
F 406	55.5**	75.98	77	263
F 403	46.9	75.7	78	297
§ 235	39.8	77.9	72	206 <sup>0</sup>
§ 151	47.4	80.5	76	208 <sup>0</sup>
§ 64	47.7	78.8	76	229
§ 13	29.9 <sup>00</sup>	79.6	72	183 <sup>00</sup>
K 5361	38.3	83.4*	79	260
K 8112	42.6	73.3*	75	315**
K 9340	50.0*	75.8	71	290
K 7448	32.3 <sup>00</sup>	80.5	78	263
K 4432	44.9	76.0	72	231
K 7619	36.3	80.3	79	231
Media	43.3	78.1	76	252
S2E	18.11	5.70	69.07	732.90
DL 5%	7.58	4.25	14.79	48.19
DL 1%	10.63	5.96	20.76	67.64
DL 0.1%	15.01	8.42	29.31	95.49

## CONCLUSIONS

1. Phenotypical variation of some inbred corn lines can be interpreted as basis factor in achieving a high heterosis with the following hybrids.
2. The theoretical researches and the practice of breeding have influenced the hybridization between inbred lines as the most effective method
3. With the researches about the androfertile and androsterile inbred lines on a whole there can be appreciated that uniformity of the plant height of insertion show that the breeding works with the androsterile source have been properly conducted and the androsterile analogues as T ms type and ES ms have phenotypical uniformity that is indispensable for the elite hybrids of the future.
4. With all cases of phenotypical differentiation of the studied lines it is close as value with the local inbred lines and the foreigner ones, cobs features as well as the performance features. This observation illustrates the fact that the breeding methods have reached a standardization level and the finding of hybrid combinations overpass the existing material is more and more difficult.

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# RESEARCH PAPER REGARDING HUNGARIAN OAK AND TURKEY OAK GROWTH AND EVOLUTION WITHIN BRUSHES LOCATED IN THE WESTERN PART OF THE GETIC PLATEAU

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## INTRODUCTION

Ecosystems with Hungarian oaks and Turkey oaks formed stable structures across the time, but were seriously affected during 1989-1994 by extended draught, followed by massive drying.

The intensity of the drying phenomenon manifested differently in the case of the two species, being more intense in Hungarian oaks, in brushes of various ages.

The decline in Hungarian oaks and Turkey oaks resulted in the initiation of research activities with an extensive character of evaluation of the state of brushes and the degree of influence on trees.

Draught also affected installed seedlings and the regeneration of Hungarian oak brushes underwent a difficult period. Very extended surfaces of Hungarian oaks and Turkey oaks in the studied territory and, especially, in the South of the territory, do not allow for the restoration of forests by plantations, and the substitution of such species is impossible. Given the physical-geographical and climate conditions of this territory, Hungarian oaks and Turkey oaks are the only species likely to make woods and use existing resorts.

Therefore, known solutions for the regeneration of brushes of Hungarian oaks and Turkey oaks have to be adjusted to the new conditions and optimal solutions have to be found for the remediation of the process of regeneration of the two species. The behaviour of the two species is different in what regards the growth of seedlings in the individual development phase.

Research on growth and development under various concrete conditions will result in scientific solutions on the possibilities of regeneration in Hungarian oaks and Turkey oaks, with applicability in production.

Researches were made between 2000 and 2006 in brushes with Hungarian oaks and Turkey oaks at the West of the Getic Plateau included in the Jiu basin. During the research, we dealt with difficulties regarding the lack of fructification in Hungarian oaks and, implicitly, seedlings, in the first years from the commencement of research.

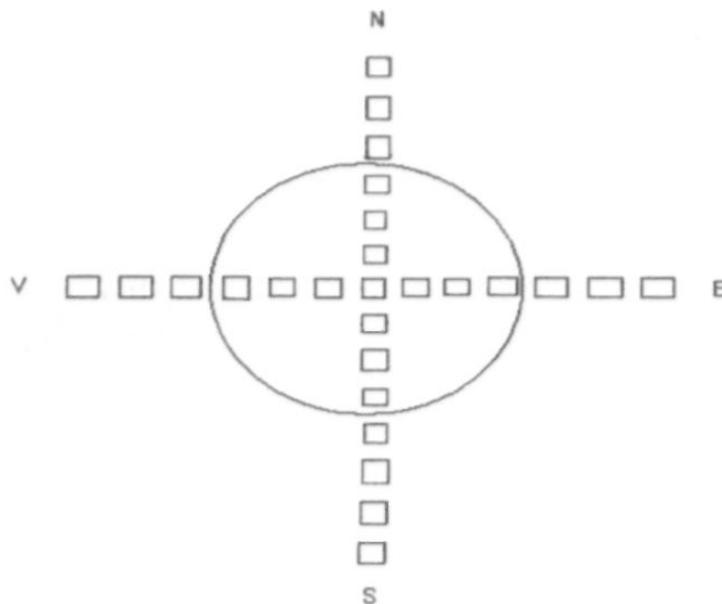
Hungarian oaks and Turkey oaks make up pure or combined brushes and generally occupy the same places in which soils are heavy, argillaceous (preluvosoils), vertic, and the climate is draughty, with multi-annual average temperatures ranging from 10 to 11°C and low precipitations, between 500 and 700 mm. Through physiological adjustments, Turkey oaks also bear lower temperatures, which is why its area is more extended in latitude, to the North, but also to the South, including the Hungarian oak area.

The evolution of seedlings was analysed in its development, both during a vegetation season and from installation to the removal of maternal brush or the closure of the storey status. The phenomenon includes various aspects and a wide range of situations of which we chose, for the study, the part which may be observed and determined during a vegetation season, through the growths occurring in seedlings, as well as the result of

multi-annual growths summing up the action of ecological factors during a longer time period.

## MATERIALS AND RESEARCH METHOD

For solving goals, a wide range of researches was initiated, developed on site and in the office. Experimental researches were performed for establishing the most efficient methods of regeneration of Hungarian oak and Turkey oak, under normal vegetation conditions, as well as in high oscillation conditions of primary ecological factors. Experiences refer, firstly, to the study of progressive cutting, which is why permanent experimental research surfaces were installed. Group cuts of various dimensions, in various types of woods in the main locations of Hungarian oaks and Turkey oaks in the studied territory, were opened in such surfaces.



**Fig. 1** Sample of permanent plot installed both in group cuts and under storey

Inside group cuts, on the direction of the four cardinal points, permanent trial surfaces were delimited at equal distances (1 meter), where periodical measurements were performed on the above-mentioned properties. Likewise, measurements were made on light and heat, for determining micro-climate conditions by areas in each group cut, as well as on the daily variation thereof, by seasons and vegetation seasons, using thermometers and light meters. The complex effect of determinant ecological factors on seedlings in regenerations was assessed by means of the average height of seedlings and the average annual increases in height and diameter.

The natural regeneration of Hungarian oak and Turkey oak from seed was followed in production works and in certain specially created group cuts, where the number of seedlings per m<sup>2</sup>, the annual growth, number of annual growths and the size thereof were determined, corroborated with the evolution of weather in the period or season involved.

Regeneration from sprouts was followed by determining the number of sprouts per stump, the annual growth, the number of annual growths and size thereof.

The lack of fructification in Hungarian oaks, in the beginning of researches, imposed the use of experimental plots in production works. The dynamics of installing seedlings in such plots did not allow the performance of research on the seedlings installed in the same seeding year, either because of the too low number of installed seedlings, or because of the different age of seedlings. The age of Hungarian oak and Turkey oak seedlings has a very high influence on the growth of seedlings, which is why an experimental block had to be placed in equivalent resorts, homogeneous under ecological terms, for the determination and analysis of growth differences, after the very good fructification in Hungarian oaks in 2003.

### Research plots list

**Table 1**

No.	Forest district	Number of research plots							Total
		Progressive cuts	Preservation works	Extraction of the 2nd floor	Extraction of the 2 <sup>nd</sup> floor only under the crown of seedling trees	Soil mobilization in the seeding year, under trees	Removal of herbs	Removal of flooding wooden species	
0	1	2	3	4	5	6	7	8	9
1	Craiova	6	4	0	0	4	4	0	18
2	Filiasi	34	0	10	0	8	8	4	64
3	Strehaia	11	0	5	5	6	6	5	38
4	Turceni	1	0	0	0	0	0	2	3
5	Motru	1	0	0	0	0	2	0	3
6	Carbunesti	2	0	0	0	2	2	0	6
Total		55	4	15	5	22	24	11	132

Researches were made both for seedlings of the same age in both species, following the evolution thereof during a three-year period (2004, 2005, 2006) and for previously installed seedlings, existing on sample plots before 2004, for analysing the entire variety of aspects met in the development of Hungarian oak and Turkey oak seedlings in the studied territory.

The observation method was used for the study of the various ecological and biological phenomena related to the development and growth of Hungarian oak and Turkey oak as well as for production works. Apart from the above-mentioned methods, the study of documents existing in forest districts and directorates, as well as in meteorological stations in the studied territory, was used.

## RESULTS OF RESEARCHES

### GROWTH AND DEVELOPMENT OF HUNGARIAN OAK SEEDLINGS IN A VEGETATION SEASON

Observations and measurements on the development of the height growth process during a vegetation season were performed in sample plots in group cuts with various sizes located in operable brushes. The lack of fructification in Hungarian oaks before 2003 did not allow for the installation of high density seedlings of the same age, where current, decadal or decadal group growths could be followed. This is why the evolution of annual growth in seedlings of various ages was shown, which were installed in the same stationed conditions and, however, with high brush variability, but, especially, with individual variability influencing the dynamics of height growth, which is why the causes determining the dynamics of growth in each seedling. However, the resultant of this high diversity approximately shows the important moments of beginning of growth, the dynamics thereof, the stop or resumption of growth.

Under climate terms, 2004 may be characterised as a year with normal precipitations and temperatures, but with a high alternance in short intervals, of high temperatures and low temperatures. In July and August, after a few days with very high temperatures, periods with low temperatures followed, with differences of more than 20°C, which made that the first hoar-frost in the studied territory be on September 9 in deep and narrow valleys, and the first hoar-frost over the entire studied territory be on October 10. Therefore, climate factors influenced both the occurrence of growth and the intensity and dynamics thereof.

Thus, height growth in Hungarian oak seedlings began in the spring of 2004, around March 20, after the rain of March 12, followed by the high temperatures of the following days. In the beginning, the growth was low, then increased, reaching a maximum around April 20, after which a period of slowdown occurred, starting May 10, so that, on May 20, the first growth was completed. There followed the period of increase of leaves on stems and the maturation of stems by increasing flexibility and tear resistance, which lasted until around June 15, 2004.

The 2<sup>nd</sup> height growth started around June 15, being caused by the abundant rains in the first decade of the month, followed by moderate warming, sometimes with fog in the mornings. The duration of intense growth was lower than in the first growth, until July 10, after which a slower growth period followed, completed around July 26, because of the very high temperatures in July 7-9.

The 3<sup>rd</sup> increase began around July 27, in a low number of individuals, with ages of more than 5 years, proceeding from seeds, and in a higher number of individuals proceeding from sprouts, being caused by the rains in July 27-28, 2004. The growth period was small, until around August 15, being followed by a slower growth period, completed around September 10.

The analysis of growths was made in 90 Hungarian oak seedlings in a group cut of 1.5 H, where the group cut widening cut was made in 2001. Seedlings were well illuminated, with low density and ages ranging from 1 to 7 years. According to the remarks made in previous years, in the sample market where research was made, it can be found that in surfaces with low density of seedlings, in the first years they develop side branches until accomplishing a soil coverage degree able to create the forest micro-climate, after which enhanced height growth follows, as it occurred in u.a. 110 E in 2004 (table 2).

The development of Hungarian oak seedlings in the first years of life where the number of seedlings installed by square meter is very low, and humidity and temperature conditions are unfavourable, is the expression of the high adaptability of the species of growing and developing in conditions of absence of humidity and extreme temperatures starting the 2<sup>nd</sup> year, they self cut back and then develop the basic branches almost parallelly to the soil, and, after sufficient closure to the crown of neighbouring seedlings, the vigorous height growth starts.

Unlike seedlings proceeding from seeds, the annual growth of Hungarian oak seedlings proceeding from sprouts is 235% higher (table 3). The assignment of the size of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> growths for seedlings proceeding from seeds, in comparison with those proceeding from sprouts, is very different. If the first growth in seedlings proceeding from seeds represents 72.5% of the total growth, it only represents 49.2% in seedlings proceeding from sprouts, first growth. The 2<sup>nd</sup> growth in seedlings proceeding from seeds represents 25.6%, and in those proceeding from sprouts it is almost equal to the first growth, representing 36.7%. High differences can also be noticed in the 3<sup>rd</sup> increase, in seedlings proceeding from seeds, of only 1.9% of the annual growth, and 14.1% in seedlings proceeding from sprouts. This distribution can only be explained through the different possibilities of water supply to seedlings during the entire period from the beginning of each growth and until the completion thereof. The access to light of seedlings in the sample plots where research was made is the same, both for seedlings proceeding from seeds and for those proceeding from sprouts.

**Dynamics of Hungarian oak seedlings growth over a season of vegetation in 2004 in u.a. 110 E, U.P. II Argetoaia, Forest District Filiasi**

**Table 2**

No.	Period	Duration of the period (days)	Height growths (mm)		Growth period		Growths	
			For the entire duration	Daily average	Type of period	No. of days	In mm	In %
0	1	2	3	4	5	6	7	8
1	20 III- 20 IV	30	33	1.1	Start of the 1 <sup>st</sup> growth period	85	221	72,5
2	21 IV-10V	20	147	7.4	1 <sup>st</sup> growth period			
3	11V-20V	10	36	3.6	1 <sup>st</sup> slowdown period			
4	21 V-15VI	25	5	0.2	1 <sup>st</sup> stagnation period			
5	16 VI-10 VII	25	62	2.5	2 <sup>nd</sup> growth period	40	78	25,6
6	11VII-26VII	15	16	1.1	2 <sup>nd</sup> slowdown period			
7	27VII-15VIII	19	5	0.3	3 <sup>rd</sup> growth period	44	6	1,9
8	16VIII-10 IX	25	1	0	3 <sup>rd</sup> stagnation period			
	Total		305			169	305	100

The difference is given by the size and deepness of the root supplying water and mineral salts to seedlings. According to the performed observations, the factors starting the growth process are, for the first growth, the average daily temperature, and, for the immediately following growths, humidity, as they only started immediately after rain.

For the studied territory, the moment of beginning of growths during a vegetation season could be highlighted, as the territory lacks precipitations in summer and at the beginning of autumn.

Apart from temperature and humidity, as determinant factors, the degree of illumination mostly contributed to the growth and development of Hungarian oak seedlings, highlighted in pedunculate oaks and common oaks by various researchers (**Chirita, 1933; Ciumac, Constantinescu, 1962; Damian, 1963; Damaceanu, 1960, 1984; Petcut, 1941; Purcelean, 1963**)

**Dynamic of Hungarian oak seedlings growth proceeding from sprouts over a vegetation season in 2004 in u.a. 110 E, U.P. II Argetoaia, Forest District Filiasi**

**Table 3**

No.	Period	Duration of period	Height growths (mm)		Growth period		Growths	
			For the entire duration	Daily average	Type of period	No. of days	In mm	In%
0	1	2	3	4	5	6	7	8
1	20 III-20 IV	30	82	2,7	Start of the 1 <sup>st</sup> growth period	85	353	49,2
2	21 IV-10V	20	170	8,5	1 <sup>st</sup> growth period			
3	11 V-20 V	10	78	7,8	1 <sup>st</sup> slowdown period			
4	21 V-15 VI	25	23	0,9	1 <sup>st</sup> stagnation period	40	263	36,7
5	16 VI-10 VII	25	222	8,9	2 <sup>nd</sup> growth period			
6	11VII-26VII	15	41	2,7	2 <sup>nd</sup> slowdown and stagnation period	44	101	14,1
7	27VII-15VIII	19	81	4,3	3 <sup>rd</sup> growth period			
8	16 VIII-10IX	25	20	0,8	3 <sup>rd</sup> stagnation period			
Total			717			169	717	100

The degree of illumination is usually in indirect proportion with the consistence of brushes. Additional growths do not occur under the closed storey. According to the observations made in brushes including Hungarian oaks, the apparition of additional growths in brushes with consistency of 0.6 – 0.7 is noticed. They are more numerous in seedlings in the brushes with low consistency and occur in most seedlings in the areas where maternal brushes were extracted. For the study of the phenomenon, sample plots were installed, where the size and frequency of annual growths as well as additional growths were followed (table 4).

As it can be noticed in table 4, additional growths occurred in the seedlings in group cuts, the 2<sup>nd</sup> growth occurred in 36% seedlings, the 3<sup>rd</sup> growth in 2%, and no additional growths occurred in the seedlings outside the group cut, although the brush has a consistency of 0.5 – 0.6.

**Dimension and frequency of annual and additional growths over a vegetation season in Hungarian oak seedlings in 2004 in u.a. 110 E, U.P. II Argetoaia, Forest District. Filiasi)**

**Table 4**

Specifications	Average height in spring, cm	1 <sup>st</sup> growth			2 <sup>nd</sup> growth			3 <sup>rd</sup> growth			Average height in autumn, cm
		Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	
1	2	3	4	5	6	7	8	9	10	11	12
Group cuts with diameter of 1.5 H	30,4	25,9	90,0 3,0	100	25,7	57 3	36	25, 0	31 19	2	56,4
Under a Hungarian oak storey with consistency of 0.5 - 0.6	21,0	7.0	20,0 3,0	100	-	-	-	-	-	-	28,0

We can also notice differences in the dimension of growths, both between the first growth (25.9 cm) and the two additional following growths (25.7 cm and 25.0 cm) and between the dimension of the annual growth of seedlings in the group cut (25.9 cm) and the dimension of annual growths of seedlings under the storey (7.0 cm).

In group cuts with dimensions equal to a tree height in u.a. 99 F the 2<sup>nd</sup> increase occurred only in 5% of the total number of seedlings (table 5). Annual growths are proportional to the dimension of group cuts, as in u.a. 99 F they are lower than the annual growths of seedlings in u.a. 110 E. The 2<sup>nd</sup> and 3<sup>rd</sup> growth do not occur under the storey, because of the lower level of light intensity.

## GROWTH AND DEVELOPMENT OF TURKEY OAK SEEDLINGS

In Turkey oaks, the first growth holds the greater percentage, of 89%, and the 2<sup>nd</sup> growth of only 10%. Growth begins a few days later in comparison to Hungarian oaks, and the weight of the first growth is more than 16% higher than in Hungarian oak. 2<sup>nd</sup> and 3<sup>rd</sup> growths start after a day with precipitations.

### Size and frequency of annual and additional growths over a vegetation season in Hungarian oak seedlings in 2004 in u.a. 99 F, U.P. II Argetoiaia, Forest District, Filiasi

**Table 5**

Specifications	Average height in spring, cm	1 <sup>st</sup> growth			2 <sup>nd</sup> growth			3 <sup>rd</sup> growth			Average height in autumn, cm
		Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	
1	2	3	4	5	6	7	8	9	10	11	12
Group cuts with diameter of 1,0 H	69.5	18.9	48 3	100	7.5	15 3	5	-	-	-	88.4
Under a Hungarian oak storey with consistency of 0.5 - 0.6	24.2	7.5	28 3	100	-	-	-	-	-	-	31.7

The data presented below in table 6 refers to the growth of the entire mass of seedlings subject to research, but a high individual variability can be noticed as regards phenological phases, as well as the dynamics thereof, but especially the absolute value of growths, as the beginning of growths and the dimensions of growth are differentiated in almost each individual. In certain individuals, the 2<sup>nd</sup> growth is higher than the 1<sup>st</sup> growth, and the 3<sup>rd</sup> growth exceeds half of the first growth. The higher proportion of the first growth in the weight of total annual growth in Turkey oaks is explained through the action of the physiological mechanisms thereof, which make better use of the periods with lower spring temperatures, when almost 90% of the annual growth occurs. Perspiration reduces in the apparition of high temperatures and it is less vulnerable in the absence of precipitations. In periods with favourable temperatures, Turkey oaks take full advantage of the situation and perform growths.

This adjustment of the species becomes a favouring factor not only in the installation of seedlings but also in the growth thereof on colder Northern slopes, as well as at the basis of shadowed slopes.

**Dynamic of Turkey oak seedlings growth over a season of vegetation in 2004  
in u.a. 46 B, U.P. II Bucovat, Forest District Craiova**

**Table 6**

No.	Period	Duration of period	Height growths (mm)		Growth period		Growths	
			For the entire duration	Daily average	Type of period	No. of days	In mm	In%
0	1	2	3	4	5	6	7	8
1	25 III- 30 IV	36	142	3,9	1 <sup>st</sup> growth period	68	169	89
2	30 IV-15 V	16	23	1,4	1 <sup>st</sup> slowdown period			
3	15 V-01 VI	16	4	0,3	1 <sup>st</sup> stagnation period			
4	01 VI-25 VI	25	4	0,2	Beginning of the 2 <sup>nd</sup> growth period	70	18	10
5	25 VI-15 VII	20	13	0,7	2 <sup>nd</sup> growth period			
6	15 VII-05 VIII	25	1	0	2 <sup>nd</sup> slowdown and stagnation period			
7	05 VIII-15 VIII	10	1	0,1	3 <sup>rd</sup> growth period	35	12	1
8	16VIII-10IX	25	0	0	3 <sup>rd</sup> stagnation period			
Total			188			173	188	100

Similarly to Hungarian oak seedlings, annual growths in Turkey oak seedlings are lower under storey, in comparison to the seedlings installed in group cuts (table 6). Lower dimensions of group cuts and the smaller contribution of light also entailed lower growths of seedlings of only 6.9 cm, whereas growths were even lower under the storey, of 4.5 cm.

**Size and frequency of annual and additional growths over a vegetation season in Turkey oak seedlings in 2004 in u.a. 47 C, U.P. IV Susita, Forest District, Strehaia**

**Table 7**

Specifications	Average height in spring, cm	1 <sup>st</sup> growth			2 <sup>nd</sup> growth			3 <sup>rd</sup> growth			Average height in autumn, cm
		Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	Average, cm	Maximum and minimum, cm	Occurring in ... % of the seedlings	
1	2	3	4	5	6	7	8	9	10	11	12
Group cuts with diameter of 1,0 H	20.2	6.9	30,0 3,0	98	-	-	-	-	-	-	27,1
Under a Hungarian oak storey with consistency of 0.5 - 0.6	20,0	4,5	6,9 3,0	100	-	-	-	-	-	-	24,5

The development of seedlings at various distances from the seeding tree was studied in sample plots located in u.a. 153 B, U.P. II Argetoaia under a seeding Turkey oak with brush closed around, practically with no side light contribution (table 8).

Measurements were made in two years seedlings of 2002 fructification. Average heights were determined in sample plots located at 1 meter each on the direction of the four cardinal points, annual growth was measured and averages were recorded in table 41. Analysing this table, it results that the greater height is in seedlings at two and three meters from the tree (22.4 cm, respectively 18.6 cm) and the lowest height is recorded in seedlings at 5 meters from the basis of the tree (16.4 cm), followed by those on the first meter at the basis of the seeding tree (18.2 cm). The most fertile part under the tree crown is in the medium area of the crown projection, at 2 and 3 meters from the basis of the tree (h=22.4 cm and 18.6 cm) and the less fertile part is at the outside extremity of the crown projection (h=16.4 cm) and immediately next to the seeding tree (h=18.2 cm).

**Development of 2 years seedling at different distances from the tree collar basis on the direction of 4 cardinal points under the protection of crown of Turkey oak in u.a. 153 B, U.P. II Argetoiaia, Forest District, Filiasi**

**Table 8**

Distance from the basis of the tree (m)	Average height (cm) on the direction .....					Average growth (cm) on the direction .....				
	E	S	W	N	Average	E	S	W	N	Average
1	2	3	4	5	6	7	8	9	10	11
1	10,7	25,5	15,7	21,0	18,2	5,3	12,0	4,0	8,8	7,5
2	20,5	32,0		16,8	22,4	8,2	22,0	11,8	7,9	12,5
3	17,0	19,8	18,3	19,1	18,6	3,0	8,8	5,7	7,1	6,2
4	17,3	-	17,1	20,4	18,3	7,1	-	6,3	5,0	6,1
5	17,7	22,0	19,9	6,0	16,4	4,7	8,0	9,0	2,0	5,9
Average	16,6	24,8	18,3	16,7	18,8	5,7	12,7	7,4	6,2	7,6

Highest average heights were recorded in the South (24.8 cm) and West (18.3 cm), being the most fertile zones under the projection of the seeding tree crown. Lowest average heights were recorded in the East (16.6 cm) and North (16.7 cm).

From the analysis of annual average growths in 2 year Turkey oak seedlings installed under the projection of the seeding tree crown, the highest growth results at a distance of 2 meters from the basis of the seeding tree (12.5 cm), superposing over the highest average height of seedlings. The lowest annual average growth was recorded at 5 meters from the basis of the tree (5.9 cm) and 4 meters from the basis of the tree (6.1 cm). From the analysis of the average height of seedlings and the average annual height growth, the most favourable areas for the growth and development of seedlings result, under the projection of tree crowns. Thus, the most fertile part can be found at two and three meters from the tree basis, as an effect of the action of determinant ecological factors: humidity, light and warmth. Humidity and light are faulty close to the tree basis, limiting the development of seedlings, and humidity becomes faulty to the outside of the crown projection, due to the storey edge effect, in draught periods or in low precipitations during summer.

From the analysis on the direction of the four cardinal points of favourable and less favourable areas under the seeding tree, it results that the most fertile areas are, in order, the Southern and Western one, resulting both from the analysis of the average height of seedlings and from the analysis of annual average height growths (table 8).

Annual additional growths of Hungarian oak and Turkey oak seedlings, especially the 2<sup>nd</sup> growth in 2003, coincided with the favourable epoch of oak mildew (*Microsphaera alphitoides*), occurring in all seedlings of Hungarian oak, Turkey oak and common oak, a situation ascertained on 23.07.2003, with the opportunity of the measurements in u.a. 46 D. U. P. IV Susita, Strehaia Forest District (fig. 2).



**Fig. 2 Hungarian oak and Turkey oak seedlings infested by *Microsphaera alphitoides***

The attack of *Microsphaera alphitoides* was very strong, affecting young stems, showing a tendency of drying.

The growth of the root in the first years is more active than the one of the stem. According to the seedling analyses performed in 2004 and 2005, it results that, after two years of vegetation, roots had an average length of 23.6 cm in Hungarian oaks and 20.2 cm in Turkey oaks. The root of Hungarian oak seedlings is richer, with more side secondary roots than the root of Turkey oak seedlings, which has a very obvious, more vigorous pivot, with obvious vertical development.

The most active growth of Hungarian oak and Turkey oak seedlings starts early in spring, which imposes the protection thereof in vegetation, by stopping forest operations and prohibiting any type of displacement on the occupied plots.

## **CONCLUSIONS**

The height growth in Hungarian oak seedlings starts in spring, around March 20, reaching a maximum around April 20, after which a slowdown period follows, until May 20, when the first growth completes. There follows the growth of leaves on stems and maturation thereof, which lasts until June 15, when the 2<sup>nd</sup> height growth starts, less intense than the first one, until July 10, completing at the end of this month, because of high temperatures. The 3<sup>rd</sup> increase begins in a low number of individuals, with ages of more than 5 years, proceeding from seeds, and in a higher number proceeding from sprouts, being caused only by rains, until around August 15, completed around September 10. The first growth occurs in all seedlings, the 2<sup>nd</sup> growth occurs only in a part of the seedlings (20 to 60%)

and the third growth occurs in a lower number of seedlings (less than 20%), depending on the age of seedlings, the degree of illumination and weather.

The development of Hungarian oak seedlings in the first years is the expression of the high adaptability of the species to extreme humidity and temperature conditions. Given a low density of seedlings, they self cut back starting the 2<sup>nd</sup> year, then develop their basic branches almost parallelly to the soil, with low height growths, and, after getting close enough to the crown of neighbouring seedlings and the creation of the forest micro-climate, maintaining soil humidity more easily, vigorous height growth starts.

The annual growth of Hungarian oak seedlings proceeding from sprouts is 235% higher than the one of seedlings proceeding from seeds. The assignment of the size of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> growths for seedlings proceeding from seeds, in comparison with those proceeding from sprouts, is very different. If the first growth in seedlings proceeding from seeds represents 72.5% of the total growth, the first growth only represents 49.2% in seedlings proceeding from sprouts; the 2<sup>nd</sup> growth in seedlings proceeding from seeds represents 25.6%, in those proceeding from sprouts the 2<sup>nd</sup> growth is almost equal to the first one, representing 36.7%. High differences can also be noticed in the 3<sup>rd</sup> increase, in seedlings proceeding from seeds, of only 1.9% of the annual growth, and 14.1% in seedlings proceeding from sprouts. This distribution is conditioned by the different possibilities of water supply to seedlings during the entire period from the beginning of each growth and until the completion thereof. The difference is given by the size and deepness of the root supplying water and mineral salts to seedlings.

The annual height growth in Turkey oaks occurs in a proportion of 89% in the first growth and only 10% in the 2<sup>nd</sup> growth. Growth begins a few days later in comparison to Hungarian oaks, and the weight of the first growth is more than 16% higher than in Hungarian oak. 2<sup>nd</sup> and 3<sup>rd</sup> growths start after a day with precipitations. The commencement of growths is different in almost every individual, the same as the size thereof. In certain individuals, the 2<sup>nd</sup> growth is higher than the 1<sup>st</sup> growth, and the 3<sup>rd</sup> growth exceeds half of the first growth. The higher proportion of the first growth in the weight of total annual growth in Turkey oaks is explained through the action of the physiological mechanisms thereof, which make better use of the periods with lower spring temperatures, when almost 90% of the annual growth occurs, reduce perspiration in high temperatures and are less vulnerable in the absence of precipitations. In periods with favourable temperatures, Turkey oaks make full advantage thereof and perform growths. This adjustment of the species becomes a favouring factor not only in the installation of seedlings but also in the growth thereof on colder Northern slopes, as well as at the basis of shadowed slopes. Additional growths occur in brushes with consistency lower than 0.6 – 0.7. Additional growths are more numerous in seedlings in the brushes with low consistency and occur in most seedlings in the areas where maternal brushes were extracted.

Diameter growths almost always follow height growths. They are easily highlighted at the end of the vegetation season.

The growth of the root in the first years is more active than the one of the stem. According to the seedling analyses performed in 2004 and 2005, it results that, after two years of vegetation, roots had an average length of 23.6 cm in Hungarian oaks and 20.2 cm in Turkey oaks. The root of Hungarian oak seedlings is richer, with more side secondary roots than the root of Turkey oak seedlings, which has a very obvious, more vigorous pivot, with obvious vertical development.

The most active growth of Hungarian oak and Turkey oak seedlings starts early in spring, which imposes the protection thereof in vegetation, by stopping forest operations and prohibiting any type of displacement on the seedling plots.

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# RESEARCH REGARDING THE RESISTANCE TO SHADE OF HUNGARIAN OAK AND TURKEY OAK SEEDLINGS

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## INTRODUCTION

In the extended draught period of 1988-1993, followed by the massive drying of Hungarian oak and Turkey oak brushes, the reaction of the two species and the various methods of adjustment and resistance to adversities were observed. The maintenance of the natural regeneration capacity in Hungarian oaks and Turkey oaks in the occupied territories was also manifested through the resistance to shade of seedlings installed under the storey. The behaviour of the two species is different, as Hungarian oaks are installed naturally and resist under the storey for a longer time, whereas Turkey oaks maintain their capacity of normally fructifying under draught conditions as well.

Researches were performed in the Jiului basin starting from the area of high pre-mountainous hills up to the forest steppe, in all types of woods of Hungarian and Turkey oaks.

The purpose of researches focused on establishing the regime of ecological factors with a determinant action in the installation and maintenance of Hungarian oak and Turkey oak seedlings inside brushes under the canopy, as well as the physiological processes occurring in seedlings and the form of manifestation thereof.

Through the analysis of Hungarian oak brushes with ages of more than 40 years, under development phases: small wood, medium wood and old wood, we can notice that, in more illuminated places, where the consistency of brushes descends under 0.85, seedlings with very different ages were installed, which, in time, acquire the aspect of bushes and are maintained until the replacement of the maternal brush they proceed from. This phenomenon is more obvious in brushes affected by the very strong drying of Hungarian oak brushes in 1989-1994, in the studied territory.

The phenomenon manifested with different intensities in all brushes with ages of more than 40 years, as the intensity of drying is in indirect proportion to the latitude and worthiness of the station or micro-station, as a resultant of ecological factors, humidity and temperature.

The amplitude and intensity of the phenomenon manifested in Hungarian oak brushes caused concern among those who cared for the administration and maintenance of woods in this territory. Portions of woods or entire plots, in 1992-1994, had thousands of trees dried and fallen down, dried on the stem or in various phases of drying, so that they could not be stocked and marked in due time, without considering the operation and usage thereof. However, after this phenomenon reached its maximum level, in 1993, after a year with normal precipitations, in 1994, in brushes with trees able to fructify, the development on the horizontal of the crowns of remaining trees was noticed, as well as, simultaneously, the installation of seedlings under the storey. According to some opinions, seedlings

proceeded from root-suckers, due to the mobilisation of soil and injury of roots with the opportunity of operation works performed for the extraction and collection of trees affected by drying. According to the researches performed in this work, it was ascertained that seedlings proceed from seeds, not from root-suckers.

The capacity of regeneration of Turkey oak brushes and especially Hungarian oak brushes was also maintained under extended draught conditions and high temperatures during summer, through the properties of seedlings of resisting to shade under storey for a long time.

## **MATERIALS AND RESEARCH METHOD**

The installation of seedlings under the storey under different degrees of illumination or shading and the adjustment thereof to such conditions, so that their existence under the storey is ensured, was researched in Hungarian oak brushes with different consistency and in wood parts with various degrees of closure, where light intensity was measured by means of light meters. For avoiding incongruities between the values displayed by light meters and the variation of light in different times and different dates, light intensity in brushes was expressed as a percentage of the light measured in open field, performed with the same device and on the same date and hour.

Researches were also made in brushes not affected by drying with various consistencies and degrees of closure, where light intensity was measured in correlation with the maintenance and development of seedlings in the first two years after the fructification in 2003.

The observation method was used for the study of the various ecological and biological phenomena such as the shapes of stems and crowns of seedlings, related to the development and growth of Hungarian oak and Turkey oak as well as for production works. Apart from the above-mentioned methods, the study of documents existing in forest districts and directorates, as well as in meteorological stations in the studied territory, was used.

## **RESULTS OF RESEARCHES**

According to these researches performed in sample plots, it results that, in March, before the foliation of trees, light represented 49% of the light intensity in an uncovered field, and 45% of light intensity in an uncovered field at a soil level (0.30 m), in brushes with consistency of 0.6-0.8. If brushes are too thick and have a consistency of more than 0.8, or sub-brushes are developed, forming a second floor and also present a thick border layer, the start into vegetation of seedlings is delayed, with light intensity being under 40% with respect to the one in an uncovered field. The delay may be large enough, and the delay of the starting of growths coincides with the blooming of hawthorn.

Immediately after the foliation of woods, light intensity in the storey decreases, reaching 6-25% of the light intensity in an uncovered field, and barely 3% at the level of seedlings. Under these conditions, seedlings in the second year of vegetation and subsequent years, stop growth or growth very little (0.1 cm), stems extend, the root almost stagnates, and leaves become yellow earlier and dry in the next 2-3 years.

In 2005 the resistance under storey of 2 year-old seedlings was followed in sample plots in brushes with consistency of 0.6-0.8. Thus, at a full consistency of maternal brushes, light intensity is 4% of the one in an uncovered field, maintaining 27% of the number of seedlings installed in 2004. At a light intensity of 5% - 8% from the one in an uncovered field, 30-32% of the number of seedlings installed in 2004 were maintained, and at an

intensity of 9% - 15%, 35-37% were maintained, and at a light intensity of 30-35% of the one in an uncovered field, 64-65% of the total number of seedlings in 2004 were maintained.

If after the first year of vegetation in brushes with full and almost full consistency in which light intensity has a proportion of 4-5% of light intensity in an uncovered field, 4-15 seedlings per square meter were maintained, enough for ensuring regeneration in the second year of vegetation, the number of seedlings decreased, reaching 1-4 seedlings per square meter, not enough for regeneration. This is why in wood portions where light intensity is less than 5% of the one in an uncovered field, the storey has to be opened in the seeding year or in the first vegetation year, for ensuring regeneration. It results that in brushes with consistency of less than 0.8, the opening of the storey can be made until the third year of vegetation at the latest.

According to the researches performed in 2004 and 2005 in Turkey oak brushes in u.a. 47 C, U.P. IV Susita; 81 D, 80 H, 82 M, U.P. II Argetoaia; 46 B, U.P. II Bucovat, regarding the resistance to shade of seedlings installed pursuant to the good fructification in 2002, the following resulted:

- in brushes with full consistency in which light intensity has a proportion of 4-5% of light intensity in an uncovered field, 5-15 seedlings per square meter were maintained in the first year of vegetation, and 1-5 Turkey oak seedlings per square meter remained in the second year, not enough for regeneration.
- in parts of brushes with a consistency of less than 0.8 and light intensity between 5-8% of the one in an uncovered field, 32-35% of the number of installed seedlings were maintained, and, at a light intensity of 9-15%, 36-39% of the number of installed seedlings were maintained;
- in parts of brushes in which light intensity ranges from 30 to 35% of the one in an uncovered field, 60-65% of the total number of seedlings installed in 2003 were maintained.

The result of researches and observations on Turkey oak seedlings in the good fructification of 2002 leads to the conclusion that the resistance to shade of Turkey oak seedlings is similar to the one of Hungarian oak seedlings and no differences have to be made regarding the time of brush opening for regeneration works.

According to the observations performed on the itinerary and with the opportunity of production works, in all Hungarian oak brushes there can be found the existence of a floor made up of wrongly shaped individuals, presenting deformation in the lower third of the stem, with large horizontal extension, mostly grouped by two, three or more individuals with the same starting basis, with an obvious aspect of shrub. Through their shape, they were considered as individuals proceeding from sprouts or even root-suckers. For clarification, sample plots were installed, including such individuals with highly different dimensions. Individuals were extracted with the entire root, and it was found out that they proceed from seeds, with the following properties:

- at a depth ranging from 5 to 15 cm, the root starts with a strong pivot penetrating deeply;
- from the same level, the stem branches into two, three individuals, reaching the soil in an inclined position, under an angle of 150° - 200°;
- all individuals starting from the same root have branches completely covering the stem on the entire air part, which, because of the development of lateral branches, is not obviously differentiated;

- stems and lateral branches develop on the horizontal, under the form of a shrub, covering the soil on an area of 1 m<sup>2</sup> - 4 m<sup>2</sup>;
- this is due to the repeated self-cut back of seedlings on a period from 4 to 10 years. The installation of the floor of pre-existing seedlings with the aspect of a shrub is produced in brushes with ages of more than 40 years, able to fructify, in which, for various reasons, consistency was reduced under 0.8;
- the installation of such forms of seedlings under the storey which show high resistance to shade is only specific to Hungarian oaks;
- in pure Hungarian oak brushes with consistency of less than 0.7, this form of manifestation and installation of the so-called seedlings represents a sub-floor with a height of up to 2.5 m, covering the soil in a proportion of 30-70%;
- light intensity in the areas occupied with pre-existing individuals with the aspect of a shrub ranges from 15 to 35% of light intensity in an uncovered field;
- the increase of the blank space in the upper ceiling of the maternal brush results in the activation of the height growth of illuminated individuals, favouring the straightening and highlighting of a single stem, but with limited effects on the rectitude of the stem and subsequent growths;
  - the age of individuals with a shrub aspect ranges from 3 to 40 years;
  - the installation of individuals with the aspect of a shrub was made in years with very low fructifications of Hungarian oak, provided that the forest soil does not present herbs and has a continuous edge layer, able to ensure the germination of seeds and installation of seedlings from the masts attacked by *Balaninus glandium* as well;
  - the resistance of Hungarian oak seedlings under the storey is explained through the very strong development of the root and its penetration into the soil up to big depths, becoming thus able to supply water to the stem which has much lower growths in the first years for all Hungarian oak seedlings and, especially, for those installed under the almost closed storey (fig. 1);



**Fig. 1 Sample of Hungarian oak with shrub look in u.a. 124, U.P. III Seaca de Padure**

- the self-cut back of Hungarian oak seedlings installed under the storey is first conditioned by the absence of light and second by the absence of humidity, which is explained through the resistance of seedlings under the storey in all stations where

Hungarian oaks grow, starting from the forest steppe where the lack of water is higher up to the area of high hills in the studied territory, where soil humidity is enough for the requirements of the species;

- this way of installation and resistance of Hungarian oak seedlings under the storey (fig. 2), can be found in all types of woods and stations, where the installation of sub-brushes or other main basic or combined species is limited by the lack of humidity;
- the phenomenon also explains the exclusive constitution of pure Hungarian oak brushes in stations with heavy soils and low humidity existing on the plateaus in the Southern part of the studied territory;
- this floor only misses in brushes with a consistency under 0.8, with intense grazing, especially in spring, before the foliation of woods;
- the remaining of shrub-looking individuals in the future brush is only useful for the constitution of the storey state, as they shall be extracted upon care cuts (cleanings or thinnings),



**Fig. 2 Growth of Hungarian oak seedlings under canopy with shrub look in 99 F, U.P. II Argetoaia, Forest District Filiasi**

- the installation and constitution of seedlings under this form, frequently with an aspect of sub-floor of vegetation in pure Hungarian oak brushes represents the expression of resistance to draught of the species and keeping the soil capacity of receiving seeds by maintaining a certain degree of humidity in the soil and by maintaining the grass layer under limits not preventing natural regeneration through seed (fig. 3);
- wrongly shaped seedlings, with a shrub aspect, installed under extreme conditions and lack of fructification 5-10 years before the first regeneration cuts may be used as valid seedlings, participating in the constitution of the new brush, only after the cut of shrub-looking individuals under the soil level, in the previous year to the first regeneration cut. In the studied territory, such works are performed in the range of activity of Strehaia Forest District with good results.

- mature brushes, which were originally made up of such seedlings as well, include individuals presenting deformation in the package area, similar to individuals proceeding from sprouts.



**Fig. 3. Growth of Hungarian oak seedlings under canopy with shrub look in u.a. 47 D, U.P. IV Susita, Forest District Strehaia**

Researches and observations made in brushes also including Turkey oaks highlight that this species does not have the capacity of Hungarian oaks of resisting under the storey for a very long period of time, a period in which they undergo the above-described phases for Hungarian oak, regarding repeated self-cut back and the shrub aspect taken by Hungarian oaks in low light intensity.

For this reason pure Turkey oak brushes, with a consistency of less than 0.8, do not include Turkey oak individuals with a shrub aspect, proceeding from seeds, similarly to Hungarian oaks. Turkey oaks remaining in mature brushes are grouped in holes with dimensions of more than 6-7 m<sup>2</sup>, are highlighted in regeneration groups and represent pre-existing seedlings.

In research plots located in U.P. II Argetoaia, u.a. 112 C, 112 B, 99 F, 110 E, both height growths and the number of Turkey oak seedlings installed in 2004, from the fructification of 2003, were followed, and the following were noted:

- the average height growth in the first year (2004) was 11 cm, and only 3.7 cm in the second year;
- the number of seedlings removed in the second vegetation year was very high, about 80%;

In the same sample plots located under the storey, in brushes with full consistency and no incoming side light, height growths in 2005 were determined for seedlings of various ages, with the following results:

- average annual height growths decrease with the age, as follows: the growth is 8.0 cm in seedlings of 1 year; 7.4 cm in 2-year seedlings; 6.0 cm in 3-year seedlings; 5.1 cm in 4-year seedlings; and 4.0 cm in 5-year seedlings;
- seedlings of more than five years were found in no sample plots, allowing us to conclude that, in the given conditions, Hungarian oak seedlings resist no more than five years under the storey.

#### 4. CONCLUSIONS

1. Hungarian oaks have the capacity of being installed under the storey under certain limits of light intensity, in direct correlation to the opening of the brush. At a full consistency of maternal brushes, light intensity is 4 % of the one in an uncovered field, maintaining 27% of the number of seedlings installed. At a light intensity of 5% - 8% from the one in an uncovered field, 30-32% of the number of seedlings installed were maintained, and at an intensity of 9% - 15%, 35-37% of the total number of seedlings were maintained. At a light intensity of 30-35% of the one in an uncovered field, 64-65% of the total number of installed seedlings were maintained.
2. In brushes with full and almost full consistency in which light intensity has a proportion of 4-5% of light intensity in an uncovered field, 4-15 seedlings per square meter were maintained, enough for ensuring regeneration. In the second year of vegetation, the number of seedlings decreased, reaching 1- 4 seedlings per square meter, not enough for regeneration. In wood portions where light intensity is less than 5% of the one in an uncovered field, the storey has to be opened in the seeding year or in the first vegetation year, for ensuring regeneration.
3. In brushes with consistency of less than 0.8, the opening of the storey can be made until the third year of vegetation at the latest.
4. In pure Hungarian oak brushes with ages of more than 40 years, there are seedlings with a shrub aspect, whose origin was not established in specialised papers. Researches have shown that all individuals proceed from seeds and have the following characteristics:
  - at a depth ranging from 5 to 15 cm, the root starts with a strong pivot penetrating deeply;
  - from the same root level, the stem branches into two, three individuals, reaching the soil in an inclined position, under an angle of 150° - 200°;
  - all individuals starting from the same root have branches completely covering the stem on the entire air part, which, because of the development of lateral branches, is not obviously differentiated;
  - stems and lateral branches develop on the horizontal, under the form of a shrub, covering the soil on an area of 1 m<sup>2</sup> - 4 m<sup>2</sup>;
  - the stems of this individuals acquired the above-mentioned shape by repeated self-cut back of seedlings, for a very long time, from 4 to 10 years;
  - the installation of the floor of pre-existing seedlings with the aspect of a shrub is produced in brushes with ages of more than 40 years, able to fructify, in which, for various reasons, consistency was reduced under 0.8;
  - the installation of such forms of seedlings under the storey which show high

resistance to shade is only specific to Hungarian oaks;

- in pure Hungarian oak brushes with consistency of less than 0.7, this form of manifestation and installation of the so-called seedlings represents a sub-floor with a height of up to 2.5 m, covering the soil in a proportion of 30-70%;
  - light intensity in the areas occupied with pre-existing individuals with the aspect of a shrub ranges from 15 to 35% of light intensity in an uncovered field;
  - the increase of the blank space in the upper ceiling of the maternal brush results in the activation of the height growth of illuminated individuals, favouring the straightening and highlighting of a single stem, but with limited effects on the rectitude of the stem and subsequent growths;
- the age of individuals with a shrub aspect ranges from 3 to 40 years;
5. A year after the opening of group cuts, natural removal in group cuts ranges from 20 to 63%, and under the storey around group cuts it ranges from 54% to 70%. The stronger removal in the first year occurred in group cuts with low dimensions (0.5 H), and, under the storey, stronger removal occurred where the consistency of the brush is higher. In years with enough humidity, light is the main factor in the natural removal of seedlings. Thus, the more light is supplied, the more the proportion of removed seedlings decreases.

6. The natural removal of Hungarian oak and Turkey oak seedlings is a complex process which manifests differently, depending on the unfavourable resultant of determinant ecological factors, light, soil humidity and heat, specific to the two species, to which the density of seedlings in the involved area is added, as well as the variability of the genetic adjustment of the species, manifested in portions in the extreme amplitudes of limitative manifestation of one of the ecological factors. The main factor influencing natural removal is light, followed by soil humidity and very high extreme temperatures.

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# DETERMINAREA PERFORMANTELOR AGRONOMICE LA CÂȚIVA HIBRIZI DE FLOAREA-SOARELUI (HELIANTHUS ANUUS)

## THE AGRONOMIC PERFORMANCES DETERMINATION TO SOME SUNFLOWER (HELIANTHUS ANNUUS L.) HYBRIDS

*Bonciu Elena, Iancu Paula, Soare, M.*

**Cuvinte cheie:** floarea-soarelui, hibrid, variabilitate, performanțe agronomice.  
**Key words:** sunflower, hybrid, variability, agronomic performances.

### ABSTRACT

*Din floarea-soarelui, plantă oleaginoasă cu floare distinctă, se obține un ulei care conține mai multă vitamina E decât oricare alt ulei vegetal. În cea mai mare parte, uleiul de floarea-soarelui este folosit în alimentație.*

*Acest studiu a fost inițiat pentru a evalua performanțele agronomice la câțiva hibridi comerciali autohtoni de floarea-soarelui, cât și pentru a determina variabilitatea genotipică a acestora, în condițiile ecologice din Oltenia. Experiența a fost amplasată la S.D. Banu-Mărăcine, între anii 2004-2007.*

*Au fost utilizați 5 hibridi de floarea-soarelui, alături de martorul Favorit. Rezultatele obținute au demonstrat existența unor diferențe semnificative între toate caracterele de producție investigate. De asemenea, condițiile ecologice au avut o influență semnificativă asupra parametrilor agronomici ai genotipurilor experimentate.*

*Pe baza rezultatelor obținute după cei 4 ani de experiențe, putem concluziona că hibridii de floarea-soarelui Performer și Saturn au înregistrat cele mai semnificative performanțe agronomice, iar potențialul lor ridicat de producție, atât de semințe cât și de ulei, îi recomandă ca hibridi de succes în regiunea Oltenia.*

*The sunflower is a distinctive, flowering plant, the seeds of which contain a valuable edible oil that contains more Vitamin E than any other vegetable oil. Most sunflower oil is used in food products.*

*Therefore, this study was initiated to evaluate the agronomic performances of some commercially available oilseed sunflower hybrids, and to determine the genotypic variability among the genotypes under Oltenia ecological conditions. A field study was conducted on the Banu-Maracine Research Station during the 2004 and 2007 years.*

*In this study, 5 sunflower Romanian hybrids, in the presence of a control hybrid (namely Favorit) were used. The results showed that the genotypes differed significantly in all the characteristics investigated. Similarly, ecological conditions had a significant influence on the agronomic parameters of the genotypes.*

*The present paper suggests that higher seed yields may be achieved through the use of hybrid genotypes under the region's conditions. Based on these 4 years' data, it can be concluded that Performer and Saturn sunflower genotypes with their higher seed and oil yield could be successfully grown under Oltenia region.*

### INTRODUCTION

Sunflower continues to be (after soybean) a world leader of the plants with high nutrition's value, as it is considered a miraculous source of food and a therapeutic miracle in the treatment of many diseases.

The sunflower crop in Romania has registered a large variation related to the cultivated area. In average in Romania in every year were cultivated about 850000 ha with a medium yield/ha of 1300 kg/ha (FAO, 2006).

The achievement of a genetic diversity by cultivating more hybrids with different reactions at the conditions of environment, with different precocity, constitutes the simplest and the most secure way of reduction of the fluctuation of the production of the sunflower. If the technological elements are to a great extend firmly and correctly applied, and the climatic conditions practically incontrollable, the genotype is the most dynamic factor of influence of the productivity of the sunflower.

Successful oilseed-sunflower cropping depends on the yielding ability of genotypes, as well as on the reliability of production systems. Numerous studies have been conducted to evaluate the agronomic performances of commercially available sunflower genotypes in different areas of Romania.

Although a large number of sunflower hybrids for production have recently been released, the yield capabilities of these genotypes have not been studied under south Oltenia conditions.

## **MATERIALS AND METHODS**

A field study was conducted on the Banu-Maracine Research Station during the 2004 and 2007 years. The experiments were performed in a red preluvosoil with 11.6 g kg<sup>-1</sup> organic matter and pH of 7,2. The precipitations values were collected from a meteorological station and are presented in fig. 1.

The experiment was established as a randomized complete block design with 4 replicates. The biological material used for the experiment has been represented by 5 sunflower Romanian hybrids, in the presence of a control, namely: Select, Rapid, Performer, Minunea, Saturn and Favorit (Ct.). The density used was 50000 plants/ha, under non irrigated conditions.

There were performed both in the field and lab measurements and determinations regarding the variability of productivity traits: the capitulum's diameter, the number of seeds to the capitulum, MMB and the membranes percentage, as well as the seeds production and the oil volume in the seeds.

The sunflower genotypes were hand-harvested at the stage of physiological maturation when the back of the head had turned from green to yellow and the bracts were turning brown (in the second week of September in both years). At harvest, 10 plants from each plot were selected for determining the capitulum's diameter, the number of seeds to the capitulum, MMB and the membranes percentage. Seed oil content (% dry matter) was determined using the Soxhlet method.

All data were analyzed by analysis of variance for individual years and combined over the years.

## **RESULTS AND DISCUSSION**

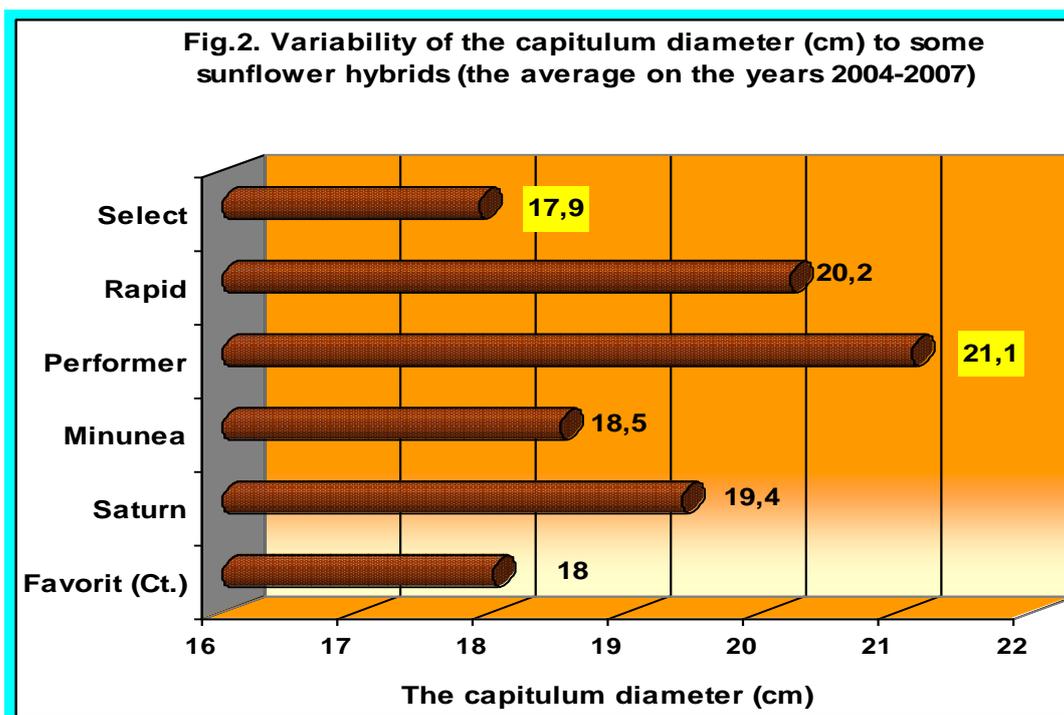
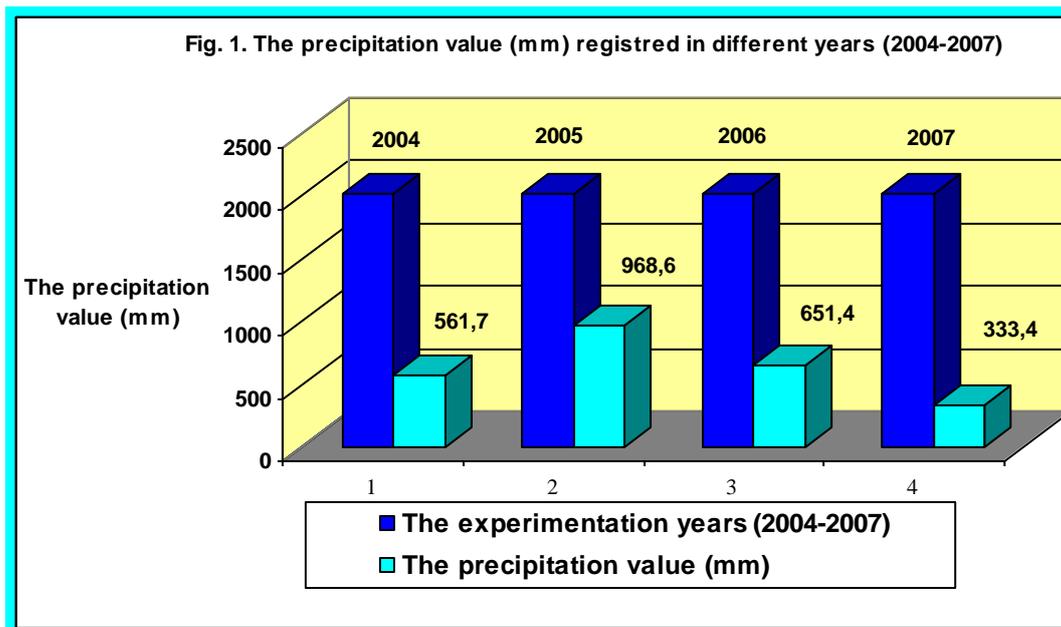
In this study, significant year x genotype interactions for capitulum's diameter, the number of seeds to capitulum, 1000-seed weights, seed oil content and seed yield were observed. Differences observed among the genotypes were probably related to genotypic variation, as reported by different authors.

The differences between the years were largely caused by climatic conditions, particularly precipitation (fig. 1). The higher adaptation of some hybrids to different climatically conditions represent an important step into obtaining high and qualitative yields. In general, the environmental conditions in 2005 and 2006 were more favorable for

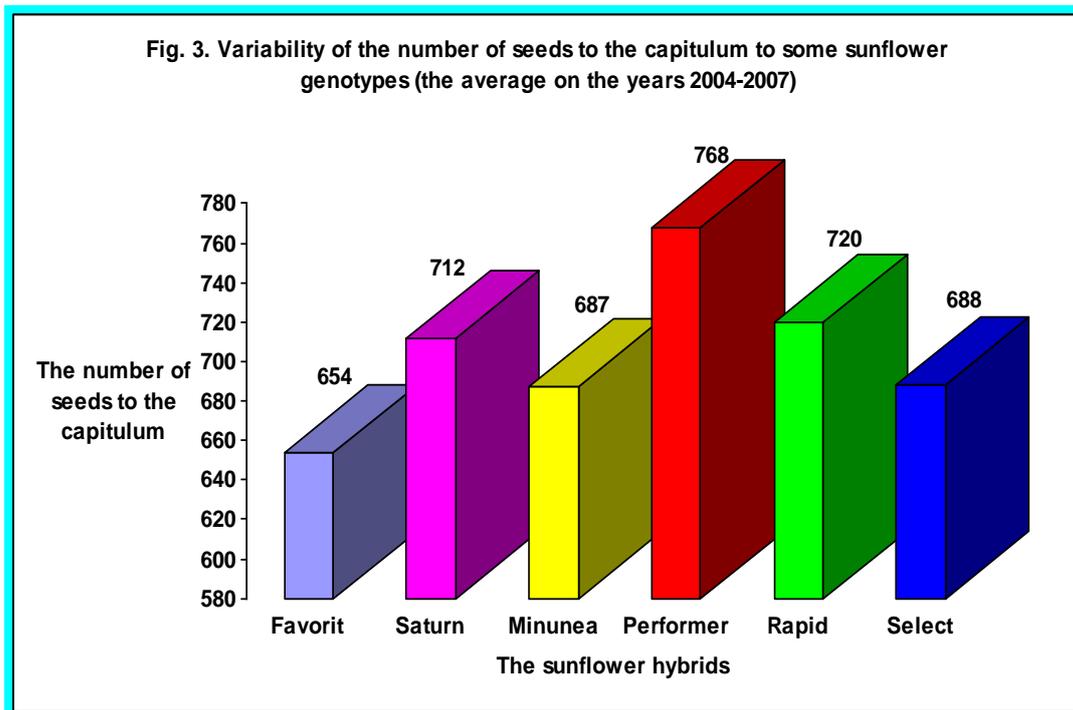
the growth of sunflowers than those in 2004 and 2007. The average precipitation for 2005 (968,6 mm) was higher than that observed (333,4 mm) in 2007.

The sunflower capitulum's has a variable diameter, according to the genotype and the environment conditions. These were one of the most important yields elements determinate at the studied sunflower hybrids. Experimental results concerning the variability of the sunflower capitulum's diameter are reported in fig. 2. In this respect, the researched cultures have registered values between 17,9 cm (Select) and 21,1 cm (Performer). Most capitulum's diameter differences can be attributed to genotypic variation, which is in agreement with several other reports (2,7).

**There is a positive correlation between the capitulum's diameter and the seeds production.**

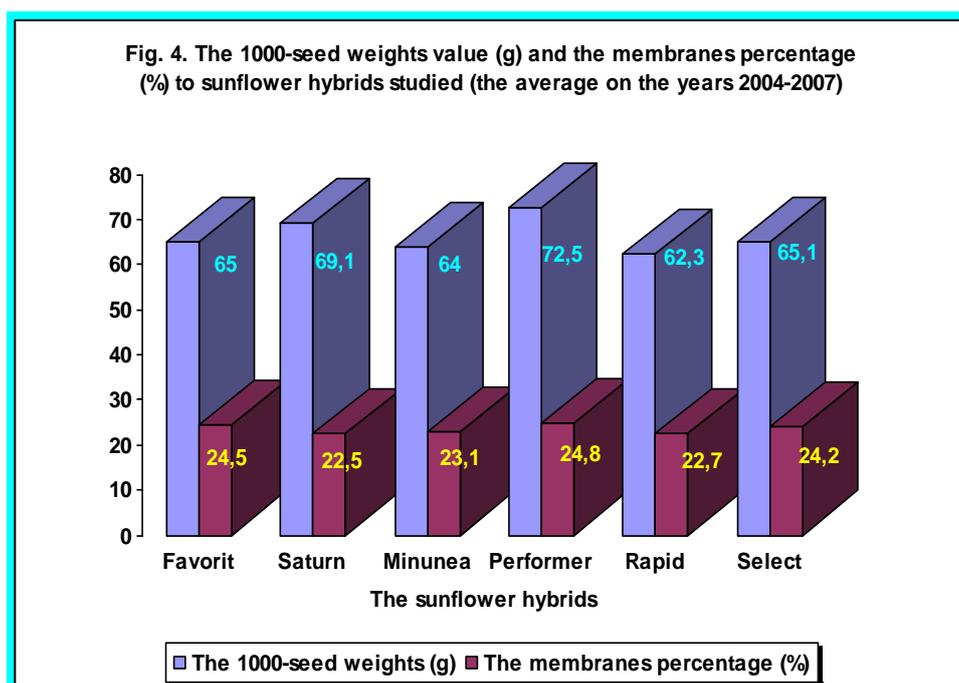


The obtained results regarding the number of seeds to the capitulum, are reported in fig. 3. Thus, we state that hybrid Performer has reached the maximum number of seeds (768), while hybrid Minunea has registered the lowest number of seeds (687).



From the analysis of fig. 4 results that during the average on the year 2004-2007, the most significant 1000-weight value was reported at hybrid Performer (72,5 g), but the lowest membranes percentage was reported at hybrid Saturn (22,5%).

Towards the control, hybrid Rapid reported the smallest 1000-weight value (62,3 g), and hybrid Performer reported the highest membranes percentage (24,8%). This variation in seed weight most likely resulted from genotype differences. The genotype responses in this study were probably genotype-dependent. There is a positive correlation between the low membranes percentage, the high 1000-weight value and the seeds production.



In table 1 there is reported a synthesis of the production results of the sunflower genotypes experimented. Seed oil content was significantly influenced by genotype. Seed oil content depends on genotype but is also affected by environmental conditions and cultural practices.

Previous studies reported that seed oil content could vary widely with plant variety and growing conditions. The potential yield of sunflower is highly dependent on environmental conditions during the life of the crop. In the present study, seed yield was substantially influenced by both genotype and year. We observe that hybrid Performer has clearly separated from the control, registering a seeds production of 2150 kg/ha, but the most significant oil content value was reported at hybrid Saturn (53,5%).

It is interesting to note that all of the hybrids yielded more seed than the Favorit genotype, which was included in this study as a standard genotype recommended for the region according to previous study results. Again, the seed yields of the genotypes investigated in the present study were comparable to those reported for this region in previous studies. The sunflower genotypes produced higher seed yields in 2005 and 2006 than in 2004 and 2007. However, the higher yields in these years were due to more favorable weather conditions, particularly precipitation. A differential response occurred among the genotypes in the average on the years 2004-2007. This caused a significant year x genotype interaction.

**Table 1**

**The variability of seeds production and the oil content to some native sunflower hybrids cultivated in the central area of Oltenia (The average on the years 2004-2007)**

Crt. no.	Hybrid	Seed production (kg/ha)	±d (kg)	Signification	Oil content (%)
1	Favorit (Ct.)	1710	-	-	50,1
2	Saturn	2112	+312	X	53,5
3	Minunea	1765	-35	-	50,1
4	Performer	2150	+350	XX	49,3
5	Rapid	1770	-30	-	51,2
6	Select	1855	+55	-	49,5

DL 5%=285 kg/ha

DL 1%=321 kg/ha

DL 0,1%=350 kg/ha

## CONCLUSION

1. The results showed that the genotypes experimented differed significantly in all the characteristics investigated. Similarly, ecological conditions had a significant influence on the agronomic parameters of the genotypes.

2. The experimental results prove the variability of productivity traits to the sunflower genotypes studied. The genetic potential of the yield components and yield capacity are different at the researched sunflower hybrids.

3. The yield component number of seeds to the capitulum can be successfully used in indirect selection for sunflower yielding capacity.

4. The mutability of the seeds production and the oil content at the studied hybrids prove the value of hybrids Performer and Saturn, as well as their advantage regarding adaptability to the environmental conditions within the central area of Oltenia.

5. According to the results of the current study, it can be concluded that Performer and Saturn hybrids with their high seed and oil yield can be suggested as the best genotypes under the ecological conditions of Oltenia. However, we see a need for

conducting additional genotype performance studies including recently developed sunflower genotypes.

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# POTENȚIALUL GENETIC DE PRODUCȚIE LA CÂȚIVA HIBRIZI DE FLOAREA-SOARELUI CULTIVAȚI ÎN OLTENIA

## THE GENETIC YIELDING POTENTIAL TO SOME SUNFLOWER HYBRIDS CULTIVATED IN OLTENIA REGION

*Bonciu Elena, Voica, N.*

**Cuvinte cheie:** floarea-soarelui, hibrizi străini, potențial genetic, ameliorare.

**Keywords:** sunflower, foreign hybrids, genetic potential, improvement.

### **ABSTRACT**

*În scopul stabilirii celor mai productive genotipuri care pot fi cultivate cu succes în Oltenia, au fost investigați 5 hibrizi străini de floarea-soarelui, împreună cu un hibrid autohton de control, sub aspectul variabilității potențialului genetic de producție al acestora, precum și variabilitatea unor elemente componente ale producției.*

*Hibridul Flavia a demonstrat o excelentă adaptabilitate la condițiile de cultură din zona experimentată, de aceea, poate fi recomandat pentru extinderea în producție, în combinație cu hibrizi românești de floarea-soarelui, în scopul îmbunătățirii diversității genetice, care să asigure producții mari și constante de semințe și ulei la unitatea de suprafață.*

*Rezultate bune a înregistrat, de asemenea, și hibridul străin Barolo, care poate fi extins în cultură și, eventual, introdus în programul de ameliorare a florii-soarelui, ca material parental valoros pentru obținerea de noi hibrizi, mai productivi și de calitate.*

*Îmbunătățirea diversității genetice prin cultivarea unui sortiment de hibrizi cu reacție diferită la condițiile de cultură și mediu, cu perioade diferite de vegetație, constituie cea mai simplă și sigură cale de reducere a fluctuației producției de semințe la floarea-soarelui.*

*In order to establish the most productive genotypes that can be cultivated successfully in the Oltenia region, it was investigated the behavior of 5 foreign hybrids, together with a Romanian control, under the aspect of variability of the genetic yielding potential and some fructification traits.*

*The Flavia foreign sunflower hybrid have demonstrated an excellent adaptability to environmental conditions of the experimental area, and thus it is recommended to be expended into production in association with Romanians hybrids, in order to achieve a genetic diversity which should suppose great and constant yield of seed and oil per area unit*

*The best results have been obtained by the Barolo sunflower hybrid too, these being able to be extended in culture and, eventually, introduced in the programme of improving the sunflower as valuable producers.*

*The achievement of a genetic diversity by cultivating more hybrids with different reactions at the conditions of environment, with different precocity, constitutes the simplest and the most secure way of reduction of the fluctuation of the production of the sunflower.*

### **INTRODUCTION**

Sunflower is a major source of vegetable oil in the world. Worldwide production of sunflower has increased steadily since the last revision of some publication. Domestic use and export of non-oilseed sunflower has also increased.

Manny sunflowers hybrids have been selected for optimal performance in multiple markets and various growing conditions. Performance traits and characteristics that should be considered when selecting the right sunflower hybrids include cross type stand ability, maturity, drought tolerance and yield potential. Expanded world production of sunflower resulted primarily from development of high-oil varieties by plant scientists and more recently by the development of hybrids.

Sunflower is widely grown in the world where the climates are favorable and a high quality oil is desired. The achievement of a genetic diversity by cultivating more hybrids with different reactions at the conditions of environment, with different precocity, constitutes the simplest and the most secure way of reduction of the fluctuation of the production of the sunflower. If the technological elements are to a great extent firmly and correctly applied, and the climatic conditions practically incontrollable, the genotype is the most dynamic factor of influence of the productivity of the sunflower.

Successful oilseed-sunflower cropping depends on the yielding ability of genotypes, as well as on the reliability of production systems. Numerous studies have been conducted to evaluate the agronomic performances of commercially available sunflower genotypes in different areas of Romania.

## **MATERIAL AND METHODS**

The experiment has been located at no irrigated, following the method of multi-stage blocks, in the years 2005-2007. The biological material used within the experiment consisted of 5 foreign sunflower hybrids, along with the Romanian Control Favorit, namely: PR64A83, Tuscania, Barolo, Flavia and Fleuret.

There were performed both in the field and lab measurements and determinations regarding the plants height, 1000-seed weight and the membranes percentage, as well as the seeds production and the oil volume in the seeds.

The sunflower genotypes were hand-harvested at the stage of physiological maturation when the back of the head had turned from green to yellow and the bracts were turning brown (in the second week of September in both years). At harvest, 10 plants from each plot were selected for determining the plant height, 1000-seed weight and the membranes percentage. Seed oil content (% dry matter) was determined using the Soxhlet method.

All data were analyzed by analysis of variance for individual years and combined over the years. The mutability study of certain quantitative characters was done based upon the biometrical measurements.

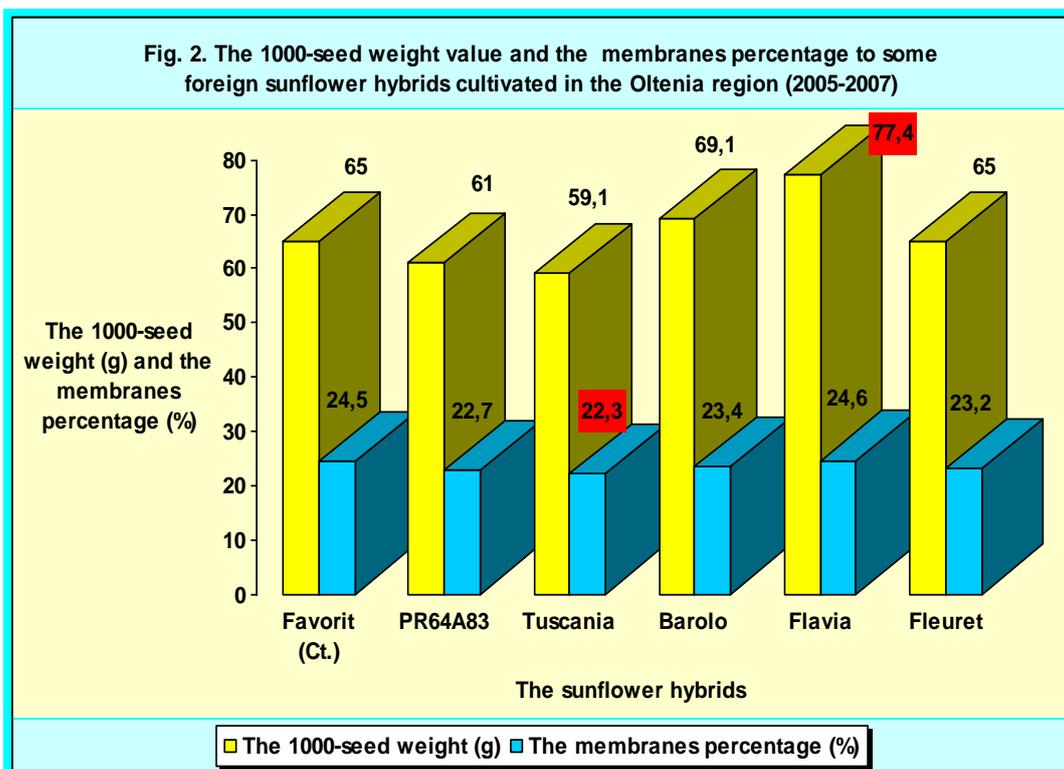
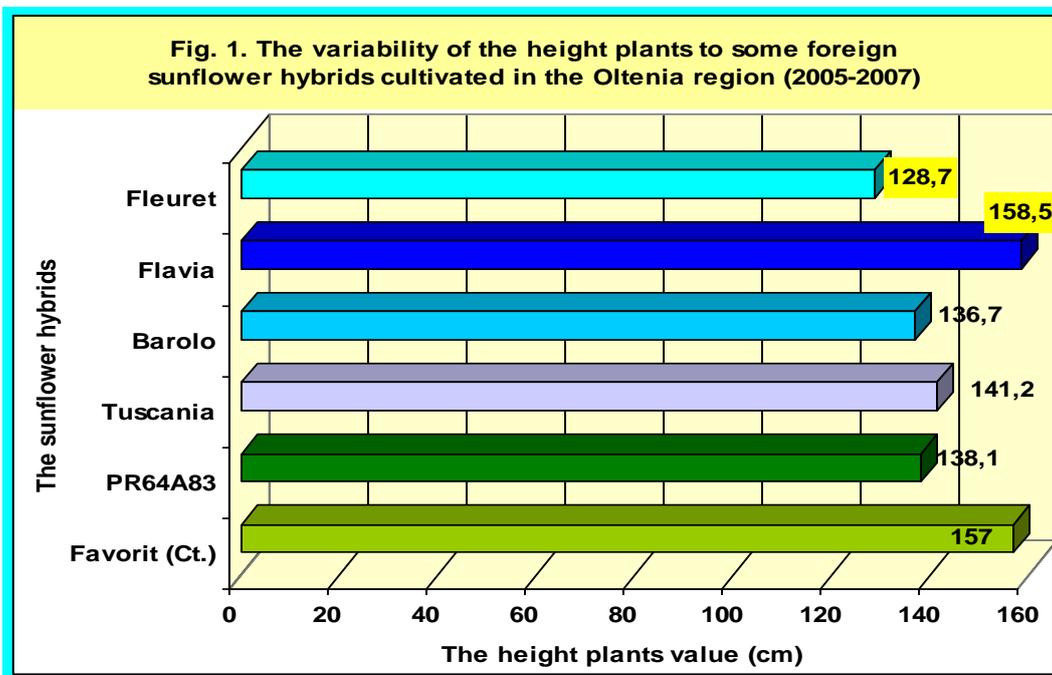
## **RESULTS AND DISCUSSION**

Selection of adaptable hybrids combined with use of recommended production practices are important factors for profitable sunflower production. Hybrids replaced open-pollinated varieties because of their increased yield, pest resistance, uniformity, stalk quality and self compatibility.

The obtained results regarding the plants height variety at the studied hybrids are reported in figure 1. Thus, we state that hybrid Flavia has registered the maximum height (158,5 cm), while hybrid Fleuret has registered the lowest height (128,7 cm).

The experimental results stressed out a great genetic diversity related to the analyzed sunflower hybrids, considering the plant height, and made the proof that it is a character of good stock. This character is correlative to the growth period and seed yield. For the central area of Oltenia, there are recommended short genotypes in order to both avoid the phenomenon of stem breaking and achieve a better mechanized harvesting. From this point of view, the most valuable genotypes for improvement are the foreign Fleuret and Barolo sunflower hybrids.

From the analysis of figure 2 results that during the years 2005-2007, the most significant 1000-seed weight value was reported at hybrid Flavia (77,4 g) the latter also proving the highest membranes percentage (24,6%) towards the control, and hybrid Tuscania reported the smallest 1000-seed weight value (59,1 g), the latter also proving the lowest membranes percentage (22,3%) towards the control. There is a positive correlation between the low membranes percentage, the high 1000-seed weight value and the seeds production.



Seed yield potential is an important trait to consider when looking at an available hybrid list. Yield trial results from experimental stations and from commercial companies should identify a dozen or so consistently high yielding hybrids for a particular area. Oil percentage should be another trait to consider in hybrid selection.

Several environmental factors influence oil percentage, but the hybrid's genetic potential for oil percentage also is important. Historically, moisture and temperature during flowering time had significant impacts on the absolute levels of linoleic fatty acid (polyunsaturated) and oleic fatty acids (monounsaturated), and therefore on their ratios.

Sunflower seed grown in cooler climates yielded generally higher linoleic acid contents, while seed produced under warmer conditions saw higher oleic acid contents. In a very general sense, the inverse relationship results in a one percent increase in oleic acid approximating a simultaneous one percent decrease in linoleic acid and vice versa, depending on the climate. The other fatty acids see only limited changes. Recent research has been leading to the development of high oleic sunflower varieties with oil that may approach or exceed 90% oleic fatty acid content.

In table 1 and figure 3 there is reported a synthesis of the production and oil seeds content results of the studied foreign sunflower hybrids. We observe that hybrid Flavia has clearly separated from the control, registering a seeds production of 2656 kg/ha, also highlighting itself through the biggest oil content (53,1%). The Barolo foreign sunflower hybrid registering a seed production of 2585 kg/ha and 50,2% oil content. The big value oil content was reported also to hybrids PR<sub>64</sub>A<sub>83</sub> and Fleuret (51,5%).

In figure 4 is reported the variability of the relative seed production value (%) towards to control – Favorit sunflower hybrid. Thus, we state that hybrid Flavia has registered the maximum value (128%) towards to control, while hybrid Fleuret has registered the lowest relative seed production value (95%).

The Flavia foreign sunflower hybrid have demonstrated an excellent adaptability to plantation and environmental conditions of the experimental area, and thus it is recommended to be expended into production in association with Romanians hybrids, in order to achieve a genetic diversity which should suppose great and constant yield of seed and oil per area unit.

**Table 1**

**The variability of seeds production and the oil content to some foreign sunflower hybrids cultivated in the Oltenia region (2005-2007)**

Crt No.	Hybrid	Seed product. (kg/ha)	Relative product. (%)	±d (kg)	Signific.	Oil content (%)
1	Favorit (Ct.)	2070	100	-	-	50,1
2	PR <sub>64</sub> A <sub>83</sub>	2437	118	+367	X	51,5
3	Tuscania	2037	98	-33	-	51,1
4	Barolo	2585	125	+515	XX	50,2
5	Flavia	2656	128	+586	XX	53,1
6	Fleuret	1967	95	-103	-	51,5

DL 5%=285 kg/ha    DL 1%=450 kg/ha    DL 0,1%=610 kg/ha

Fig. 3. The seed production and the oil content to foreign sunflower hybrids studied (2005-2007)

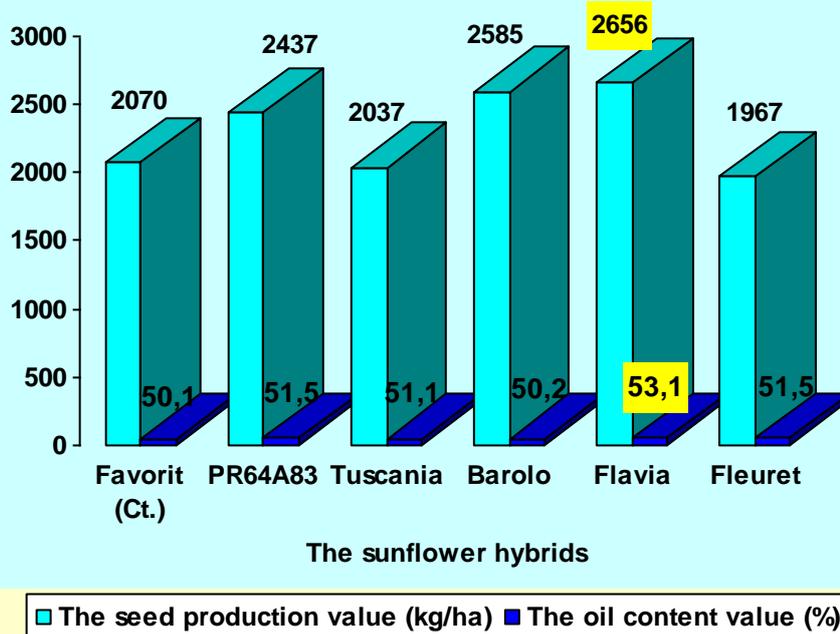
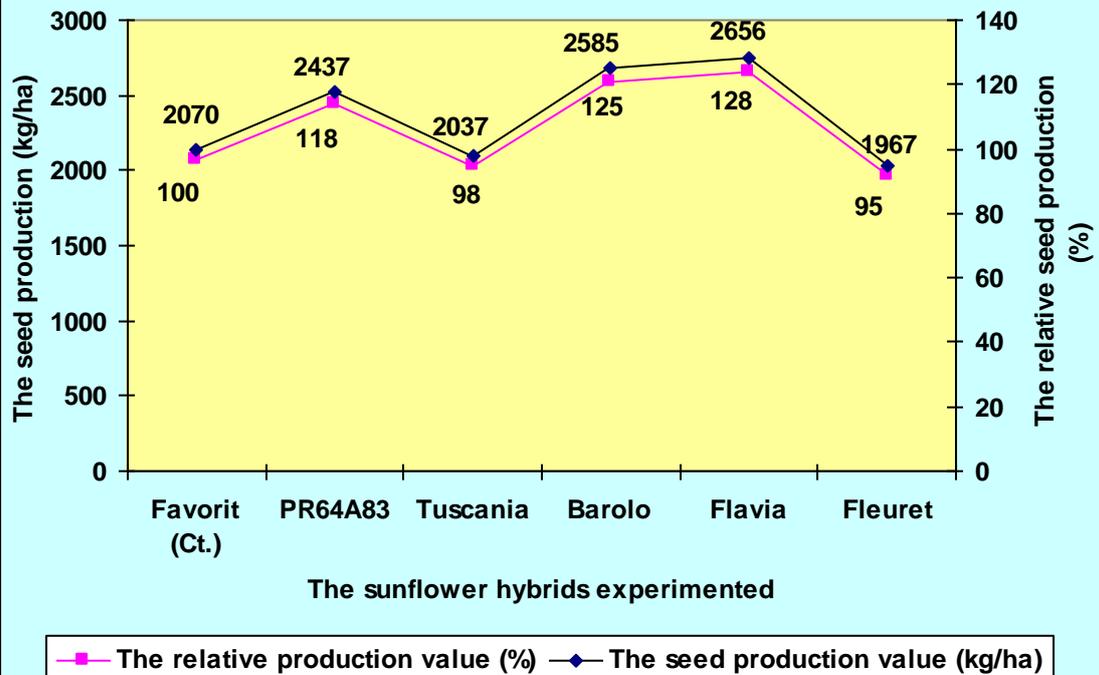


Fig. 4. The relative seed production (%) towards to control to some sunflower hybrids



## CONCLUSIONS

1. The foreign sunflower hybrids studied during the years 2005-2007, were distinguished as plant height, this being a remarkable character;
2. The Flavia sunflower hybrid has registered the maximum plant height, while hybrid Fleuret has registered the lowest plant height;
3. For the central area of Oltenia, there are recommended short genotypes in order to both avoid the phenomenon of stem breaking and achieve a better mechanized harvesting. From this point of view, the most valuable genotypes for improvement are the foreign Fleuret and Barolo sunflower hybrids;
4. The most significant 1000-seed weight value was reported at hybrid Flavia the latter also proving the highest membranes percentage towards the control, and hybrid Tuscania reported the smallest 1000-seed weight value, the latter also proving the lowest membranes percentage towards the control.
5. The mutability of the seeds production and the oil content at the studied hybrids prove the value of hybrid Flavia, as well as their advantage regarding adaptability to the environmental conditions within the central area of Oltenia. From the synthesis of the obtained results, Flavia and Barolo proved to be the most valuable foreign sunflower hybrids studied.
6. The achievement of a genetic diversity by cultivating more hybrids with different reactions at the conditions of environment, with different precocity, constitutes the simplest and the most secure way of reduction of the fluctuation of the production of the sunflower.

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# STUDIUL PROCESELOR FIZIOLOGICE ȘI BIOCHIMICE CARE AU LOC ÎN PLANTELE DE NARCISSUS PSEUDONARCISSUS PE PARCURSUL CREȘTERII ȘI DEZVOLTĂRII

## THE STUDY OF PHYSIOLOGICAL AND BIOCHEMICAL PROCESSES WHICH HAPPEN IN NARCISSUS PSEUDONARCISSUS PLANTS ALONG THE GROWTH AND DEVELOPMENT

*Luminita Buse-Dragomir*

Cuvinte cheie: narcise, creștere, dezvoltare, fotosinteză  
Key words: Narcissus, growth, development, photosynthesis

### ABSTRACT

*Cercetările cu privire la cracteristicile proceselor fiziologice și biochimice care au loc în plantele de Narcissus pseudonarcissus au fost efectuate în cadrul serelor RAADPFL Craiova la varietatea Printal, aplicându-se tehnologia curentă pentru cultura acestor plante în seră.*

*Din datele prezentate în lucrare a reieșit că intensitatea fotosintezei a fost influențată de faza de dezvoltare și de vârsta frunzelor.*

*În ceea ce privește conținutul în pigmenți asimilatori al frunzelor, acesta a marcat o creștere progresivă până în perioada de înflorire deplină.*

*Intensitatea procesului de transpirație a fost influențată de gradul de maturare al frunzelor, umiditatea atmosferică și temperatura mediului ambiant.*

*Substanța uscată totală din frunzele plantelor luate în studiu a crescut de la faza vegetativă la faza de înflorire deplină cu cca 2 procente, modificându-se totodată și valoarea raportului dintre substanța uscată și glucidele solubile.*

*The researches about the characteristics of physiological and biochemical processes which happen in Narcissus pseudonarcissus plants they was effectuated within greenhouses from RAADPFL Craiova, with Printal variety, using current technology for Narcissus crop in greenhouses.*

*The intensity of photosynthesis process of Narcissus plants it was affected by development phase of plant, so also by leaves age.*

*From data synthetized it cans see that it has recorded increases of content in chlorophyllian pigments from leaves until final flowering period, when it has effectuated the last determination.*

*The intensity of transpiration process it is mainly affected by three factors: leaf maturing degree, atmospheric humidity and surrounding environment temperature.*

*The total dry substances from Narcissus leaves it increase from the vegetative phase to the total flowering phase with approximately two percents, concomitantly modifying also the value of proportion between dry substance and soluble glucids.*

### INTRODUCTION

Plants have biological clocks -internal time-measuring mechanisms that have a biochemical basis. They also can reset the clocks and make seasonal adjustments in their patterns of growth, development and reproduction. Yet it still has a genetically based capacity to respond to a range of conditions characteristic of the environment in which that type of plant evolved.

## MATERIAL AND METHODS

The researches about the characteristics of physiological and biochemical processes which happen in Narcissus plants they was effectuated for Printal variety, within greenhouses from RAADPFL Craiova, using current technology for Narcissus crop in greenhouses.

The analysis was effectuated on fifth leaf in three different development phases: vegetative phase, floral stem appearance and final flowering.

The physiological and biochemical indicators which are followed within this experiment, they was determined using next methods:

Intensity of leaf photosynthesis with LCA-4 automatic analyzer help directly in greenhouse, the results expressed in  $\mu\text{mole}/\text{m}^2/\text{s}$ .

The content in assimilation pigments (mg/100g) it was established by spectrophotometric method, with help of Jasco-95 instrument.

Cellular juice concentration, expressed in soluble drying substance percents, it was refractometric established, using Abbe refractometer.

Transpiration intensity it was establish by moment method consisted of double weighing of leaves at 10 minutes distance, the result been expressed in  $\text{mg water}/\text{dm}^2/\text{h}$ .

## PERSONAL RESULTS AND DISCUSSIONS

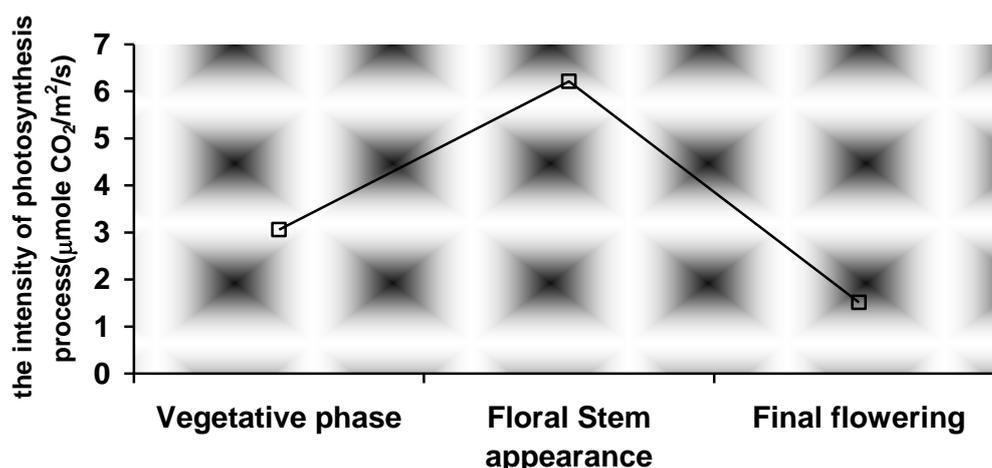
The intensity of photosynthesis process

Looking on data from table nr.1, it can observe that the intensity of photosynthesis process of Narcissus plants from Printal variety it was affected by development phase of plant, so also by leaves age.

In this way, it has been ascertained that, the average value of photosynthesis process intensity in leaves growth phase, it was  $3,06 \mu\text{mole CO}_2/\text{m}^2/\text{s}$  and it reached maximum value in the period of floral stem appearance ( $6,21 \mu\text{mole CO}_2/\text{m}^2/\text{s}$ ), when the leaves continue to grow, while in final flowering phase it decreased to  $1,51 \mu\text{mole CO}_2/\text{m}^2/\text{s}$ . Between the three determination moments it has recorded significant differences from the statistical point of view.

Along growth and development season of Narcissus plants, the bright intensity it varied between  $1019 \mu\text{mole}/\text{m}^2/\text{s}$  in vegetative phase,  $1163 \mu\text{mole}/\text{m}^2/\text{s}$  in floral stem appearance phase and  $1075 \mu\text{mole}/\text{m}^2/\text{s}$  in final flowering, while the average temperature it recorded variations relatively insignificant, it situating between  $26,8^\circ\text{C}$  and respective  $28,8^\circ\text{C}$  values.

Graf.1. The intensity of Narcissus leaf photosynthesis process in accordance with growth and development phase



### The content in pigments of leaves

From data synthesized in Table 1 it can be seen that it has recorded increases of content in chlorophyllian pigments from leaves until final flowering period, when it has effectuated the last determination.

In this way the content in chlorophyll a from leaves it has increased from 210,14mg/100g in vegetative growth period, to 229,1mg/100g in final flowering period.

The content in chlorophyll b it has increased from the value 71,80 mg/100g determined in flowering phase to 75,6mg/100g in final flowering phase, while total chlorophyll it marked a quite significant increase, from 269,47 mg/100g to 304,7 mg/100g.

**Table 1. The content in pigments of Narcissus leaves from Printal variety depending on development (mg/100g).**

Development phases	Chlorophyll a	Chlorophyll b	Chlorophyll a+b	a/b	Carotenoid pigments
Vegetative phase	210.14	59.33	269.47	3.53	10.10
Floral Stem appearance	221.31	71.84	293.11	3.07	10.61
Final flowering	229.12	75.63	304.74	3.02	11.33

The proportion between the two chlorophylls (a and b) it presented very little differences between determined values in the two plants development phases (3,02-3,53 mg/100g).

The carotenoid pigments presented a relatively reduced accumulation on growth and maturing process of leaves. In this way, in leaves drawn from plants case, which are in vegetative phase, they had the value 10,10 mg/100g, while for leaves drawn from plants in final flowering period, they had the value 11,33 mg/100g.

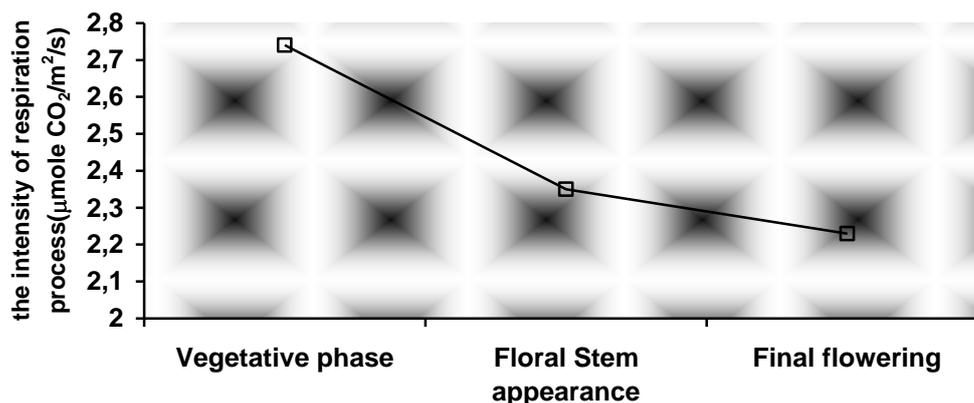
The values of chlorophyllian/carotenoid pigments proportion they have recorded variations relatively increased, between 30,14 and 31,94.

### The intensity of respiration process

The Narcissus leaf respiration it is affected by growth and development phase, the biggest intensity of process it realizing in vegetative phase, when it takes place the intense processes of cellular division and extension.

Ulterior, the process intensity decreases along the maturing and senescent process.

**Graf.2. The intensity of Narcissus leaf respiration process in accordance with development of leaves phase.**



The presented data distinguish that in young leaves case the average value of respiration intensity it was by 1,96  $\mu\text{mole CO}_2/\text{m}^2/\text{s}$ , while in floral stem appearance period it reaches the value 1,31  $\mu\text{mole CO}_2/\text{m}^2/\text{s}$ .

### The intensity of transpiration process

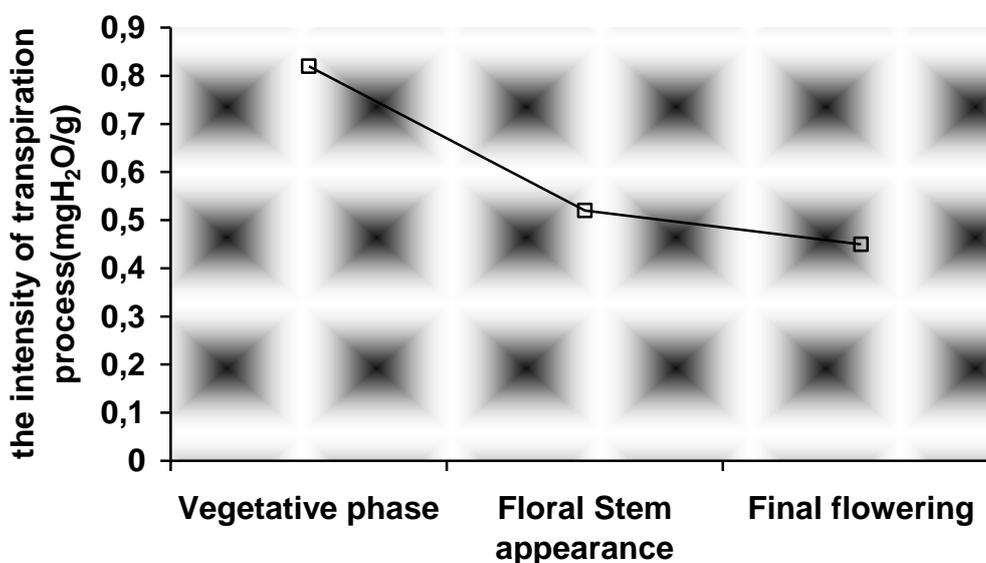
The intensity of transpiration process it is mainly affected by three factors: leaf maturing degree, atmospheric humidity and surrounding environment temperature.

Because in hothouse conditions the temperature and humidity they maintained at relatively constant values, the biggest influence it had it the leaves maturing degree.

As it follows from table 4, the maximum intensity of transpiration it was determined on young leaves, which had the thinner cuticle.

In this way, the values of transpiration intensity they were 0,82 mg/100g in case of leaves drawn from young plants and they decrease to 0,52 mg/100g on leaves of plants in floral stem appearance phase, but on the lower level, with value 0,45 mg/100g, it was determined at leaves drawn from plants in final flowering phase.

**Graf.3 The intensity of transpiration process**



### The content in dry substance

From data presented in table 2 it can be observed that the total dry substance from Narcissus leaves increases from the vegetative phase to the total flowering phase with approximately 2 percents, concomitantly modifying also the value of proportion between dry substance and soluble glucids.

**Table 2. The content in dry substance(%)**

Development phases	Dry substance	Soluble glucids	Dry substance/ soluble glucids
Vegetative phase	16.21	7.83	2.07
Floral Stem appearance	16.83	6.97	2.41
Final flowering	16.97	6.41	2.64

## CONCLUSIONS

- The physiological and biochemical processes from Narcissus plants leaves are significant influenced by the growth and development phase.
- The photosynthesis presents the maximum value in floral stem appearance and a minimum in final flowering phase.
- The respiration and perspiration processes present the maximum value in vegetative growth phase.
- The accumulation of chlorophyllian and carotenoid pigments it is influenced by the plants development phase, the values increasing from the vegetative phase to flowering phase.

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**MODIFICĂRI FIZIOLOGICE ȘI BIOCHIMICE PRODUSE DE CIUPERCA ALTERNARIA HELIANTHI LA PLANTELE DE FLOAREA SOARELUI (HELIANTHUS ANNUUS L.)**  
**PHYSIOLOGICAL AND BIOCHEMICAL MODIFICATIONS PRODUCED BY ALTERNARIA HELIANTHI FUNGI ON SUNFLOWER PLANTS (HELIANTHUS ANNUUS L.)**

*Luminița Bușe-Dragomir*

**Cuvinte cheie:** Floarea soarelui, ciupercă, fotosinteză, respirație, pigmenți  
**Key words:** Sun flower, fung, photosynthesis, respiration, pigments

**ABSTRACT**

În cadrul experiențelor am urmărit reacția hibridului simplu de Floarea soarelui Florom 350 la atacul ciupercii patogene *Alternaria helianthi*, semnalată în toate țările europene și care produce daune importante în special în anii cu veri bogate în precipitații.

Metoda de studiu a constatat în determinarea comparativă a proceselor fiziologice și a parametrilor biochimici la plantele sănătoase și la cele atacate, crescute în condiții identice.

Analizând procesul de fotosinteză la plantele atacate de ciupercă, s-a constatat o scădere semnificativă a procesului, acesta ajungând să reprezinte 63% din valoarea înregistrată la plantele sănătoase.

În urma studierii procesului de respirație, a reieșit că acesta este puternic intensificat la plantele bolnave, cea mai mare valoare înregistrându-se în momentul înfloririi.

Cantitatea totală de pigmenți asimilatori din frunze a avut valori mai reduse la plantele atacate de ciupercă, modificându-se în același timp și raportul dintre pigmenții verzi și cei galbeni, precum și raportul dintre clorofilele a și b.

Within the framework of experiments we follow the reaction of FLOROM 350 sunflower simple hybrid to the infestation of *Alternaria helianthi* pathogen fungi, pointed out in all European countries and which produce important damages especially in the years of precipitation rich summery control system

The examination method it consists of the comparative determination of physiological processes activities and biochemical parameters to infested and healthy plants, grown in identical conditions.

Analyzing comparatively the photosynthesis process on healthy plants and on infected plants by *Alternaria helianthi* pathogen fungi, it has been ascertained that one significant decrease of process on the infested plants, this one coming to represent 63% from the value of the photosynthesis intensity of healthy plants.

As a result of respiration process study on the infected plants, it follows that this one is strongly increased, the biggest value recording in blooming moment.

The total quantity of assimilator pigments from leaves it decreased values on infected plants by fungi, in the same time modifying also the rapport between green and yellow pigments, also the rapport between a and b chlorophyll.

The content of calcium and magnesium elements us an increasing of their quantity on the infected leaves level, because the intensifying of the catabolic processes under the mycelium fungi influence.

## INTRODUCTION

The sunflower can be characterized by a high sensibility to the attack of different pathogen microorganisms (viruses, mycoplasmas, bacteria, and fungi), which can constitute an important limitative factor both of production and of extension of culture on certain geographical areas.

The large variations of phythopathology image of sunflower it due not only to the complex interactions between the host plant and parasites, but also to the interactions with variable conditions of the environment and technologies of culture.

## MATERIAL AND METHODS

Within the framework of experiments we follow the reaction of FLOROM 350 sunflower simple hybrid to the infestation of *Alternaria helianthi* phatogen fungi, pointed out in all European countries and which produce important damages especially in the years of precipitation rich summer.

First symptoms of the fungi infest it usually appear in flowering time, the infection intensity increasing gradual to the end of vegetative period.

The examination method it consists of the comparative determination of physiological processes activities and biochemical parameters to infested and healthy plants, grown in identical conditions. In this sense, it was determined: the intensity of photosynthesis, respiration and perspiration, as well as the content in calcium,

The intensity of photosynthesis and respiration it was determined with clasical methods, measured in the same time the air temperature and photosynthetic active radiation.

The intensity of transpiration it was gravimetrically determined, by double measurement of leaves on 10 minutes time, the result being expressed in mg water/dm<sup>2</sup>/h.

The content in calcium and magnesium it was established by titrimetrical methods, while the pigment quantity from leaves it was established by uv/vis Jasco 95 spectrophotometer help.

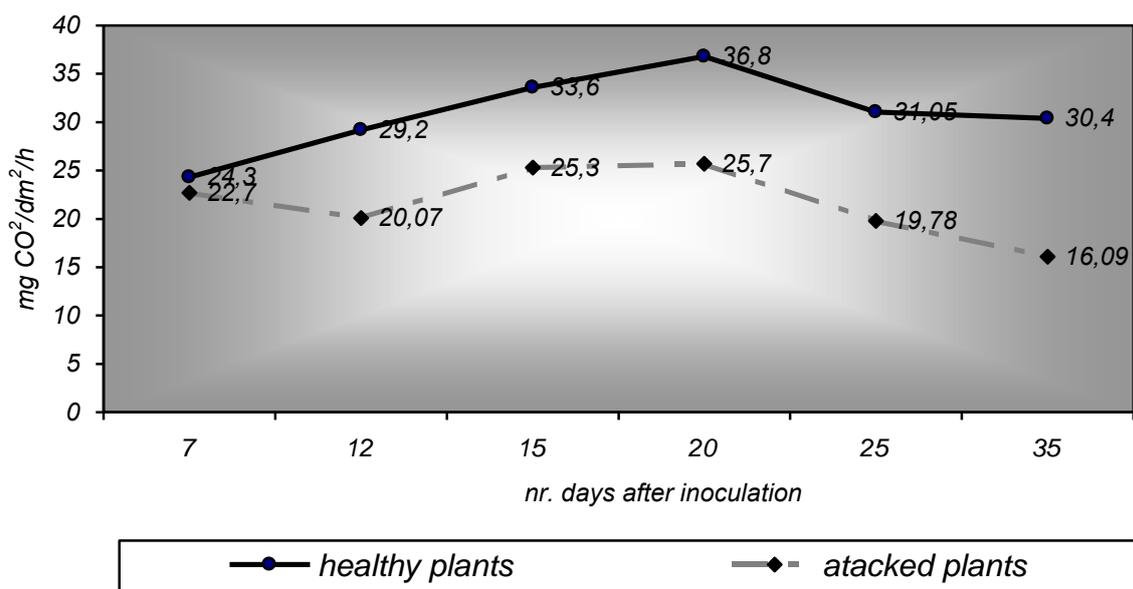
## RESULTS AND DISCUSSIONS

Analyzing comparatively the photosynthesis process on healthy plants and on infected plants by *Alternaria helianthi* phatogen fungi, it has been ascertained that one significant decrease of process on the infested plants, this one coming to represent 63% from the value of the photosynthesis intensity of healthy plants. Because the infested plants they had a surface of leaves affected just in 5% proportion, the increasing with 37% of photosynthetic energy it can't be conferred on assimilator surface decrease, but more sure, on the action exercised by the toxins produced by fungus.

Graphic nr.1.The photosynthesis process on healthy plants and on infected plants by *Alternaria helianthi*

As a result of respiration process study on the infected plants, it follows that this one is strongly increased, the biggest value recording in blooming moment. Is interesting to mark that the respiration it increased not only in the infected place, but also on the all plant, so also to healthy organs or apparently healthy plants.

As a result of fungi charging, it has taken place modifications to the stomata function level, characterized by disturbing the mechanism for closing and opening of osteols. As a result of this fact, the transpiration intensity is increased, the supplementary loss of water following to fading of plants, even in the conditions of saturated soil in water.



Gr. nr.2. The respiration process on healthy plants and on infected plants by *Alternaria helianthi*

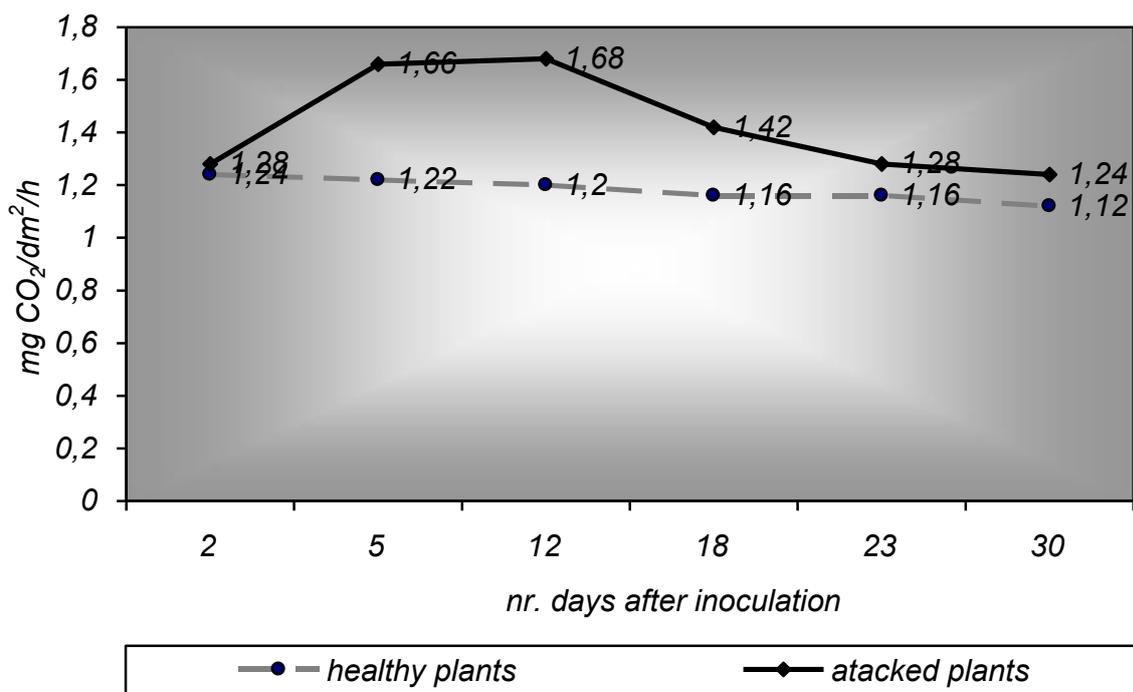


Table nr. 1. The transpiration intensity on healthy and infected plants

Vegetative phase	Intensity of transpiration (g water/dm <sup>2</sup> /h)	
	Healthy plants	Atacked plants
Bud flower	2,56	2,61
Blossom	3,09	3,87
Maturity	1,93	1,75

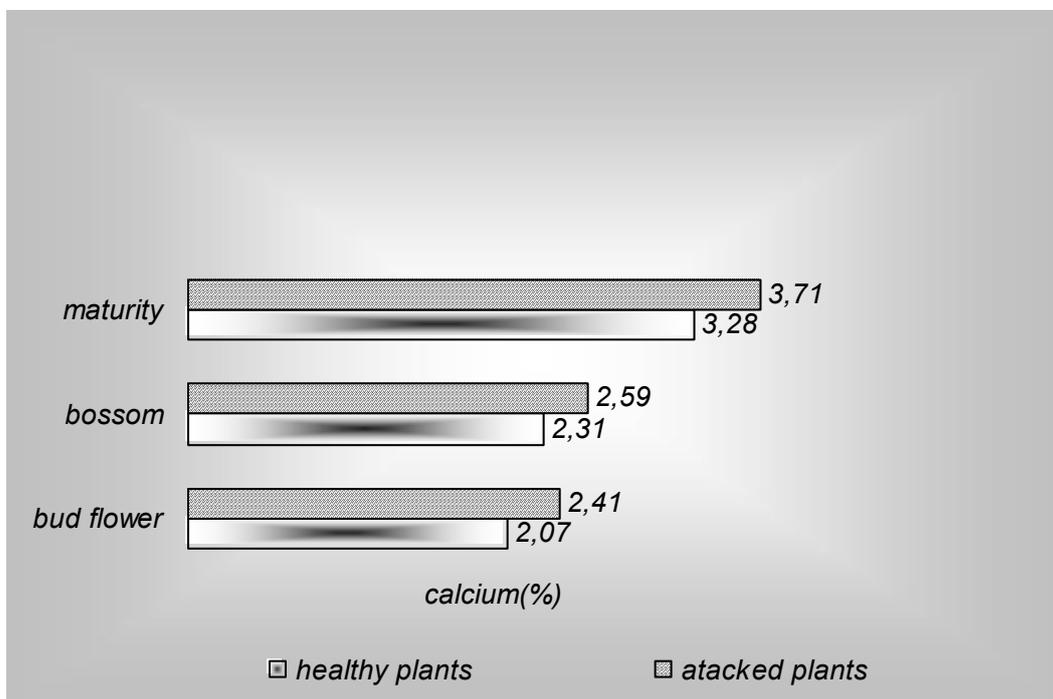
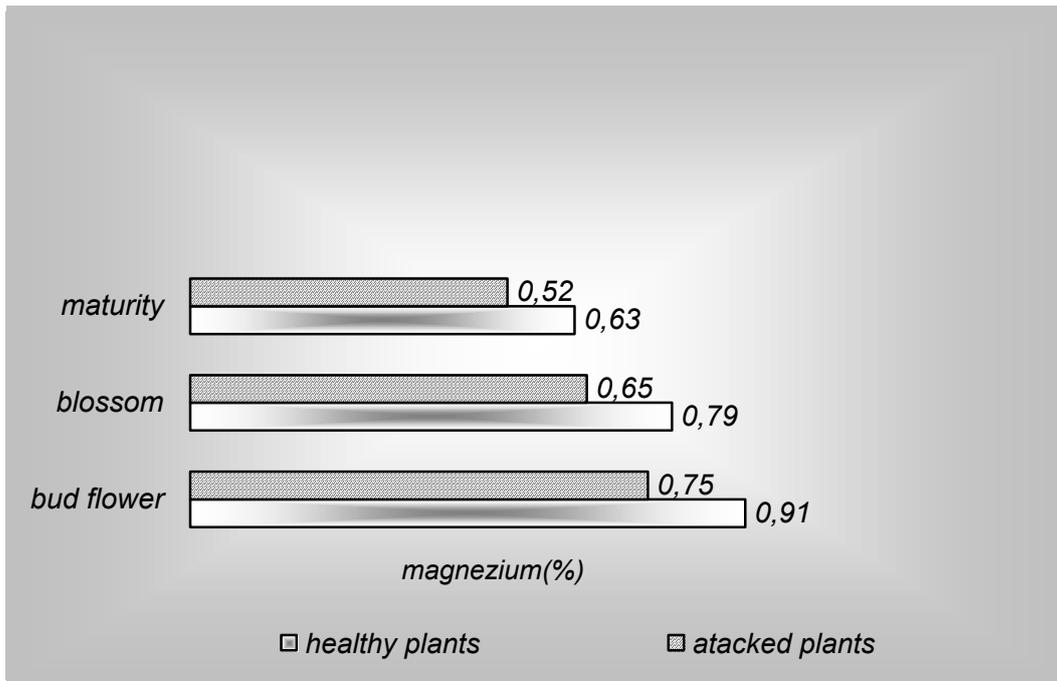
Table nr.2 The quantity of assimilator pigments from leaves(g/100g fresch mat.)

Nr. days after infection	Variants	The total quantity	Chlorophyll a	Chlorophyll b	Yellow pigments
7	Healthy	0,810	0,357	0,148	0,305
	Atacked	0,773	0,322	0,149	0,302
20	Healthy	0,820	0,360	0,150	0,310
	Atacked	0,738	0,297	0,146	0,295
35	Healthy	0,817	0,363	0,144	0,312
	Atacked	0,612	0,223	0,123	0,346

The total quantity of assimilator pigments from leaves it decreased values on infected plants by fungi, in the same time modifying also the rapport between green and yellow pigments, also the rapport between a and b chlorophyll.

As regarding the content of calcium and magnesium elements, the data from graphic nr.3, it shows us an increasing of their quantity on the infected leaves level, because the intensifying of the catabolic processes under the mycelium fungi influence.

Ghraph. nr.3. The content of calcium and magnesium elements(% in d.s.)



### CONCLUSIONS

As a result of pathogen attack, always it takes place the modification of functional equilibrium of host plant. Every time these functional modifications persist a long time, exceeding the adaptability limit, it coming up such named pathological process.

By the enzymes and toxins that are secreted, *Alternaria helianhi* fungi influence all the vital functions of sunflower plants. In this way, it is modifying the photosynthetic activity, the processes of chlorophyll produce, the unassimilated processes, and the water and mineral elements circuit.

The early diagnosing of illness condition, before the appearing of visible symptoms, using physiological methods, get us the possibility to defend our crops trough elaboration of the most efficient!

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# EFFECT OF OSMOTIC STRESS ON LEAF AREA AND CLOROPHYLL CONTENT OF SOME BEAN (*Phaseolus vulgaris* L.) LOCAL LANDRACES FROM BANAT AREA

## EFECTELE STRESULUI OSMOTIC ASUPRA SUPRAFETEI FOLIARE ȘI CONȚINUTULUI DE CLOROFILĂ LA UNELE POPULAȚII LOCALE DE FASOLE (*Phaseolus vulgaris* L.) DIN BANAT

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**Key words:** bean, chlorophyll, leaf area, osmotic stress

### **ABSTRACT**

*In our experiment we study the salt stress tolerance of 6 bean (*Phaseolus vulgaris* L.) local land races. The osmotic stress was induced by using salt solution: 106,70 kPa, 320,11 kPa, 512,18 kPa. We measured the followed physiological index: leaf area and chlorophyll content.*

*The increase of NaCl concentrations produced a decrease of chlorophyll a and b concentrations. Stress condition led to growth reduction as shown by fresh weight, dry weight and leaf area (LA).*

*The experimental results showed value between 3,94 mg/g f.w. and 9,06 mg/g f.w. for chlorophyll content when osmotic stress was induced by using of 512,18 kPa salt solution.*

*În acest experiment am studiat toleranța la stresul salin la 6 populații locale de fasole. Stresul osmotic a fost indus prin utilizarea soluțiilor saline : 106,70 kPa, 320,11 kPa, 512,18 kPa. Au fost determinați următorii indici fiziologici: suprafața foliară și conținutul de clorofilă.*

*S-a constatat că o creștere a concentrației de NaCl provoacă scăderea conținutului de clorofilă a și b. Condițiile de stres osmotic provoacă de asemenea reducerea unor parametrii cum ar fi masa proaspătă, substanța uscată și suprafața foliară (LA).*

*Rezultatele experimentale arată valori cuprinse între 3,94 mg/g m.p. și 9,06 mg/g m.p. pentru conținutul de clorofilă totală la o presiune osmotică de 512,18 kPa .*

### **INTRODUCTION**

Beans are an important source of protein in the diet of the Banat population and are farmed in an array of cropping systems, in areas ranging from less than one hectare to hundreds, under rain fed conditions or supplementary irrigation, providing three major harvests per year. The methods used for attenuate the hyper salt soils effects are very expensive and overfulfield by the expansion of this field in agricultural circuit.

From this reason the improvement of salt tolerance of cultivated species is a necessity by capitalization of the salt tolerance variability in local land races of the same species or other species or by the “*novo*” creation of some varieties by different methods.

The common bean is principal protein sources in human alimentation in numerous course of development countries.

Bean protein is very valuable from qualitative point of view, including the majority of essential amino acids, at a lower cost comparative with animal protein.

From this consideration, our research fallowed the tolerance showed by 6 bean genotypes at salt stress.

## MATERIAL AND METHOD

The sampling procedure was directed to seeds from the farmer's own stocks kept in cellars, conditioned in bags, boxes or any other container.

The negative influence of the salt excess on plants is reflected in two directions, these being osmotic and toxic. The osmotic effect restrains water supplies and induces tissue dehydration. The physiological drought is installed when external solution contains combinations that can not reach the plant cells and in such conditions high osmotic pressure is induced (3). The experiment were conducted to examine a range of genetic variability for salinity tolerance among and within *Phaseolus* species, and to confirm the reproducibility of leaf area and chlorophyll content. The experimental variants were: V<sub>0</sub> – control (distillated water), V<sub>1</sub> – NaCl 106,70 kPa V<sub>2</sub> – NaCl 320,11 kPa, V<sub>3</sub> – NaCl , 512,18 kPa

The leaf area (LA) was calculated by an undistruptive method using portable *Leaf Area Meter AM-300*.

**The chlorophyll content was determinate by the spectrophotometer method by measured the absorbance in 645 nm and 663 nm.**

$$Ca = 12,7 * OD 663 - 2,69 * OD 645$$

$$Cb = 22,9 * OD 645 - 4,68 * OD 663$$

$$Ca+b = 8,02 * OD 663 + 20,20 * OD 645$$

## RESULTS AND DISCUSSION

The data recorded on leaf area showed differences between bean local landraces on different variant of osmotic stress.

**Table 1**

**Experimental results regarding the dynamic of leaf area in bean local land races**

Genotype	Variant	Leaf area/plant 1.2 BBCH (cm <sup>2</sup> )	Leaf area/plant 2.1 BBCH (cm <sup>2</sup> )
CIREȘU	V0	89,4 ± 0,21	110,13±0,23
	V1	32,17±1,12	41,22±1,16
	V2	24,54±0,07	28,26±2,42
	V3	14,87±1,21	19,55±1,15
BOCȘA ROMÂNĂ	V0	68,7±1,46	75,43±0,88
	V1	50,1±0,06	56,74±0,25
	V2	44,23±2,16	47,25±1,74
	V3	31,15±1,18	34,72±2,54
CARAȘOVA	V0	53,14±1,12	59,25±2,97
	V1	42,43±2,06	46,23±1,88
	V2	27,12±0,01	33,12±2,35
	V3	19,87±1,89	25,18±0,09
PĂTAȘ	V0	40,3±1,11	44,97±1,10
	V1	37,21±1,77	30,24±2,27
	V2	25,15±0,04	28,53±2,17
	V3	15,07±2,25	17,14±1,87
SOCENI	V0	70,24±1,55	74,37±1,14
	V1	59,43±2,87	62,82±2,42
	V2	38,46±1,22	40,91±2,64
	V3	11,59±2,53	14,73±0,72

Regarding the leaf area determination we chose 2 phenological stages: 1.2. BBCH (2 leaves) and 2.1 BBCH (first lateral stem). The results showed in variant v3 some

differences between bean local landraces, the best results in dynamics manifested Carasova genotype (5,31 cm<sup>2</sup>).

The results for chlorophyll content is presented in table 2, and we determinate the chlorophyll a and b content and also the total amount of chlorophyll from bean leaf.

**Table 2**

**Total chlorophyll content in bean genotypes**

Genotype	Variant	Chlorophyll a (mg/g f.w.)	Chlorophyll b (mg/g f.w.)	Total chlorophyll (mg/g f.w.)
CIREȘU	V0	4,96	3,25	8,21
	V1	3,87	4,77	8,64
	V2	4,22	3,35	7,57
	V3	2,77	3,68	6,46
BOCȘA ROMÂNĂ	V0	4,03	6,18	10,21
	V1	4,73	8,75	13,47
	V2	2,54	7,38	9,92
	V3	2,63	6,43	9,06
CARAȘOVA	V0	3,66	5,63	9,29
	V1	4,53	6,39	10,92
	V2	3,58	4,96	8,54
	V3	2,80	2,66	5,47
PĂTAȘ	V0	1,40	3,86	5,26
	V1	2,77	3,68	6,46
	V2	2,51	1,57	4,08
	V3	1,33	2,61	3,94
SOCENI	V0	3,23	7,55	10,77
	V1	7,52	4,47	12,00
	V2	6,77	0,96	7,73
	V3	2,54	2,23	4,77

From the data obtained, regarding the total content of chlorophyll we observed that osmotic stress produced modification of chlorophyll content. We mentioned that a moderate level of stress (V1) not produce a decrease of chlorophyll content but shoed even an increase of that. But in V2 and V3 stressed variant we observed a decrease of chlorophyll content in all bean local land races.

## CONCLUSIONS

- Regarding the leaf area dynamic we observed differences between bean local land races after osmotic stress induced by using salt stress solutions. The best results was noted in Carasova genotype with 5,31 cm<sup>2</sup> difference between the two determination moment (1.2 BBCH and 2.1 BBCH) ;
- In our experiment regarding the total content of chlorophyll from leaf in bean local landraces we observed that an moderate osmotic stress produce a increase of total chlorophyll content (v1), but in stressed variant (v2 and v3) we noted a decrease of chlorophyll content in all genotypes. The best results was showed by Bocsă Romana local land races with 9,06 mg/g f.w. total chlorophyll content.

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#### **ACKNOWLEDGEMENT**

We would like to thank to Ministry of Education and Research from Romania and the National University Research Council (CNCSIS) which finance the research program: *RESEARCHES REGARDING THE PHYSIOLOGY OF TOLERANCE TO OSMOTIC STRESS OF SOME LOCAL POPULATIONS OF PHASEOLUS VULGARIS L. WITHIN BANAT'S AREA IN ORDER TO USE THEM IN AMELIORATION PROCESSES*

# EVALUAREA INTERACȚIUNII GENOTIP X MEDIU ASUPRA UNOR COMPONENTE DE PRODUCȚIE LA GRÂUL DE TOAMNĂ

## EVALUATION OF GENOTYPE X ENVIRONMENT INTERACTION ON SOME YIELD COMPONENTS IN WINTER WHEAT

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**Key words:** winter wheat, yield, genotype environment.

### ABSTRACT

*Amelioratori adesea iau în considerare interacțiunea genotip x mediu în vederea testării mai multor cultivare în diferite localități dintr-o anumită zonă. În acest sens, un soi de grâu ideal ar trebui să prezinte o producție medie ridicată asociată cu o variație redusă a acesteia în diferite condiții de mediu. Obiectivele acestui studiu a constat în evaluarea stabilității unor componente ale producției la o colecție de 21 de soiuri de grâu de toamnă, prin intermediul unor diferite modele statistice de analiză a interacțiunii genotip x mediu.*

*Soiurile Fundulea 4, Alex, Crina și Turda 95 au prezentat o interacțiune genotip x mediu redusă asociată cu valori ale numărului de boabe din spic superioare mediei experienței. În același timp soiurile Turda 2000, Dropia, Dor și Greti au realizat valori ale numărului de boabe din spic inferioare mediei experienței asociate cu o stabilitate ridicată. Valori ale MMB-ului superioare mediei experienței asociate cu o stabilitate ridicată au fost observate la soiurile: Arieșan, Lovrin 34, Turda 2000, GKOthalom.*

*Plant breeders invariably encounter genotype x environment interaction (GEI) when testing different cultivars across a number of environments. An ideal wheat variety should have a high mean yield combined with a low degree of fluctuation under different environments. The objective of this study was to evaluate the stability of some yield components for 21 winter wheat cultivars through different statistical models genotype-by-environment interaction analysis.*

*Cultivars Fndulea 4, Alex, Crina, and Turda 95 presented low genotype x environment interaction associated with values of grain number in spike superior to the experience mean. In the same time Turda 2000, Dropia, Dor, and Greti cultivars attained values of grain number/spike inferior to the experience mean associated with high stability. Values of the thousand grain weight superior to the experience mean associated with a high stability were observed for Arieșan, Lovrin 34, Turda 2000, GKOthalom.*

### INTRODUCTION

In plant breeding multi-location trials carried out during series of years are used in the final selection cycles to identify superior genotypes. This task is not generally easy due to the frequent presence of genotype by environment interaction (GE). GE represents the differential genotypic expression across environments which attenuate association between phenotype and genotype, reducing genetic progress in breeding programs. The most important type of GE is crossover or qualitative, which implies change in the ranking of genotypes across environments (Baker, 1990). With non-crossover interactions, genotypes with superior means can be recommended for all environments.

High yield stability usually refers to a genotype ability to perform consistently, whether at high or low yield levels across a wide range of environments (Tarakanovas P., Ruzgas V., 2006). An ideal wheat variety should have a high mean yield combined with a low degree of fluctuation under different environments (Annicchiarico P., 2002). There are

two contrasting concepts of stability: static (type 1) and dynamic (type 2), (Becker and Leon, 1988; Lin et.al., 1986).

Static stability is analogous to the biological concept of homeostasis: a stable genotype tends to maintain a constant yield across environments. Dynamic stability implies for a stable genotype a yield response in each environment that is always parallel to the mean response of the tested genotypes, i.e. zero GE interaction (Annicchiarico P., 2002).

The objectives of this study were to evaluate the stability of some yield components for 21 winter wheat cultivars through different statistical models to analyze and partitioning of the genotype-by-environment interaction.

## MATERIAL AND METHODS

The biological material was represented by 19 winter wheat native varieties, created by Fundulea Research Institute, Lovrin Research Station and Turda Research Station and two foreign varieties. Experiments were organized on 5 square foot plots and considering three replications according to randomized blocks method. The Flamura 85 variety was used as control variant.

**Table 1**

**Romanian and foreign studied cultivars**

No.	Variety	Institution	No	Variety	Institution
1	Flamura 85	Fundulea	12	Dor	Fundulea
2	Fundulea 4	Fundulea	13	Farmec	Fundulea
3	Lovrin 34	Lovrin	14	Falnic	Fundulea
4	Ariesan	Turda	15	Gloria	Fundulea
5	Dropia	Fundulea	16	Gruia	Fundulea
6	Alex	Lovrin	17	Greti	Fundulea
7	Ardeal	Turda	18	Turda 2000	Turda
8	Romulus	Fundulea	19	Turda 95	Turda
9	Boema	Fundulea	20	GK Othalom	Szeged
10	Crina	Fundulea	21	Bezostaia	Krasnodar
11	Delabrad	Fundulea			

First, the two yield component stability of the studied cultivars has been established using regression model of Shukla (1972). According this model the sum of the genotype effects and the genotype-by-environment interaction effects which is equivalent to is regressed on the environmental indices.

$$\beta_i = \frac{\sum_j (X_{ij} - \bar{X}_{.j})(\bar{X}_{.j} - \bar{X}_{..})}{\sum_j (\bar{X}_{.j} - \bar{X}_{..})^2}, \text{ where } (g_i) -$$

genotype effects and  $(ge)_{ij}$  equivalent with  $(X_{ij} - \bar{X}_{.j})$  - genotype-by-environment interaction effects.

Also, the Additive Main Effects and Multiplicative Interaction (AMMI) model was used to estimate the stability of grain number/spike and thousand grain weight for different cultivars. The AMMI model separates the multiplicative portion of GE interaction in to specific patterns of response of genotype and environments (Chahal and Gosal, 2002). In this analysis the information about GE interaction after taking out the main effects of environments and genotypes is used for PCA to extract patterns of GE or residual variation, to understand the underlying causes of such interactions (Gauch and Zabel, 1988).

## OBTAINED RESULTS

According to the variance stability analysis (table 2), significant differences in grain number in spike between three experimental year are observed. Thereby, cultivars Delabrad,

Dropia, Turda 200, Greti, Gloria presented the most stabile grain number in spike, with low variances in experimental period.

Table 2

**Grains number/spike stability variance analysis (a) (Shukla) and regression heterogeneity (b) for winter wheat cultivars studied during 2004/2007**

a) Variability source	SS	DF	MS(SS/DF)	F Test	Stability rank
Cultivars	523,36	20	26,17	3,59**	
Years	3460,04	2	1730,02	237,64**	
Cultivars x Years	453,38	40	11,33	1,55	
Flamura85			20,88	2,87*	18
Fundulea 4			29,59	4,07**	19
Lovrin 34			1,98	0,27	7
Ariesan			12,17	1,67	12
Dropia			0,23	0,03	2
Alex			8,11	1,11	11
Ardeal			15,94	2,19*	17
Romulus			13,63	1,87	15
Boema			13,66	1,88	16
Crina			3,08	0,42	8
Delabrad			0,03	0,01	1
Dor			1,17	0,16	6
Farmec			13,12	1,80	13
Falnic			41,32	5,68**	21
Gloria			0,33	0,05	5
Gruia			5,92	0,81	10
Greti			0,26	0,04	4
Turda 2000			0,24	0,03	3
Turda 95			5,17	0,71	9
GK Othalom			38,63	5,31**	20
Bezostaia			13,48	1,85	14

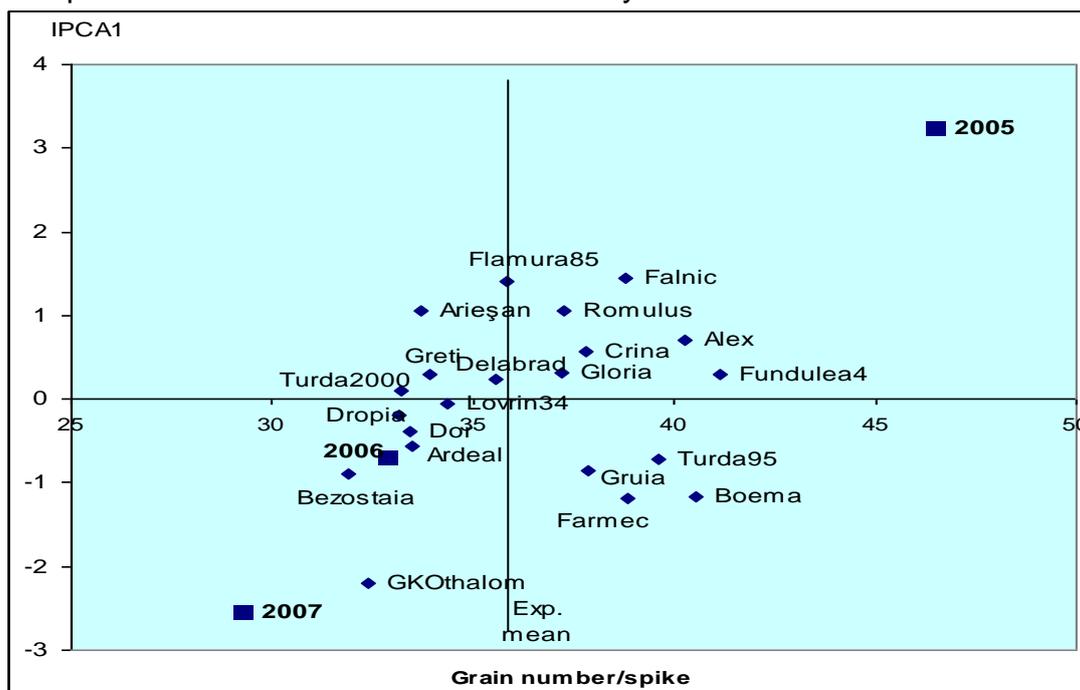
b) Variability source	SS	DF	MS(SS/DF)	F Test	Stability rank
Regression Heterogeneity	307,69	20	15,3869	2,11*	
Balance	145,69	20	7,28	1,01	
Cultivars x Years	453,38	40	11,33	1,56	
Flamura85			42,56	5,85**	21
Fundulea 4			0,11	0,01	3
Lovrin 34			0,24	0,03	5
Ariesan			9,25	1,27	16
Dropia			0,31	0,04	7
Alex			0,10	0,01	2
Ardeal			4,44	0,61	14
Romulus			0,38	0,05	9
Boema			22,24	3,05**	19
Crina			5,92	0,81	15
Delabrad			0,70	0,10	11
Dor			0,25	0,03	6
Farmec			20,94	2,88*	18
Falnic			13,64	1,87	17
Gloria			0,80	0,11	12
Gruia			0,09	0,01	1
Greti			0,38	0,05	10
Turda 2000			0,33	0,04	8
Turda 95			0,16	0,02	4
GK Othalom			29,07	3,99**	20
Bezostaia			4,05	0,56	13

High values of variance for this trait were observed in cultivars: Falnic, GKOthalom, Fundulea 4, Flamura, with significantly different values of grain number in spike depending on climatic conditions of the three experimental years.

Regression and balance variance showed the highest stability of grain number in spike for cultivars: Gruia, Alex, Fundulea 4 Turda 95, Lovrin 34. Decreased stability of the mentioned trait according to the evaluation based on variance stability was observed in cultivars: Flamura 85, GKOthalom, Boema, Farmec, Falnic. This cultivars expressed high variance values, therefore the interaction genotype x environment has a high impact on phenotypic expression of this trait.

The biplot of Additive Main Effects and Multiplicative Interaction (AMMI), represents the visual expression of relationships between interaction principal component analysis axis (IPCA1) and genotypes years mean, respectively.

Based on figure 1, the highest values of grain number in spike were achieved in year 2005 climatic conditions, followed by year 2006 and 2007. Also, the lowest variability of grain number in spike in studied cultivars was recorded in year 2006.



**Fig. 1 Biplot of grains number/spike and interaction principal component axis (IPCA1) for winter wheat cultivars studied during 2004/2007**

During the experimental period, cultivars Fundulea 4, Crina, Alex, Turda 95 achieved a superior grain number in spike in comparison to the experience mean, with high stability, considering the reduced values of main components interaction (IPCA1). In the same time, for cultivars Turda 2000, Drobia, Dor, Greti, the high stability is combined with values of grain number in spike, inferior to the experience mean. Based on vector lengths (distance from the origin) of every cultivar, the value of interaction genotype x environment for yield of every cultivar can be appreciated. Therefore, it is observed that cultivar GKOthalom achieves a grain number in spike inferior to experience mean, highly influenced by genotype x environment interaction, while the superior grain number in spike in cultivar Falnic is mainly due to the influence of genotype x environment interaction.

Significant values of F test from variance stability analysis table, during the experimental period (table 3a) indicate that significant differences between the experimental years existed, regarding the TGW o the cultivars. Low variances in experimental period for this trait were recorded by cultivars: Crina, Lovrin 34, Gloria, Alex which present a high stability of TGW in climatic conditions of the experimental period.

Table 3

**Thousand grains weight stability variance analysis (a) (Shukla) and regression heterogeneity (b) for winter wheat cultivars studied during 2004/2007**

a) Variability source	SS	DF	MS(SS/DF)	F Test	Stability rank
Cultivar	493,83	20	24,69	3,73*	
Years	657,09	2	328,55	49,70*	
Cultivars x Years	258,30	40	6,46	0,97	
Flamura85			4,78	0,72	12
Fundulea 4			4,34	0,66	11
Lovrin 34			0,10	0,01	2
Ariesan			2,16	0,33	6
Dropia			2,40	0,36	7
Alex			0,29	0,04	4
Ardeal			2,70	0,41	8
Romulus			6,90	1,04	14
Boema			7,19	1,09	15
Crina			0,07	0,01	1
Delabrad			3,15	0,48	10
Dor			1,06	0,16	5
Farmec			22,14	3,35**	20
Falnic			8,23	1,25	17
Gloria			0,12	0,02	3
Gruia			2,87	0,43	9
Greti			7,21	1,09	16
Turda 2000			14,51	2,20*	19
Turda 95			27,69	4,19**	21
GK Othalom			11,93	1,80	18
Bezostaia			6,34	0,96	13

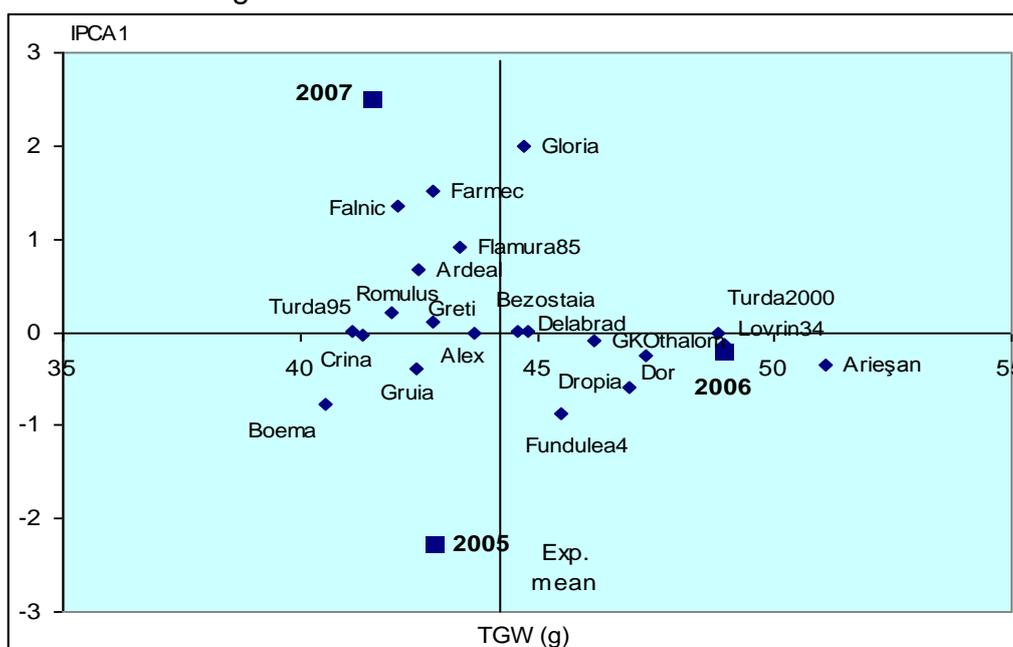
  

b) Variability source	SS	DF	MS(SS/DF)	F Test	Stability rank
Regression heterogeneity	126,15	20	6,31	0,95	
Balance	132,15	20	6,61	1,01	
Cultivars x Years	258,30	40	6,46	0,97	
Flamura85			2,98	0,45	12
Fundulea 4			0,17	0,03	11
Lovrin 34			0,02	0,01	2
Ariesan			4,64	0,70	6
Dropia			0,25	0,04	7
Alex			0,25	0,04	4
Ardeal			0,34	0,05	8
Romulus			11,73	1,77	14
Boema			14,12	2,14*	15
Crina			0,19	0,03	1
Delabrad			5,54	0,84	10
Dor			2,44	0,37	5
Farmec			0,35	0,05	20
Falnic			11,56	1,75	17
Gloria			0,34	0,05	3
Gruia			5,61	0,85	9
Greti			0,33	0,05	16

Turda 2000			29,27	4,43**	19
Turda 95			51,77	7,83**	21
GK Othalom			0,17	0,03	18
Bezostaia			0,21	0,03	13

Considering the low and insignificant values of F test (table 3b) for regression heterogeneity, result that the model of regression used for TGW is adequate for this study, and allows obtaining probative results over cultivars studied in period 2004-2007. Low values of regression variance which indicates high stability of TGW in this experimental year were observed in cultivars: Crina, Lovrin 34, Gloria, Alex. High instability due to significant influence of interaction genotype x environment over phenotypic expression of this trait, was observed in cultivars: Turda 95, Farmec, Turda 2000, GK Othalom.

Biplot of main additive effects and multiplicative interactions (AMMI) indicates that highest average values of this trait were achieved by cultivars studied in 2006 and 2005. also, based on vector lengths for three experimental years, it is observed that the lowest value of TGW in studied cultivars was recorded in year 2006, while in the year 2007 highest differences among cultivars were recorded.



**Fig. 2. Biplot of thousand grains weight and interaction principal component axis (IPCA1) for winter wheat cultivars studied during 2004/2007**

Cultivars Arieșan, Lovrin 34, Turda 2000, GK Othalom achieved TGW values superior to experience mean with high stability, considering the low values of main components interaction (IPCA1). In the same time, for cultivars Farmec, Falnic, Drobia, Greti, high stability is combined with values of this trait inferior to experience mean. Based on vector length, it is observed that cultivars Turda 95, Crina, Greti, Alex, achieve a TGW inferior to experience mean highly influenced by genotype x environment interaction, while the value superior to experience mean in Gloria is mainly due to the influence of genotype x environment interaction.

## CONCLUSIONS

1. During the experimental period, cultivars Fundulea 4, Crina, Alex, Turda 95 achieved a superior grain number in spike in comparison to the experience mean, with high stability. In the same time, for cultivars Turda 2000, Drobia, Dor, Greti, the high stability is combined with values of grain number in spike, inferior to the experience mean;

2. Cultivars Arieşan, Lovrin 34, Turda 2000, GK Othalom achieved TGW values superior to experience mean with high stability, In the same time, for cultivars Farmec, Falnic, Dropia, Greti, high stability is combined with values of this trait inferior to experience mean;

3. The grains number/spike and TGW values superior to experience mean in Gloria is mainly due to the influence of genotype x environment interaction that certify a high adaptation of this cultivar to favorable environments;

4. According with the high influence of influence of genotype x environment interaction to both traits in cultivar Flamura 85, we can conclude that this cultivar achieve values close to experimental mean in the unfavorable environments.

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# GENETIC IMPROVEMENT OF SOYBEAN RESISTANCE TO BIOTIC STRESS THROUGH MUTATIONS

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## REZUMAT

În vederea stabilirii influenței iradierii  $\gamma$  asupra caracterului de rezistență a genotipurilor de soia, s-a studiat în condiții de câmp (anii 2006-2007) reacția a 6 soiuri de soia: Kizelniska, KOO3, Ki237xKOO3, Glia, Mida și Alina, la atacul de către ciupercile *Fusarium* sp. Analiza mutațională a unor caractere importante a plantelor: toleranța la stresul abiotic, rezistența la factorul stresogen de natură biotică și caracteristica unor indici fiziologici (capacitatea de germinare, energia de creștere) au elucidat modificări în reacția de răspuns a genotipurilor de soia sub acțiunea dozelor mici (30 – 50 Gy) de radiații ionizante prin manifestarea rezistenței inducibile.

## INTRODUCTION

Soybean is susceptible to many species of fungi and bacteria in the seed and seedling stage. Root rots and seedling blights of soybeans are generally worse when soybeans are planted under cool, wet conditions. The species of fungi responsible for disease in a soybean field depends on several factors: species complex present, temperature and moisture conditions and the genetics of the soybean variety. Soybean seed treatments can help protect soybean seed and seedlings from fungal attack early in the season. Fungicides for seed treatment, although some are systemic, have a limited time period in which they are effective. This means that soybeans can be protected early in the season but succumb to root rots when conditions are favorable for infection later in the season. Genetic resistance is available in the form of Rps genes and field tolerance. Some molecular marker of the soybean resistance detection have been analyzed /1, 2/.

*Fusarium* root rot of soybean, caused by *Fusarium solani* can cause root rot on older plants. Infected seedlings can result in poor weak stands, late emergence or stunted plants. Infected seedling roots will show reddish brown or dark to light brown discoloration and decay. The disease at this stage may be misdiagnosed as *Rhizoctonia* because symptoms are similar. Symptoms on older plants consist of reddish brown to black lesions on lateral roots and the tap root (fig.1). In advanced stages of disease, there is decay of the cortex, the roots are black, and there are fissures in the dead surface tissues of the tap root. The leaves eventually become completely yellow, then die from the edges inward and fall from the petioles.



Fig.1. *Fusarium* root rot of soybeans.

Disease severity may be greater in plants showing iron chlorosis /4/. Sudden death syndrome (SDS), caused by *Fusarium solani f.sp. glycines*, is considered one of the most severe diseases of soybean in many countries /3/.

## MATERIAL AND METHODS

We have studied in the field condition the reaction to *Fusarium* sp. infections of 6 soybean genotypes: Kizelniska, KOO3, Ki237xKOO3, Glia, Mida and Alina, the wet seeds of which were treated with  $\gamma$  radiation on RXM-  $\gamma$ -20 installation with  $^{60}\text{Co}$  radiation source. Seeds were treated with 10 Gy, 30 Gy and 50 Gy doses. The dose debit consisted 0, 67 Gy/s.

In *in vitro* conditions the study of the *Fusarium* species composition variability have been carry out.

## RESULTS AND DISCUSSION

Our study about the variability of the *Fusarium* species composition demonstrates that the different soybean genetics form (variety, hybrid populations, mutants form) have been affected by: *F. oxysporum* (27,17 % strains), *F. oxysporum var.orthoceras* (42,09 %), *F.solani* (9,57 %), *F.solani var.coeruleum* (4,59 %), *F. javanicum* (2,30 %), *F. javanicum var.redolens* (1,40 %), *F. javanicum var.radicicola* (3,95 %), *F. merismoides* (2,30 %), *F. moniliforme* (2.04 %), *F. gibbosum var.bullatum* (1,79 %), another species –2.81 % (tab. 1).

**Table 1**

**The variability of the *Fusarium* species composition in function of the soybean genotypic particularities**

Species and subspecies	Genetic forms						Total number of species	
	Variety, n=14		Hybrid populations, n=42		Mutant forms, n=5			
	Nr	%	Nr	%	Nr	%	Nr	%
<i>Fusarium oxysporum</i>	63.0	23.59	114	26.33	36	42.85	213	27.2
<i>F.oxysporum var.orthoceras</i>	95.0	35.58	223	51.51	12	14.29	330	42.1
<i>F. solani</i>	15.0	5.61	36	8.31	24	28.57	75	9.6
<i>F. solani var.coeruleum</i>	11.0	4.11	21	4.85	4	4.76	36	4.6
<i>F. javanicum</i>	11.0	4.11	6	1.39	1	1.19	18	2.3
<i>F. javanicum var.redolens</i>	11.0	4.11	-	-	-	-	11	1.4
<i>F. javanicum var. radicola</i>	10.0	3.74	15	3.46	6	7.14	31	4.0
<i>F.merismoides</i>	11.0	4.11	6	1.39	1	1.19	18	2.3
<i>F.moniliforme</i>	10.0	3.74	6	1.39	-	-	16	2.0
<i>F.gibbosum var.bullatum</i>	10.0	3.74	4	0.92	-	-	14	1.8
Another species	20.0	7.49	2	0.46	-	-	22	2.8
Total:	267		433		84		784	

Under the consideration of creation of mutant soybeans initial materials tolerant to *Fusarium* infections, we have studied in the field condition the reaction to this infections of 6 soybean genotypes: Kizelniska, KOO3, Ki237xKOO3, Glia, Mida and Alina, the dry seeds of which were treated with  $\gamma$  radiation on RXM-  $\gamma$ -20 installation with  $^{60}\text{Co}$  radiation source. Seeds were treated with 10 Gy, 30 Gy and 50 Gy doses. The dose debit consisted 0, 67 Gy/s.

Mutational analysis of important crop characters (tolerance to abiotic stresses, resistance to diseases and insects, quality and nutritional characters, etc.) demonstrated the modification of the response reaction of the soybean genotypes under the  $\gamma$  radiation treatment to *Fusarium* diseases attack. In general under the influence of all used doses of  $\gamma$  radiation treatment all genotypes manifested higher resistance to *Fusarium* root rots by 9, 52 % and to seedling blights by 5, 75 %. Simultaneously, the specific reaction in the function of genotype has been elucidated. Varieties Glia and Mida manifested higher

susceptibility to  $\gamma$  radiation treatment. So, under  $\gamma$  radiation treatment (30 Gy and 50 Gy) the intensity of rots root and seedling blights development of Glia variety decreased by 25,5 % and 18,5 %, respectively and by 22,5% and 16,5 %, respectively, at Mida variety.

### CONCLUSION

The modification of response reaction to Fusarium diseases of 6 soybeans genotypes: Kizelniska, KOO3, Ki237xKOO3, Glia, Mida and Alina under the  $\gamma$  radiation treatment (10 Gy, 30 Gy, and 50 Gy) have been revealed, in the resistance increase direction, especially under the influence of doses 30 Gy and 50 Gy.

*The genotypic specific reaction to the  $\gamma$  radiation treatment has been established.* Varieties Glia and Mida manifested higher susceptibility to  $\gamma$  radiation treatment. So, under  $\gamma$  radiation treatment (30 Gy and 50 Gy) the intensity of rots root and seedling blights development of Glia variety decreased by 25,5 % and 18,5 %, respectively and by 22,5 % and 16,5 % at Mida variety.

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# REAL-TIME PCR-BASED METHOD FOR DETECTION OF *CLAVIBACTER MICHIGANENSIS* SSP. *SEPEDONICUS* AND *RALSTONIA SOLANACEARUM*

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**Keywords :** Brown rot, Ring rot, diagnosis, potato.

## ABSTRACT

*Clavibacter michiganensis* ssp. *sepedonicus* and *Ralstonia solanacearum* are two quarantine organisms difficult to detect in symptomless tubers. The only reliable control for these diseases caused by these bacteria is avoidance and clean seed potato. The aim of the study was to establish that Real-Time PCR test has a higher sensitivity compared to routine immunofluorescence assay, is a fast method that permits results in few hours and has the advantage to be a close system that limits the possibility of contamination. The protocols need to be optimized for routine use.

## INTRODUCTION

*Ralstonia solanacearum* (RS) and *Clavibacter michiganensis* subsp. *sepedonicus* (CMS) are the causal bacterial agents of potato brown rot, and potato ring rot. These two bacteria are responsible of significant losses in potato crops throughout the world. In Europe, RS and CMS are listed as A2 quarantine pests and their positive diagnosis results in severe economic consequences for growers. In order to eradicate or to avoid the introduction and spread of these bacteria through trade exchanges, sensitive and specific methods allowing detecting latent pathogen populations in seed tubers or in the environment are needed. In Europe, potato samples are currently screened by using indirect immunofluorescence (IF) microscopy, following an approved European Plant Protection Organization method (OEPP, 1992). To confirm the presence of the pathogens, typical colonies are purified and the culture is identified by IIF staining, PCR and a pathogenicity test on tomatoes and egg plants. PCR detection (Seal, 1993) has been used as an alternative to IIF and/or the confirmatory test but was found until now to be not reliable enough (Janse, 1996). These methods are time-consuming, not always reliable because of cross-reactions with other bacteria and of limited sensitivity (Shaad, 2002). Recently, more sensitive and specific PCR-based methods have been developed. Real-Time PCR test has a high sensitivity, higher than the routine immunofluorescence test, is a fast method that permits results in a few hours and it has the advantage to be a close system that limits the possibility of contamination.

## MATERIALS AND METHODS

### Sampling and assay of tubers.

Three samples representing twenty healthy potato tubers, from Turkey were sampled by core tissue extraction shaker incubation procedure following EU Directive 98/57. To these samples, three cores from three other tubers contaminated with *R. solanacearum* were added. All cores were placed into 25mL of 50mM phosphate buffer (pH 7.2) and agitated for four hours at room temperature. Two tubers (A and B) possibly contaminated with *C. m. ssp. sepedonicus* from United States of America were surface sterilized and the cores

removed. Extractions of cores were made in 6 mL of 50mM phosphate buffer (pH 7.2) and then agitated for four hours at room temperature.

#### **Growth of *C. m. ssp. sepedonicus* and *R. solanacearum* on agar media.**

The three samples contaminated with *R. solanacearum* (Rs gp1, Rs gp2 and Rs gp3) were plated on SMSA media (100 µl of non-diluted sample) for direct visualization (3 plates each sample) and BIO Real-Time PCR (3 plates each sample) and incubated at 28°C. A positive control of *R. solanacearum* was also plated onto YPG and SMSA media. For the 2 samples (A and B) contaminated with *C.m. ssp. sepedonicus* dilution 10 fold serially to 10<sup>-5</sup> were plated (100 µl of each dilution) on YPG agar medium and NCP-88. 100 µl of non-diluted samples and dilutions 10<sup>-1</sup> were plated on YPG agar medium (3 plates each). The plates were incubated at 23°C. These serially dilutions were made for CFU count and by this establishment of a standard curve to determine the concentration of the bacteria in the sample. The sample A was mixed with a healthy tuber extract and plated on YPG agar (6 plates) and NCP-88 (3 plates for direct visualization and 3 plates for BIO Real-Time PCR). A positive control of *C.m. ssp. sepedonicus* was also plated on YPG and NCP-88 media. NCP-88 and SMSA media were chosen for selective growth of target cells from the tuber extracts.

#### **Direct Real-Time PCR for the extracts contaminated with *R. solanacearum***

**DNA extraction.** For DNA extraction, a volume of 100 µL of each three extracts contaminated with *R. solanacearum* (Rs gp1, Rs gp2, Rs gp3) were frozen at -20°C and then boiled at 100°C (Patrik, 2000).

**DNA amplification.** Direct Real-Time PCR for the extracts contaminated with *R. solanacearum* was carried out using Smart Cycler II. The master mix (25 µL) contained 25 µM (both primers OLi-1 and Y-2), 10 µM FAM probe, 3 mM MgCl<sub>2</sub> and 2µL of the template DNA solution. Two beads per reaction tube containing Taq buffer, hot-start Taq polymerase, dNTP and MgCl<sub>2</sub> (OmniMix HS, cat. no. PCR10-100N-160, Cepheid) were added. A positive (DNA extract of *R. solanacearum* from Turkey) and a negative control were used for amplification. The thermocycler program for amplification followed initial denaturation at - 95°C 300s and cycling 40X (95°C 15s, 60°C 30s).

#### **Direct Real-Time PCR for the extracts contaminated with *C. m. ssp. sepedonicus***

**DNA extraction.** For DNA extraction, a volume of 100 µL of each extract A and B were frozen at -20°C and boiled at 100°C (Patrik, 2000). This extraction protocol was also applied to 7 samples (NIB1, NIB2, NIB3, NIB4, NIB5, NIB6, NIB7) from Slovenia positive on immunofluorescence assay, to extract B mixed with extract Rs gp1 and to extract A mixed with healthy tuber extract.

**DNA amplification.** Direct Real-Time PCR of the extracts contaminated with *C. m. ssp. sepedonicus* was carried out using Smart Cycler II. The master mix (25 µL) contained 25 µM (both primers PSA-1 and PSA-R 10 µM FAM probe, 3 mM MgCl<sub>2</sub> and 2µL of the template DNA solution. Two beads per reaction tube containing Taq buffer, hot-start Taq polymerase, dNTP and MgCl<sub>2</sub> (OmniMix HS, cat. no. PCR10-100N-160, Cepheid) were added. A positive (DNA extract of *C. m. ssp. sepedonicus* from Turkey) and a negative control were used for amplification. The thermocycler program for amplification followed initial denaturation at - 95°C 300s and cycling 40X (95°C 15s, 60°C 30s).

#### **Multiplex Direct Real-Time PCR for *R. solanacearum* and *C.m. ssp. sepedonicus***

**DNA extraction.** DNA (extracts of NIB1 and Rs gp3) from two single Real-Time PCR described before was used in the Multiplex Direct Real-Time PCR for *R. solanacearum* and *C.m. ssp. sepedonicus*.

**DNA amplification.** Multiplex direct Real-Time PCR for extracts contaminated with *C. m. ssp. sepedonicus* and *R. solanacearum* was carried using Smart Cycler II. The master mix (50  $\mu$ L) contained 25  $\mu$ M per primer (PSA-1, PSA-R, OLi-1 and Y-2), 10  $\mu$ M per probe (FAM and TexRed), 3 mM MgCl<sub>2</sub> and 1 $\mu$ L of the template DNA solution for each pathogen (*C. m.ssp.sepedonicus* and *R. solanacearum*). Four beads per reaction tube containing Taq buffer, hot-start Taq polymerase, dNTP and MgCl<sub>2</sub> (OmniMix HS, cat. no. PCR10-100N-160, Cepheid) were added. A positive (DNA extract of *C. m. ssp. sepedonicus* and DNA extract of *R. solanacearum* from Turkey) and two negative controls were used for amplification. The thermocycler program for amplification followed initial denaturation at - 95°C 300s and cycling 40X (95°C 15s, 60°C 30s).

#### **Single BIO Real-Time PCR for *R. solanacearum***

**DNA extraction.** The SMSA plates were washed and DNA extraction was made by freezing and boiling (Pastrick, 2000). The samples tested represented Rs gp1 (dilutions 10<sup>-1</sup> and 10<sup>-2</sup>) and Rs gp2 (dilutions 10<sup>-1</sup> and 10<sup>-2</sup>), three IIF (indirect immunofluorescence) positive seed potatoes samples from Turkey.

**DNA amplification.** Single BIO Real-Time was carried out using Smart Cycler II. The master mix (25  $\mu$ L) contained 25  $\mu$ M (both primers, OLi-1 and Y-2), 10  $\mu$ M FAM probe, 3 mM MgCl<sub>2</sub> and 2 $\mu$ L of the template DNA solution. Two beads per reaction tube containing Taq buffer, hot-start Taq polymerase, dNTP and MgCl<sub>2</sub> (OmniMix HS, cat. no. PCR10-100N-160, Cepheid) were added. A positive (DNA extract of *R. solanacearum* from Turkey) and two negative controls were used for amplification. The thermocycler program for amplification followed initial denaturation at - 95°C 300s and cycling 40X (95°C 15s, 60°C 30s).

#### **Single BIO Real-Time PCR for *C.m. ssp. sepedonicus***

**DNA extraction.** The NCP-88 plates were washed and DNA extraction was made by freezing and boiling; (Pastrick, 2000). The tested samples were represented by A extract and dilutions of this extract (10<sup>-1</sup>, 10<sup>-2</sup> and 10<sup>-3</sup>) and tuber A extract mixed with healthy tuber extract and dilution of this mixed extract (10<sup>-1</sup> and 10<sup>-2</sup>).

**DNA amplification.** Single BIO Real-Time was carried out using Smart Cycler II. The master mix (25  $\mu$ L) contained 25  $\mu$ M (both primers, PSA-1, PSA-R), 10  $\mu$ M FAM probe, 3 mM MgCl<sub>2</sub> and 2 $\mu$ L of the template DNA solution. Two beads per reaction tube containing Taq buffer, hot-start Taq polymerase, dNTP and MgCl<sub>2</sub> (OmniMix HS, cat. no. PCR10-100N-160, Cepheid) were added. A positive (DNA extract of *C. m. ssp. sepedonicus* from Turkey) and a negative control were used for amplification. The thermocycler program for amplification followed initial denaturation at - 95°C 300s and cycling 40X (95°C 15s, 60°C 60s).

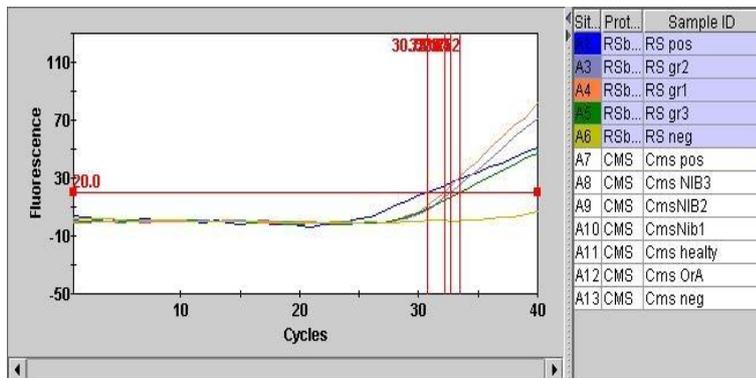
## **RESULTS**

#### **Direct Real-Time PCR for the extracts contaminated with *R. solanacearum***

All the samples contaminated with *R. solanacearum* gave positive results (Table 1).

**Table 1. Single Real Time PCR for samples contaminated with *Ralstonia solanacearum***

<b>Sample</b>	<b>Ct value</b>
Rs pos	30.74
Rs gp2	32.64



Rs gp1                    32.17

Rs gp3                    32.52

**Direct Real-Time PCR for the extracts contaminated with *C. m. ssp. sepedonicus***

The negative control turned out positive proving contamination, most probably due to the fact that the negative control was prepared last, after samples and positive control. The samples from Slovenia were positive and presented Ct values greater than the positive control of *C.m. ssp. sepedonicus* from Turkey (Table 2).

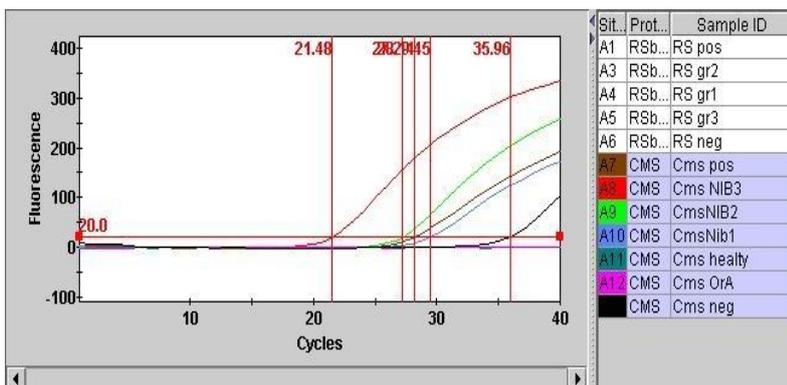
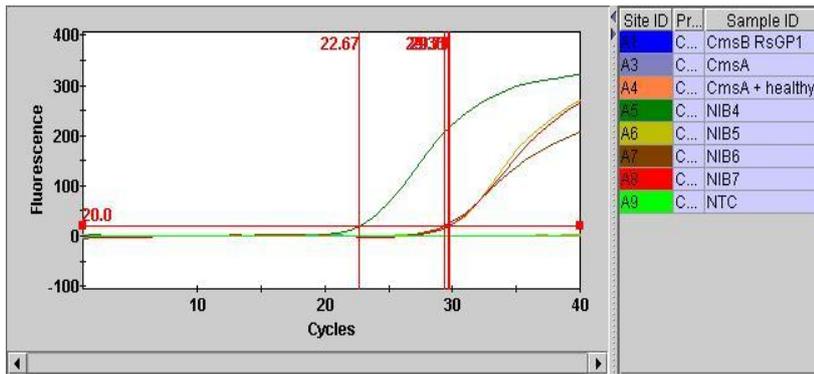


Table 2.  
Single  
Real-  
Time  
PCR for  
samples  
NIB1,  
NIB2,  
NIB3 and  
extract A

**Ct value      Results**

**Sample**

Cms pos	28.14	+
NIB3	21.48	+
NIB2	27.20	+
NIB1	29.45	+
CMS A+ healthy	-	-
CMS A	-	-
CMS neg	35.96	+



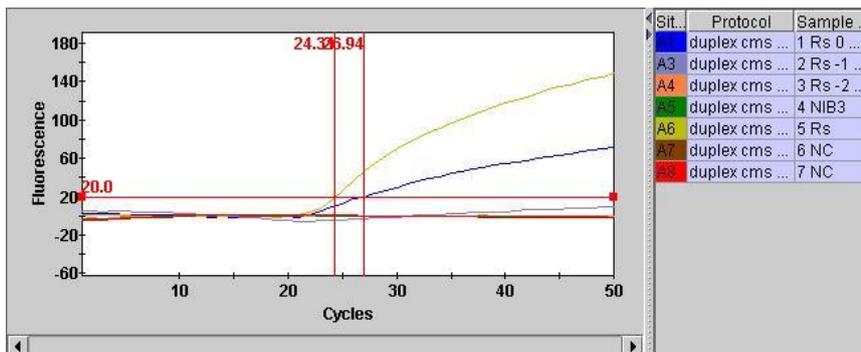
Ct values

Results

Table 3. Single Real-Time PCR for samples NIB4, NIB5, NIB6, NIB7 and extract A, extract A and healthy tuber, extract B mixed with Rs gp1.

### Multiplex Direct Real-Time PCR for *R. solanacearum* and *C.m. ssp. sepedonicus*

The results obtained indicates a competition between the two amplifications, as shown by the  $C_t$  values in comparison with the values obtained for the singleplex reaction. The  $C_t$  values of dilutions for *R. solanacearum* indicate the presence of reaction inhibitors (the potato extracts were stored under refrigerated conditions for 48 hours determining the growth of saprophytes with inhibitive effect). The  $C_t$  value of DNA amplified in multiplex is smaller that that of singleplex, most probably due to the DNA quantity reduced to half in the case of multiplex (Table 4).



Samples

CmsB+RsGp1	0	-
CmsA	0	-
Cms+healthy	0	-
NIB4	22.67	+
NIB5	29.79	+
NIB6	29.36	+
NIB7	29.71	+
Cms negative	0	-

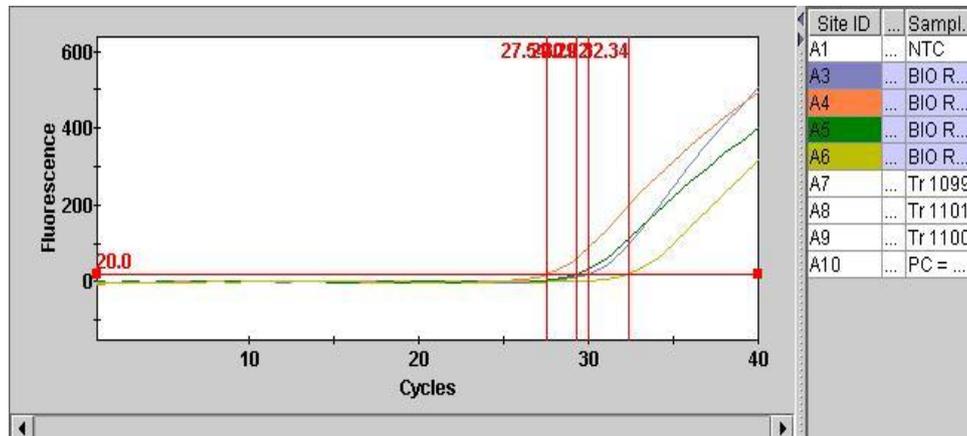
Table 4. Multiplex Direct Real-Time PCR for NIB1 and Rs gp3

Samples	Ct values FAM	Results	Ct values TexRed	Results
NIB 3+ Rs gp3 0	29.94	+	23.87	+
NIB 3+ Rs gp3 -1	0	-	23.76	+
NIB3+ Rs gp3-2	0	-	23.97	+

NIB3	24.31	+	22.63	+
Rs gp3	0	-	0	-
Negative control	0	-	0	-
Negative control	0	-	0	-

### Single BiO Real-Time PCR for *R. solanacearum*

All samples showed positive for *R. solanacearum*. It can be observed that the Ct values are lower for  $10^{-1}$  dilution when compared with  $10^{-2}$ , this resulting from the DNA quantity. The IIF positive samples from Turkey present a high level of infection (Table 5).

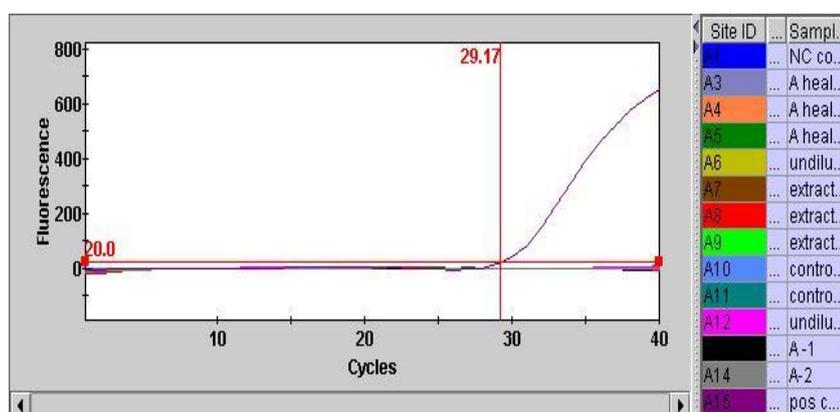


**Table 5. Single BiO Real-Time PCR for Rs gp1 (dilutions  $10^{-1}$  and  $10^{-2}$ ) and Rs gp2 (dilutions  $10^{-1}$  and  $10^{-2}$ ), three IIF (indirect immunofluorescence) positive seed potatoes samples from Turkey (Tr 1099, Tr 1101, Tr 1100).**

Samples	Ct values	Results
Rs Gp1 -2	30.02	+
Rs Gp1 -1	27.54	+
Rs Gp2 -1	29.29	+
Rs Gp2 -2	39.34	+
Tr 1099	20.96	+
Tr 1101	21.29	+
Tr 1100	28.55	+
Rs positive	23.48	+
Rs negative	0	-

### Single BiO Real-Time PCR for *C. m. ssp. sepedonicus*

All the samples tested for *C. m. ssp. sepedonicus* were negative meaning that the tber A and B were not infected with this pathogen or the level of infection was too low (under the limit of detection).



**Table 6. Single BiO Real-Time PCR for *C.m. ssp. sepedonicus* of extract A and dilutions of this extract ( $10^{-1}$ ,  $10^{-2}$  and  $10^{-3}$ ) and tuber A extract mixed with healthy tuber extract and dilution of this mixed extract ( $10^{-1}$  and  $10^{-2}$ ).**

Samples	Ct value	Results
Cms A control 0	0	-
Cms A extract 0	0	-
Cms A extract -1	0	-
Cms A extract -2	0	-
Cms control -1	0	-
Cms control -2	0	-
Cms A undiluted -3	0	-
Cms A -1	0	-
Cms A - 2	0	-
Negative control	0	-
Positive control	29.17	+

## DISSCUSIONS AND CONCLUSIONS

In this paper we report the development of a PCR-based method for detection of latent infections caused by two quarantine pathogens in potato. This method presents a series of advantages than the current methods used for detection in quarantine laboratory practices (immunofluorescence assay or PCR).

The major advantages of the Real-Time PCR-based detection system described are: allows the quantification of the amplified DNA in real time; eliminating extra pipetting steps and multiple reagents reduces contamination risk and provides better reproducibility; has high sensitivity ( $10^1$  cells/mL) higher than the routine immunofluorescence assay ( $10^3$  cells/mL) used as screening test; it is a fast method that permits results in a few hours and it has the advantage to be a close system that limits the possibility of contamination.

The size of the potato tubers samples should be increased for more accurate diagnosis. Comparative studies between immunofluorescence assay and Real Time PCR need to be carried out regarding sensibility and specificity of these two techniques used as

routine screening tests for detection of the two quarantine bacteria species. The Real Time PCR Protocols used need to be optimized for routine use.

The primers and probes used in the Real Time PCR techniques have an important role and must be specific for the analyzed pathogen, avoiding otherwise cross reactions.

The Real Time PCR test does not exclude the biological pathogenic test and a positive result for this test should be followed by isolation of the pathogen agent and virulence determination with the help of biological test.

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## **F1 TOMATO HYBRIDS FROM SCDL ISALNITA DOLJ**

*Nicoleta Constantinescu, Virgil Poli, Ioan Pintilie*

**Key words:** hybrid, tomatoes, backcross.

## ABSTRACT

*Between 1965 and 2007 several amelioration processes were implemented at SCDL Isalnita in order to obtain greenhouse, polytunnel and field growing F1 tomato hybrids that would satisfy productivity, quality and natural tolerance to nematodes and TMV demands.*

The germoplasm collection was diversified, thus obtaining a valuable initial amelioration material. The new genitor lines were used to obtain 700 hybrid combinations that were later studied in "F1 Hybrids Field". By rigorous selection of the biological material, 36 new F1 hybrids were recommend to be studied in C.C.C., at C.S.I.O.S. the following F1 hybrids were homologated: Oltbrid (1975), Craiobrid (1976), Isabrid (1977), Isalnita 50 (IH-50) (1984), Ioana (IH-29) (1988), Doljbrid (Rada) (2002). The Cris 1 hybrid is in its second year of trial at I.S.T.I.S. the new biotypes were characterized by: natural tolerance to nematodes, TMV, verticilliosis, precocity, productivity and superior fruit quality.

*Între anii 1965-2007 la Stațiunea de Cercetare Dezvoltare pentru Legumicultură Ișalnița au fost executate lucrări de ameliorare în vederea obținerii de hibrizi F<sub>1</sub> de tomate, pentru cultura în seră, solar și câmp, care să satisfacă cerințele de productivitate, calitate, dar mai ales de toleranță naturală la atacul de nematozi și VMT.*

*S-a realizat diversificarea colecției de germoplasmă, obținând un material inițial de ameliorare valoros. Liniiile genitoare noi au fost utilizate pentru realizarea a peste 700 combinații hibride, ce au fost ulterior studiate în "Câmpul de hibrizi F<sub>1</sub>". Trierea riguroasă a materialului biologic, în raport cu obiectivele urmărite și hibrizii de comparat, a permis ca 36 dintre hibrizii F<sub>1</sub> noi să fie recomandați în vederea studierii în C.C.C, la C.S.I.O.S. Dintre aceștia au fost omologați hibrizii F1: Oltbrid (1975), Craiobrid (1976), Isabrid (1977), Ișalnița 50 (IH-50) 1984), IH-29 (Ioana) (1988), Doljbrid (Rada) (2002). Hibridul Cris 1 se află în anul II de verificare la I.S.T.I.S. Noile biotipuri obținute s-au caracterizat prin : toleranță naturală la nematozi, VMT, verticilioză, precocitate, productivitate, fructe de calitate superioară pentru direcțiile de producție vizate (exportul și consumul intern în stare proaspătă).*

## INTRODUCERE

As a result of obtaining greenhouse, polytunnel and field growing F1 tomato hybrids, tomato fruits may be consumed throughout the year

The economical advantages due to the heterosis vigor of F1 hybrids are indisputable.

The hybrid stores in its heredity a series of biological traits that once correlated with a superior agricultural technique result in certain economical advantages.

A high number of specialized F1 hybrids were created worldwide. Many of these have been put to trial in our country both in experimental conditions and in production. Results regarding natural tolerance to disease and pests were not satisfying, as the spectra of races and strains of pathogenic agents from our country differ from the hybrids' countries of origin.

The improvement of the native range of early tomatoes has been a permanent necessity. Between 1965 and 1980 several amelioration processes were implemented at SCDL Isalnita in order to obtain greenhouse, polytunnel and field growing F1 tomato hybrids that would satisfy productivity, quality and natural tolerance to nematodes and TMV demands.

The social and economic realities of our country, following the December 1989 revolution, have had a strong impact upon the Romanian agriculture.

The main objective of F1 hybrid tomato amelioration has been the improvement of photosynthetic output by creating plants able of a maximum light energy to organic substances conversion, while simultaneously increasing natural tolerance to disease and pests.

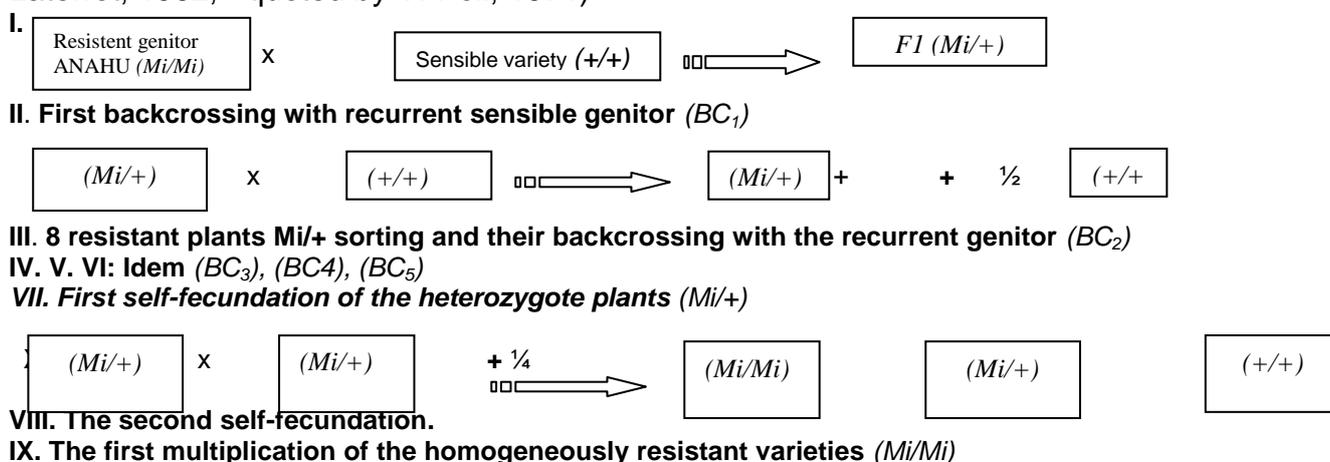
## MATERIALS AND REASERCH METHODES

In order to achieve our objectives, research was directed to broadening the genetical basis of cultivated tomato varieties. Wild species of *Lycopersicon*, world-wide and native varieties and hybrids that were easily accessible and highly variable were used in the amelioration processes.

The Anahu variety (received in 1964 from Montfavet, France) was used as a resistance genitor in the tomato amelioration processes (1965 – 1980, Isalnitá).

The initial amelioration material was made up of 11 greenhouse varieties cultivated in our country during 1960 – 1975. The chosen method was backcrossing, the simplest and fastest way to deal with a dominant monofactorial trait. The tomato resistance to nematodes amelioration diagram is rendered in figure 1. Resistant subject (*Mi/Mi*) sorting was accomplished by artificial steam induced infection in sterilized soil.

**FIG. 1 - The tomato resistance to nematodes amelioration diagram** (by Pecaut and Laterrot, 1962, - quoted by V. Poli, 1971)



**FIG. 1 - The tomato resistance to nematodes amelioration diagram** (by Pecaut and Laterrot, 1962, - quoted by V. Poli, 1971)

Backcrossing was used as the method for TMV resistance transfer (1965-1980). After each generation of backcrossing, resistant subjects were sorted by artificial infection, as recommended by Pecaut and Laterrot, 1962, - quoted by V. Poli, 1971.

The following amelioration methods: interspecific and intraspecific hybridisation, genealogical selection, backcross hybridisation and self-fertilization were used.

The experiments took place in greenhouses, polytunnels and in the field, with linear placement (selection field, hybridisation field) or 4 repetition randomised blocks, following specific guidelines.

Region specific hybrids were used as control. Maintenance procedures recommended by culture specific technology were applied during vegetation period. Observations and biometric determinations of plant and fruit traits were taken. Early and total production was dynamically registered. Other determinations such as mean fruit weight, diameter, height, number locular cavities, fruit color, shape and size of pistil scar, pericarp thickness, fruit solidity, and main fruit chemical components were taken.

Results were statistically processed according to each experimental technique.

## RESULTS AND DISCUSSIONS

The germoplasm collection was diversified, thus obtaining a valuable initial amelioration material characterized by: natural tolerance to nematodes, TMV, verticilliosis, precocity, productivity and superior fruit quality. The new genitor lines were used to obtain 700 hybrid combinations (tab. 1) that were later studied in "F1 Hybrids Field". By rigorous selection of the biological material, 36 new F1 hybrids were recommended to be studied in C.C.C., at C.S.I.O.S. The following F1 hybrids were homologated: Oltribrid (1975), Craiobrid (1976), Isabrid (1977), Isalnița 50 (IH-50) (1984), Ioana (IH-29) (1988), Doljbrid (Rada) (2002). The Cris 1 hybrid is in its second year of trial at I.S.T.I.S (tab.2).

### Biological material studied and created at S.C.D.L Ișalnița during 1957 – 2007

**Table 1**

Species	Cultivation	Germoplasm collection (lines, varieties, F1 hybrids)		F1 hybrid combinations		F1 hybrid combinations studied in C.C.O.		F1 hybrids proposed for trial in C.C.C. at C.S.I.O.S.		Homologated F1 hybrids		F1 hybrids in trial in C.C.C. at C.S.I.O.S.
		1957 1980	1981 2005	1957 1980	1981 2005	1957 1980	1981 2005	1957 1980	1981 2005	1957 1980	1981 2005	2005 2007
<b>Tomatoes</b> <i>Lycopersicon esculentum</i> Mill.	Greenhouse	400	-	130	-	45	-	8	-	3	-	-
	Polytunnel		280	200	200	52	52	14	12	-	3*	-
	Field	580	305	98	135	-	130	-	2	-	-	1*
		250										

\* recommended for early polytunnel and field cultivation

**F<sub>1</sub> tomato hybrids created at S.C.D.L. Işalniţa and homologated during 1957-2007.**

**Table 2**

Variety	Year of homologation	Production potential (t/ha)	Main characteristics
OLTBRID F <sub>1</sub>	1975	130-140 In 2 cycles	<ul style="list-style-type: none"> <li>■ First Romanian greenhouse tomato hybrid;</li> <li>● undetermined plant growth (<i>sp/+</i>);</li> <li>● globular fruits, mean weight of 70-80g;</li> <li>● 80% of production is of extra and I quality;</li> <li>● resistant to <i>nematodes</i>, <i>verticilliosis</i> and <i>TMV</i>.</li> </ul>
CRAIOBRID F <sub>1</sub>	1976	130-140 In 2 cycles	<ul style="list-style-type: none"> <li>■ Resembles <i>OLTBRID</i> hybrid, but it is 10 days earlier.</li> </ul>
ISABRID	1977	90 - 100	<ul style="list-style-type: none"> <li>■ resistant to <i>nematodes</i>, <i>verticilliosis</i> and <i>TMV</i>.</li> <li>● for greenhouse cultivation.</li> </ul>
IH 50 F1 (IŞALNIŢA 50)	1984	90 - 100	<ul style="list-style-type: none"> <li>■ undetermined plant growth (<i>sp/+</i>);</li> <li>● early, vegetation period of 100-110 days;</li> <li>● globular fruits, mean weight of 110-115g, uniformly deep red at technological maturity, resistant to transportation, pleasant taste;</li> <li>● natural tolerance to <i>verticilliosis</i> and <i>TMV</i>;</li> <li>● for early polytunnel and field cultivation.</li> </ul>
<b>IH 29 F1</b> (IOANA)	1988	98 - 100	<ul style="list-style-type: none"> <li>■ undetermined plant growth (<i>sp/+</i>);</li> <li>● early, vegetation period of 98-100 days;</li> <li>● medium size fruits 75-80 g, deep red at technological maturity, 5-6 mm pulp, 2-3 locular cavities; resistant to transportation, <i>attractive commercial aspect and highly pleasant taste</i>;</li> <li>● natural tolerance to <i>verticilliosis</i> and <i>TMV</i>;</li> <li>● for early polytunnel and field cultivation.</li> </ul>
DOLJBRID (RADA)	2002	100 - 110	<ul style="list-style-type: none"> <li>■ undetermined plant growth (<i>sp/+</i>);</li> <li>● early, vegetation period of 100-110 days;</li> <li>● large globular fruits (150-200g, deep red at technological maturity; thick pulp (7-8 mm); au 5-7 locular cavities; very good solidity; equilibrated taste, <i>attractive commercial aspect</i>;</li> <li>● 30-35% of total production is early production;</li> <li>● natural tolerance to: <i>TMV</i>, <i>Cladosporium fulvum</i> and <i>Fusarium sp</i>;</li> <li>● for early polytunnel cultivation;</li> <li>● production of F1 hybrid seeds according to classic technology, output of 600-700 kg fruits/1kg seeds (STAS)</li> </ul>
CRIS 1	In trial at ISTIS	100 - 105	<p>CRIS 1- differs from Doljbrid by:</p> <ul style="list-style-type: none"> <li>● vegetation period of 98-100 days;</li> <li>● mean fruit weight of 200-250g.</li> </ul>

## CONCLUSIONS

The following F1 hybrids were homologated: Oltbrid (1975), Craiobrid (1976), Isabrid (1977) for greenhouse cultivation, Isalnita 50 (IH-50) (1984), Ioana (IH-29) (1988), and Doljbrid (Rada) (2002) for early polytunnel and field cultivation.

The Cris 1 hybrid is in its second year of trial at I.S.T.I.S for early polytunnel and field cultivation

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# CERCETĂRI IN BIOTEHNOLOGIA VEGETALA: UTILIZAREA FLUIDELOR MAGNETICE

## RESEARCHES IN VEGETAL BIOTECHNOLOGY: THE USE OF MAGNETIC FLUIDS

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**In memoriam Dr. Doina Bica and Dr. Lazăr Gabor, Polytechnic University, Timișoara,  
and Prof. Dr. Constantin Cotae, Polytechnic University, Iasi**

**Key words:** *in vitro* culture, ferrofluids, Romanian priorities.

### **ABSTRACT**

*Prima lucrare elaborata pe plan mondial, privind utilizarea fluidelor magnetice (ferofluid) in biotehnologia vegetala (cultura in vitro a celulelor si tesuturilor vegetale) a fost realizata la Craiova, prezentata si publicata la cea de a sasea Conferinta Internatiionala despre Fluide Magnetice, Paris, 1992. Incepand cu aceasta data s-au dezvoltat cercetarile in acest domeniu, pe plan mondial. Colectivul de cercetare de la Universitatea din Craiova, in colaborare cu specialisti de la Universitatea Politehnica din Timisoara, Universitatea Babes-Bolyai Cluj- Napoca si Institutul de Tehnologie Izotopica si Moleculara Cluj-Napoca, and others, in urma cercetarilor efectuate, au dobandit unele prioritati, pe plan mondial in acest domeniu al biotehnologiei, confirmate de experti internationali: utilizarea ferofluidelor la stimularea micropropagarii in vitro si pentru pentru inlocuirea fitohormonilor clasici; utilizarea ferofluidelor in experimente de biologie spatiala sau biologie experimentală; utilizarea ferofluidelor ca substante radioprotectoare sau imunostimulatoare, s.a.*

*The first paper elaborated on the world, regarding the magnetic fluids (ferrofluids) use in the vegetal biotechnology (in vitro cell and tissue culture), was realized at Craiova, presented and published at the Sixth International Conference on Magnetic Fluids, Paris, 1992. Begin with this data, were developed the researches at the world level, in this domain. The research collective from Craiova University, in collaboration with specialists from "Politehnica" University from Timisoara, Babes-Bolyai University from Cluj-Napoca, Institute for Molecular and Isotopic Technology Cluj-Napoca, and others, as result of the effected researches, obtain some priorities at the world level, confirmed by international experts: The ferrofluids use for in vitro micropropagation stimulation and supplied of the classical phytohormones; use of the ferrofluids in the spatial biology experiments and experimental biotechnology; use of the ferrofluids as radioprotective and immunostimulatory substances, and others.*

### **INTRODUCTION**

Ferrofluids (magnetic fluids) are ultra stable colloidal suspension of ferro- or ferrimagnetic particles in different carrier liquids. As carrier liquids are used water, oleic acid, petroleum, transformer oil, butane, diester, a/o. The ultra fine magnetite particles of 3-18 nm in size, "integrate" themselves in the structure of the carrier liquid by means of a surface active substance, which forms a protective "elastic" layer around each particle (Corneanu et al., 1997). Under the influence of an external magnetic field, the magnetic

fluids reversible modify their physical properties, the magnetorheological and magneto-optical effects. Used initially in physics and technique, they were recent used in biology, medicine and in biotechnology. In biology, are used the ferrofluids with magnetite particles of about 15-18 nm in size (nanoparticles), which can interact with the cell. The first paper regarding the use of the ferrofluids at *in vitro* explant culture (vegetal biotechnology), was presented in 1992 at Sixth International Conference on Magnetic Fluids at Paris, and was published in the Abstracts Book of this Conference (Butnaru and Corneanu, 1992).

Subsequent, numerous researchers from Romania and other countries used the ferrofluids in experiments in vegetal biotechnology and presented their results in scientific manifestation or printed in specialized reviews.

In Romania, the researches were performed by interdisciplinary collective especially in Craiova, Timisoara, Iasi, Pitesti, Cluj-Napoca, Oradea or Constanta. The collective from Craiova University, used in their researches the magnetic fluids prepared especially at "Politehnica" University from Timișoara by Ladislau Vékas, Doina Bica, Romulus Minea and Lazăr Gabor. Also, were used the magnetite or magnetic fluids prepared at "Gheorghe Asachi" Polytechnic University by Constantin Cotae and Gheorghe Călugăru.

## MATERIALS AND METHODS

### 1. Biological material

The experiments were performed at many species of prokaryote and eukaryote. In prokaryote, the experiments were performed in bacteria (*Escherichia coli*) and in Cyanobacteria (*Spirulina platensis*), which were inoculated on media supplied with ferrofluids. In eukaryote the experiments were performed especially at species with economic importance, used as decorative plant (*Nigella damascena* L., *Ranunculaceae* family; *Coryphantha elephantidens* (Lem.) Lem.; *Krainzia longiflora* (Br. & R.), Backbg., *Mamillaria duwei* Rogoz & Braun from *Cactaceae* family; *Dendrobium phalaenopsis* Fitzgerald, *Orchidaceae* family; *Chrysanthemum hortorum* Bailey, *Asteraceae* family), medicinal plant (*Drosera rotundifolia* L., *Droseraceae* family; *Aloe arborescens* Miller, *Liliaceae* family), or in the economical purpose (*Arachis hypogaea* L.; *Robinia pseudoacacia* L. var. *oltenica*, *Fabaceae* family; *Cerasus avium* (L.) Moench, *Fragaria x ananassa* (Weston) Decne. et Naudin, HV Early Belle, *Rosaceae* family; *Ipomoea batatas* (L.) Lam, *Convolvulaceae* family), a/o.

From each species, was used different explants type, inoculated on different culture media, supplied or not with different ferrofluids, and exposed at different experimental conditions.

### 2. Bioactive substance: magnetite and/or ferrofluids

As bioactive substance at the culture medium supplementation, were used: magnetite ( $\text{Fe}_3\text{O}_4$ ), ferrofluids single or complexes with other substances.

**Stabilized magnetite** (a mixture of  $\text{FeO}$  and  $\text{Fe}_2\text{O}_3$ , under powder shape, with the ratio between  $\text{Fe}^{2+} / \text{Fe}^{3+}$  of 1 : 2 (*Mamillaria duwei*), 80 mg/l).

**Single ferrofluids**, represented by a colloidal suspension in a carrier liquid, presented a different ration between  $\text{Fe}^{2+} / \text{Fe}^{3+}$ , as well as the carrier liquid. Were used the following ferrofluids:

- MFH-1, with water as carrier liquid, with a  $\text{Fe}^{2+} / \text{Fe}^{3+}$  ratio of 4 : 1 (*Fragaria x ananassa*, *Chrysanthemum hortorum*, *Mamillaria duwei*);
- MFH-2, with water as carrier liquid, with a  $\text{Fe}^{2+} / \text{Fe}^{3+}$  ratio of 4 : 1 (*Fragaria x ananassa*, *Ch. hortorum*, *M. duwei*);
- MFO-1, with oil as carrier liquid (*Fragaria x ananassa*, *Ch. hortorum*, *M. duwei*); (Fig. 1).

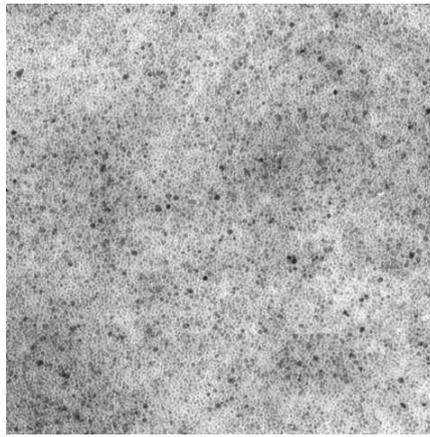


Fig. 1. MFO-1 ferrofluid - magnetite nanoparticles. TEM, 100,000x.

- MFO-2, with oil as carrier liquid (*Fragaria x ananassa*, *Ch. hortorum*, *M. duwei*);
- LMW, with water as carrier liquid, added in culture medium in a concentration of  $24 \times 10^3 \text{ cm}^3 / \text{cm}^3$  culture medium (*M. duwei*:  $10.2$ ,  $15.2$  and  $30.4 \times 10^{-6} \text{ Fe}_3\text{O}_4 / \text{cm}^3$  culture media; *M. duwei*,  $7.5 \times 10^{-6} \text{ Fe}_3\text{O}_4 / \text{cm}^3$  culture media);
- LMP, with petroleum as carrier liquid, added in culture medium in a concentration of  $24 \times 10^3 \text{ cm}^3 / \text{cm}^3$  culture medium (*M. duwei*, *Dendrobium phalaenopsis*, *Drosera rotundifolia*:  $24 \times 10^{-6} \text{ cm}^3 \text{ Fe}_3\text{O}_4 / \text{cm}^3$  culture medium and  $96 \times 10^{-6} \text{ cm}^3 \text{ Fe}_3\text{O}_4 / \text{cm}^3$  culture medium; *Ch. hortorum*, *Ipomoea batatas*, *M. duwei*:  $1.8$ ,  $3.6$  and  $5.4 \times 10^{-6}$  magnetite particles /  $\text{cm}^3$  culture medium);
- LMP-1, with petroleum as carrier liquid and a  $\text{Fe}^{2+} / \text{Fe}^{3+}$  ratio of 2 : 1
- LMP-2, with petroleum as carrier liquid and a  $\text{Fe}^{2+}:\text{Fe}^{3+}$  ratio of 1 : 1 (*D. rotundifolia*, 60 mg/l; *M. duwei*, 60- mg/l);
- FM-5, with oleic acid as carrier liquid and  $\text{Fe}^{2+} : \text{Fe}^{3+}$  ratio of 4 : 1 (*D. rotundifolia*, 60 mg/l);
- FM-5C, with oleic acid as carrier liquid and  $\text{Fe}^{2+} : \text{Fe}^{3+}$  ratio of 1 : 2 (*M. duwei*, 60 mg/l);
- FM-7, with oleic acid as carrier liquid and  $\text{Fe}^{2+} : \text{Fe}^{3+}$  ratio of 1 : 1 (*Coryphantha elephantidens*, 25-68 mg/l);
- LM-22, with oleic acid as carrier liquid, and citric acid (*Spirulina platensis*; *Robinia pseudoacacia* var. *oltenica*: 20 mg/l);

**Mixed ferrite**, which present other metals chelate to iron:

- FM-1, with oleic acid as carrier liquid, and p-xylene as solvent, performed from Mn : Zn :  $\text{Fe}^{2+}$  in a ratio of 0.2 : 0.3 : 1.0 (*M. duwei*, 60 mg/l; *C. elephantidens*, 25-68 mg/l; *D. rotundifolia*, 60 mg/l);
- FM-2, with oleic acid as carrier liquid, and n-dodecane as solvent, performed from Mn : Zn :  $\text{Fe}^{2+}$  in a ratio of 0.2 : 0.3 : 1.0 ratio (*M. duwei*);
- FM-5, with oleic acid as carrier liquid and solvent, performed from Mn : Zn :  $\text{Fe}^{2+}$  in ratio of 0.2 : 0.3 : 1.0 (*M. duwei*);
- FM-10, with oleic acid as carrier liquid, performed from Ni : Zn :  $\text{Fe}^{2+}$ , ratio of 0.6 : 0.4 : 1.0 ratio (*C. elephantidens*, 25-68 mg/l)

**Multiple emulsions with magnetic fluids** (complexes ferrites), are constituted from an emulsion substance and a magnetic fluid, being soluble in hydrophilic and lipophilic media. These properties confer them a great advantage in use in different combinations in biotechnology. The first use at *in vitro* culture, underlined their different features (Minea et al., 2003).

### 3. Direction of researches

The collective from Craiova University, in co-operation with two collective from Polytechnic University, Timișoara (Ladislau Vékas and Doina Bica, respectively Romulus Minea and Lazăr Gabor), the collective from Electron Microscopy Centre, *Babes-Bolyai* University, Cluj-Napoca (Constantin Crăciun and co-workers), and the Institute for Molecular Isotopic Technology from Cluj-Napoca (Vasile V. Morariu), *A.I. Cuza* University from Iasi (Horia Chiriac), and others, used the ferrofluids in following research field, by our collective regarding the use of ferrofluids:

- ferrofluids as a tool for *in vitro* micropropagation stimulation;
- ferrofluids as a tool for supplied the classical phytohormones;
- ferrofluids as a tool for the spatial biology experiments;
- ferrofluids as a tool in experiments of radiobiology and immunobiology;
- experiments in prokaryote;
- other research domains from experimental biotechnology.

## RESULTS AND DISCUSSIONS

### 1. Experiment regarding *in vitro* micro propagation stimulation

The research effected in *Drosera rotundifolia* (the morphogenesis processes under influence of the ferrofluids) and *Mamillaria duwei* (effects on long term of the ferrofluids), presented at Symposium from Nitra (Slovak Republic, 1995) and published in the book *Recent Advances in Plant Biotechnology* (Institute of Plant Genetics, Nitra), were positive appreciate in *Agricell Report* by E.B. Herman (1995), as a “new work method in biotechnology”. The *in vitro* development in *Drosera rotundifolia*, in subculture, on culture media supplied with a ferrofluid on petroleum basis (LMP), enhanced the morphogenesis processes. Also, the orientation of the magnetite particles in an electromagnetic field influenced both the explants development and the assimilatory pigments amount. In *Mamillaria duwei*, the presence in the culture media of a ferrofluid of a LMP or LMW type, determine a high growth rhythm. This effect is on long term, being maintained and after neofomed plant acclimatization at *ex vitro* conditions.

The effect of the micro propagation stimulation was reported in other species, on different culture media, in experiments with different ferrofluid type. The study of the organogenesis processes in *Mamillaria duwei*, *in vitro* culture on media supplied or not with ferrofluids (LMP-1, LMW-2, FM-1 and FM-5, point out that ferrofluids enhanced the shooting process and the growth rhythm of the explants (Corneanu M. et al., 1996). The analysis of the stem ultrastructure (Corneanu G. et al., 1996), point out that the presence in the culture medium of a ferrofluid (of LMP or LMW type), induced a stimulation of the synthesis processes, in a natural or in near-null geomagnetic field. The presence in the culture medium of a ferrofluid of LMW type, affected the normal ultrastructure of the stem and the stem diameter.

In other researches, performed in a natural or a cvasi-null geomagnetic field in *Mamillaria duwei*, was established the interaction between magnetite nanoparticles (from a LMP or LMW ferrofluid type) and the vegetal cell (Corneanu G. et al., 2000). The magnetite particles penetrate in the cell through wall cell and plasmalemma from the culture medium, being accumulated in a big number in the parenchyma cells. They are disposed on the tonoplast surface, on the internal face of plasmalemma, in different cellular organelles (especially in chloroplast; Fig. 2 and mitochondria), in nucleus (Fig. 3) and free in cytoplasm.

Experiments performed in Iasi by Manoliu et al. (2000a, 2000b), established the ferrofluids influence on the protein and nucleic acid synthesis, another Romanian priority in this domain.

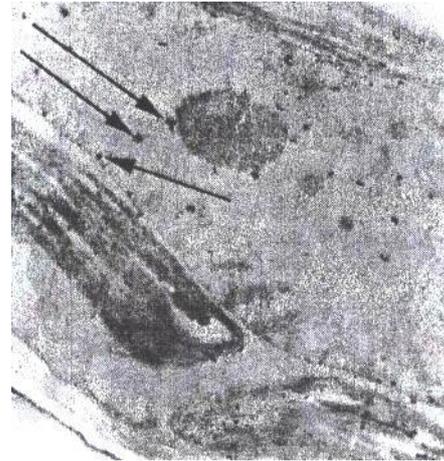


Fig. 2. Magnetite particles (arrow) in chloroplast. Fig.3. Magnetite particles (arrow) in nucleus.

## 2. Experiments evidenced the classical phytohormones supplied

Explants from *Robinia pseudoacacia* var. *oltenica* (fragments of offshoots), were inoculated on a **MS** basal medium, free phytohormones, but supplied with 20 mg/l with the LM-22 ferrofluid (in other variants, the culture medium was supplied or not with phytohormones; Fig. 4). On the MS basal medium, free of phytohormones, but supplied with a small amount of LM-22 ferrofluid, was recorded an enhancement of the metabolism and organogenesis processes (Fig. 5). Thus in presence of the LM-22 ferrofluid, take place an enhancement of the shoots number per explant, leaves number per shoot (the height values), upper values for the shoots size (Corneanu M. et al., 2001b). The similar results were reported in our experiments for other species.

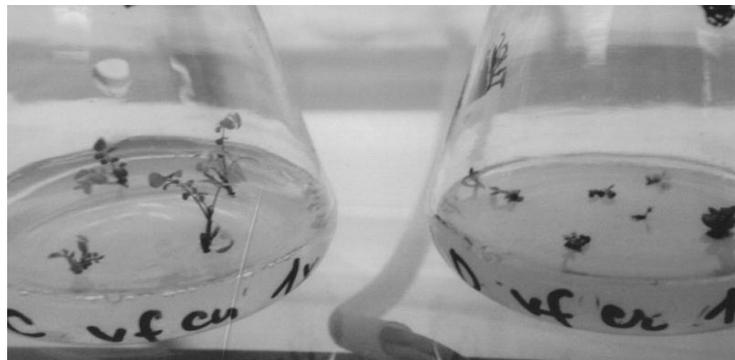


Fig.4. *In vitro* culture in *Robinia pseudoacacia* var. *oltenica*, on different culture media.

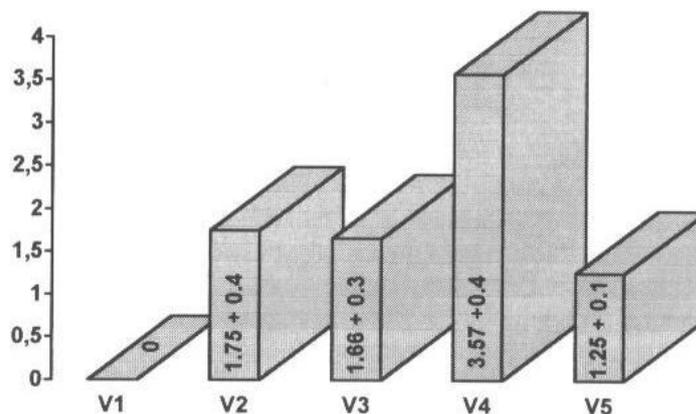


Fig. 5. The shooting process (shoots number/explant) in *R.pseudoacacia* var. *oltenica* on different culture media. V1 – Control (MS basal medium, free phytohormones); V4 – Control medium supplied with LM-22

### 3. Experiments of spatial biology

In many grand's sponsored by Romanian Spatial Agency, were analysed the *in vitro* explants development on culture media supplied or not with biocompatible some ferrofluids. As environment factors, were considered: thermal shocks, variation of the geomagnetic field (near null or double in comparison with natural geomagnetic field), presence or not of the geoelectrical field, a great inertia force (similar with a hyper gravitation), a/o. Must be mentioned as in Romania, in Timisoara, were performed experiments in a hypo gravitation conditions, by G. Butnaru and his co-workers (1998).

The experiments were performed at different species, with different ferrofluid type. The *Nigella damascena* seeds, imbibed or not time of three hours in two different suspension of ferrofluid with petroleum as carrier liquid (with different massy and volume concentration, were exposed at a thermal shock of  $-196^{\circ}$  C for a different time (1- 60 min), in a normal geomagnetic field, or in a cvasi-null geomagnetic field (200 nT), electrical screened, time of 1 - 60 min. The cytogenetics modifications analysis and peroxidase isoenzymes at plantlets of 28 days-old, evidenced the protective effect of the ferrofluids (Corneanu et al., 1998).

The experiment performed in *Drosera rotundifolia* (*in vitro* subculture from leaf fragments), developed in a natural or double geomagnetic field, on different culture media supplied or not with three ferrofluids type (LMP-2, FM-1 or FM-5, 60 mg/l), and evidenced a different effect, depending on the ferrofluid type. The FM-5 stimulates the plant developed, while the LMP-2 ferrofluid inhibited. The ferrofluids enhanced the peroxidase isozyme activity, especially in a double geomagnetic field. The nature of the carrier liquid no affect on organogenesis and development (Corneanu M. et al., 1997).

In experiments of spatial biology effected on many species from *Cactaceae* family (*Krainzia longiflora*, *Mamillaria duwei*, and others), Corneanu M. (1998) studied the effect of the culture medium supplementation with different ferrofluid on the organogenesis processes (rhysogenesis, caulogenesis and calusogenesis), and some biochemical adaptation (peroxidase isozymes analysis), towards different conditions meet in the extraterrestrial environment (hyper gravity, thermal shocks, different values of geomagnetic field, a screened geoelectrical field, a/o. The experimental results, underlined the protective effects induced by the biocompatible ferrofluids presence in the culture media.

### 4. Ferrofluids as a tool in experiments of radiobiology and immunobiology

The ferrofluids can be used as a tool for the experiment regarding the interaction between stress factors at the cell, tissue or at the whole organism. In experiments performed with ferrofluids, can be analyzed the interaction between the effects induce by these, and the effects induced by other stress factors.

Thus, was analyzed in the interaction between ferrofluids and X-rays, in an experiment performed *in vitro* in *Coryphantha elephantidens*. An *in vitro* subculture of *Coryphantha elephantidens*, developed on culture media supplied or not with some ferrofluids (FM-1, FM-7 and FM-10), was exposed or not under action of a source of X-rays (a unique dose of 40 Gy). Were analyzed the effect of the two factors on the *in vitro* explants developed (Corneanu M. et al., 2000). Was establishment that a dose of 40 Gy, stimulates the *in vitro* developed of the neoformed plants. At interaction with the ferrofluids from culture media, take place a significantly enhanced of the neoformed shots per explants as well as their size. Also, are evidenced modification in the number and activity of the isoperoxidase fractions,

### 5. Experiments in prokaryote

In bacteria, experiments were performed at five genotypes (*Agrobacterium tumefaciens* pmP 115, *Azospirillum braziliense* SpF 94, *Rhizobium leguminosarum* 1003

TY, *Escherichia coli* JM 109 and *E. coli* LE 392), inoculated on culture media supplied or not with a ferrofluid of LMW type and exposed or not in a cvasi-null geomagnetic field, electrical screened. The presence of a ferrofluid in the culture media conduct at annulment of the negative effects of the cvasi-null geomagnetic field, on the ultrastructural features (Corneanu G. et al., 1996).

A culture of *Spirulina platensis* (Cyanobacteria) was developed in different experimental conditions, on media without and with a ferrofluid of LM-22 type: in a natural geomagnetic field, or in precinct with different screening degree of the geomagnetic field (10%, 20%, 30%, 40% or 50%). The development of the *Spirulina platensis* filaments reveals a response depending on the analyzed features (filaments length, filaments density/mm<sup>3</sup> medium, total biomass, a/o), and experimental conditions (the value of geomagnetic field, light intensity, the presence of the ferrofluid; Corneanu M. et al., 2001a).

## CONCLUSIONS

1. Ferrofluids (magnetic fluids), were used for the first in vegetal biotechnology, in Romania.
2. The researches performed by specialists from Craiova University, in collaboration with other specialists from other research collective from Romania, conduct at some priorities on the world level, confirmed by international experts.
3. The applications of the ferrofluids in vegetal biotechnology refer to: stimulation of the *in vitro* micro propagation; substitution of the classical phytohormones; use in experiments of spatial biology and experimental biology; used as stress protective and immunostimulatory substances; experiments in prokaryote, a/o.

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# STUDII ASUPRA VARIABILITATII FLORII SI FRUNZELOR LA GENOTIPURI DE *ROBINIA PSEUDOACACIA* DIN SUDUL OLTENIEI

## STUDIES ON THE FLOWER AND LEAVES VARIABILITY IN *ROBINIA PSEUDOACACIA* GENOTYPES OF SOUTH OLTENIA

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**Key words:** variability; *Robinia pseudoacacia*

### ABSTRACT

*In scopul infiintarii unor plantatii de salcam pe terenuri nisipoase si/sau degradate, studiile asupra genotipurilor de **Robinia pseudoacacia** faciliteaza procesul de selectie. Au fost observate 13 descendente de **R. pseudoacacia** var. **oltenica**, 2 descendente de arbori plus, in comparatie cu salcamul comun, din livada de seminceri de la Arginești, Mehedinți si descendentele materne rezultate din samanta, cultivate la Statiunea Didactica Experimentala (SDE) apartinand USAMVB Timisoara. Au fost analizate caracterile biometrice ale frunzelor si florilor, precum si procesul de meioza. Au fost determinate diferente semnificative intre genotipurile analizate privind rectitudinea, morfologia foliolelor si a florilor, alterari ale meiozei, viabilitatea embrionilor. Analiza variantei a relevat faptul ca genotipul are un effect foarte semnificativ asupra tuturor caracterelor analizate. **Robinia pseudoacacia** var. **oltenica**, o clona identificata pe nisipurile din Sudul Olteniei, prezinta diferente semnificative fata de salcamul comun. Are o rectitudine buna, un ritm de crestere mare, foliole de forma diferita, floare cu morfologia modificata si o productie redusa de seminte.*

*Studies on **Robinia pseudoacacia** genotypes make easier the selection of the valuable clones for quality wood production, in order to establish plantations on sandy and/or degraded soils in South Romania. There were analysed 13 descendants of **R. pseudoacacia** var. **oltenica**, 2 descendants of selected plus trees, in comparison with common black locust, belonging to orchard Arginești, Mehedinți and mother descendents cultivated in Didactical and Experimental Station (DES), belonging to the University, Timișoara. There were analysed the biometrical features of the leaves and flowers, as well as the meiosis process. There are significant differences between the analysed genotypes regarding rectitude, leaflet and flower morphology, meiosis and embryo viability. Analysis of variance revealed a very significant influence of the genotype on all analysed characters. **Robinia pseudoacacia** var. **oltenica**, a clone identified on sandy soils from South Romania, presents significant differences in comparison with common black locust. It has a good rectitude, a high growth rhythm, different shape leaflets, a modified flower morphology and a low seed production.*

### INTRODUCTION

*Robinia pseudoacacia* was introduced in Romania, as an ornamental species in 1750, but the first forestry plantation was established in 1852 in Oltenia, near the town of

Băilești. Nowadays, the occupied area with this specie is about 250.000 ha (4% from the total forestry area). Since the first plantations were established in Romania until the present, remarkable results were registered, as the following: the settling of the flying sands from the South of Oltenia (a great part of the established forest being cut improperly after 1960), improving soil conditions in more than 150.000 ha of degraded areas, the creation of protection forest belts (most of them cut abusively after 1991), the increase of the wood resources and melliferous basis.

The last report regarding the status, as well as the decline of the black locust forests in Romania (1994), performed by a team of researchers from Research Institute for Forestry and Forest Management, revealed the “worsted situation of the vegetation state in the black locust arboretum”, the most dramatic situations being recorded in the South and South- Est Romania. Even the black locust presents an ecological plasticity, its resistance to drought is limited. Dr. Doc. Enescu Valeriu recommended that in the cultural cuttings to be performed a selection in the favour of variety *pinnata* and *oltenica*, pointed out the fact that the last one wasn't studied from genetic and taxonomic point of view (Enescu V., 1989).

Recently, the interest for the specie has increased, for the afforestation of abandoned cultivated lands based on an E.U. regulation, as well as for the melliferous qualities – black locust honey being a superior quality one, very appreciated by the consumers. However, in Central (e.g. Hungary) and Eastern (e.g. Romania, Bulgaria) Europe several high-yielding varieties (e.g. var. *oltenica*- Photo 1a) of the species with high quality wood have been selected and cultivated (Rédei K., et al, 2002; Corneanu M. et al., 2004 ; Iliev N. et al., 2005). Due to the fact that *R. pseudoacacia* is a variable and fast-growing species, many of its varieties and clones with desired traits were selected up to now such as biomass productivity, wood quality etc. Studying four Serbian clones Orlović and co-workers (2004) observed that a high photosynthetic production and N, P, K accumulation is correlated with the mesophyll volume, pigment concentration and leaf area. Studies on *Robinia pseudoacacia* genotypes make easier the selection of the valuable clones for quality wood production, in order to establish plantations on sandy and/or degraded soils in South Romania. In this region, due to the climate changes and pollution, the desertification process started.

## MATERIALS AND METHODS

**Biological material.** There were analyzed 12 genotypes of *R. pseudoacacia* var. *oltenica*, 1 descendants of selected plus trees, in comparison with common black locust- from Orchard Arginesti, Forestry District Strehaia (Mehedinti) (Photo 1b), and their descendants obtained from seeds, 2 years old – planted in a comparative culture (16X16), in February 2008.

**Biometric observations** were performed on the traits of leaf and flower (50 observations per variant);

**Cytology.** Meiosis and pollen viability were performed on squash slides. There were stained with aceto-carmin 2.5% and the observations were made to a OPTECH optical microscope.

**Processing of the biometric data** was made with STATISTICA 7.0 program – Basic Statistics - ANOVA test, for means, standard deviation and Fisher test. The significance of the differences between the genotypes was made with Duncan test.



a.



b.

Photo 1 a. Plantation of *Robinia pseudoacacia* var. *oltenica* in South Oltenia (Ciurumela - Dolj);  
 1b. Clone Orchard – Arginesti (Mehedinti)

## RESULTS AND DISCUSSIONS

The Orchard Arginesti, was established 25 years ago by grafting. Most of the genotypes belong to *oltenica* variety, a valuable one, with a good rectitude and a high wood quality (Photo 1a, b). A problem in using this variety for afforestation is the low amount of seeds, due to modified flower morphology and sensitivity to climate changing during the flowering period.

The mother plants from the orchard belong to few plus trees discovered in 1966 by a forestry researcher Bârlănescu, on the sandy soil from the South of Oltenia. Even if, after their provenance it was expected to have similar characters, the variability is very high, but within *R. pseudoacacia* species variability represents an important factor in the selection of fast growing genotypes (Orlović et al, 2004). There are a lot of data that evidenced the possibility of improving the growth of black locust by selection and breeding for large leaf area, high rates of net photosynthesis and low rates of dark respiration (Mebrшту et al., 1991).

**1. The variability manifested by the seedlings** is high between the descendants of different clones, but also, inside populations, concerning leaves characters. It was registered a high difference between maximum and minimum values in all descendants. The length of the rachis was superior in most of the cases in mother plants than in descendants, but they have less leaflets with a bigger size. A stability concerning leaves traits was observed in clones Nisipeni 16, Nisipeni 5, Piscu 16, where in leaflets size and number there were not significant differences between mother plants and descendants.

The analysis of variance revealed that the genotype has a very significant effect on all analyzed traits of the leaves and flowers (Table 1).

There are 8 genotypes harvested from the Forest Point Ciurumela, but after different traits of the leaves and/or flower they are split in at least three groups as values (Figs. 1 - 4, Table 2). In general the values are significant higher, in comparison with Control, concerning leaves features and significant lower, concerning flower and a normal meiosis process. Genotype Ciurumela 24, registered for all leaves traits the highest values.

Table 1.

The effect of the genotype on some leaf and flower traits (Fisher test)

Analysis of Variance		
Marked effects are significant at $p < ,05000$		
Traits	F	P
Rachis length	29,89549	0,0000
Leaflet no.	18,95420	0,0000
Leaflet length	23,51863	0,0000
Leaflet width	47,03188	0,0000
Flower rachis length	57,76982	0,0000
Flower length	17,66663	0,0000
Vexil width	44,87159	0,0000

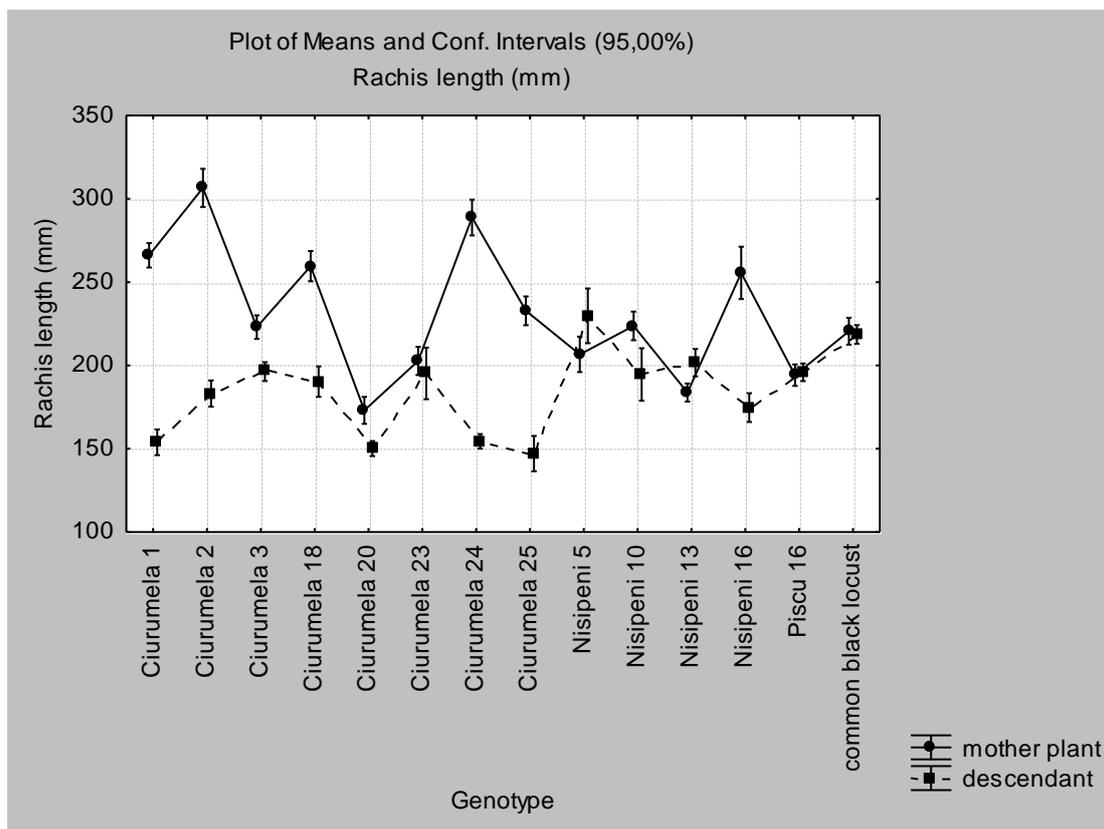
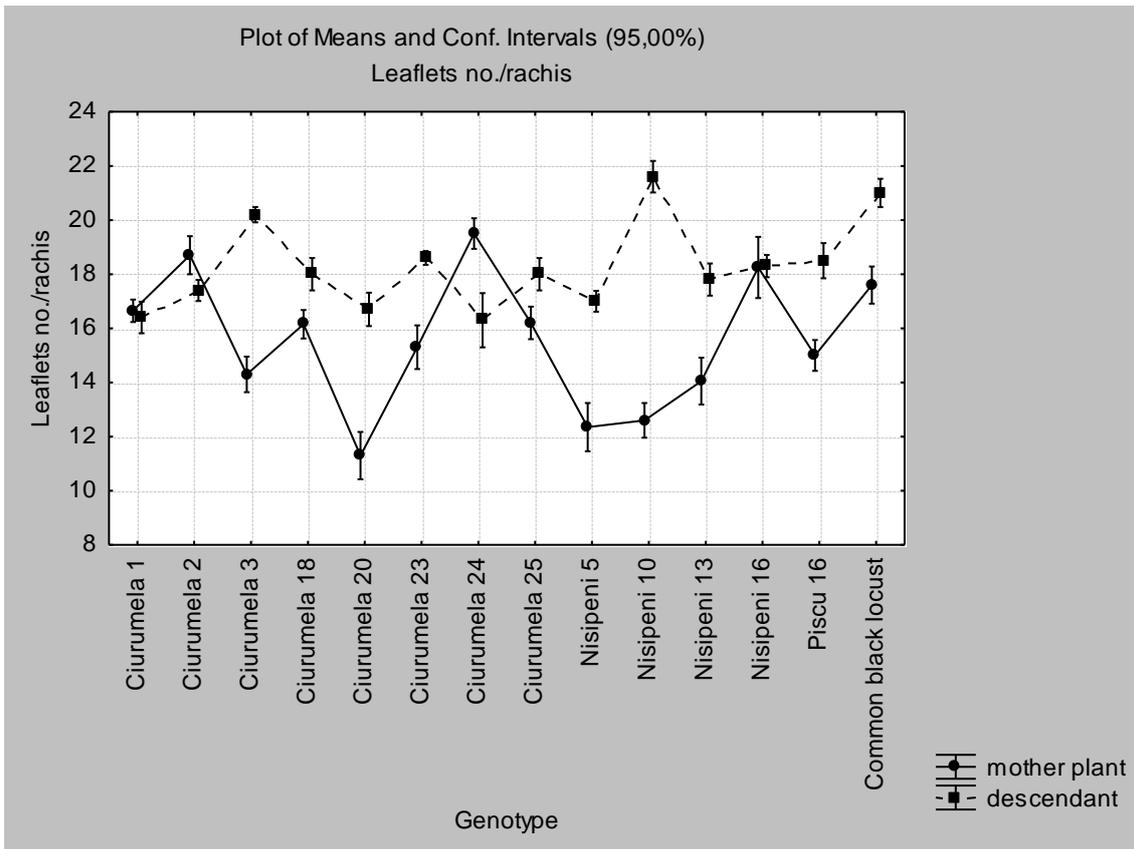
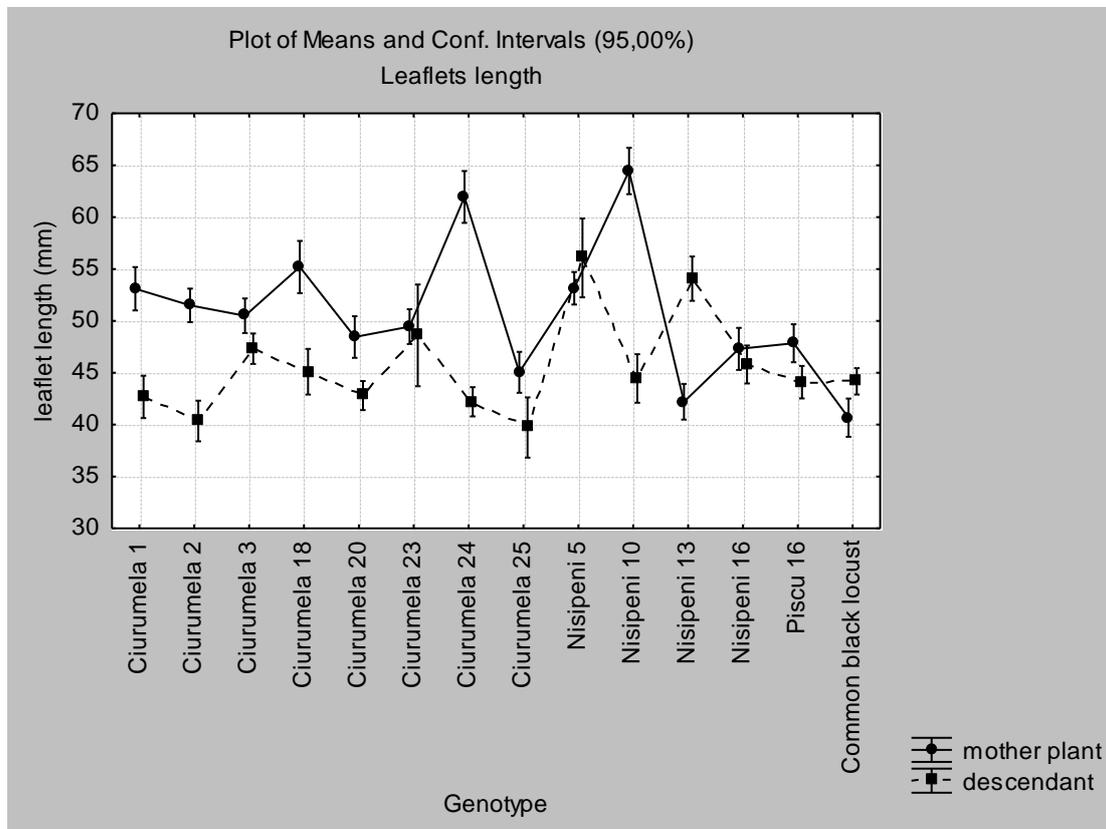


Fig. 1. Comparison regarding the leaf rachis length registered in mother plants (Arginesti Orchard) and mother descendants 2 years old (DES Timisoara)



**Fig. 2. Comparison regarding the leaflet number/rachis registered in mother plants (Arginesti Orchard) and mother descendants 2 years old (DES Timisoara)**



**Fig. 3. Comparison regarding the leaflets length registered in mother plants (Arginesti Orchard) and mother descendants 2 years old (DES Timisoara)**

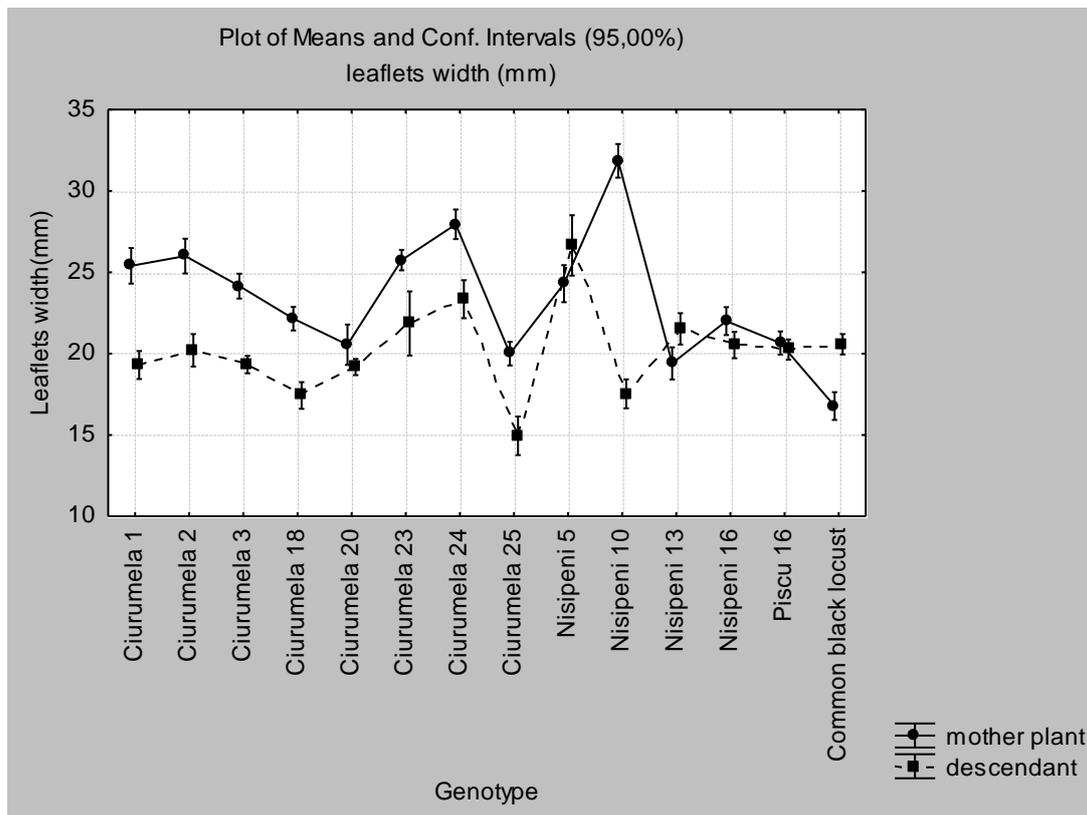


Fig. 4. Comparison regarding the leaflets width registered in mother plants (Arginesti Orchard) and mother descendants 2 years old (DES Timisoara)

**2. The variability manifested in the inflorescence and flowers morphology, was analyzed at the biological material provenance from Arginesti Orchard.**

The flowers are significant smaller in all clones in comparison with Control. Some of the genotype are particularly sensitive to late low temperature and didn't formed fruits at all. Even the percent of normal meiosis is high and pollen fertility good, the percent of flowers that developed fruits was low or very low in comparison with Control. The number of seeds/fruit was low due to the immature abortion of the embryos.



Photo 2. The flower morphology in common black locust (a) and in clone Nisipeni 10 (b)

The values recorded for some features of the inflorescences and flowers in different genotypes of *Robinia pseudoacacia*, are presented in Table 2. Genotype Nisipeni 10 registered the most significant differences in comparison with control, and with the other

genotypes. It has modified flower, some petals are rudiments, and, if the fecundation process took place, the maturation of the seeds in most cases failures (Photo 2).

**Table 2.**

**Variability in inflorescence and flower morphology in different *Robinia pseudoacacia* clones from Arginesti Orchard**

Clone	Rachis length (mm)	Flowers no./infl.	Flower length (mm)	Vexil width (mm)
	Mean $\pm$ SD	Minim maxim	Mean $\pm$ SD	Mean $\pm$ SD
Clone <i>oltenica</i> Ciurumela 1	103.15 $\pm$ 7.9 <b>c</b>	19-20	18.30 $\pm$ 1.8 <b>bc</b>	17.05 $\pm$ 2.1 <b>b</b>
Clone <i>oltenica</i> Ciurumela 2	78.80 $\pm$ 19.4 <b>e</b>	17-29	16.90 $\pm$ 1.4 <b>bc</b>	12.35 $\pm$ 3.9 <b>d</b>
Clone <i>oltenica</i> Ciurumela 3	94.20 $\pm$ 11.7 <b>d</b>	19-24	17.35 $\pm$ 1.5 <b>bc</b>	16.75 $\pm$ 1.9 <b>b</b>
Clone <i>oltenica</i> Ciurumela 18	75.30 $\pm$ 14.1 <b>e</b>	14-22	15.40 $\pm$ 2.2 <b>c</b>	12.35 $\pm$ 1.5 <b>d</b>
Clone <i>oltenica</i> Ciurumela 20	103.80 $\pm$ 7.2 <b>c</b>	25-32	17.00 $\pm$ 2.0 <b>bc</b>	14.85 $\pm$ 1.8 <b>c</b>
Clone <i>oltenica</i> Ciurumela 23	138.65 $\pm$ 7.7 <b>a</b>	18-28	18.30 $\pm$ 1.8 <b>b</b>	17.45 $\pm$ 1.4 <b>b</b>
Clone <i>oltenica</i> Ciurumela 24	119.95 $\pm$ 18.5 <b>b</b>	20-29	17.70 $\pm$ 2.1 <b>b</b>	16.25 $\pm$ 2.0 <b>b</b>
Clone <i>oltenica</i> Ciurumela 25	84.10 $\pm$ 15.3 <b>d</b>	18-28	16.55 $\pm$ 2.0 <b>c</b>	14.40 $\pm$ 3.1 <b>c</b>
Clone <i>oltenica</i> Nisipeni 5	100.25 $\pm$ 5.6 <b>c</b>	19-24	13.75 $\pm$ 4.6 <b>d</b>	12.25 $\pm$ 1.9 <b>d</b>
Clone <i>oltenica</i> Nisipeni 10	67.70 $\pm$ 6.3 <b>f</b>	16-20	13.95 $\pm$ 1.8 <b>d</b>	10.20 $\pm$ 1.7 <b>e</b>
Clone <i>oltenica</i> Nisipeni 13	107.35 $\pm$ 13.2 <b>c</b>	12-22	17.20 $\pm$ 1.7 <b>b</b>	16.30 $\pm$ 1.1 <b>b</b>
Clone <i>oltenica</i> Nisipeni 16	100.00 $\pm$ 15.8 <b>c</b>	19-26	16.55 $\pm$ 1.8 <b>c</b>	19.30 $\pm$ 1.1 <b>a</b>
Plus tree Piscu 16	103.40 $\pm$ 8.6 <b>c</b>	16-27	16.75 $\pm$ 1.7 <b>c</b>	18.30 $\pm$ 1.4 <b>b</b>
Common black locust	89.67 $\pm$ 7.9 <b>d</b>	12-24	20.47 $\pm$ 0.9 <b>a</b>	19.57 $\pm$ 0.9 <b>a</b>

\*For differences significance was used Duncan test, level of confidence 5%

Between different descendents from *R. pseudoacacia oltenica* genotype, developed in the same environment, were recorded differences regarding the analyzed features and pointed out their genetic determinism. The significant differences were recorded for the rachis length (75.30 mm at genotype Ciurumela 18, and 138.65 mm at genotype Ciurumela 23), vexil width (10.20 mm at Nisipeni10, and 19.30 m at Nisipeni 16), as well as for flower length (variability limits between 13.75 mm – 18.30 mm) and flowers number per inflorescence (Table 2).

A low variability was established for the flowers number per inflorescence, this being a species feature, in comparison with the rachis length which represent a feature with importance in evolution and speciation at the *Robinia* genus.

In comparison with a common black locus developed in the same environment conditions, the analyzed index for inflorescence morphology, were recorded different values. For the flowers number per inflorescence at the common black locust were recorded the great variability limits of variability, this genotype being one “primitive”, in comparison with *R. pseudoacacia* var. *oltenica* genotype. For the flower length and vexile width, in the common black locust were recorded significant higher values in comparison with *oltenica* genotypes and with a plus tree of *Robinia pseudoacacia* (Table 2).

### 3. The meiosis process and flower fertility in analyzed genotypes.

At the genotypes from the Arginesti Orchard, were performed analysis regarding their fertility. Thus was analyzed the pollen viability (%), fertile flowers per inflorescence (%) and number and seeds per fruit, in comparison with a common black locust (Table 3).

Table 3.

The meiosis process and flower fertility in different *Robinia pseudoacacia* clones from Arginesti Orchard

Clone	% Normal meiosis	Pollen viability %	% Fertile flower /infl.	Number of seeds/pod
Clone <i>oltenica</i> Ciurumela 1	96.7	89.7	27.3	1-11
Clone <i>oltenica</i> Ciurumela 2	96.9	88.8	*	*
Clone <i>oltenica</i> Ciurumela 3	94.7	91.5	*	*
Clone <i>oltenica</i> Ciurumela 18	95.9	87.4	19.5	1-3
Clone <i>oltenica</i> Ciurumela 20	97.3	88.6	46.8	2-11
Clone <i>oltenica</i> Ciurumela 23	98.5	89.7	20,5	3-7
Clone <i>oltenica</i> Ciurumela 24	92.6	85.4	7.7	1-4
Clone <i>oltenica</i> Ciurumela 25	96.3	86.3	32.5	1-2
Clone <i>oltenica</i> Nisipeni 5	92.7	85.0	13.5	1-8
Clone <i>oltenica</i> Nisipeni 10	<b>88.4</b>	<b>70.6</b>	*	*
Clone <i>oltenica</i> Nisipeni 13	91.3	79.4	28.6	1-4
Clone <i>oltenica</i> Nisipeni 16	90.8	80.5	18.5	1-7
Plus tree Piscu 16	99.5	99.3	*	*
Common black locust	96.7	89.7	78,6	5-14

\* Sensitive to late frozen

The lowest values were recorded at the clone *oltenica* Nisipeni 10, for the percentage of normal meiosis (88.4%) as well as for the pollen viability (70.6%). Must be mentioned that this clone, present also a sensitivity at early and late frozen. The common black locust recorded an intermediate values, in comparison with *oltenica* genotypes, for the percentage of normal meiosis and for pollen viability. The fertile flower per inflorescence (%) and the seeds number per pod, recorded lower values for the all *oltenica* genotypes. Must be mentioned thus, that this feature constitute a particularly characteristic for *oltenica* genotype.

### CONCLUSIONS

- The selected clone isn't yet stabilized, but keeping in mind that the forest is anyway a complex ecosystem, these can be utilized, after the propagation method will be completely solved, for afforestation.
- Further molecular studies will establish if *Robinia pseudoacacia oltenica* is a clone, or a *rectissima* variety.
- Selection of potential parents in plant propagation program requires complete physiological and anatomical analysis of available genotypes;
- The high variability manifested both by the mother plants and the seedlings proof in fact a great capacity for adaptation and evolution.
- Some features of flower characteristics (flower length and vexil width), and flowers fertility, constitute proper features for a distinct genotype for the *oltenica* descendents.

**Acknowledgement:** These researches were financially supported by the Ministry of Education and Research, Bucharest, Romania, by the CNCSIS grant 74 GR/2007-2008, code 1180.

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# STUDIUL PRIVIND CULTURA PRIN LIMITAREA SPAȚIULUI DE NUTRIȚIE LA *MURRAYA PANICULATA* (L.) JACK.

## SURVEY REGARDING ON THE LIMITATION OF NUTRITIVE AREA AT THE *MURRAYA PANICULATA* (L.) JACK. SPECIES CROPPING

Sonia Cruceru

Cuvinte cheie: *Murraya paniculata*, diameter pots, sub layer

### ABSTRACT

*Murraya paniculata* (L.) Jack. (syn. *M. exotica* L.), originară din Asia, face parte din familia Rutaceae și este una din plantele de interior ce decorează atât prin frunzișul bogat de culoare verde închis, prin florile albe cu parfum asemănător iasomiei cât și prin fructele care ajunse la maturitate capătă o culoare roșu portocaliu.

Lucrarea de față prezintă aspecte cu privire la cultura prin limitarea spațiului de nutriție folosind ghivece de diferite dimensiuni.

*Murraya paniculata* (L.) Jack. (syn. *M. exotica* L.) originates from Asia and is part of the Rutaceae family. It is one of the indoor plants that decorate, both with rich dark-green leafage, the white jasmine-like scent flowers, but also with red-orange mature fruit.

The hereby survey is an attempt to present the aspects regarding the limitation of nutritive area at the *Murraya paniculata* species, by using various sized flower pots.

### INTRODUCTION

Flat plants are a main flower category, which develop in an appropriate environment, similar to their natural growth conditions.

In the hereby survey, there are presented the results that were obtained at the *Murraya paniculata* species, by using various dimensions flower pots. There were used 6 cm diameter flower pots, with a reduced soil exploration area of the root. The exploration area is reduced, in comparison with 8-11 cm diameter flower pots.

### MATERIAL AND METHOD

The plants that were used within this survey are part of the Botanic Garden in Craiova collection, and were obtained by seed multiplication. This experiment was carried out within the survey regarding generative multiplication at the *Murraya paniculata* species. The study was published the previous year. For plant cropping there used 6, 8 and 11 cm diameter flower pots. The crop sub layer that was used contained natural components: leaf soil, lay land, black and red peat, sandy soils.

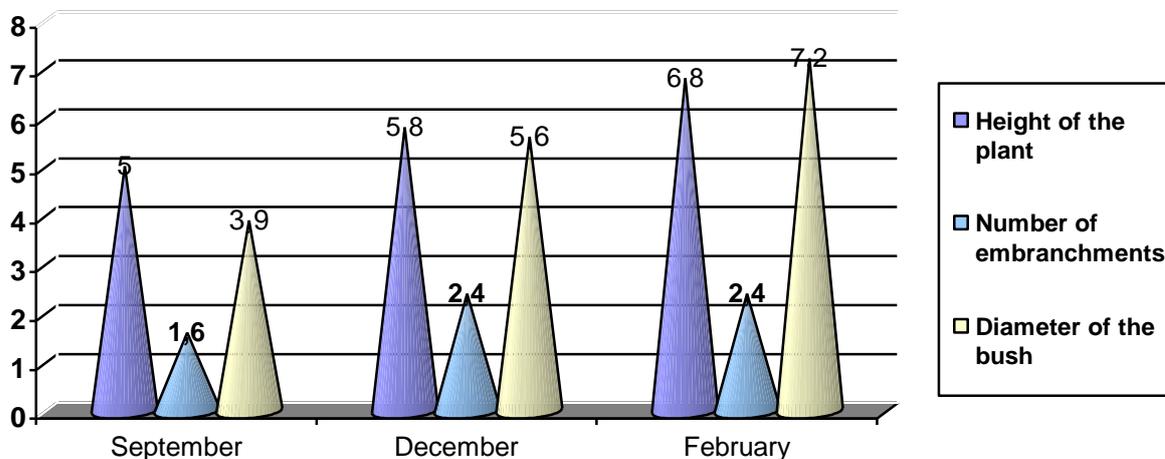
There was noticed the evolution of plants during 5 months, taking into account the height of plants, embranchment, the diameter and florescence of the bush.

### RESULTS AND DISCUSSIONS

Taking into account the nutrition area, there are main differences between the analyzed parameters.

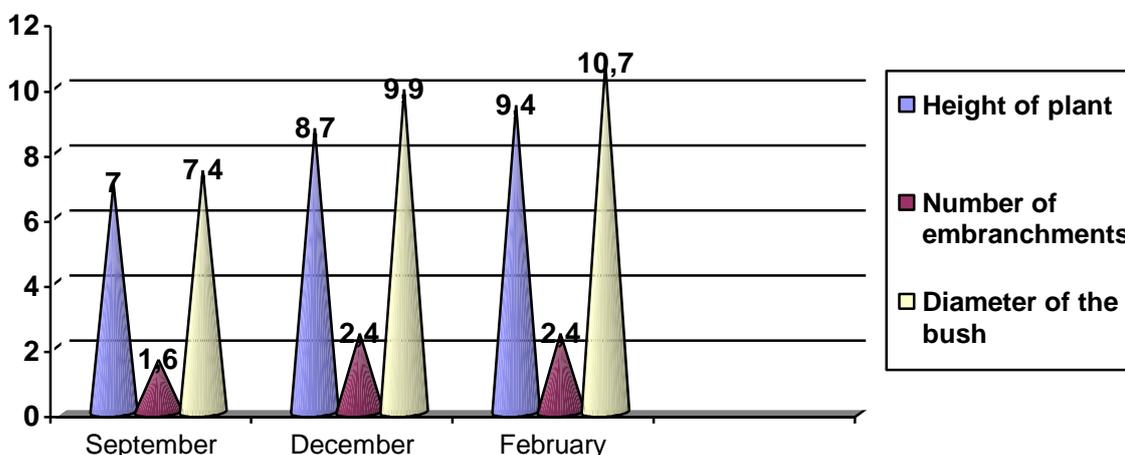
Using 6 cm diameter flower pots, the height of plants when planted had an average of 5 cm and, after 3 months of cropping, it reached 5.8 cm and 6.8 cm, after 2 more months, when first buds bloomed. The embranchment and diameter of plants first had

averages of 1.6 and 3.9 cm, reaching to 2.4 cm embranchments and 5.6 cm diameter for the bush, after the first 3 month of cropping in flower pots. After two more months, they reached to a 7.2 cm diameter for the bush, while the number of embranchments remains constant. (Fig. 1)



**Fig. 1 Morphologic features of plants using 6 cm diameter flower pots**

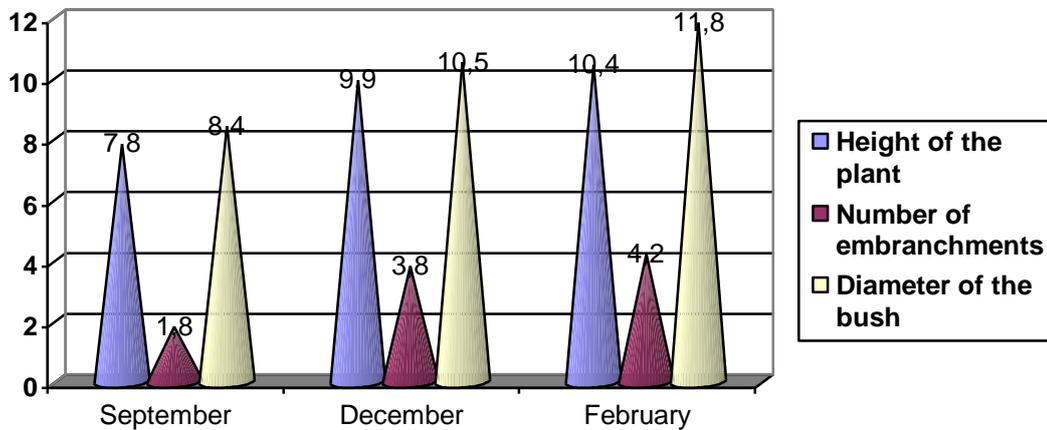
Using 8 cm diameter flower pots, plants had an average height of 7 cm, 1.6 embranchments, while the bush diameter was about 7.4 cm. Plants had an auspicious evolution in the 3 cropping months, reaching to 8.7 cm height, 2.4 embranchments, 9.9 cm diameter, and blooming buds. After 2 more months, plants reached a 9.4 cm height, 2.4 embranchments and a bush diameter of 10.7 cm, blooming buds, too. (Fig.2)



**Fig.2 Morphologic features of plants using 8cm diameter flower pots**

When the cropping of plants was in 11 cm diameter flower pots, the plants average height was of about 7.8 cm, 1.8 embranchments and the bush diameter of 8.4 cm. There were noticed progressive increases of the plant values, up to 9.9 cm height, 3.8 embranchments and 10.5 cm bush diameter, after 3 month of cropping. The plants reached the bud stage, as well as those cropped in 8 cm flower pots.

After two more months, plants reached to 4.2 embranchments and 11.8 cm bush diameter. In this case, plants are fully bloomed. (Fig. 3).



**Fig.3 Morphological features of plants using 11cm diameter flowers pots**

It was noticed that using various dimensions flower pots in the cropping of *Murraya paniculata* species affects the growing and blooming process. When little diameter flower pots were used, such as 6 cm diameter, in 5 months of cropping plants only reached a 1.8 cm height. When bigger flower pots were used, plants grew with 2.4 cm in height, in flower pots of 8 cm diameter, and up to 2.6 cm height, in 11 cm diameter flower pots.

As about embranchment, there were not noticed differences when using 6 and 8 cm diameter flower pots, the average reaching the 0.8 value. When using 11 cm diameter flower pots, the embranchment value reached 2.4.

The situation is similar for the bush diameter. Plants cropped in 6 and 8 cm diameter flower pots reached 3.3 cm, while the ones cropped in 11 cm diameter flower pots, 3.4 cm.

The most abundant blossom was at 11 cm diameter flower pots. The other analyzed parameters reached a higher value, too.



**Murraya paniculata- flowers and Murraya paniculata- flowers fruit**

## CONCLUSIONS

*Murraya paniculata* is an indoor plant that decorates with its dark leafage, with its white jasmine-like scent flowers, but also with red-orange mature fruit.

Out of the data that were hereby presented, there was noticed that this species needs a large nutritive area, in order to have a rich blooming. Using little flower pots the nutritive area is damaged, and so are the growing and embranchment of the plant.

The height of the plant, number of embranchments, diameter of the bush.

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# STUDII PRIVIND NUMĂRUL DE BOABE ÎN SPICUL PRINCIPAL LA SOMACLONELE ȘI GAMETOCLONELE SOIULUI DROPIA

## STUDIES CONCERNING THE NUMBER OF GRAINS IN THE MAIN SPIKE FOR DROPIA'S SOMACLONES AND GAMETOCLONES

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**Key words:** somaclones, gametoclones, comparative cultures, control, number of grain in the main spike

### ABSTRACT

*Cultura de țesuturi este o importantă sursă de variație somaclonală motiv pentru care pornind de la două tipuri de explante, reprezentate de antere și embrioni imaturi, s-au obținut gametoclone și somaclone ale soiului de grâu Dropia. Materialul biologic utilizat în aceste experimentări a fost reprezentat de 18 somaclone și 7 gametoclone. Martorul a fost reprezentat de soiul Dropia.*

*Somaclonele și gametoclonele soiului Dropia au fost studiate în două culturi comparative după metoda blocurilor randomizate cu trei repetiții.*

*Comparând rezultatele obținute la somaclone cu cele obținute la gametoclonele soiului Dropia s-a observat că numărul de boabe din spicul principal este superior statistic la somaclone față de gametoclone. Martorul a prezentat valori inferioare gametoclonelor și somaclonelor soiului Dropia în ceea ce privește caracterul studiat.*

*Tissue culture is an important source of somaclonal variation thus for, starting from two types of explants represented by anthers and immature embryos gametoclones and somaclones were obtained for the wheat cultivar Dropia. The biological material used for these studies was represented of 18 somaclones and 7 gametoclones. The control was represented by the cultivar itself.*

*The somaclones and gametoclones of the cultivar Dropia were studied in two comparative cultures as for the randomized blocks by three repetitions.*

*Comparing the results obtained for the cultivar Dropia somaclones and gametoclones on observed that the average of the number of grains in the main spike is superior for the somaclones comparing with the gametoclones. The control presented inferior values comparing with both gametoclones and somaclones, for this character.*

### INTRODUCTION

Somaclonal variation in wheat can be obtained by new plants regeneration from callus. Different types of explants can be used in order to generate callus, but the most efficient and regenerative callus was proved to be the one derived from immature embryos [2, 4]. This is the reason why this method was proposed to be the standard *in vitro* regeneration technique for wheat [4].

Characters like plants high, stalk thickness, number of spikes and ears, number of fertile tillers, grains color, cover color, development rhythm, gliadin quantity from grains, proteins and  $\beta$ -amylase quantity of the grains are generally affected by somaclonal variation [1, 6].

Ryan *et al.* (1987) reported that a significant somaclonal variation might be generated by *in vitro* culture for characters important agronomical and qualitative. Analyses realized on 256 wheat lines selected of R<sub>3</sub> and R<sub>4</sub> generation proved their qualities after being tested in the field. Thus, significant modifications were observed of all

the characters analyzed as plants high, number of grains in the main spike, grains weigh (thousand grains weigh – MMB), yield capacity, total dry weigh and harvesting index [5].

All the lines selected for these characters, except of those for yield capacity and harvesting index, presented significant increases overcoming the donor plant even in the following generations. These results represents and important source for breeders [5].

## **BIOLOGICAL MATERIAL AND METHODS**

Biological material used in these studies was represented by cultivar Lovrin 41's somaclones and gametoclones. The somaclones were obtained by regeneration from callus originated in immature embryos *in vitro* culture and the gametoclones come from callus resulted from anther culture.

Somaclones and gametoclones obtained by *in vitro* culture of immature embryos and anthers were studied for three years, in successive cultures, in the experimental fields of the Plant Breeding Department of the Horticulture Faculty from Timișoara. Seeding was realized at 12.5 cm, wheat normal distance between rows. The culture method consisted in one gametoclone or somaclone per row. Seeding was manually done and the distance between grains/row was 5-6 cm.

Thirty mature plants were randomized choused and yielded for each somaclone and gametoclone respectively. Biometrical measurements regarding the number of grains in the main spike for each somaclone and gametoclone were done.

Data obtained from the biometrical measurements were statistically processed determining the average, the standard deviation and the variability coefficient.

## **RESULTS AND DISCUSSIONS**

The number of grains per spike represents one of the most important components of the yielding capacity, depending directly of the spike length and density [5]. Thus, long and lax spikes with a small number of grains per spike but also short and compact spikes with high number of grains per spike might exist [6]. The number of grains per spike depends on the number of ears initiated per spike and on their surviving percentage. Ears abortion depends both on the genotype and more over on the environmental conditions [4, 6].

Analyzing average variability limits, presented in table 1, concerning the number of grains in the main spike, can be observed that, for Dropia's somaclones was between 35.23 grains for the somaclone 2 and 38.05 grains for the somaclone 15. This character shows a low variability between the somaclones studied and a medium variability inside each somaclone for 94.44% of the somaclones and a high variability inside the somaclones members for 5.5% of the somaclones.

Data from table 2 show that, regarding the character the number of grains in the main spike, 3 of the cultivar Dropia's somaclones (16.66%) are statistic distinctly significant superior to the control and 15 of them (83.33%) are very significant superior to the control represented by the cultivar Dropia.

Studying the results obtained for cultivar Dropia's gametoclones (table 3) regarding the number of grains in the main cultivar it was observed that average variability limits were between 35.44 grains for the gametoclone 2 and 36.38 grains for the gametoclone 7.

Tabelul 1

Estimative values concerning the number of grains in the main spike for Dropia's somaclones analyzed in the experimental period (2000-2003)

Nr. crt.	Genotype	2000-2001		2001-2002		2002-2003		Average 2000-2003	
		$\bar{x} \pm s_x$	$S\%$						
1	Control	30,56±1,55	27,83	30,56±1,55	27,83	30,56±1,55	27,83	30,56±1,55	27,83
2	Somaclona 1	32 ± 1,10	18,84	37,6 ± 1,02	14,87	37,36±0,88	12,91	35,65±0,63	16,91
3	Somaclona 2	32 ± 1,47	24,92	37,46±1,24	18,19	36,23±1,09	16,58	35,23±0,76	20,55
4	Somaclona 3	32,40±0,86	13,15	39,46±1,41	19,65	38,30±0,96	13,76	36,72±0,65	16,27
5	Somaclona 4	36 ± 0,74	11,80	36,96±1,10	16,31	37,43±1,02	14,94	36,80±0,57	14,91
6	Somaclona 5	34,36±0,49	8,15	36,96±0,90	13,37	36,96±0,96	14,23	36,09±0,50	13,34
7	Somaclona 6	33,13±0,99	14,93	37,80±1,10	16,06	37,06±0,95	14,16	36,00±0,58	14,98
8	Somaclona 7	36,53±1,59	25,92	39,13±0,90	12,60	37,23±1,06	15,65	37,63±0,73	19,08
9	Somaclona 8	33,66±0,96	14,67	38,76±1,01	14,30	36,73±0,95	14,22	36,38±0,57	14,58
10	Somaclona 9	36,03±1,26	18,27	37,33±1,47	21,68	35,8 ± 0,91	13,88	36,39±0,71	18,28
11	Somaclona 10	37,93±0,68	10,92	37,46±1,24	18,18	37,33±1,03	15,17	37,57±0,60	15,71
12	Somaclona 11	34,10±1,46	21,14	37,40±1,11	16,34	35,70±0,92	14,11	35,73±0,68	17,59
13	Somaclona 12	38 ± 1,24	18,19	35,03±1,28	20,03	36,03±0,91	13,91	36,35±0,66	17,56
14	Somaclona 13	37,46±1,30	18,76	37,80±1,14	16,57	36,33±0,86	13,01	37,20±0,64	16,32
15	Somaclona 14	38,03±1,41	19,65	36 ± 0,86	13,15	36,53±1,08	16,27	36,85±0,67	17,10
16	Somaclona 15	39,46±1,19	16,18	37,66±1,08	15,82	37,03±0,96	14,31	38,05±0,63	15,77
17	Somaclona 16	40,26±1,10	16,31	36,86±1,09	16,25	36,36±0,89	13,42	37,83±0,59	15,25
18	Somaclona 17	36,96±0,90	12,62	38,66±1,28	18,15	35,83±0,96	14,67	37,15±0,62	15,69
19	Somaclona 18	39,40±0,90	13,37	37,93±1,26	18,27	36,73±0,97	14,45	38,02±0,60	15,45
	Somaclones average	35,98±0,63	7,44	37,57±0,25	2,82	36,72±0,16	1,86	36,75±0,34	4,04

Tabelul 2

Experimental results concerning the number of grains in the main spike for Dropia's somaclones obtained in the experimental period (2000-2003)

Nr. crt.	Genotype	Average	Relative value toward the control	Difference toward the control	Signification
1	Martor	30,56	100,00	0,00	Control
2	Somaclona 1	35,65	116,67	5,09	**
3	Somaclona 2	35,23	115,28	4,67	**
4	Somaclona 3	36,72	120,16	6,16	***
5	Somaclona 4	36,80	120,41	6,24	***
6	Somaclona 5	36,09	118,11	5,53	***
7	Somaclona 6	36,00	117,79	5,44	***
8	Somaclona 7	37,63	123,13	7,07	***
9	Somaclona 8	36,38	119,06	5,82	***
10	Somaclona 9	36,39	119,07	5,83	***
11	Somaclona 10	37,57	122,95	7,01	***
12	Somaclona 11	35,73	116,93	5,17	**
13	Somaclona 12	36,35	118,96	5,79	***
14	Somaclona 13	37,20	121,72	6,64	***
15	Somaclona 14	36,85	120,59	6,29	***
16	Somaclona 15	38,05	124,51	7,49	***
17	Somaclona 16	37,83	123,78	7,27	***
18	Somaclona 17	37,15	121,56	6,59	***
19	Somaclona 18	38,02	124,41	7,46	***

$$DL_{5\%} = 2,93 \quad DL_{1\%} = 3,93 \quad DL_{0,1\%} = 5,19$$

The very low variation amplitude (0.80 grains) and the low variability between the gametoclones studied certify a high uniformity between Dropia's gametoclones regarding this character.

Also, basing on the data from table 3, a low variability inside each gametoclone can be observed.

Comparing with the control, all Dropia's gametoclones proved to be very significant superior regarding the number of grains in the spike.

**Tabelul 3**

**Estimative values concerning the number of grains in the main spike for Dropia's gametoclones analyzed in the experimental period (2000-2003)**

Nr. crt.	Genotype	2000-2001		2001-2002		2002-2003		Average 2000-2003	
		$\bar{x} \pm s_x$	$S_{\%}$						
1	Martor	30,56±1,55	27,83	30,56±1,55	27,83	30,56±1,55	27,83	30,56±1,55	27,83
2	Gametoclona 1	36,96±0,70	11,20	35,06±0,82	12,81	36,93±0,91	13,58	36,32±0,47	12,80
3	Gametoclona 2	34,63±0,75	11,43	35,4 ± 0,87	13,48	36,30±0,88	13,38	35,44±0,48	12,69
4	Gametoclona 3	35,90±0,77	12,01	35,30±0,79	12,38	36,43±0,93	14,00	35,88±0,48	12,81
5	Gametoclona 4	35,20±0,83	12,81	35,46±0,89	13,74	36,63±0,92	13,81	35,76±0,50	13,40
6	Gametoclona 5	35,53±0,79	12,33	36,46±0,99	14,91	35,86±0,87	13,31	35,95±0,51	13,49
7	Gametoclona 6	35,33±0,91	14,04	36,20±0,88	13,42	37,06±1,09	16,09	36,20±0,55	14,50
8	Gametoclona 7	35,76±0,84	13,04	36,56±0,82	12,28	36,83±1,01	14,94	36,38±0,51	13,44
	Media gametoclone	35,61±0,27	2,03	35,78±0,23	1,71	36,58±0,15	1,13	35,99±0,21	1,62

**Tabelul 4**

**Experimental results concerning the number of grains in the main spike for Dropia's gametoclones obtained in the experimental period (2000-2003)**

Nr. crt.	Genotype	Average	Relative value toward the control	Difference toward the control	Signification
1	Control	30,56	100,00	0,00	Control
2	Gametoclona 1	36,32	118,84	5,76	***
3	Gametoclona 2	35,44	115,98	4,88	***
4	Gametoclona 3	35,88	117,40	5,32	***
5	Gametoclona 4	35,76	117,03	5,20	***
6	Gametoclona 5	35,95	117,64	5,39	***
7	Gametoclona 6	36,20	118,44	5,64	***
8	Gametoclona 7	36,38	119,06	5,82	***

DL<sub>5%</sub> = 1,03 DL<sub>1%</sub> = 1,43 DL<sub>0,1%</sub> = 1,99

All the results obtained did not emphasized any somaclonal variation apparition following *in vitro* wheat regeneration from anthers or immature embryos and an increasing of descendants, somaclones or gametoclones, values regarding the number of grains in the main spike.

### CONCLUSIONS

1. Dropia's somaclones presents a low variability between the genotypes and a medium variability inside each somaclone.

2. Three of the somaclones were statistic distinctly significant superior to the control the rest of them were significantly superior to the control, regarding the character number of grains in the main spike.

3. The very low variation amplitude and the low variability between the gametoclones studied certify a high uniformity between Dropia's gametoclones regarding this character.

4. All Dropia's gametoclones proved to be very significant superior to the control for the number of grains in the main spike.

5. Both somaclones and gametoclones proved to be superior to the control regarding the number of grains in the main spike.

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# IMPLICATIILE AGENTILOR DE DAUNARE ASUPRA PIERDERILOR DE PRODUCTIE LA SOIUL DE GRAU DROPIA

## THE IMPLICATTIONS AGENTS OF DAMAGES ABOUT THE YIELD OF LOSS TO THE DROPIA WHEAT KIND

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**Key words:** wheat, yield, loss, agents of damages, treatments

### ABSTRACT

*Rezultatele de cercetare obtinute la cultura graului evidentiaza aplicarea a doua tratamente cu fungicidul pe baza de propiconazol 75g/l + carbendazim 300 g/l, in doza de 1 l/ha, care a realizat cel mai bun control al bolilor foliare, diferenta de productie obtinuta, comparativ cu martorul netratat, fiind de 1375 kg/ha, distinct semnificativa din punct de vedere statistic. Pierderile de productie la soiul de grau Dropia se cifreaza la 41, 2% la netratat, comparativ cu aplicarea a 2 tratamente pentru boli foliare. Dintre acestea, 10% datorita agentilor patogeni Erysiphe graminis f. sp. Tritici, Fusarium sp., Puccinia recondita, Septoria sp., 6,2% datorita atacului produs de Cephus pygmaeus si Trachelus tabidus, 1% atacului produs de Eurygaster integriceps si Aelia accuminata, iar diferenta de pierdere cantitativa a productiei este produsa de seceta.*

*The results investigatory obtained to the culture wheat emphasized the adhibition two treatments with the fungicide on the strength of of propiconazol 75g/ l + carbendazim 300 g/ l, in the dose of 1 l / ha achieved best check of foliar infections, difference of yield obtained, comparative with the untreaty witness, be of 1375 kg/ ha, distinctly significantly from statistical viewpoint. Miss of productions to the corny kind Dropia encoded to 41, 2% to untreaty comparative with the adhibition two treatments for complaints foliare. Among these, 10% owing to pathogenetic agents Erysiphe graminis charm. Sp. Tritici, Fusarium sp., Puccinia recondita, Septoria sp., 6, 2 % owing to the attack produced of Cephus pygmaeus and Trachelus tabidus, 1% the attack produced of Eurygaster integriceps and Aelia accuminata, and difference of quantitative loss the yield is produced of the drought.*

### INTRODUCTION

The wheat autumnaculture constitute a specific of microclimate, favourably development agents of damages, due to carpet of plants dominant on same grounds a long period of time, from autumn and within the summer of next year. The agroecosystem wheat suffers loss of vegetable biomass equip due to damages, of the plant of nominally pathogenetic agents carved up in the net trofica. The natural mechanisms of self-adjustment am thin in ecosystem, so, in favourably conditions, complaints and pests, evolution, the productivity can be gravely affected ( Banita Emilia and col., 1992, 2002, Searpe Doina and col., 2001.

In near all the zones of the culture ale wheat, pathogenetic agents constitute importantly limitative factors have yield, only that miss of the harvest am determinate, in main, of of a evolution foliar complaints ( Ionescu C. And col., 1989, Puscasu gheorghe D., 1981, Sesan Tatiana, Ionescu C., 1993.

The work proposes to bring one contributions to the rebutment importantly pathogenetic what agents compose the environment of the culture of wheat and to substantiate incorporate the agroecosystem protection, proper the conditions of sabulous soils.

## MATERIAL AND RESEARCH METHOD

The researches they accomplished to CCDCPN Dabuleni, to the culture wheat, on psamosol with reduced fertility, characterized through content in humus of 0,41 - 0,61%, and  $pH_{H_2O} = 6,8-7,1$ . The experiment were emplaced in the irrigation conditions, after the method of the block of random flats with 6 experimental variants:

V1 - untreated

V2 - propiconazol 75g/l + carbendazim 300 g/l - (1l/ha, 2 treatments);

v3 - propiconazol 250 g/l (0,5 l/ha, 2 treatments);

v4 - propiconazol 75g/l + carbendazim 300 g/l - (1l/ha, 1 treatments);

v5 - propiconazol 250 g/l (0,5 l/ha, 1 treatments);

v6 - tiofanat methyls 70% (1 l/ha, 1 treatments).

He sowed the kind Dropia, and the treatments were applied to the registration P.E.D.. Former the treatment he achieved to II-III knot (the prime - two decays the month April), and one of the two treatment to the spike apparition (the April decays three - the bonus decays the May month). They accomplished the determinations concerning: the number of plants rised and the number of plants harvesting, the size of the plant, the length of the spike, the number of beans in spike, MMB, yield of beans, frequent dry beans. On the strength of these calculating determinations the loss of plants and the quantitative damage (due P% of the attack challenged of *Erysiphe graminis* charm. Sp. Tritici, *Cephus pygmaeus* and *Trachelus tabidus*, *Eurygaster integriceps* and *Aelia accuminata*, alti factors (the drought, unmaturing spikes).

The results obtained were processed and construed through the analysis of the variant.

## RESULTS

Is known the fact that the appearance and the development pathogenetic agents by-paths are determined of coexist three his factors conditions: host plant, vector and average external. Struggle incorporate he is the harmonious joining the everybody of fight methods against the harmful organisms and their adhibition except when needs. She don't follows the pathogenetic eradication, but maintain their below a certain high threshold the economically threshold of damage (P. E. D.), carry represents the level of attack of harmful what causes the of a registration loss of coequal harvest the cost of the treatments.

This in the sense they achieved the studies concerning the damages challenged of pathogenetic agents to the cultivated wheat on the sabulous soils, in conditiile adhibition correct the technology of cultivate the plant. Were testate in vegetation produced: on the strength of of propiconazol 75g/l + carbendazim 300 g/l, in the dose of 1 l/ha, on the strength of of propiconazol 250 g/l, in the dose of 0,5 l/ha and on the strength of of tiofanat methyl 70%, in the dose of 1 kg/ha, through adhibition in vegetation in one or doua splashes, in the phase of II-III knot and to spike apparition.

The adhibition two treatments with the fungicide on the strength of of propiconazol 75g/l + carbendazim 300 g/l, in the dose of 1 l/ha achieved, lowest interest of plants irretrievable totals (24,8%), and among which 6% due infection with *Erysiphe graminis* charm. Sp. tritici. The degree of attack / spike produced of *Erysiphe graminis* charm. Sp. Tritici in as part as this experimental were of 2,7%), (the table 1).

**The table 1.**

**The efficaciousness of the fungicides and number of treatments applied for the rebutment of the fungus *Erysiphe graminis* charm. Sp. Tritici.**

No. var	Variant			Loss of plants (%)		The degree of attacks spikes produced of <i>Erysiphe graminis</i> charm. Sp. Tritici (%)
	Antifungal active matters	Dose of fungicide (kg, l/ha)	No. Treatments applied to P.E.D.	Total	which due <i>Erysiphe graminis</i> charm. Sp. Tritici	
1	untreated	-	-	47,3	26,6	46,1
2	propiconazol 75g/l + carbendazim 300 g/l	1	2 (I,II)	24,8	6,0	2,7
3	propiconazol 250 g/l	0,5	2 (I,II)	30,1	6,7	3,0
4	propiconazol 75g/l + carbendazim 300 g/l	1	1 (I)	28,8	11,1	8,1
5	propiconazol 250 g/l	0,5	1 (I)	32,3	12,6	9,5
6	tiofanat metil 70%	1	1 (I)	31,9	13,5	10,9

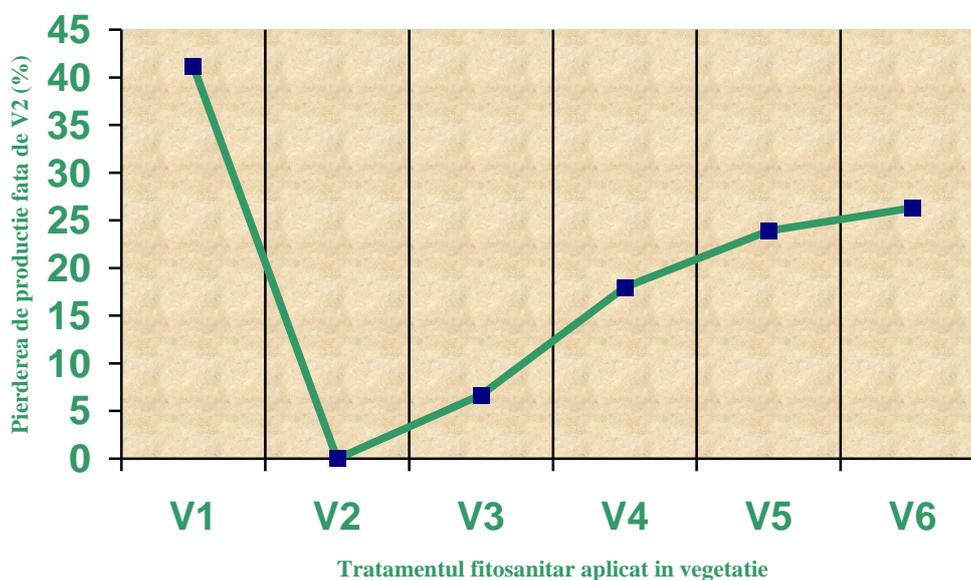
The results obtained in the conditions from CCDCPN Dabuleni demonstrates the must adhibition of the fitosanitar treatment and this correlation with the phases of growthes and develop the plant when registered one maul hello comparative efficaciousness with the witness untreated consisted increases of the height of the plant and measure of the spike and number of beans in spike through the adhibition in wheat vegetation a two treatments with propiconazol 75g /l + carbendazim 300 g/ l, in the dose of 1 l/ ha,( the table 2). The number of beans in spike in corroboration with massage 1000 beans drove to the of a realization yield maxims obtained this in the experimental variant,( 3350kg/ha), difference of yield of 1375 kg/ ha be distinct semnificativ against the witness untreated. The signification adhibition of the treatments is emphasised in the figure 1, from which remarked the adhibition two treatments in vegetation, when miss of yield are most little.

**The table 2.**

**Influence of the fungistats and number of treatments applied about productivity to the kind Dropia.**

No. var	Variant			height of the plant (cm)	length of the spike (cm)	No. beans /the spikes	MMB (g)	Yield (kg/ha)
	Antifungal active matters	Dose of fungicide (kg, l/ha)	No. treatments applied to P.E.D.					
1	netratat	-	-	62,8	5,6	20,2	33,3	1975
2	propiconazol 75g/l + carbendazim 300 g/l	1	2 (I,II)	72,9	7,0	28,5	41,1	3350**
3	propiconazol 250 g/l	0,5	2 (I,II)	72,6	6,9	28,1	41,1	3125**
4	propiconazol 75g/l + carbendazim 300 g/l	1	1 (I)	71,2	6,8	25,3	39,7	2747*
5	propiconazol 250 g/l	0,5	1 (I)	69,7	6,7	25,3	39,2	2550
6	tiofanat metil 70%	1	1 (I)	70,3	6,7	25,0	38,8	2469

DL 5% = 741 kg/ha  
 DL 1% = 1045 kg/ha  
 DL 0,1% = 1495 kg/ha



**The figure 1. Influence of the phytosanitary treatments about the loss of productions to the Dropia wheat kind**

Analysis the parasitical factors implicated in the yield diminution, in the variant treated with propiconazol 75g/ l carbendazim 300 g/ l, 1 l/ ha remarked, comparative with the witness untreated, as most big loss of plants owes his Erysiphe graminis charm. Sp. Tritici and the drought( the table 3). Uneffectuation of the treatment for the rebutment foliar complaints drove to the of a registration loss of plants of 18, 5%, due his Erysiphe graminis charm. Sp. Tritici, of 11, 6%, due his Cephus pygmaeus and Trachelus tabidus, of 1, due the attack of Eurygaster integriceps and Aelia accuminata, of 15, 1% due the drought and of 1, 2%, due the unmaturing spikes.

**The table 3**

**Parasitical factors inwrought in the quantitative diminution to the twheat yield.**

Variant	Dose of fungicide (kg, l/ha)	No. treatments applied to P.E.D.	Density of the plants/ m <sup>2</sup>		Loss of plants (%)	Which due the parasitical factors			Another factors	
			total plants	harvest spikes		Erysiphe graminis f. sp. tritici	Cephus pygmaeus si Trachelus tabidus	Eurygaster integriceps si Aelia accuminata	drought	unmature spikes
propiconazol 75g/l + carbendazim 300 g/l	1	2 (I,II)	586	456	24,8	4,0	11,6	0,4	5,1	3,7
untreated	-	-	545	342	47,3	18,5	11,6	1,0	15,1	1,2

The results of productions obtained to wheat emphasises the importance of the treatment for the check foliar complaints, the damage produced of uneffectuation this drive many times to the of a discredit cults( the table 4).

Miss total from quantitative yield is of 41, 2%, most big be produced of infection of the plants with Erysiphe graminis charm. Sp. Tritici, Fusarium sp., Puccinia recondita, Septoria

sp.( 10%). Frequent dry beans registered also erect values the varied and depending on the parasitical factor, in the variant untreated( 2, 9-24, 2%), comparative with the adhibition two treatments with products on the strength of of propiconazol 75g/ l + carbendazim 300 g/l in the dose of 1l/ ha 2, 9 -15%).

**The table 4**

**Miss of quantitative yield due of parasitical factors to the Dropia wheat kind**

Specify		UM	Two treatments with products on the strength of of propiconazol 75g/l + carbendazim 300 g/l (1l/ha) ( mt.)	Untreated
Yield of beans STAS		kg/ha	3350	1975
Miss from quantitative yield (P%)		%	mt	41,2
		kg/ha	mt.	1375
Frequent dry beans	Erysiphe graminis f. sp. tritici, Fusarium sp., Puccinia recondita, Septoria sp.	%	5,8	24,2
	Cephus pygmaeus si Trachelus tabidus	%	15,0	15,0
	Eurygaster integriceps si Aelia accuminata	%	2,9	2,9
	Alti factori	%	7,1	8,5
The quantitative damage produced of the parasitical factors (P%)	Erysiphe graminis f. sp. tritici, Fusarium sp., Puccinia recondita, Septoria sp.	%	mt	10,0
		kg/ha	mt	333,0
	Cephus pygmaeus si Trachelus tabidus	%	mt	6,2
		kg/ha	mt	207,0
	Eurygaster integriceps si Aelia accuminata	%	mt	1,0
	kg/ha	mt	33,4	
The total quantitative damage owedof parasitical factors		%	mt	17,2
		kg/ha	mt	574,0

## CONCLUSIONS

1. The adhibition two treatments in vegetation with the fungicide on the strength of of propiconazol 75g/l + carbendazim 300 g/l, in the dose of 1 l/ha achieved, best check of foliar complaints to the culture wheat, difference of comparative yield with untreated, be of 1375 kg/ha significantly, distinctly from statistical viewpoint;

2. The results investigatory obtained show as miss of yield to the Dropia wheat kind digitized to 41, 2% to comparative untreated with the adhibition two treatments for foliar complaints;

3. Most big loss of yield to the wheat sowed on the sabulous soils owes pathogenetic agents Erysiphe graminis charm. Sp. Tritici, Fusarium sp., Puccinia recondita, Septoria sp.

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# METODE DE PROGNOZĂ ȘI AVERTIZARE ASISTATE DE CALCULATOR

## PROGNOSIS AND WARNING METHODS ASSISTED BY THE COMPUTER

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**Key word:** plant protection, personal computer, software, hardware, station, acquisition board, treatment.

### **ABSTRACT**

*This article presents a modern way of protecting plants that are dedicated to a software interface and a set of hardware (station measurement and transmission of data coupled to the PC, acquisition board, sensors).*

*The system must be looked like a tool which help you to correctly supervise and optimize the application of the treatments against some diseases. The system is not a decision factor mustn't and it looked like that. A software can not take a decision, but who use this software can consult or not these recommendations.*

*Acest articol prezintă o modalitate modernă de protecție a plantelor care are un software dedicat și o interfață hardware de configurat (stație de măsurare și transmitere de date cuplată la PC, placă de achiziție, senzori).*

*Sistemul trebuie să fie privit ca un instrument care vă ajută la o supraveghere corectă și are rolul de a optimiza aplicarea tratamentelor împotriva unor boli. Sistemul nu este un factor de decizie, nu trebuie înțeles așa. Un program de computer nu poate să ia o decizie, dar cine folosește acest software poate consulta sau nu aceste recomandări.*

**Cuvinte cheie :** protecția plantelor, calculator personal, software, hardware, stație, placă de achiziție, tratament.

### **FACTORS WHICH INFLUENCE THE APPARITION OF DISEASES**

Common diseases depend largely on climatic conditions that allow the system to reduce the quantity of chemicals used.

Is the pathogen that causes damage. Is the host plant or culture. Environment means weather conditions. The disease is the manifestation of symptoms, damage. All these three components must meet certain conditions for the disease to appear.

If the host is not sensitive, it will not be symptoms. If the pathogen is not present, but the host is sensitive and weather conditions are favorable, then, will also be symptoms. Finally, if the host is susceptible and the pathogen is present, but weather conditions are not favorable, again will not be simtome.

Consider the possibility that the environmental conditions appear favorable climate pathogen. When these conditions, control of crops have intensified, and when weather conditions are unfavorable for the production of disease control on crops may be less intensive, because the risk of disease is lower.

The possibility of centralizing data allows you to have more points of observation (measuring stations), which send data to the PC where it is located-intelligence algorithms that analyze information stored in the database. Adding to the possibility of installing stations to the tens of miles, you can make an idea about the area you can cover with this system.

The advantage of this solution would be the minimum cost per user and provide all information about the need for optimum application time of treatment.

The solution presented above can be applied to large farms in this case, the advantage would be huge, because one person responsible for the protection of plants

could have a good control over the entire area. He can concentrate labor and resources available at the place and time required. Of course, this does not mean that the system can not be used for smaller areas, can use the PC to get in touch with a base station where they can retrieve data via the modem.

## WHAT IS THIS SYSTEM?

The system comprises two parts, a hardware (equipment itself) and other software (programs), with which you can measure some parameters on a relatively large area. By parameters, we understand any physical converted into electric equivalent. For example: air temperature, relative humidity, soil moisture, wind speed, the water level in a river - all these values can be converted into electrical signals due to sensor. If there is a sensor for a given physical parameter, it is very easy for him to be attached to the system. But there are some limits: electricity consumption of the sensor must be small enough that it can be used together with the station for measuring and transmitting data, which is supplied from solar energy.

Parameters converted into electrical signals are stored in the memory station for measuring and transmitting data. Station to measure and transmit data has its own intelligence, in the form of a microprocessor, which regularly performs various functions: "interrogates" sensors, înmagazinează measured data, check the radio channel, measuring voltage battery, etc.. Station for measuring and data transmission is equipped with a radio module, which communicate in real time with other station for measuring and transmitting data or base. Thus, contact with base can be made through other stations for measuring and transmitting data, which means that it can build a network over a wide area.

Base consists of a receiver and a personal computer (PC).

Receptor acts as a supervisor of the network: periodically (every 15 minutes) it requires data via radio module which is equipped, at all stations for measuring and data transmission network. Receiver stores data in memory being able to "interrogate" up to 50 stations and maintain data for at least five days without that they be transferred to the computer. In addition, an internal battery enables it to operate at least 20 hours without being connected to the electricity grid.

Periodically, normally once a day, data from the receiver are transferred to a PC running with the launch of the program. The program collects data from the receiver or another system through a modem - these data can be viewed or analyzed.

Depending on the application on its own use, you'll need to install the base, and one or more extensions. Extensions are modules that make analysis of data, answering some questions such as:

- Is treatment needed in potato?
- Is irrigation needed?
- Is treatment needed in vine?

So, let us review:

- The purchase data is a part hardware (equipment itself) and a software (programs).
- The hardware components are:
  - personal computer (PC)
  - receiver
  - stations for measuring and transmitting data
  - sensors and actuators
  - Other helpful parts (antennas, cables, Connectors, etc.)
- The software consists of:
  - Program (kernel)
  - specific extensions

- tools for configuration and maintenance

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# CERCETAREA ASISTATĂ DE CALCULATOR. APROXIMĂRI ȘI INTERPOLĂRI FOLOSIND CA SOFTWARE MATLAB ÎN VEDEREA SIMULĂRII DESFĂȘURĂRII FAZELOR DE CREȘTERE ȘI DEZVOLTARE A VIȚEI-DE-VIE

## THE RESEARCH ASSIST BY COMPUTER. APPROXIMATIONS AND INTERPOLATIONS USING THE SOFTWARE MATLAB IN VIEW OF SIMULATION IN PROCESS PHASES OF VINE'S INCREASE AND DEVELOPMENT

*Marian Nicolae\*, Elena Nicolae\*, Adrian Dulugeac\**

**Key words:** approximation, interpolation, software Matlab, simulation, process phases, substance.

### **ABSTRACT**

*MATLAB is a programming language likewise a developing system which integrates the calculus, the visualisation and the programming in a easy to use medium. The problems and their solution are concured in a approachable mathematical language. Starting from the experimental data, the accumulation of the drysubstance like a function of actif temperature ( $\Sigma^{\circ}\text{C}$ ) and time (t), the software gets a function which brings the increase of vine  $SU(\Sigma^{\circ}\text{C},t)$ , through interpolations with a very little step; so, this evolution can be determined empiric.*

*For mathematical thoroughness in the approximation of function - accumulation of dry matter (SU) depending on the temperature have used a variety of functions: exponential, logarithmic, polynomial depending on the type curve nonliniare sometimes fragmenting the diagram on parts. Simultaneos we can choose the function that proximate the best the experimental data by using dedicated software and we can get the values  $y=f(x)$  by interpolation  $y_i=f(x_i)$ , the interpolation step being very small,  $10^{-6}$ . We can make such calculations of the value of dry matter (SU) not by experimental way, but by using the applied sciences on computer. Where experimental data collection are a disparate values we can complete, however small it would be intervening Variation  $\Delta x$ , can learn at any time variața  $\Delta SU$ .*

### **INTRODUCERE**

Matlab este un sistem interactiv care are ca element de bază tabloul, ceea ce permite rezolvarea problemelor de calcul numeric, în special cele care necesită preucrarea de vectori sau matricie.

Programul permite atât evaluarea unor secvențe de calcule cu un set de date introduse de utilizator direct și cu rezultat imediat, cât și elaborarea și apoi folosirea repetată a unor programe de calcul pentru rezolvarea problemelor similare, dar cu set de date inițiale diferit. De aceea programul a fost dezvoltat pentru ca un mediu de lucru care asigură desfășurarea integrată și simultană a acestor activități.

S-a plecat de la datele experimentale disparate  $SU(\Sigma^{\circ}\text{C})$ , acumularea substanței uscate în funcție de temperatura activă, încercând apoi prin metode de interpolare (polinomiale, cubice) să se determine funcția care aproximează cel mai bine evoluția reală. Important este faptul că Matlab-ul face interpolări atât de o singură variabilă cât și de două variabile  $SU(\Sigma^{\circ}\text{C}, t)$ , acumularea substanței uscate în funcție de temperatura activă și de timp.

## TIPURI DE APROXIMĂRI FOLOSIND MATLAB PENTRU ACUMULAREA DE SUBSTANȚĂ USCATĂ ÎN FUNCȚIE DE TEMPERATURĂ ȘI TIMP

Modurile de lucru permise de sistemul Matlab sunt: modul de lucru direct și modul de lucru program (utilizând fișierele sursă.m).

Pentru modelarea și ilustrarea proceselor datele au fost editate într-un fișier text date.m cu conținut de forma:

```
6      10  20   65  126  172  205      → zile
183  250  346 1060 2430 3320 3740      → temperatura
1      6   250  875 1600 2380 2615      → substanță uscată
```

corespunzător tabelului de mai jos:

Luna	1	2	3	4			5	6	7	8	9	10	11	12	
	ian	feb		mar	apr			mai	iun	iul	aug	sep	oct	nov	dec
Data	-	12	20	-	6	10	20	-	5	-	5	21	23	-	-
Nr zile	-	-	-	-	6	10	20	-	65	-	126	172	205	-	-
Faza	RR	SF	PI	-	În	Dz	DI	-	Înf	-	Pg	M	CF	RR	RR
$\sum^{\circ}\text{C}$ active	-	21	42	-	183	250	346	-	1060	-	2430	3320	3740	-	-
SU(g)	-	-	-	-	1	6	250		875	-	1600	2380	2685	-	-
-	-	-	-	-	perioadă activă								-	-	

Unde:

- RR – repaus relativ
- SF – start fiziologic
- PI – plâns
- În - înmugurit
- Dz – dezmugurit
- DI – degajarea inflorescențelor
- Înf – înflorit
- Pg – pârga
- M- maturarea deplină
- CF – căderea frunzelor

ele fiind încărcate printr-o comandă de forma:

```
load date.m
```

Procedura de trasare a graficului prin puncte este salvată în fișierul trasare\_grafic.m :

```
x=[183 250 346 1060 2430 3320 3740]; → perechile xi, yi det experimental
y=[1 6 250 875 1600 2380 2615];
p=polyfit(x,y,4) → se traseaza graficul prin aproximare polinomiala de ordin 4
```

```
x1=180:.1:4000;
y1=polyval(p,x1);
plot(x,y,'o',x1,y1);
```

```
a=[183 250 346]; → perechile xi, yi determinate experimental
b=[1 6 250];
r=polyfit(a,b,4) → se traseaza graficul prin aproximare polinomiala de ordin 4
```

```

a1=0:.1:350;
b1=polyval(r,a1);
plot(a,b,'o',a1,b1);

```

```

m=[1060 2430 3320 3740];    → perechile xi, yi determinate experimental
n=[875 1600 2380 2615];
t=polyfit(m,n,4)           → se traseaza graficul prin aproximare polinomiala de ordin 4

```

```

m1=350:.1:4000;
t1=polyval(t,m1);
plot(m,t,'o',m1,t1);

```

```

plot(x1,y1,'o', a1,b1,'x',m1,t1,'*')

```

Comanda de execuție este:

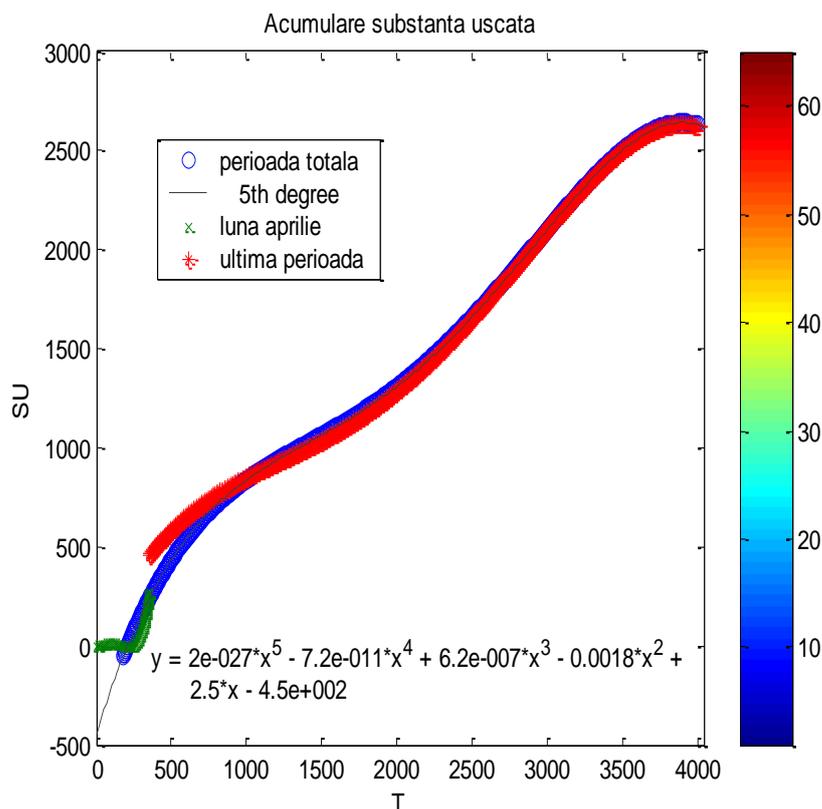
```
run trasare_grafic.m
```

## METODA POLINOMIALĂ

Vom aproxima curba experimentală cu un polinom de gradul 5, celelalte aproximări polinomiale (prin această variantă) de gradul 2, 3, 4 sau mai mari decât 5 având erori mari.

funcția polinomială de gradul 5 are expresia:

$$y = 2 \cdot 10^{-27} \cdot X^5 - 7,2 \cdot 10^{-11} \cdot X^4 + 6,2 \cdot 10^{-7} \cdot X^3 - 0,0018 \cdot X^2 + 2,5 \cdot X - 450$$



Procedura de calcul a unei valori  $p(x_i)$  găsim în fișierul calcul\_valoare.m care are conținutul următor:

```
x=180:1:350;
p=[p1 p2 p3 p4 p5 p6];
polyval(p,346)
r=roots(p)
```

unde  $p_{1...6}$  sunt coeficienții polinomului, iar funcția root determină rădăcinile polinomului în cauză.

Interpolarea ne ajută să găsim într-un mod simplu valorile  $y_i(x_i)$  cu un pas de variație foarte mic (1, 0.1, 0.1., 0.01, 0.001), fișierul interpolare.m având conținutul (după realizarea interpoării se trasează graficul cu ajutorul funcției plot):

```
x=0:10;
y=x.^2+5.355*x-8.145;
xi=0:.25:10;
```

```
yi=interp1(x,y,xi)
plot(x,y,'o',xi,yi)
```

sau putem folosi o interpolare spline pe care o putem găsi în fișierul interp\_spline.m

```
x = 0:10;
y = 2.235*x.^3+2*x.^2-55.2687*x-8.56;
xx = 0:.25:10;
yy = spline(x,y,xx)
plot(x,y,'o',xx,yy)
{fplot('2.235*x.^3+2*x.^2-55.2687*x-8.56',[2 8])}
```

### Interpolare spline cu pasul 100

Valorile interpolate le vom compara cu cele determinate experimental, observând totodată că la la orice moment  $x_i$  putem afla valoarea  $y_i$ .

Nr crt	T măsur experimental $\Sigma^{\circ}\text{C}$ active	T Interpolat pas $5\Sigma^{\circ}\text{C}$ active	SU experimental	SU interpolat
1	346	350	250	236,51
2	nedeterminat	1050	nedeterminat	863,96
3	1060	1060	875	869,09
4	nedeterminat	2425	nedeterminat	1601,1
5	2430	2430	1600	1605
6	nedeterminat	3315	nedeterminat	2371,2
7	3320	3320	2380	2375,1
8	nedeterminat	3735	nedeterminat	2615,6
9	3740	3740	2685	2617,2

Se observă viorile apropiate ale SU raportate la temperatura activă.

## Exemplu de interpolare multiplă de două variabile (cu datele experimentale folosind Matlab):

$x=[6,10,20,65,126,172,205]$  → nr. zile

$y=[183,250,346,1060,2430,3320,3740]$  → temperatura

$z=[1,0,0,0,0,0,0;0,6,0,0,0,0,0;0,0,250,0,0,0,0;0,0,0,875,0,0,0;0,0,0,0,1600,0,0;0,0,0,0,0,2380,0;0,0,0,0,0,0,2615]$  → SU

z =

1	0	0	0	0	0	0
0	6	0	0	0	0	0
0	0	250	0	0	0	0
0	0	0	875	0	0	0
0	0	0	0	1600	0	0
0	0	0	0	0	2380	0
0	0	0	0	0	0	2615

$zic=interp2(x,y,z,172,3320,'cubic')$

$zic =2380$

$zic=interp2(x,y,z,170,3315,'cubic')$

$zic =2352$

## CONCLUZII

Temperatura activă și mai ales cea utilă ( $\geq 10$  °C) pare să piloteze vizibil ritmul zilnic al creșterii și dezvoltării viței, confirmând încă o dată meteosensibilitatea acesteia.

Remarcăm totodată multitudinea de metode de interpolare și bibliotecile bogate de familii de funcții de aproximare (logaritmice, exponențiale, polinomiale). Rezultatele obținute prin folosirea aceleiași metode de interpolare (de exemplu metoda polinomială de grad 5) în cadrul softurilor diferite (Microcal Origin, Matlab, Microsoft) ne arată faptul că diferențele sunt extrem de mici, coeficienții diferind foarte puțin. Făcând o analiză a facilităților de program remarcăm superioritatea produsului din partea MathSoft, în speță Matlab, datorită posibilităților grafice de exprimare și a puterii de calcul deosebite.

Punctăm aici faptul că de multe ori curbele (setul de date de intrare/ieșire) trebuie tratate pe porțiuni și găsită tipul de funcție care aproximează cel mai bine realitatea. Rezultate foarte bune s-au obținut prin interpolările polinomiale și anume cele de grad  $n=5$ , unde  $n$  este gradul polinomului  $P(x)=a_nx^n + a_kx^k + \dots + a_0$ . Am avut 6 valori experimentale, deci 6 coeficienți  $a_k$ , rezultând în mod firesc  $n=5$ , gradul polinomului optim de interpolare.

Pentru a aproxima funcția acumulării de substanță uscată (SU) în funcție de temperatură am folosit diferite funcții: exponențiale, logaritmice, polinomiale în funcție de tipul curbei nonliniare, uneori fragmentând graficul pe porțiuni.

După alegerea funcției care aproximează cel mai bine datele experimentale folosind softuri dedicate putem afla valorile  $y=f(x)$  prin interpolare  $y_i=f(x_i)$ , pasul de interpolare fiind foarte mic, de ordinal  $10^{-6}$ . Putem astfel să determinăm valori ale substanței uscate (SU) nu pe cale experimentală, ci folosind informatica aplicată. Acolo unde colecția de date experimentale are valori disparate o putem completa, oricât de mic ar fi intervalul de variație  $\Delta x$ , putând afla în orice moment variața  $\Delta SU$ .

Semnificativ este faptul că putem face predicții nu numai de forma  $y=f(x)$ , funcție de o singură variabilă (acumularea de SU în funcție de temperatură,  $SU=f(T)$ ), ci și de forma  $z=f(x,y)$ , funcție de două variabile (acumularea SU în funcție de temperatură-T și evoluția în timp-t,  $SU=f(T,t)$ ).

Din analiza tabelelor sinoptice cu valorile substanței uscate (SU), atât cele experimentale cât și cele aflate prin interpolare după o funcție determinată prin analiză numerică cu suport informatic, în funcție de temperatura (T), rezultă valori reziduale care

tind spre zero, deci valori foarte apropiate ale SU măsurată cu cele SU determinate cu ajutorul calculatorului (ex: la  $T=3320\sum^{\circ}\text{C}$  avem  $SU_{\text{exp}}=2380\text{g}$  și  $SU_{\text{int}}=2375,1\text{g}$ ).

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# STUDIUL COMPARATIV ÎNTRE *TRITICUM AESTIVUM* ȘI *TRITICUM DURUM* PRIN PRISMA PRODUCȚIEI ȘI A ELEMENTELOR SALE COMPONENTE ÎN CONDIȚIILE DE LA SCDA ȘIMNIC

## THE COMPARATIVE STUDY BETWEEN *TRITICUM AESTIVUM* AND *TRITICUM DURUM* REGARDING YIELD AND ITS COMPONENTS IN ARDS SIMNIC AREA CONDITIONS

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**Key words:** wheat, yield, 1000 kernels weight, test weight

### ABSTRACT

*În perioada 2006-2008, la SCDA Șimnic au fost cultivate într-o experiență, 14 soiuri de grâu comun și 11 soiuri de grâu durum. S-au determinat producția și elementele de productivitate: numărul de boabe/spic, greutatea boabelor/spic, masa a 1000 de boabe și masa hectolitră.*

*În medie pe 3 ani față de producția soiului martor – soiul Dropia și față de media tuturor grânelor comune testate, 10 dintre cele 11 soiuri de grâu durum au manifestat diminuări ale producției asigurate statistic.*

*În ceea ce privește numărul de boabe/spic, trei dintre grânele durum și anume soiurile Hazera 11, Hazera 13 și Hazera 45 au obținut sporuri semnificative față de soiul Dropia, primul având o valoare a acestui caracter semnificativ mai mare și decât media soiurilor durum.*

*Între greutatea boabelor pe spic la cele două specii nu au existat diferențe semnificative, nici individual și nici ca medie ( $d = 0,06$  g). La fel și la masa a 1000 de boabe ( $d = 0,89$  g). Diferențe nu au existat nici la determinările ce au vizat masa hectolitră ( $d = 0,80$  kg/hl).*

*During 2006-2008 to ARDS Simnic area have been tested in experimental conditions, fourteen winter wheat varieties and eleven durum wheat varieties. There were established yield and productivity components: number of kernels per spike, kernels weight per spike, 1000 kernels weight and test weight.*

*As a three years average, comparatively with Dropia yield (witness variety) and the average of all tested varieties, ten of eleven durum varieties recorded yield decreases, statistical provided.*

*Among kernels weight per spike values for both species haven't been recorded significant differences neither individual level nor as average ( $d=0,06$  g). The same situation was recorded for 1000 kernels weight and test weight values ( $d=0,80$  g).*

### INTRODUCTION

In Oltenia area, the durum wheat, known as autumn „albanian”, is ancient, excepting short periods in co-operativization years. There were seeded first romanian and foreign inbred varieties, as follows: Miciurinka, Rubej, Apulicum 233, Topaz, Rodur (Ilicevici Stefania et al., 1988).

During the last years the largest areas seeded with durum wheat are in Canada, SUA, Australia, China and Russia with approximatively 2-3 million ha in every year. In

Europe durum wheat is seeded especially in Italy, Turkey, Spain and south of France. Globally, the average surface seeded with durum wheat is 18 million ha and the average yield is 30 million tones (International grains Council, 2002). The biggest producer is European Union with 8 million t/year. The second producer is Canada (4,6 million t/year), followed by Turkey (4 million t/year) and USA (3,5 million t/year) (\*\*\*, 2004).

The global average yield is generally low (1200-1400 kg/ha) because durum wheat is seeded especially in dry areas under rain fed conditions. The highest values are recorded in developed countries, as SUA and Canada (1500-2000 kg/ha). Under intensive cropping system the inbred durum wheat varieties created in Mexico by CIMMYT recorded yields similar with those of new common wheat varieties (5-6 t/ha) or even superior. Actually, the durum wheat yield decrease with 15-20%, but this crop efficiency is realized by the higher selling price (25-30%).

## MATERIAL AND METHODS

The research was focus on the comparative study between common wheat and durum wheat varieties regarding milling and baking quality, under two fertilizing treatments.

There have been tested 25 wheat varieties, as follows: 14 common wheat varieties and 11 durum wheat varieties. the fertilizing treatments include: N100P40 rate (complex fertilizer, basal applied in autumn + urea applied in spring) and N60P40 rate (complex fertilizer basal applied in autumn).

**Table no.1**

**The common and durum wheat varieties tested during 2006-2007 years**

No.	Common winter wheat	No.	Durum wheat
1	DROPIA	10	RODUR
2	FLAMURA 85	11	PANDUR
3	FUNDULEA 4	12	CONDUR
4	GLOSA	13	GRANDUR
5	BRIANA	14	DF 99047/12
6	BOEMA	15	PROWIDUR
7	SIMNIC 30	16	HAZERA 11
8	CRINA	17	HAZERA 13
9	FAUR	18	HAZERA 45
21	DUNAI	19	ELIDUR
22	S 9535	20	AURADUR
23	S 0417		
24	S 0421		
25	S 0430		

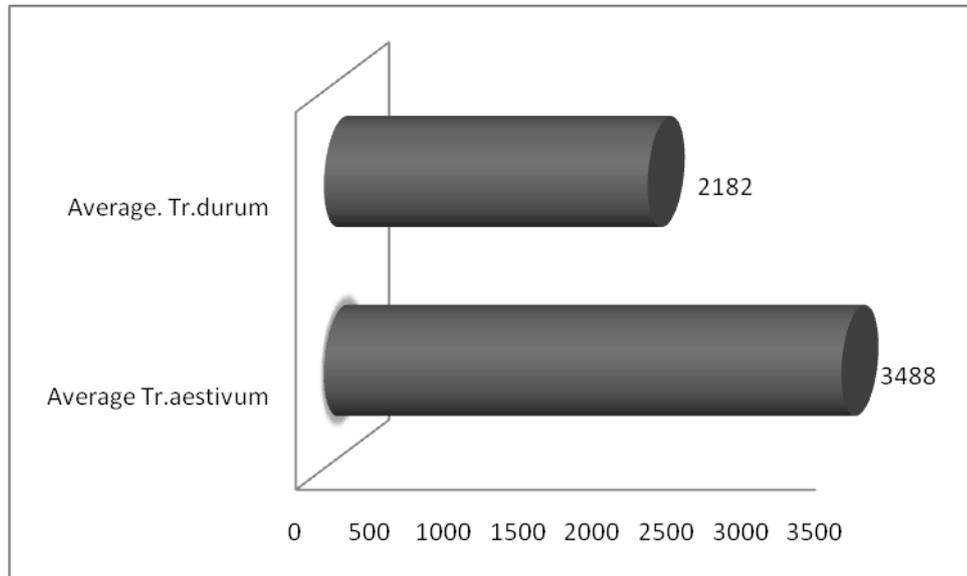
The agro technical practices were:

- pre-crop: pea
- tillage: ploughing + disking +combinator
- fertilizing treatment: 20-20-0 complex fertilizer (150 kg/ha) in autumn  
nitrogen fertilizer (150 kg/ha) in spring
- seeding density: 550 grains/m<sup>2</sup>
- seeding depth: 4-5 cm
- seeding date: 11.10.2005, 11.10.2006, 13.10.2007
- seed treatment: Orius 1,5 kg/t
- weeds control: Peak 20 g/ha.

The seeding rate was calculated for each variety depending on germination, purity, density and 1000 kernels weight.

## RESULTS AND DISCUSSION

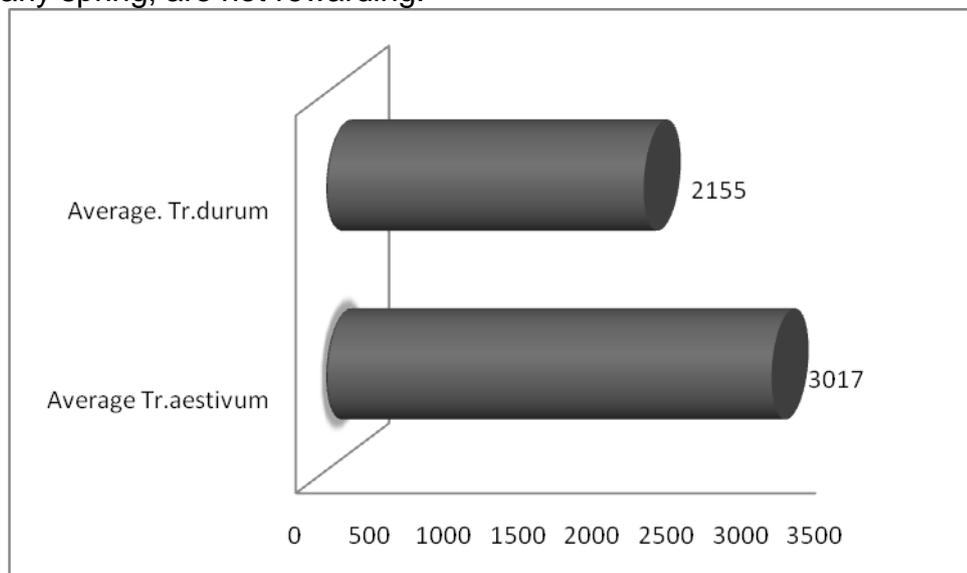
On three years average the yield ranged among 1685 kg/ha (by Auradur) and 3733 kg/ha (by Crina). The only one exception was recorded by durum varieties, under N100P40 fertilizer rate, which realized yield decreases up than 1000 kg/ha comparatively with the control variety (Dropia), followed by: Elidur (significant difference), Hazera 11, Hazera 45, Grandur, Condur, Auradur and the line DF 99047/12 (very significant decrease). The yield difference between common wheat and durum wheat varieties was extremely high. Using *t* test the yield was established as very significant under first fertilizing treatment (Fig.no.1).



DL 5% = 196; 1% = 265; DL 0,1% = 356; d=1306\*\*\*

**Fig. no.1 The comparative yield of two wheat species under N100P40 fertilizing rate (on three years average)**

Under nitrogen fertilizing rate the yields was also very significant despite the lower difference between two wheat species (Fig. no.2). The average yield for durum wheat was equal for both fertilizing treatments meaning that durum wheat didn't responde to higher nitrogen rate. Therefore, in droughty years thje costs for nitrogen fertilizer, applied especially in early spring, are not rewarding.

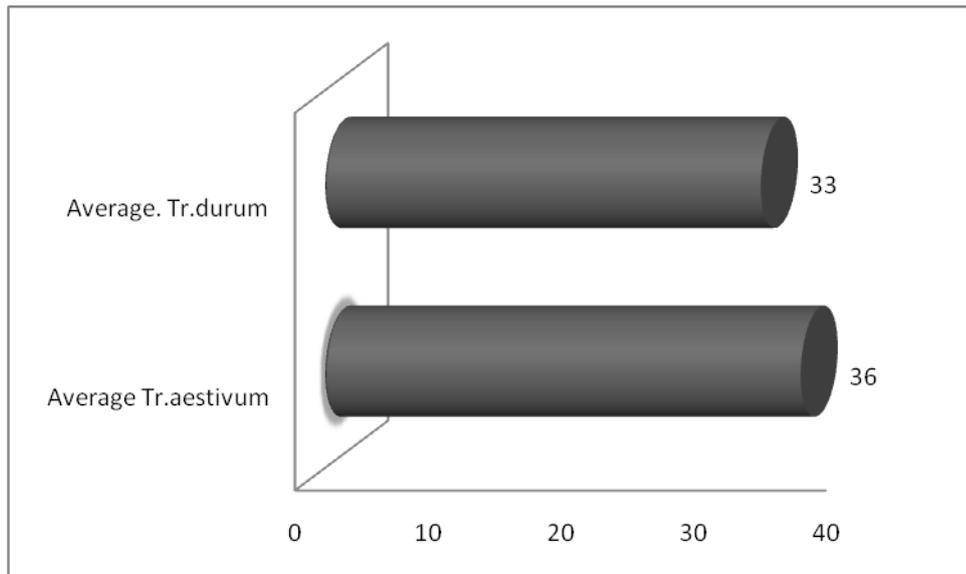


DL 5% = 189; 1% = 256; DL 0,1% = 344; d=862\*\*\*

**Fig. no.2 The comparative yield of two wheat species under N40P40 fertilizing rate (on three years average)**

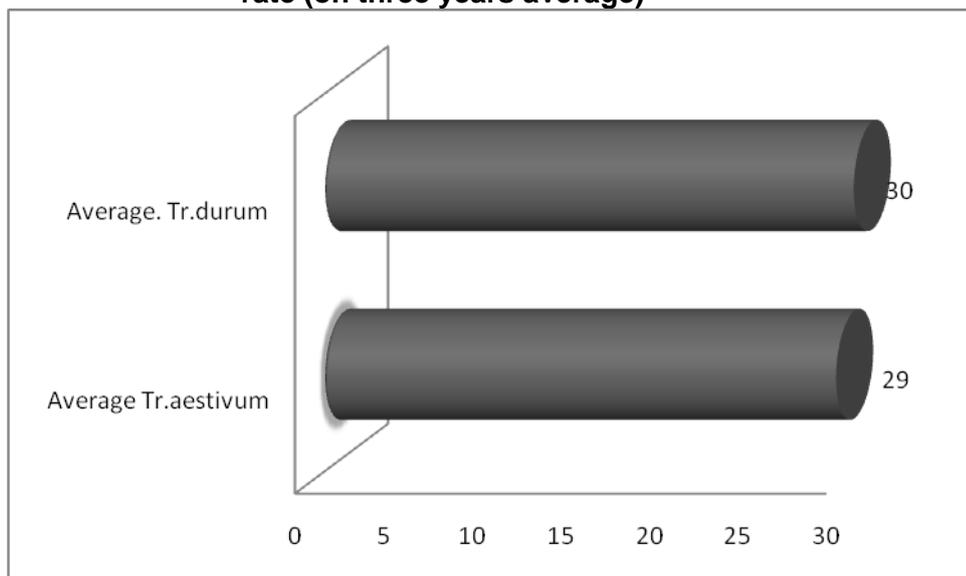
One of the wheat yield components is represented by the grains number/spike. The limits values for this character are large among 15-20 grains/spike and 70-80 grains/spike) depending on each variety, cropping system and environmental conditions. O three years average, under normal fertilizing treatment, the grains number/spike ranged among 29 grains for durum line DF 99047/12 and 42 grains for Austrian common wheat Dunai.

Using *t* test the differences of this character were low, under both fertilizing treatments (Fig. no 3 and 4).



DL 5% = 3; 1% = 4; DL 0,1% = 6; d=2,5

**Fig. no.3 The grains number/spike of two wheat species under N100P40 fertilizing rate (on three years average)**

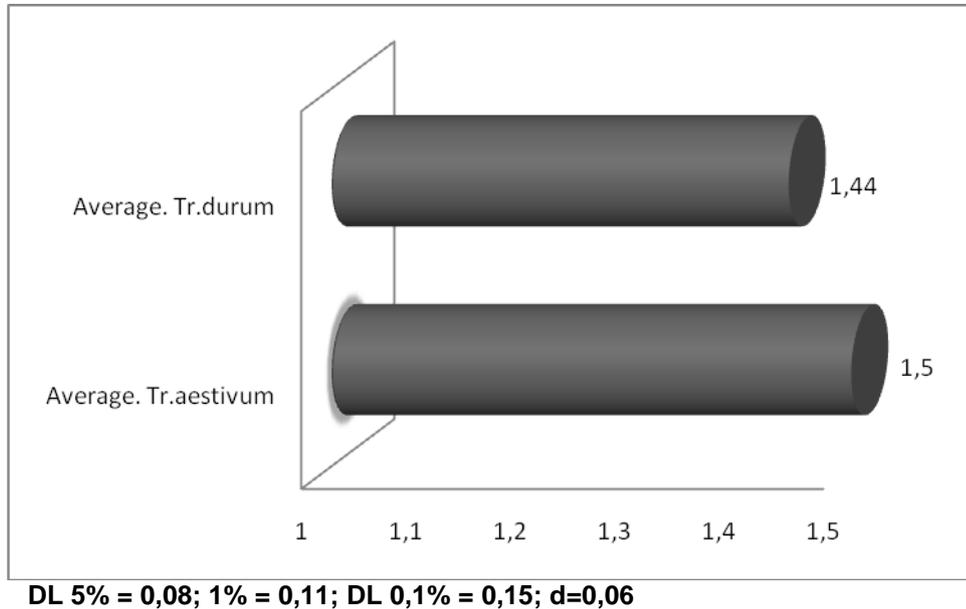


DL 5% = 3; 1% = 4; DL 0,1% = 5,5; d=-0,4

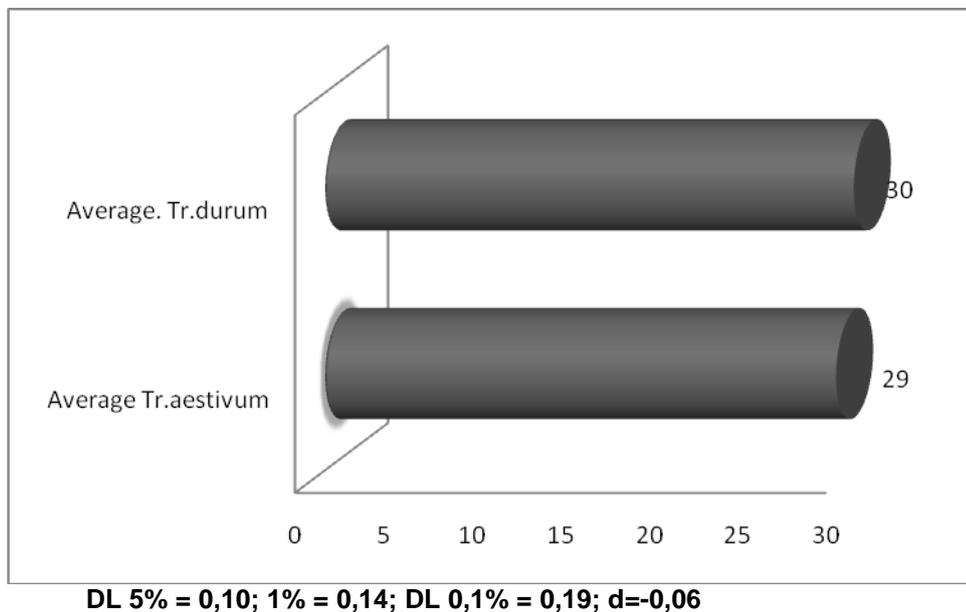
**Fig. no.4 The grains number/spike of two wheat species under N40P40 fertilizing rate (on three years average)**

Under N100P40 fertilizing treatment, the grains weight/spike values ranged among 1,22 g (by Briana) and 1,66 (by Fundulea 4). Comparatively with the control variety (Dropia) none wheat varieties didn't recorded increases or decreases statistical assured (Fig.no.5)

Under N40P40 fertilizing treatment, the grains weight/spike values are lower and ranged among 1,06 g (by Auradur) and 1,58 g (by Hazera 45). Using *t* test the differences of this trait were low under both fertilizing treatments (Fig. no. 6).



**Fig. no.5 The grains weight/spike of two wheat species under N100P40 fertilizing rate (on three years average)**

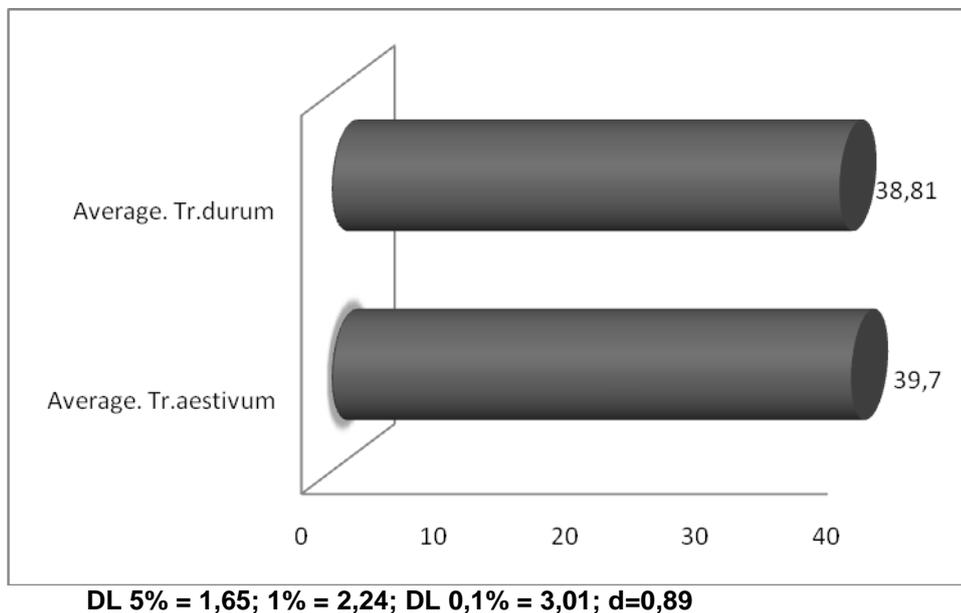


**Fig. no.6 The grains weight/spike of two wheat species under N40P40 fertilizing rate (on three years average)**

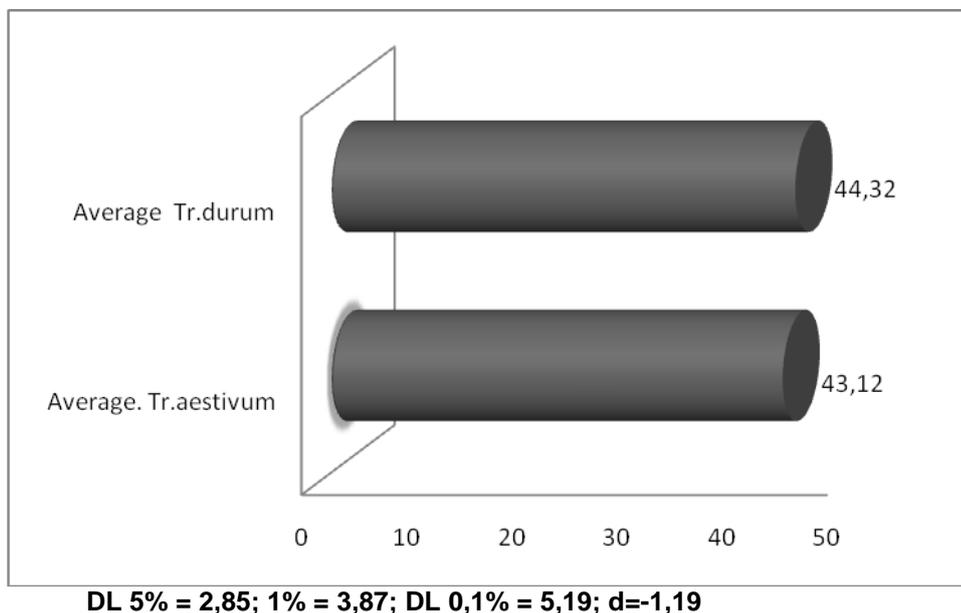
The 1000 kernels weight means grains gram weight at the testing moment moisture. A big seed has few advantages comparatively with small seed, as follows: rapid

growth rhythm, higher tillering capacity, higher yield. The advantage of the seed size is obvious under stress conditions, especially in drought years.

On three years average, 1000 kernels weight values ranged among 35,87 g (by Briana) and 43,07 g (by Fundulea 4) under normal fertilizing treatment. Using *t* test the differences of this character were low under fertilizing treatments (Fig. 7 and 8).



**Fig. no.7 The 1000 kernels weight of two wheat species under N100P40 fertilizing rate (on three years average)**



**Fig. no.8 The 1000 kernels weight of two wheat species under N40P40 fertilizing rate (on three years average)**

## CONCLUSIONS

Under ARDS Simnic conditions, the difference between *Triticum aestivum* and *Triticum durum* yields was higher for *Tr. Aestivum* with 1306 kg/ha (normal fertilizing treatment) and 862 kg/ha (low nitrogen rate). Both values were statistical assured as very significant.

The low differences for the grains number/spike, the grain weight/spike and 1000 kernels weight traits were insignificant for both fertilizing treatments.

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# CERCETĂRI PRIVIND REZISTENȚA LA SECETĂ LA *TRITICUM DURUM* ÎN CONDIȚIILE CLIMATICE DE LA SCDA ȘIMNIC

## THE RESEARCH REGARDING *TRITICUM DURUM* DROUGHT RESISTANCE IN SIMNIC AREA FIELD CONDITIONS

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**Key words:** winter wheat, durum wheat, drought resistance, drought index, yield

### ABSTRACT

În perioada 2006-2008, la SCDA Șimnic au fost cultivate într-o experiență, 14 soiuri de grâu comun și 11 soiuri de grâu durum. În anul 2007 s-a instalat una dintre cele mai accentuate perioade de secetă dintre cele manifestate în ultimii 50 de ani la Șimnic. În aceste condiții, producția la *Triticum durum* a fost cuprinsă între 330 kg/ha la Rodur și 1380 kg/ha la Hazera 13.

La o intensitate a secetei de 0,64, soiurile de *Triticum durum* au manifestat un indice de toleranță cuprins între 945 kg/ha la Auradur și 3430 kg/ha la Rodur și un indice de sensibilitate la secetă de peste 0,500 la majoritatea soiurilor.

În condiții de fertilizare normală, diferența între notarea la secetă la grâul comun și grâul durum a fost foarte semnificativă ( $d = -2,09^{000}$ ) iar diferența dintre procentul de spice sterile la cele două specii, distinct semnificativ ( $d = -12,64\%$ ).

Având în vedere că media producțiilor soiurilor de grâu comun a fost mai mare cu 300% față de media producțiilor de grâu durum, putem evidenția faptul că *Triticum durum* este mult mai sensibil la secetă în condițiile extreme de la Șimnic.

During 2006-2008 to ARDS Simnic field conditions were tested in a trail fourteen winter wheat varieties and eleven durum wheat varieties. In 2007 year was recorded the driest period for the last fifty years in Simnic area. In this environmental conditions, *Triticum durum* yield ranged between 330 kg/ha (Rodur variety) and 1380 kg/ha (Hezera 13 variety). When drought intensity was 0, 64, *Triticum durum* varieties have showed a drought index which have ranged between 945 kg/ha (Auradur) and 3430 kg/ha (Rodur) and also a sensitive drought index over 0,500 for most of varieties.

In normal fertilizing conditions, the difference between winter wheat and durum wheat drought index was very significant ( $d=-2,09^{000}$ ) and the difference between sterile ears percentage of two species was distinct significant ( $d=-12, 64\%$ ).

The recorded data emphasise that the average of winter wheat yields was higher than the average of durum wheat yields with 300%, mean that *Triticum durum* is more drought sensitive in Simnic area extreme conditions.

### INTRODUCTION

The stress caused by the water lack is one of the yields limitative factors. It causes various physiological and biochemical effects on plants (Tonaka et al., 1990; Irigoyen et al., 1992; Smirnoff, 1993; Tabaeizadeh, 1998) and it is also a serious problem in many world areas, where barley, wheat and other small grains are used for raw materials (Quarrie et al., 1999). This aspect is not met only in arid and semiarid areas but also in places where the rainfalls are very abundant, but there aren't equally distributed on the whole vegetation period (Ribaut et al., 1997).

The drought tolerance is generally defined like a cultivar's property which gives a relative low yield when it is under droughty conditions. This aspect implies the improvement for adaptation of this stress which is an extension of yield potential (Visser, 1994).

The stress caused by the drought is strong heterogeneous in time (between seasons and years) and apace (in and between places) and it is extremely unpredictable. All these make difficult to identify the representative stress conditions.

## MATERIAL AND METHODS

Twenty five cultivars of common wheat and durum wheat were studied in field experiments during three years (2006-2008) at Simnic Agricultural Research & Development Station. We used the yield data to calculate for each cultivar:

**TOL** - the yield difference between the stress ( $Y_s$ ) and non-stress conditions ( $Y_p$ ).

**MP** - the average yield of  $Y_s$  and  $Y_p$ .

**GMP** – calculated with formula  $\sqrt{Y_s \cdot Y_p}$

**SSI** – stress susceptibility index expressed by following relationships

**SSI** =  $[1 - Y_s/Y_p]/SI$ , where SI (stress intensity) and is estimated as  $\left[1 - \left(\frac{\bar{Y}_s}{\bar{Y}_p}\right)\right]$  where:

$\bar{Y}_s$  = mean yield over all genotypes evaluated under stress conditions;

$\bar{Y}_p$  = mean yield over all genotypes evaluated under non-stress conditions.

**STI** = stress tolerance index  $\sqrt{p \cdot Y_s / \bar{Y}_p^2}$

Cultivars were grouped according to their origin and all indices were calculated separately for each group of wheat cultivars

## RESULTS AND DISCUSSION

To emphasize the varieties which are fit for drought conditions in the central part of Oltenia, was represented in fig. no 1 the index interaction coefficient x drought sensibility, the production in normal conditions.

The simultaneous representation of a small index and of a big production in normal conditions leads to the identification of tolerant genotypes drought during the climatic changes and also leads to the appearance of an incensement to droughty years. In the diagram no1.were emphasized two groups of points, as it comes:

- Common wheat varieties, index < 0,500, the yield in normal conditions > 4000 kg/ha.
- Durum wheat varieties, index < 0,500, the yield in normal conditions between 2500-4000 kg/ha.

Among the common wheat varieties, the best placed are: Briana and the lines Simnic S 9535 and S 0421, all these having an index of sensibility under 0,500 and the yield over 5000 kg/ha. As a conclusion, we can say that all the varieties place in this dial is the best adapted to the droughty conditions.

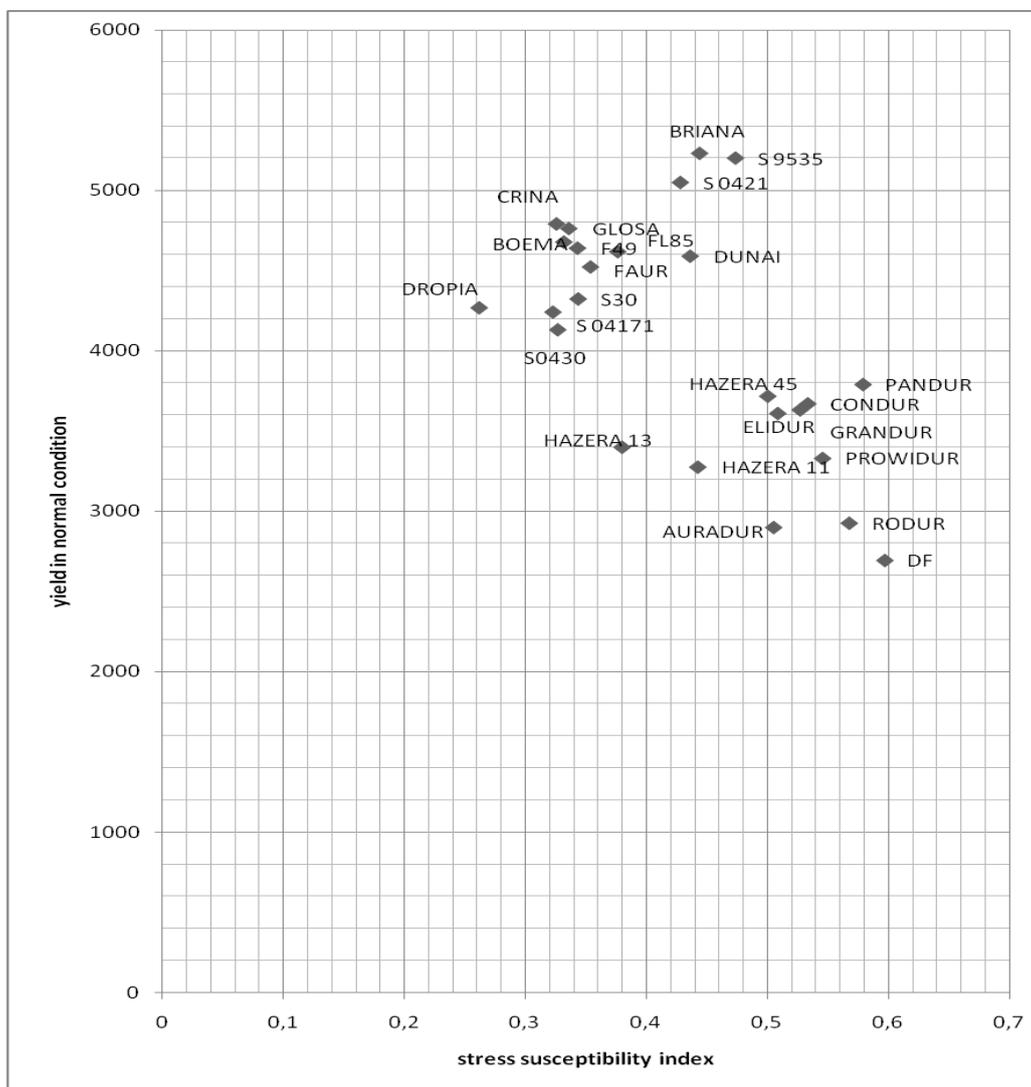
The second group contents 11 durum wheat varieties and it can be also divided in two subgroups. The most important is that which contents values of the index under 0,500 and yields ranged among 3000 and 4000 kg/ha. Here are placed four varieties, their provenience structure being:

- the Romanian variety Elidur
- the Israeli varieties : Hazera 11 and Hazera 13.

These data show that the durum wheat varieties are more sensitive to drought than the common wheat varieties in Simnic area. None of the tested durum wheat varieties

were not recommended in the central part of Oltenia, one of the driest areas.

The characterization of the tested material using the drought tolerance index showed various aspects.



**Fig. no.1 The interaction of sensibility index of stress x yield for the tested wheat varieties in normal conditions**

The majority of common wheat varieties recorded yields which ranged among 4131 kg/ha (by SO 430) and 5229 kg/ha (by Briana) and their average was 4645 kg/ha. In droughty conditions, the yield values ranged among 1350 kg/ha (by S 9535) 2520 kg/ha (by Dropia) the average was 1975 kg/ha and the yield decrease being of 57,7% (Table no.1).

From the stress tolerance point of view (TOL) were remarked the cultivars Dropia and two common wheat lines created to ARDS Simnic. But this index is not enough to characterized the stress tolerance of these genotypes.

Based on GMP calculation are remarked the cultivars: Dropia (3280 kg/ha), Glosa (3280 kg/ha), Boema (3243 kg/ha) and Crina (3570 kg/ha). The common wheat varieties registered a GMP value of 2877 kg/ha, 52% exceed the obtained value from the durum wheat varieties.

From the values index sensibility's point of view, the smallest index was recorded by Dropia cultivars (0,262), but the cultivars which obtained indices under 0,500 and yields over cross 5000 kg/ha are the most tolerant to drought. The average SSI of common wheat indicates the fact that all these are more tolerant under the stress conditions.

Table no.1

The estimation stress tolerance of common wheat varieties for on intensity of the drought evaluated at 0,64 – Şimnic 2006-2008

Cultivar	Yp	Ys	TOL	MP	GMP	SSI	STI
<b>DROPIA</b>	4268	2520	1748	3394	3280	0,262	<b>0,656</b>
<b>FLAMURA 85</b>	4617	1900	2717	3259	2962	0,377	<b>0,535</b>
<b>FUNDULEA 4</b>	4639	2150	2489	3395	3158	0,343	<b>0,508</b>
<b>GLOSA</b>	4761	2260	2501	3511	3280	0,336	<b>0,656</b>
<b>BRIANA</b>	5229	1600	3629	3415	2892	0,444	<b>0,510</b>
<b>BOEMA</b>	4677	2250	2427	3464	3243	0,332	<b>0,642</b>
<b>SIMNIC 30</b>	4323	2000	2323	3162	2940	0,343	<b>0,527</b>
<b>CRINA</b>	4790	2350	2440	3570	3355	0,326	<b>0,687</b>
<b>FAUR</b>	4522	2020	2502	3271	3022	0,354	<b>0,557</b>
<b>DUNAI</b>	4589	1460	3129	3025	2588	0,436	<b>0,409</b>
<b>S 9535</b>	5200	1350	3850	3275	2413	0,473	<b>0,429</b>
<b>S 0417</b>	4241	2100	2141	3171	2984	0,323	<b>0,544</b>
<b>S 0421</b>	5048	1670	3378	3359	2903	0,428	<b>0,514</b>
<b>S 0430</b>	4131	2020	2111	3079	1261	0,327	<b>0,509</b>
Average of common winter wheat	<b>4645</b>	<b>1975</b>	<b>2670</b>	<b>3310</b>	<b>2877</b>	<b>0,364</b>	<b>0,556</b>
Average of durum wheat	<b>3358</b>	<b>651</b>	<b>2707</b>	<b>2005</b>	<b>1389</b>	<b>0,517</b>	<b>0,159</b>

Based on the stress tolerance index (STI) were remarked the cultivars: Drobia, Glosa, Boema and Crina, all these with the STI bigger than 0,600. In general the common wheat varieties have a STI of 0,556, which means that they are the most tolerant on drought.

The tested durum wheat varieties recorded yields in normal conditions among 2900 kg/ha (Auradur) and 3790 kg/ha (Pandur) (table 2).

Table no. 2

The estimation stress tolerance of durum wheat varieties for on intensity of the drought evaluated at 0,64 – Şimnic 2006-2008

Cultivar	Yp	Ys	TOL	MP	GMP	SSI	STI
<b>RODUR</b>	2927	330	2597	1629	938	0,568	0,058
<b>PANDUR</b>	3790	360	3430	2075	1168	0,579	0,083
<b>CONDUR</b>	3670	610	3060	2140	1496	0,533	0,136
<b>GRANDUR</b>	3632	640	2992	2136	1525	0,527	0,141
<b>DF 99047</b>	2695	180	2515	1438	696	0,597	0,029
<b>PROWIDUR</b>	3330	490	2840	1910	1091	0,545	0,097
<b>HAZERA 11</b>	3276	1010	2266	2143	1819	0,442	0,202
<b>HAZERA 13</b>	3400	1380	2020	2390	2164	0,380	0,286
<b>HAZERA 45</b>	3717	810	2907	2264	1735	0,500	0,183
<b>ELIDUR</b>	3610	740	2870	2175	1634	0,509	0,163
<b>AURADUR</b>	2900	610	2290	1755	974	0,505	0,108
Average of durum wheat	<b>3358</b>	<b>651</b>	<b>2707</b>	<b>2005</b>	<b>1389</b>	<b>0,517</b>	<b>0,159</b>
Average of common winter wheat	<b>4645</b>	<b>1975</b>	<b>2670</b>	<b>3310</b>	<b>2877</b>	<b>0,364</b>	<b>0,556</b>

Under the stress conditions, the yield limits ranged among 180 kg/ha (DF 99047) and 1308 kg/ha (Hazera 13) and their average is 651 kg/ha. Based on the GMP calculation, was emphasized the cultivar Hazera 13. The SSI average is bigger than the common wheat cultivars (0,517).

The biggest difference and the most concludent is that between STI from the common wheat cultivars and the durum wheat cultivars. This index of only 0,159 at durum wheat shows that the tested cultivars aren't recommended for Şimnic area, the incidence of droughty years being more and more obviously.

The note of common wheat cultivars drought for fourteen tested cultivars was of 4,67 and the average of 11 durum wheat was of 6,77. The difference of 2,09 was very significant in advantage of common wheat which shows a better tolerance of this in droughty conditions, as there were those from Şimnic in year 2007 (table 3).

Under fertilizing treatment with nitrogen, the difference between the two species of 0,52 wasn't important. In droughty conditions, the durum wheat reacts better if it doesn't get more nitrogen. The nitrogen in droughty conditions stumbled the plants growing. There were durum wheat cultivars which were totally affected by drought getting 9 note under normal fertilizing conditions.

The minimum affected limit was identically with durum wheat and also at common wheat in conditions of fertilizing with  $N_{100}P_{40}$  (figure).

**Table no. 3**

**Noting of the drought on common wheat and durum wheat, under two fertilizing treatments in year 2007**

		note at N100P40	note at N40P40
1	DROPIA	3,6	4,5
2	FL 85	4,5	3,6
3	F4	4,8	4
4	GLOSA	4,1	4,6
5	BRIANA	4,6	4,5
6	BOEMA	4,8	4,6
7	SIMNIC 30	4,6	4,3
8	CRINA	4,5	4,3
9	FAUR	4,6	4
21	DUNAI	5,3	<b>5,1</b>
22	S 9535	6	4,6
23	S 0417	5	4,5
24	S 0421	4,1	<b>3,5</b>
25	S 0430	5	3,8
	<b>Average of common winter wheat</b>	<b>4,67</b>	<b>4,28</b>
10	RODUR	9	6
11	PANDUR	7,6	4,8
12	CONDUR	6,3	<b>3,6</b>
13	GRANDUR	6	4,6
14	DF 99047/12	7,6	5,8
15	PROWIDUR	7	5,5
16	HAZERA 11	5,8	4,5
17	HAZERA 13	5,1	4
18	HAZERA 45	6,3	4,1
19	ELIDUR	5,8	3,6
20	AURADUR	8	<b>6,3</b>
	<b>Average of durum wheat</b>	<b>6,77</b>	<b>4,8</b>

The average of total sterile spikes of common wheat on fourteen tested varieties under normal fertilizing conditions was of 5,13 and the average of durum wheat on eleven cultivars was of 17,8. The difference of 12,64 was clearly important in favour of common wheat which means a better tolerance of this in conditions of accentuated drought (table 4).

Under fertilized variant with low nitrogen rate, the difference between the notes of the two species of 0,57 wasn't significant. In droughty conditions, the durum wheat reacts better if it gets nitrogen in reduced dose.

The total sterile spikes percent decreases very much and this fact suggests that the nitrogen fertilizer isn't recommended in the droughty conditions.

The most affected durum wheat cultivars was DF 99047 with 40% sterile spikes.

The minimum affected limit was identically with durum wheat under N<sub>100</sub>P<sub>40</sub> fertilizer rate, existing cultivars where this phenomenon wasn't present, as follows: Glosa, Dunai, liniile S 0421 and 0430 at common wheat and Rodur, Pandur, Hazera 13, Hazera 45 and Elidur (durum wheat).

**Table no 4.**

**Total sterile spikes/m<sup>2</sup> (%) at two species, at two levels of fertilization in year 2007**

		note at N100P40	note at N40P40
1	DROPIA	2	0,5
2	FL 85	2,4	1,3
3	F4	3,4	0,4
4	GLOSA	3,7	0
5	BRIANA	12	0,6
6	BOEMA	1,6	1,1
7	SIMNIC 30	4,9	1,1
8	CRINA	3,2	0,9
9	FAUR	0	1
21	DUNAI	6,4	0
22	S 9535	15	0,7
23	S 0417	3,6	2
24	S 0421	3,9	0
25	S 0430	9,7	0
	<b>Average of common winter wheat</b>	<b>5,13</b>	<b>0,7</b>
10	RODUR	3,3	0
11	PANDUR	27,9	0
12	CONDUR	13,6	1,9
13	GRANDUR	4,9	2,9
14	DF 99047/12	40	4,7
15	PROWIDUR	2,9	2,8
16	HAZERA 11	10,1	1
17	HAZERA 13	7,4	0
18	HAZERA 45	40	0
19	ELIDUR	15,4	0
20	AURADUR	30	0,5
	<b>Average of durum wheat</b>	<b>17,8</b>	<b>1,25</b>

## CONCLUSIONS

These data show that the durum wheat varieties are more sensitive to drought than the common wheat varieties in Simnic area. None of the tested durum wheat varieties weren't remarked for recommended in the central part of Oltenia, one of the driest areas.

The average of total sterile spikes of common wheat on fourteen tested varieties under normal fertilizing conditions was of 5,13 and the average of durum wheat on eleven cultivars was of 17,8. The difference of 12,64 was clearly important in favour of common wheat which means a better tolerance of this in conditions of accentuated drought

The minimum affected limit was identically with durum wheat under N<sub>100</sub>P<sub>40</sub> fertilizer rate, existing cultivars where this phenomenon wasn't present, as follows: Glosa, Dunai, liniile S 0421 and 0430 at common wheat and Rodur, Pandur, Hazera 13, Hazera 45 and Elidur (durum wheat).

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# CERCETARI PRIVIND INFLUENTA FERTILIZĂRII DIFERENȚIATE ASUPRA ÎNSUSIRILOR CHIMICE ALE SPECIEI *TRIFOLIUM REPENS* PE O PAJISTE PERMANENTA DE LA POIANA BRASOV

## RESEARCH REGARDING THE INFLUENCE OF DIFFERENT FERTILIZATION ON THE CHEMICAL CHARACTERISTICS OF SPECIES *TRIFOLIUM REPENS* ON A PERMANENT MEADOW AT POIANA BRAȘOV

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**Key words:** *Trifolium repens*, chemical composition, different fertilization

### ABSTRACT

În această lucrare se va prezenta influența diferitelor practici de gestionare a unei pajiști permanente de la Poiana Brașov, asupra unor caracteristici chimice, precum digestibilitate, conținut în azot, fosfor, potasiu, calciu și magneziu, la specia *Trifolium repens*. Câmpul experimental este compus din cinci parcele, fiecare reprezentând o variantă distinctă de gestionare a elementelor nutritive în sol: V1 – martor, V2 – 20 t/ha gunoi de grajd, V3 – 1,84 t/ha CaO + 20 t/ha gunoi de grajd, V4 – N<sub>50</sub>P<sub>50</sub>K<sub>50</sub> + 1,84 t/ha CaO + 20 t/ha gunoi de grajd, V5 – 1,84 t/ha CaO + târlire 1 oaie/m<sup>2</sup>, 3 nopți. Datele obținute în urma analizelor de laborator ne indică că pe varianta V2 specia *Trifolium repens* atinge maximumul în ceea ce privește conținutul de azot, potasiu, calciu și digestibilitatea. Varianta V3 asigură cel mai mare conținut de magneziu, iar pe varianta V4 se întâlnește cel mai mare conținut de fosfor.

This paper will present the influence of different management practices of a permanent grasslands in Poiana Brasov, on some chemical characteristics, such as digestibility, content of nitrogen, phosphorus, potassium, calcium and magnesium, at *Trifolium repens* species. Experimental field is composed of five parcels, each representing a distinct management variant of nutrients in the soil: V1 – witness, V2 - 20 t / ha stable manure, V3 - 1.84 t / ha CaO + 20 t / ha stable manure, V4 - N<sub>50</sub>P<sub>50</sub>K<sub>50</sub> + 1.84 t / ha CaO + 20 t / ha stable manure, V5 - 1.84 t / ha CaO + slippers 1 sheep/m<sup>2</sup>, 3 nights. Data from our laboratory analysis indicates that in V2 variant *Trifolium repens* species reached maximum regarding the content of nitrogen, potassium, calcium and digestibility. V3 variant ensures the highest content of magnesium, and the V4 variant provides the highest content of phosphorus.

### INTRODUCTION

In Romania and other countries, permanent meadow provides the basis for forage resources. Mode of operation and their different management practices (levels of amendment, mineral or organic fertilization) represents an interesting case study, gives the possibility of providing information regarding the usefulness of the meadow, defined by the amount of forage resources, but mostly through their quality, which is in close correlation with their chemical composition.

In our country, white clovers (*Trifolium repens*) is customary in the mezofile and mezohigrofile meadows at the plain and up the mountains (COJOCARIU LUMINITA, 2005).

In spontaneous flora, white clovers is found in almost every lawn in various proportions. The meadow consists of white clover and grasses is very valuable quality, 1 kg dry matter is equivalent to 0,75-0,85 UN, a UN-being 150-200 g digestible protein.

Being a legume it grows nitrogen quantity in the soil, may be deemed that 1% white clover in the composition of flora, provides 3 kg active element nitrogen per hectare per year.

The importance of white clovers lies in the following:

- is well-resistant to grazing, repeated defoliation and treading;
- feed does not produce flatulence, being the most valuable legume in this regard;
- produces a forage rich in protein and vitamins;
- has a great perennality;
- causes lowering doses of fertilizers containing nitrogen, being an element antipoluant;
- this plant is well developed on a wide range of soils, including acid or excess moisture soils;
- is a good melifera plant (MOISUC, 2002).

Forage value of white clovers is determined by its chemical composition, which is showing a high content in crude protein (20%) and various nutrients (phosphorus, calcium, potassium, vitamins) (VARGA, 1998).

## MATERIAL AND METHOD

The research was carried out on experimental fields of the Research Institute for Culture pasturelands Brasov, the experience being placed on the brown acid criptopodzolic soil type, characterized by an advanced state of debasification, strong acid reaction, being poorly supplied with P and Mg and middle supplied with K, as may be seen in **table 1**. This experimental field was established in 1963, on a permanent mountain meadow, located at the altitude of 1,000 m.

**Table 1.**

**Physical and chemical features of acid-brown soil at Poiana Brasov**

Adânc. probei	H H <sub>2</sub> O	Al mobil	Humus	Argilă 0,002	P <sub>Al</sub>	K <sub>Al</sub>	Cationi schimbabili							V	V <sub>Ca</sub>	V <sub>Mg</sub>
							Ca	Mg	K	Na	SB	H	T			
cm		ppm	%	mm %	ppm		me/100 g sol							%	%	%
0-10	4.7	172	8.6	10.8	12	125	2.5	0.4	0.26	0.07	3.23	21.3	24.5	13.2	10.2	1.5
10-20	4.75	168	3.82	11.2	5	29	1.2	0.2	0.03	0.05	1.48	17.2	18.7	7.9	6.4	1.1

Experimental field is composed of 5 plots, each plot of 144 m<sup>2</sup>. Fertilization with N is only once in the spring, and intake of P, K, stable manure and amendments in the autumn. Experimental field is operated extensively by mowing twice a year. The scheme of experimental field is shown in **figure 1**.

**Fig. 1 The diagram of experimental field**

V1	witness
V2	20 t/ha stable manure
V3	1.84 t/ha CaO + 20 t/ha stable manure
V4	N50 P <sub>2</sub> O <sub>5</sub> 50 K <sub>2</sub> O50 + 1.84 t/ha CaO + 20 t/ha stable manure
V5	1.84 t/ha CaO + slippers 1 sheep/m <sup>2</sup> , 3 nights

Biological material studied consists of samples of white clover. From each parcel were taken a total of 20 individuals, composed the second batch of 10, one for determining the content of NPK, Ca and Mg and the other for digestibility analysis. From each plot plants were chosen randomly, but ill individuals, those with faeces cover, or those exposed more time in the shade, were removed. Was heeded that selected individuals to be as possible, in the first vegetation phase.

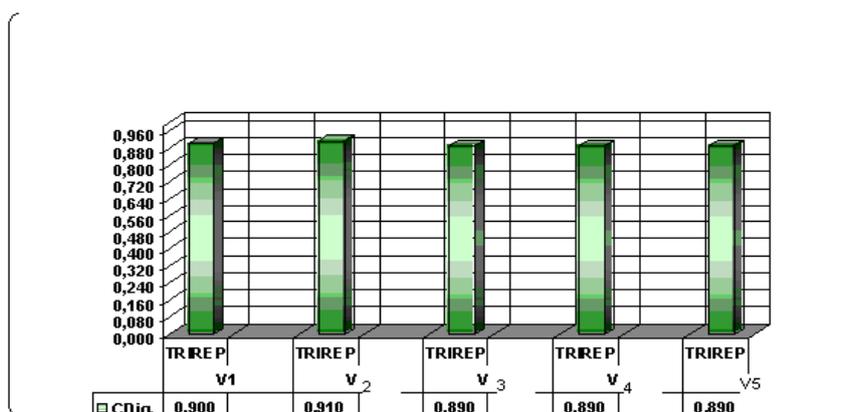
The analysis to determine digestibility, content of N, P, K, Ca and Mg in plants were completed in the chemistry lab at USAMVB Timisoara and ICDP Brasov.

## RESULTS AND DISCUSSION

### a) Cdig – The coefficient of digestibility

From **fig. 2**, respectively **table 2** for *Trifolium repens* species, can see a distinctively significant variation of the coefficient of digestibility (**CDig**), between V1 and V2, and a negative distinctively significant correlation between V1 and V3, V4 and V5.

**Fig. 2** Dynamics of digestibility value (Cdig.) in *Trifolium repens* species individuals



**Tabelul 2.**

The analysis of coefficient of digestibility variation(Cdig.) in *Trifolium repens* species individuals

Varianta	CDig.			
	Media	%	Dif.	Semnif.
V1	0,9	100		
V2	0,91	101	0,010	**
V3	0,89	99	-0,010	oo
V4	0,89	99	-0,010	oo
V5	0,89	99	-0,010	oo

### b) N, P, K - content of N, P, K

**Table 3.**

The analysis of nitrogen content variation in *Trifolium repens* species individuals

Varianta	N			
	Media	%	Dif.	Semnif.
V1	3,11	100		
V2	3,21	103	0,100	ns
V3	2,89	93	-0,220	o
V4	2,78	89	-0,330	oo
V5	2,98	96	-0,130	ns

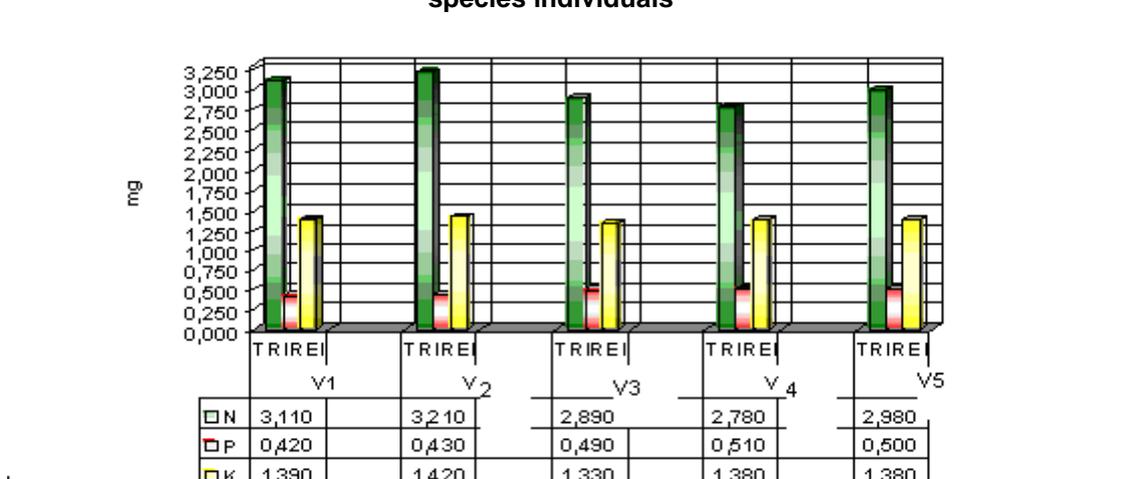
From **fig. 3** and **table 3**, for *Trifolium repens* species, can see a variation of the content of N, in a negative sense to the V1 witness, from 3.11 mg to 2.89 mg for V3 variant and 2.78 mg for V4 variant (distinctively significant).

**Table 4.**

The analysis of phosphorus content variation in *Trifolium repens* species individuals

Varianta	N			
	Media	%	Dif.	Semnif.
V1	3,11	100		
V2	3,21	103	0,100	ns
V3	2,89	93	-0,220	o
V4	2,78	89	-0,330	oo
V5	2,98	96	-0,130	ns

**Fig. 3** Dynamics of nitrogen, phosphorus and potassium content variation in *Trifolium repens* species individuals



From **fig. 3** and **table 4**, for *Trifolium repens* species, can see a significant variation of the content of P, for variants V3, V4 and V5. Differences front of witness are significant for 3 variants.

**Table 5.**

The analysis of potassium content variation in *Trifolium repens* species individuals

Varianta	K			
	Media	%	Dif.	Semnif.
V1	1,39	100		
V2	1,42	102	0,030	***
V3	1,33	96	-0,060	ooo
V4	1,38	99	-0,010	ns
V5	1,38	99	-0,010	ns

From **fig. 3** and **table 5**, for *Trifolium repens* species, can see a variation of the content of K from 1.39 mg at V1 variant to 1.42 mg at V2 (very significant variation), and at 1.33 mg for V3 variant.

c) Ca, Mg - the content of calcium and magnesium

Table 6.

The analysis of calcium content variation in *Trifolium repens* species individuals

Varianta	Ca			
	Media	%	Dif.	Semnif.
V1	0,53	100		
V2	0,74	140	0,210	**
V3	0,71	134	0,180	*
V4	0,57	108	0,040	ns
V5	0,65	123	0,120	ns

Fig. 4 Dynamics of calcium and magnesium content variation in *Trifolium repens* species individuals

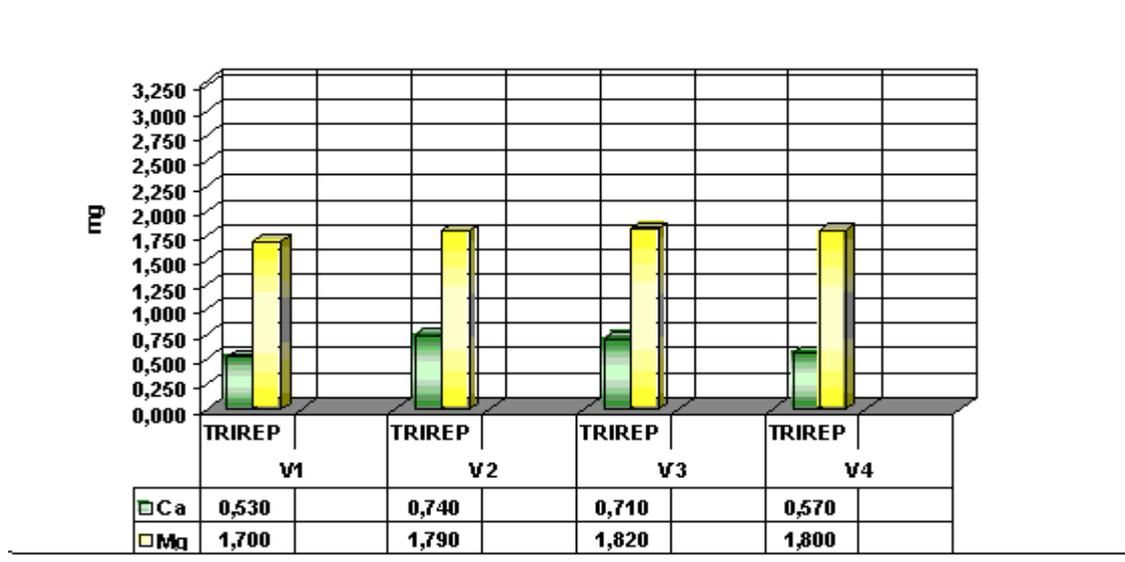


Table 7.

The analysis of magnesium content variation in *Trifolium repens* species individuals

Varianta	Mg			
	Media	%	Dif.	Semnif.
V1	1,7	100		
V2	1,79	105	0,090	*
V3	1,82	107	0,120	*
V4	1,8	106	0,100	*
V5	1,75	103	0,050	ns

From **fig. 4**, respectively **table 6**, for *Trifolium repens* species, can see a variation of the content of calcium (Ca), from 0.53 mg for the V1 variant to 0.74 mg for V2 variant. Difference front of witness is provided statistically as distinctively significant.

From **fig. 4**, respectively **table 6**, for species *Trifolium repens*, can see a variation of the content of calcium (Ca), from 0.53 mg for the V1 variant to 0.74 mg for V2 variant. Difference front of witness is provided statistically as distinctively significant.

From **fig. 4**, respectively **table 7**, for *Trifolium repens* species, can see a variation of the content of magnesium (Mg), from 1.7 mg for V1 variant to 1.79mg for the V2 variant, 1.82mg for V3, the difference front the witness being statistically assured as significant.

### CONCLUSIONS

Following analysis of the data obtained we can draw the following conclusions:  
 - *Trifolium repens* species presents the best digestibility on V2 variant

- the highest nitrogen content is met on V2 variant
- the phosphorus content reaches the maximum on V4 variant, the difference from the witness being significant
- the values of potassium content are the highest in the V2 variant
- in the V2 variant calcium content presents the highest values, the difference from the witness being distinctively significant
- the V3 variant has the highest content of magnesium

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# STUDII BACTERIOLOGICE ȘI ENZIMOLOGICE ASUPRA SEDIMENTELOR DE PE CURSUL MIJLOCIU AL RÂULUI JIU

## BACTERIOLOGICAL AND ENZYMOLOGICAL STUDY OF THE SEDIMENTS FROM THE MIDDLE COURSE OF THE JIU RIVER

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keywords: sediments, bacteriological and enzymological study, jiu river

### ABSTRACT

*Lucrarea de față conține date bacteriologice și enzimologice referitoare la sedimentele râului Jiu, date pe baza cărora putem aprecia starea de calitate a râului. În acest sens au fost prelevate probe de sediment din râul Jiu (cursul mijlociu) în sezoanele de iarnă și vară a anului 2007. Stabilirea punctelor de prelevare s-a făcut ținându-se cont de existența pe cursul râului (din spre amonte spre aval) a unor posibile surse de poluare chimică, fizică sau biologică. Punctele de prelevare au fost în număr de șapte, acestea fiind confluența cu râul Sadu, Târgu-Jiu amonte, Târgu-Jiu aval, Rovinari amonte, Rovinari aval, Craiova amonte (Ișalnița), Craiova aval (Podari). Metode enzimologice au avut în vedere determinarea următoarelor activități enzimatic: activitatea dehidrogenazică actuală, activitatea dehidrogenazică potențială, activitatea catalazică, activitatea ureazică și activitatea de reducere microbiană a  $Fe^{3+}$  din probele de sediment supuse analizelor. Studiul bacteriologic a avut în vedere determinarea a 3 grupe ecofiziologice de microorganisme: bacterii amonificatoare, bacterii nitrificatoare și bacteriile fier reducătoare. Indicatorii determinați au prezentat variații sezoniere, dar și în funcție de punctul de prelevare al probelor. Pe baza datelor obținute am stabilit că poluare pe cursul mijlociu al râului Jiu este de origine biologică la nivelul punctului de prelevare Târgu-Jiu amonte și chimică la nivelul punctului de prelevare Rovinari aval și Ișalnița.*

*The present work has bacteriological and enzymological data referred to the sediments from the Jiu River. Based on this data, we can estimate the river's qualities. Sediment samples were taken from the Jiu River (middle course) in the summer and winter of 2007. Drawing points were established according to the river course (from upstream to downstream) and possible chemical, physical or biological pollution sources. There were seven drawing points: confluence with the Sadu River, Targu-Jiu upstream, Targu-Jiu downstream, Rovinari upstream, Rovinari downstream, Craiova upstream (Isalnita), Craiova downstream (Podari). Enzymological methods had in view to establish the following enzymatic activities: actual dehydrogenase activity, potential dehydrogenase activity, catalase activity, urease activity and the microbial iron reducing  $Fe^{3+}$  activity from the studied sediment. The bacteriological study had in view to establish three microorganism ecophysiological groups: ammonifying bacteria, nitrifying bacteria and iron-reducing bacteria. The established indicators had seasonal variations, according to the drawing points. Based on our data, we established that along the middle course of the Jiu River, there is a biological pollution in the drawing point Targu-Jiu upstream. We also have a chemical pollution in the following drawing point: Rovinari downstream and Isalnita.*

### INTRODUCTION

Surface water is mainly polluted not just by natural factors, but also by social and economic factors, due to the waste water from industries which have lots of waste materials, organic substances and mineral salts.

Jiu River is one of the many polluted rivers, which has a negative influence on the microorganism and on the organism. Jiu River fills up with potable water two important

cities Targu-Jiu and Craiova. This is the reason why pollution effects can be felt by the population. Main pollution sources directly influencing the water from Jiu River are represented by substances from coal exploration, polluted substances (petroleum products), Rovinari thermoelectric power station, pesticides from CHIM Dolj, house water and industrial water from Targu-Jiu and Craiova.

Our goal is to establish the water quality and the sediments from the Jiu River, in a biological point of view, because in a chemical point of view the water quality has been established by the Romanian Water Institute in Gorj.

These biological polluting (human and animal waste), physical (temperature) and chemical (heavy metals, oxides, salts, and pesticides) negatively influence microorganism communities from the water and sediment, diminishing the enzymatic activity from the sediments.

Bacteriological and enzymological studies have been made in other rivers from Romania, trying to establish possible sources of pollution (physical, chemical or biological) and also in offering solutions to reduce pollution effects in rivers from our country. Such studies were made in the following rivers: Mures (Muntean and colab., 2004; Muntean and colab., 2005), Crisul Alb (Filimon and Dragan-Bularda, 2005; Filimon and Dragan-Bularda, 2007), Somes (Buzan and Dragan-Bularda, 2005), Barzava (Filimon, 2006) and the Bega Channel (Filimon, 2007).

For this study sediment samples were taken from the Jiu River, at the level of seven drawing points, in the summer and spring of 2007. Drawing points were chosen from along the middle course of the Jiu River, from upstream to downstream, represented by: Jiu River in confluence with Sadu River, Targu-Jiu upstream, Targu-Jiu downstream, Rovinari upstream, Rovinari downstream, Craiova upstream.

## MATERIAL AND METHODS

For the five physiological groups undertaken into this study elective mediums were used.

In order for the ammonifying bacteria to grow the following chemical composition is used to make the culture medium: NaCl 0,5 g, peptone 2 g, distilled water 100 ml. The presence of ammonia, freed consequently to the nitrifying bacteria's activity, is proved with the help of a specific color reaction which is apparent after the addition of one or two drops of Nessler reactant. An intense yellow coloration with or without precipitation is obtained (Cuşa, 1996).

For the growth of nitrifying bacteria the Barjac culture medium with the following chemical composition is used: KNO<sub>3</sub> 2 g, glucose 10 g, CaCO<sub>3</sub> 5 g, Sal. Sol.

Vinogradski 50 ml, distilled water 950 ml. The nitrate freed following the nitrifying bacteria's activity can be evidenced through a blue color reaction with diphenylamine-sulfuric acid reactant (Drăgan-Bularda, 2000).

Iron-reducing bacteria is cultivated on growth medium Ottow modified, with the following chemical composition: glucose 20 g, peptone 5 g, yeast extract 0,5 g, MgSO<sub>4</sub> x 7 H<sub>2</sub>O 0,2 g, K<sub>2</sub>HPO<sub>4</sub> 3 g, KH<sub>2</sub>PO<sub>4</sub> 0,8 g, KCl 0,2 g, Fe<sub>2</sub>O<sub>3</sub> x 3 H<sub>2</sub>O 1 g, distilled water 1000 ml. The culture medium is distributed in test-tubes (7ml/test-tube) and is sterilized by autoclaving at 105° C for 30 minutes 3 days consequently. The pink or red color indicates the presence of ferrous iron (II) in the presence of the color reactant α-dipiridil (Drăgan-Bularda, 2000).

Bacterian indicator of the sediment quality (BISQ) was calculated using the calculation formula proposed by Muntean (Muntean 1995-1996):

$BISQ = 1/n \times \sum \log_{10} N$ , where: BISQ - bacterian indicator of the sediment quality; n - number of ecophysiological groups; N - number of bacteria appertaining to each ecophysiological group.

The following 5 enzymatic and non-enzymatic catalytic activities have been measured: catalase activity, actual and potential dehydrogenase activity, urease activity and the iron-reducing activity.

Catalase activity have been determined using the permanganometric method (Dragan-Bularda, 2000). The reaction mixtures consisted of 3 g sediment, 2 ml  $H_2O_2$  3%, 10 ml phosphate buffer. It suffered incubation at 37° C for 1 hr. Enzymatic activity was expressed in mg  $H_2O_2$ /3 g sediment.

Actual and potential dehydrogenase activity has been determined using the Casida and co. (1964) methods. The reacting mixture consisted of 3 g sediment, 0,5 ml TTC solution (2,3,5 triphenyltetrazolium), 2 ml distilled water and 1 ml glucose solution, respectively, for potential dehydrogenase. The treated samples underwent incubation at 37° C for 48 hrs. Dehydrogenase activity was expressed as mg formazan/ 3 g sediment.

Urease activity has been determined according to the Dragan-Bularda (2000) method. Reaction mixtures consisted of 3 g sediment, 2 ml toluen, 5 ml phosphate buffer, 5 ml solution of urea 3% incubated at 37° C for 24 hrs. Activity was expressed as mg  $NH_4$ /3 g sediment.

The microbial iron reducing  $Fe^{3+}$  activity were analysed according to the methods presented by Drăgan-Bularda (2000). We expressed the activity in mg Fe II/3 g sediment. Fe II interacted with  $\alpha,\alpha$ -dipiridil and they have a coloured reaction together and the solution can be photocolourmetred at 240 nm.

Based on the absolute values of the enzymatic activities from every sample analyzed we calculated the enzymatic indicator of the sediment quality, after the calculation formula proposed by Muntean (1995-1996):

$EISQ = 1/n \sum Vr (i) / Vmax (i)$ , where: EISQ - enzymatic indicator of the sediment quality, n - number of activities, Vr (i) - real individual value, Vmax (i) - maximal theoretical individual value.

## RESULTS AND DISCUSSIONS

Sediment samples taken from the Jiu River, in the summer and winter of 2007, were bacteriological and enzymological studied in the lab.

The bacteriological study determined three ecophysiological groups of microorganisms: ammonifying bacteria, nitrifying bacteria and iron-reducing bacteria. Seriate dilution techniques were used. For each group its specific cultural environment is used. The obtained values for those three ecophysiological groups are recorded in table 1 and 2. The obtained values determined the bacterial indicator of the sediment's quality (BISQ).

Seasonal variations and the drawing points of the collected samples of BISQ are written below. The drawing point level located at the Jiu River's confluence with Sadu River, the bacterial indicator of the sediment's quality had lower values, both in summer and winter.

**Table 1.****Bacteriological study of the sediments from the Jiu River collected in the winter of 2007 (number of bacteria/sediment gram)**

Sampling sites	Ammonifying bacteria	Nitrifying bacteria	Iron-reducing bacteria
Confluence with Sadu River	200000	3900	2100
Târgu Jiu upstream	170000	1200	2400
Târgu Jiu downstream	540000	2000	1700
Rovinari upstream	220000	920	2100
Rovinari downstream	450000	1100	2600
Craiova upstream	470000	400	2500
Craiova downstream	540000	180	2000

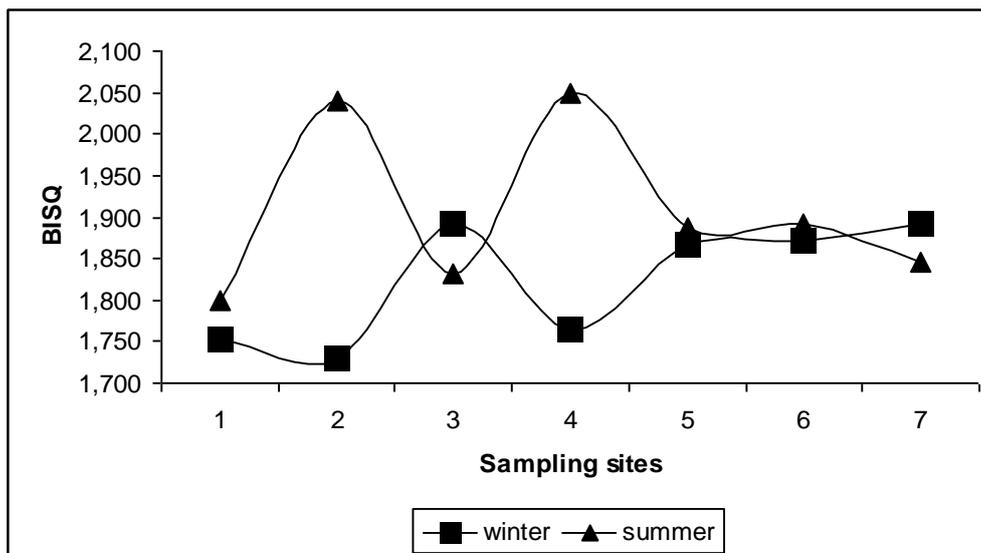
This was in accordance with the enzymatic activity at the drawing point. The seasonal dynamic keeps the usual minimal values of BISQ in winter and high values in summer. At the drawing point level Targu-Jiu upstream higher values of BISQ are recorded in the summer. One of the causes might be the overflow of waste water from the pig farm near the river. This pig farm has its most important activity in the hot season. At the next drawing point level, Targu-Jiu downstream, the sediment samples has almost the same variations in both seasons. The reason is the constant overflow and the same intensity of the house waters and industrial waters from Targu-Jiu.

**Table 2.****Bacteriological study of the sediments from the Jiu River collected in the summer of 2007 (number of bacteria/sediment gram)**

Sampling sites	Ammonifying bacteria	Nitrifying bacteria	Iron-reducing bacteria
Confluence with Sadu River	280000	1300	2300
Târgu Jiu upstream	1500000	2800	1900
Târgu Jiu downstream	350000	6400	2000
Rovinari upstream	1600000	5400	4700
Rovinari downstream	520000	2400	5200
Craiova upstream	540000	1700	5900
Craiova downstream	390000	2800	2400

At the Rovinari drawing point upstream, seasonal variations follow their natural course, with higher values in summer and lower ones in winter. At the Rovinari drawing point downstream, values of the bacterial indicator are very similar in those two seasons. This shows the constant waste water pollution from the thermoelectric power station in both seasons. The situation is the same with the seasonal variations of the BISQ. At the Isalnita drawing point level, the values are also very similar during the seasons.

At Podari drawing point, seasonal variations of the BISQ follow their natural course. The obtained values are in accordance with the EISQ values.



**Fig. 1. BISQ seasonal variations of the sediments from Jiu River (1. Confluence with Sadu River; 2.Targu-Jiu upstream,; 3. Targu-Jiu downstream; 4. Rovinari upstream; 5. Rovinari downstream; 6. Craiova upstream (Isalnita); 7. Craiova downstream (Podari)).**

The following enzymatic activities had been established: actual dehydrogenase activity, potential dehydrogenase activity, catalase activity, urease activity and the microbial iron-reducing  $Fe^{3+}$  activity from the sediment. Enzymological methods have been used for this. Recorded values are written in table 3 and 4, for the summer and winter of 2007.

**Table 3.**

**Enzymological study of the sediments from the Jiu River in the winter season (ADA - actual dehydrogenase activity (mg formasan/3 g sediment), PDA - potential dehydrogenase activity (mg formasan/3 g sediment), IRBA - iron-reducing bacteria activity (mg Fe II/3 g sediment ), CA - catalase activity (mg  $H_2O_2$ /3 g sediment), UA - urease activity (mg  $NH_4$ /3 g sediment)).**

Sampling sites	Enzymatic activity				
	ADA	PDA	IRBA	CA	UA
Confluence Sadu River	0,137	1,175	0,317	5,69	0,118
Târgu Jiu upstream	3,562	1,900	0,382	1,445	0,387
Târgu Jiu downstream	2,65	3,175	0,368	7,65	0,098
Rovinari upstream	0,075	0,775	0,387	7,225	0,058
Rovinari downstream	0,425	1,125	0,345	6,885	0,080
Craiova upstream	3,550	2,125	0,276	3,57	0,333
Craiova downstream	3,575	1,625	0,364	3,23	0,332

Using Munteanu's account formula we established the enzymatic indicator of the sediment's quality which allows us to appreciate the enzymatic activity for every sediment sample.

Based on the obtained values for EISQ, we made a graphic (fig.2) in which we present seasonal variations of EISQ in 2007, and variations according to the drawing point of the samples from the upstream to downstream on the middle course of the Jiu River.

At the drawing point level located at the Jiu River's confluence with Sadu River, we have relatively low values of EISQ, in summer and winter. Causes can be multiple: sandy consistency of the sediment which stops the development of certain bacterial communities because the lack of organic materials. It seems that the Sadu River brings a small supply of organic materia into the Jiu riverbed. This is due to the same sandy consistency of the sediment from the Sadu River upper stream. There are several mines on the defile which overflows its waste water in the Jiu riverbed.

**Table 4.**

**Enzymological study of the sediments from the Jiu River in the winter season (ADA - actual dehydrogenase activity (mg formasan/3 g sediment), PDA - potential dehydrogenase activity (mg formasan/3 g sediment), IRBA - iron-reducing bacteria activity (mg Fe II/3 g sediment ), CA - catalase activity (mg H<sub>2</sub>O<sub>2</sub>/3 g sediment), UA - urease activity (mg NH<sub>4</sub>/3 g sediment).**

Sampling sites	Enzymatic activity				
	ADA	PDA	IRBA	CA	UA
Confluence with Sadu River	0,275	3,375	0,369	7,56	0,172
Târgu Jiu upstream	3,587	2,987	0,359	0,68	0,648
Târgu Jiu downstream	1,175	2,925	0,346	3,48	0,316
Rovinari upstream	0,525	3,300	0,319	4,42	4,024
Rovinari downstream	0,275	3,350	0,355	7,39	3,410
Craiova upstream	0,362	3,112	0,409	5,61	2,339
Craiova downstream	3,500	3,537	0,421	7,65	1,867

At the drawing point level Targu-Jiu upstream, we have very similar values for EISQ in the summer and winter of 2007. Values are a little bit higher compared to the last drawing point. The explanation could be that between those two drawing points there is a cleaning station at Iezureni. Although this cleaning station has an old - fashioned technology, it stops the pollution sources.

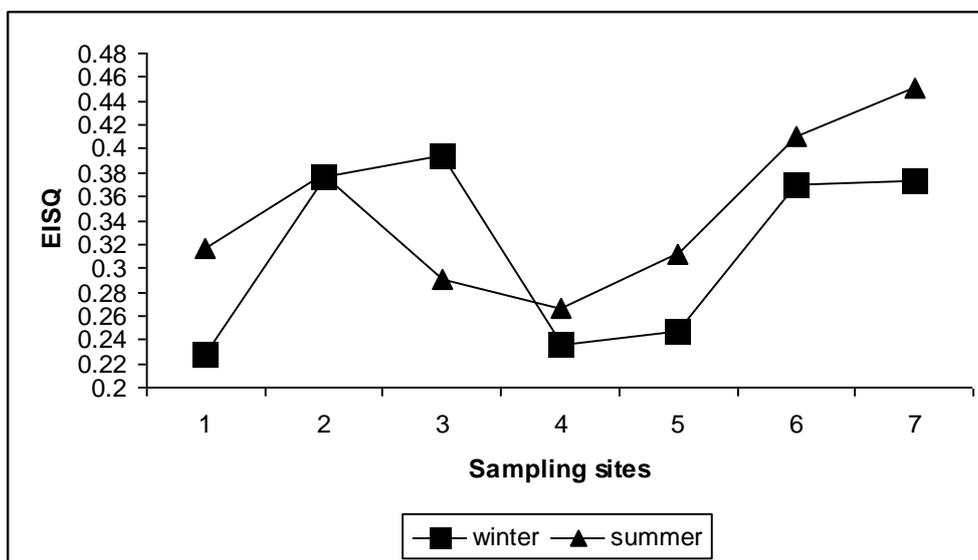
At the drawing point level Targu-Jiu down stream is characterized by intense enzymatic activities in winter, taking into consideration the natural dynamic of the seasonal variations for enzymatic activities. Possible causes of this inversion are: in summer, the overflow in the river of some polluted substances (petroleum products), destroying the microorganism, slowing down the enzymatic activity. The enzymatic activity has been slowed down because of the overflow in the riverbed in autumn and winter. The waste water was coming from the level of the dam, from the thermoelectric power station, located directly on the Jiu River.

At the drawing point level Rovinari upper stream values of the enzymatic indicator is relatively the same in both seasons, the main cause being stable environment conditions. The samples were taken from between the dam and the place where the Jiu River water enters the thermo electric power station.

The drawing point level Rovinari downstream presents water with higher temperatures, compared to other drawing points. The reason is the waste water overflow in the Jiu riverbed from the Rovinari thermoelectric power station. The Rovinari thermoelectric power station is one of the thermoelectric stations which has a high level of

air, water and soil pollution. Rovinari is considered one of the most polluted city from the Gorj district.

Pollution is released in the atmosphere by sulphur dioxide, azote oxides, powder from cinder and ash, containing a high level of Fe, Cu, Ni, Mg, Cr oxides. Parts of these powders get back to the soil and to the Jiu River, accidentally polluting them. Rovinari thermoelectric power station is part of those 174 thermoelectric power stations which do not comply with EU requirements. This thermoelectric power station might be closed in 2009 if it won't get a modern technology, to stop the pollution.



**Fig.2. Seasonal variations of EISQ in the sediments from the Jiu River (1. Confluence with Sadu River; 2.Targu-Jiu upstream,; 3. Targu-Jiu downstream; 4. Rovinari upstream; 5. Rovinari downstream; 6. Craiova upstream (Isalnita); 7. Craiova downstream (Podari)).**

Isalnita drawing point is directly polluted, especially by pesticides coming from a company called CHIM from Dolj. Although, the enzymatic activity is rather intense, because the aquatic microorganisms try to stop pollution, try to clean the water from the river.

At the level of the last three drawing points, on both seasons we established an almost lineal growth of the enzymatic activity. Biggest degrees are recorded at the Podari drawing point. The relatively high enzymatic activity from this drawing point can be determined by many causes: absence of the pollution sources in the other drawing points. The pollution was made here only by waste waters. The water speed is slower, favoring the sedimentation process, bacteria grows and implicitly, the enzymatic activity grows, too.

## CONCLUSIONS

Enzymatic activities are the following: actual dehydrogenase activity, potential dehydrogenase activity, catalase activity, urease activity and the iron-reducing microbial  $Fe^{3+}$  activity. These activities were identified in every studied sediment sample and presented seasonal variations according to the drawing point levels.

Biological polluting (animal and human dejection), physical (temperature) and chemical (heavy metals, oxides, salts and pesticides) negatively influencing the enzymatic activity from the sediment by the small number of bacteria in the aquatic sediment.

The studied ecophysiological bacteria groups are ammonifying bacteria, nitrifying bacteria and iron-reducing bacteria, these groups present seasonal variations, according to the drawing point level of the samples.

There is a biological pollution along the middle course of Jiu River, at the drawing point level Targu-Jiu upstream, there is also a chemical pollution at the drawing point level Rovinari downstream and Isalnita.

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# SEARCH ABOUT THE BEHAVIOR SOME VALUE ELITES FROM NORTH OF OLTENIA

## CERCETARI PRIVIND COMPORTAMENTUL UNOR ELITE VALOROASE DIN NORDUL OLTENIEI

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**Keywords:** *Juglans regia*, walnut, elites.

**Cuvinte cheie:** *Juglans regia*, nuci, elite.

### ABSTRACT

*In perioada 2005-2008 s-au facut observatii asupra nucului existent in zona de Nord a Olteniei. Zona de Nord a Olteniei este formata din judetele: Gorj, Mehedinti, Valcea, specia de nuci fiind foarte larg raspandita( peste 240.000 mii plante).*

*Nucii care formeaza populatiile de nuci sunt din punct de vedere genetic hibrizi naturali pe radacini proprii.*

*Vigoarea de crestere la elitele de nuc studiate este mare sau foarte mare.*

*La elitele valoroase de nuc s-a analizat: marimea fructelor(31.8mm -47.3 mm),greutatea fructului(10.9-13.7g),greutatea miezului(5-6.6 g),randamentul in miez(44%-47%).*

*Elitele din localitatile studiate prezinta fructificare terminala si grade diferite de rezistenta la *Xanthomonas campestris* pv. *Juglandis*( bacterioza) Caracteristica generala la elitele de nuc din aceasta zona este ca: au nuci normale, usor de spart, iar miezul se elibereaza usor.*

*During 2005-2008 period observation have been carried in the walnut populations from the Northern area of Oltenia. This area of Oltenia contains 3 counties: Valcea, Gorj and Mehedinț i; there walnut trees are wide spread (over 240 thousands plants). The walnut populations are from genetic point of view natural hybrids, growing on their own roots. The growth vigor of the elits walnut trees is large or very large in all the populations studied. The value elites were analyzed: the size of fruits ( 31.8 mm – 47.3 mm ), the fruit weight ( 10.9 g – 13.7 g ), the kernel weight ( 5 g - 6.6 g ), the kernel percentage44%–47.%) , etc.*

*The elites from the localities studied have terminal bearing and different degrees of resistance at *Xanthomonas campestris* pv. *juglandis* (bacteriosis). The general characteristic of the elites walnut tree from this area is: have easy cracking fruits and easy removal kernel.*

### INTRODUCTION

*The walnut tree has very ancient cultural tradition in Romania especially in the under-Carpathian area of Oltenia. The favourable ecological conditions in Oltenia have made it possible that in this area number of walnut trees be over 24000 trees , most of them being natural hybrids with own roots.*

### MATERIALS AND METHODES

*The investigation was done during a three years period (2005-2008) from the North area of Oltenia in different localities from following counties : Gorj , Mehedinti and Valcea.*

The measurements , observation and determination referring to characteristics from this area elites (type of bearing field , fruit characteristics) , growth (habits) , and low temperatures during winter and the behavior to diseases.

The marked elites have determined the following observation :

- the diameter of the tree crown
- the circumference of the trunk
- the height of the tree
- the flowering age
- the type of dichogamy
- fruits maturation
- efficiency

The climatic conditions of the area are generally favorable to the growth and bearing of walnut average annual temperature : 10.2 °C - 10.4°C; lowest temperature was -30°C , but normally the temperature drop to - 20°C/-22°C ; The average sum of rain fall 700-750 mm; the relative humidity 64-85% and the duration of the sunshine is 1900 hours per year.

## RESULTS AND DISCUSSIONS

Studies have revealed that the *Juglans regia* species in this area has great genetic variability, more distinct population and biotypes in accordance with the biological characteristics and localities where they were identified.

The trees used in the research are obtained generatively and planted in familial gardens and orchards , near footways (road plantations) and isolated.

The studied biological material is made of 15 elites selected to localities from the North of Oltenia.

Growth vigor of the walnut trees is large or very large in all the elites studied.

Limits of the tree height are : 10.9-13.6 m ; the limits crown diameter : 8.6-10.4 m and limits diameter trunk :

The flowering period of the walnut trees in the North of Oltenia takes place in a short period of the time (around 30-35 days).The beginning of the flowering starts in the firsts 4-5 days of April and flowering period ends on 7-10 of May.

The elites with early flowering (10%) , medium flowering (80%) are the majority and late flowering (10%).

The elites are presented by 85% protandrous and 15% are protogynous.

The crown shape is globular , semi-erect and spread habitus.

The variability is large regarding the size of fruits : 30.6-43.7 mm ; the fruit weight : 10.8-13.6 g ; the kernel weight 5-6.3 g ; kernel efficiency : 45.2-47.4%. (table no. 1)

**(tab no.1)**

Elites	Fruits size (mm) [(H+D+d)/3]	Weight fruit (g)	Weight kernel (g)	Kernel efficiency (%)
E-1(VL)	33.5	11.7	5.5	47.0
E-2(GJ)	34.6	12.4	5.6	5.1
E-3(GJ)	43.7	12.6	5.9	46.8
E-4(GJ)	40.0	11.8	5.5	46.6
E-5(VL)	33.4	11.6	5.4	46.5
E-6(VL)	32.6	10.9	5.0	45.8
E-7(MH)	31.8	11.8	5.3	44.9
E-8(VL)	32.6	10.9	5.0	45.8
E-99(MH)	32.4	10.9	5.0	45.8
E-10(MH)	30.6	11.2	5.1	45.5
E-11(MH)	32.3	11.7	5.3	45.2
E-12(MH)	32.3	13.7	6.5	47.4
E-13(VL)	32.6	10.8	5.0	46.2
E-14(GJ)	37.6	13.6	6.3	46.3
E-15(GJ)	35.0	12.0	5.6	46.6

The color of the kernel is 99% yellow.

The fruit ripening is a trait with low limits of variability between September 1<sup>st</sup>-October 5<sup>th</sup>.

**(tab no. 2)**

Elites	Height trees (m)	Diameter crown (m)	Volume crown	Production kg/tree	Ip (index of productivity)
E-1(VL)	12.7	9.30	567.512	36.50	0.064
E-2(GJ)	10.9	10.40	616.980	37.20	0.060
E-3(GJ)	13.5	9.80	678.522	36.70	0.054
E-4(GJ)	11.7	8.90	484.996	37.20	0.075
E-5(VL)	12.6	10.30	699.557	41.50	0.059
E-6(VL)	13.6	9.80	683.548	40.53	0.059
E-7(MH)	12.5	10.50	721.218	38.95	0.054
E-8(VL)	11.6	10.20	631.592	36.43	0.057
E-9(MH)	10.9	9.60	525.711	40.53	0.077
E-10(MH)	11.5	8.70	455.527	34.30	0.075
E-11(MH)	11.8	8.60	456.727	35.15	0.077
E-12(MH)	12.6	9.70	620.429	36.40	0.058
E-13(VL)	10.8	10.30	604.605	36.62	0.060
E-14(GJ)	12.5	10.20	680.892	37.18	0.054
E-15(GJ)	12.4	10.40	708.651	36.22	0.051

Most of the elites components are ripening their fruits between September 10<sup>th</sup>-20<sup>th</sup> (80%) the rest of them are either early ripening (10%) and late (10%)

The area is favorable to the presence and attack by *Xanthomonas campestris* p v. *juglandis* 70% of the walnut is sensitive to bacteriosis.

Generally , the majority of the walnut elites has fruits shell : 1.5mm-2.5mm.

For comparing more correctly the capacity of production to the studied elites was calculated the index of productivity ( **Ip**) referring the crown diameter and height trees.(tab no.2)

Value of the index of productivity was different to an elite the other , being generally proportionally with the capacity of production.

Then , a little index of productivity had the elite E-15

The elites with high values where registered to elites : E-9 ; E-10 ; E-11 ;

## CONCLUSION

- The North of Oltenia has favorable climatic condition very suitable for walnut culture.
- The traits of elites referring to the fruiting capacity , the internal structure of the shell and kernel color of the elites, this fact conferred importance in the breeding programs.

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**OBSERVATIONS ON THE EFFICACY OF SOME RATICIDES IN BROWN  
RAT (*RATTUS NORVEGICUS*) CONTROL  
AT S.C. TONICO GENERAL COM S.R.L.  
– NEGRAȘI FARM, DÂMBOVIȚA COUNTY**

**OBSERVAȚII PRIVIND EFICACITATEA UNOR RATICIDE ÎN  
COMBATAREA ȘOBOLANULUI CENUȘIU (*RATTUS NORVEGICUS*) ÎN  
CADRUL S.C. TONICO GENERAL COM S.R.L. – FERMA NEGRAȘI,  
DÂMBOVIȚA**

*Frăsin Loredana Beatrice*

**Cuvinte cheie:** *Rattus norvegicus*, raticide, eficacitate.  
**Key word:** *Rattus norvegicus*, raticides, efficacy.

**ABSTRACT**

*Three rodenticides were tested to control the populations of Rattus norvegicus at S.C. Tonic General Com S.R.L. – Negrași farm, Dâmbovița county - RATITELL, STORM and COLBROM, applied as they are or in combination with different alimentary baits. In the 2 cases, when products were mixed, only the mixture with vanillin sugar, wheat bran and cinnamon were eaten but death rates were reported only for STORM.*

*The COLBROM product has a high efficacy, 87 dead individuals being counted after 8 days only. No death rate was reported 10 days after, which means all rats populations had been eradicated.*

*În cadrul S.C. Tonic General Com S.R.L. – ferma Negrași, Dâmbovița, pentru combaterea populațiilor de Rattus norvegicus, s-au testat trei produse raticide: Ratitell., Storm și Colbrom, aplicate în variantă simplă sau în amestec cu diferite momeli alimentare. În cele două cazuri în care produsele au fost amestecate cu momeli alimentare au fost consumate doar variantele în care momeala a fost zahăr vanilat + tărațe de grâu și scorțișoară însă mortalități nu s-au înregistrat decât în cazul produsului Storm.*

*Produsul Colbrom are o eficacitate ridicată înregistrându-se după numai 8 zile 87 exemplare moarte. După 10 zile nu s-a mai observat nici o mortalitate ceea ce înseamnă că populațiile de șobolani au fost eradicate.*

**INTRODUCTION**

Rodents represent over a third of the total number of mammals in the world. They are well known for the important damages produced in all economical sectors and for the epizootological and epidemiological danger for public health.

Chemical means are nowadays the most powerful and efficient weapon in rodent control, but due to an extreme precaution these animals do not always eat the rodenticides, so alimentary baits are needed to attract them.

**MATERIALS AND METHODS**

The efficacy of rodenticide products was tested at S.C. TONICO GENERAL COM S.R.L.- Negrași farm, Dâmbovița county, where a high density of *Rattus norvegicus* populations had been reported.

Negrași farm covers a 7 ha area and is populated with dairy cows grown in a free stabulation system.

The following rodenticides were tested: RATITELL - impregnated wheat grains, applied in linear system, 40 gr bait; STORM - pellets, applied in piles of 100 gr at 10 m distance one another; COLBROM - fresh pasta bait, 12 -15 gr sachets.

Baits were placed in paper board trays at the exits of rodent nests or very close to them, at walls corners or along them, on usual rats pathways and in the feeding areas.

## RESULTS AND DISCUSSIONS

As shown in table 1, the RATITELL rodenticide was not eaten by rats as a simple product or mixed with wheat bran, fish flour and chopped meat.

Mixed with vanillin sugar + wheat bran or with cinnamon, the product was in part eaten, but no death rate was reported during the 10 days of observations.

Results presented in table 2 show that the use of STORM rodenticide produced, a great number of reported dead rats, 51, which would lead to a total number of 510 dead rats in the entire farm.

### Efficacy testing of RATITELL rodenticide at S.C. Tónico General Com S.R.L. - Negraşi farm

**Table 1**

Crt. no.	Comercial product (+ bait)	Active ingredient	Dead rats			
			after 4 days	after 6 days	after 8 days	after 10 days
1.	RATITELL (simple)	difetialone	0	0	0	0
2.	RATITELL + wheat bran	difetialone	0	0	0	0
3.	RATITELL + vanillin sugar + wheat bran	difetialone	0 in part eaten product	0	0	0
4.	RATITELL + fish flour	difetialone	0	0	0	0
5.	RATITELL + chopped meat	difetialone	0	0	0	0
6.	RATITELL + cinnamon	difetialone	0 in part eaten product	0	0	0

The best results had the combination STORM with wheat bran and vanillin sugar, STORM with cinnamon. There was not reported any rat in the farm 12 days after.

**Efficacy testing of STORM rodenticide  
at S.C. Tonic General Com S.R.L. - Negrași farm**

**Table 2**

Crt. no.	Comercial product (+ bait)	Active ingredient	Dead rats			
			after 4 days	after 6 days	after 8 days	after 10 days
1.	STORM (simple)	flocoumafen	5	7	8	-
2.	STORM + wheat bran	flocoumafen	0	0	0	0
3.	STORM + fish flour	flocoumafen	0	0	0	0
4.	STORM + chopped meat	flocoumafen	0	0	0	0
5.	STORM + vanillin sugar + wheat bran	flocoumafen	9	12	19	24
6.	STORM + cinnamon	flocoumafen	3	12	15	19

**Efficacy testing of COLBROM rodenticide  
at S.C. Tonic General Com S.R.L. - Negrași farm**

**Table 3**

Crt. no.	Comercial product (+ bait)	Active ingredient	Dead rats			
			after 4 days	after 4 days	after 4 days	after 4 days
1.	COLBROM	denatonium benzoate	61	85	87	-

When the COLBROM rodenticide was used (table 3), 61 dead rats were reported after only 4 days, 85 after 6 days and 87 after 8 days. No death rate was reported after 10 days which means that the entire rats population was eradicated.

It was estimated a total number of about 870 dead individuals knowing the fact that one dead rat outside galleries means 10 dead rats in galleries.



**Fig. 1 – *Rattus norvegicus* at S.C. Tonic General Com S.R.- Negrași farm eating COLBROM rodenticide**

## CONCLUSIONS

Rodents represent over a third of the total number of mammals in the world. They are well known for the important damages produced in all economical sectors and for the epizootological and epidemiological danger for public health.

To control *Rattus norvegicus* populations, 3 rodenticides were tested at S.C. TONICO GENERAL COM S.R.L. – Neagrași farm, Dâmbovița county - RATITELL, STORM and COLBROM, applied as they are or in combination with different alimentary baits. Only the mixtures with wheat bran + vanillin sugar and with cinnamon were eaten but death rates were reported only when STORM rodenticide was used. Rats have a very sensible olfactive sense and they are attracted by very fragrant substances.

The COLBROM rodenticide has a high efficacy, 87 dead rats being reported after only 8 days. No rats were reported after 10 days which means the entire populations had been eradicated.

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# THE MAIN DAMAGES PRODUCED BY RODENTS

## PRINCIPALELE PAGUBE PRODUSE DE ROZĂTOARE

*Frăsin Loredana Beatrice*

**Key words:** rodents, damage, disease transmission.

**Cuvinte cheie:** rozătoare, pagube, transmitere boli.

### ABSTRACT

*A lot of damages produced in both different agricultural sectors and alimentary products industry, bakeries, supermarkets, households made rodents one of the most harmful pests of man. The wide spread of rodents, their varied feeding regime allow them an easy adaptation to the most different sources of fodders and aliments.*

*Rodents are in many cases carriers of pathogenic germs, being in permanent contact with domestic animals from farms or with wild animals from fields or forests, and the main vectors in disease transmission to man and animals. Rats and mice carry and transmit over 80 human and wild or domestic animal diseases beeing a real reservoir of infection and vectors.*

*Numeroasele daune provocate de rozătoare atât în diferite sectoare ale agriculturii cât și în fabrici de produse alimentare, brutării, magazine de alimente, gospodării etc. au făcut ca acestea să fie situate printre primii dăunători păgubitori ai omului. Răspândirea mare a rozătoarelor, regimul variat de hrană le permite să se adapteze ușor la cele mai diferite surse de furaje și alimente.*

*Fiind în contact permanent cu animalele domestice din ferme sau cu animalele sălbatice din câmp și păduri, rozătoarele sunt de multe ori purtători de germeni patogeni și vectori principali în transmiterea a numeroase boli la om și animale. Șobolanii și șoarecii sunt rezervoare de infecție și vectori, întrucât poartă și transmit germeii a peste 80 de boli la om și animalele domestice sau sălbatice.*

### INTRODUCTION

A lot of damages produced in both different agricultural sectors and alimentary products industry, bakeries, supermarkets, households made rodents one of the most harmful pests of man.

The wide spread of rodents, their varied feeding regime allow them an easy adaptation to the most different sources of fodders and aliments.

In starving conditions rodent feed on everything they found in their way - cereals, green and juicy fodders, other aliments. In lack of food, they feed on animal corpses, they eat each other or their own progenies, they attack sick animals, new-borns and destroy many other goods. For example, many cases are known when rats destroyed chicken and eggs in poultry farms, they gnawed pigs' ears and tails or bit little pigs.

In this sense, observations were effectuated at S.C. TONICO GENERAL COM S.R.L. - Negrași farm, Dâmbovița county - elite farm, populated with dairy cows grown in free stabulation.

Although the hygiene was good, the favourable microclimate from shelters, the assorted good quality food and the presence of a permanent source of water created

conditions for development of a population of *Rattus norvegicus* rats.



**Fig. 1 - Wounds made by *Rattus norvegicus* to the young calves at Negrași farm (by Loredana Beatrice Frăsin)**

From our ascertainements, we can say that brown rats may become very aggressive producing wounds even to larger animals such as newborn calves with age of 1-31 days (as one can see in Figure 1 and 2).

In the same farm, rats which attacked even people to protect themselves were noticed also (Fig. 3).

There were reported fires produced by rats which gnawed electrical isolators made of plastic or artificial resins and floods produced by dykes destruction.

Rats can also produce building colapsing or reduce their resistance by nesting in wall breaks, under floors or cratches in sewings or house attics. Because of the holes digged by rats under concrete buildings, large blocks are braking and slide in different directions.

Being in permanent contact with domestic or wild animals, rodents are often carriers of pathogenic germs and main vectors in human and animal disease transmission.

The most important losses are those produced by the direct consumption of agroalimentary products. The individual daily consumption of different species does not exceed double figures (house rat - 50 - 100 grams, german marmot - 40 - 50 grams, field mouse - 20 - 30 grams, house mouse - 15 - 20 grams) while the consumption of an entire population in an area reach impressive quantities. From calculations, a mouse feeds in one year on 4.5 kg average quantity of food, while destroy a quantity even greater by gnawing, spreading and pollution. In other words, one mouse spend at least 10 kg alimentary products which means a huge waste of aliments.

The annual worldwide damages, only for agroalimentary products, represent 10% of the stored global resources. These damages are very high during periods of excessive reproduction followed by invasions when the population of field mice can reach 10,000-20,000 individuals/ha.



**Fig. 2 - Wounds made by *Rattus norvegicus* to the young calves at Negrași farm**

**(by Loredana Beatrice Frăsin)**

From calculations, it results that in one year, in normal life conditions, from 5 couples of field mice result 6 billions of descendants which are capable to destroy 300,000 ha in 24 hours. Invasions reduce the feeding sources for rodents, fact which generates adaptation phenomenon to another feeding regime different from the specific one. Thus, it was ascertained that during the hamsters invasions in our country, although they were vegetarian, they started to feed on animal food, attacking other rodents, small mammals and even chickens.

On the occasion of invasions, many species of rodents, which usually eat a cellulose rich food, produce massive destructions to the fruit trees and to other wooden plants (water rat, field mouse, squirrel, rabbit, etc), the damages getting the aspect of real calamities.



**Fig. 3 - *Rattus norvegicus* at Negrași farm**

**(by Loredana Beatrice Frăsin)**

In nurseries and young orchards, field mouse gnaws the roots and the logs, producing great losses, especially in invasion years.

Squirrel, squirrel-tailed dormouse and field mouse attack fruits in orchards near forests.

The most damaging species of rodents are in cereal field. Thus, field mouse is reproducing himself very fast and produces great damages in cereal crops (corn, wheat, barley, rye, etc) in years with drought, when part of the crop is falling and is left on the field.

European ground squirrel and german marmot, large spread in our country, produce damages especially in cereal fields from steppe and silvosteppe area, where they reach a higher density.

Sinanthropic rodents are the greatest pests. It was calculated that in a populated area, with 1 million inhabitants, the brown rat produces damages of 20,000 tons alimentary products per year, knowing the fact that the number of rats is equal or 50% greater than the population of the infested area. Losses of about 33 millions of tons of cereals per year are produced by rats from warehouses. At the same time, more than 20% of the crops are lost and will not be given into human consumption due to rats dirt and dejections.

House rat often leave households and live, during summer, in full nature for a couple of months, period in which it attacks directly other animals such as: small mammals, birds, fish causing important damages. In farming households damages are frequently by killing an important number of little pigs, fowls, domestic rabbits.

### **RODENTS ROLE IN DISEASES SPREAD**

Due to their mobility and excessive frequency, rodents contribute, in the highest level, to infections dissemination and movement or enlargement of natural areas of disease.

Rodents can transmit infectious diseases on several ways.

Usually, microbes are expelled from the rodents bodies by dejections, which, contaminating their environment, mostly fodders, water and aliments, represent one of the most important way of disease transmission and enlargement of natural areas of disease.

Another way of infections transmission from rodents to animals and man is by hematophagous ectoparasites (fleas, louses, spiders, sheep louses). Among those, we can mention here *Xenopsylla cheopis*, *Ceratophyllus fasciatus*, *Bellonyssus bacoti*. Some infections may be mechanically transmitted, by non-parasite insects such as flies, horseflies, ants, etc.

Due to trofic relations between rodents and their natural enemies, some carnivorous animals like: wolf, fox, common badger, wildcat, marten, polecat, weasel, etc and some predatory birds like: owl, little owl, stork, etc spread over large areas the infection, eating sick rodents. On the same way, infections may be transmitted by many domestic animals such as: cat, dog, pig, fowls, etc.

Better known is the direct transmission way (contact, bite, etc) of infections from different rodents to man and animals.

Rodents may transmit certain zoonotic diseases by simple mechanical transport. This is the case of sinanthropic rodents mostly. In search for food, the precaution instinct determine them to circulate in the most polluted and infected environments, carrying mechanically germs from these areas to human populated areas or animal shelters, as mechanical vectors.

Rats and mice spread the following diseases:

- brown rat - rabies, Aujeszký's disease, tularemia, typhus, plague, leprosy, recurrent fever, infectious hepatitis, virotic meningitis, leptospirosis, foot-and-mouth disease, brucellosis, rinderpest, Newcastle disease, rickettsiosis, trichinelosis, taeniasis, Sodoku disease, melioidosis etc;
- black rat - is considered the main reservoir of plague, transmitted by *Xenopsylla cheopis* flea.

By this parasite the infection passes also to brown rat which become in this way a secondary reservoir. It may transmit also most of the diseases mentioned at brown rat;

- water rat - is the main reservoir for tularemia. It is also known its role in transmitting leptospirosis, rinderpest, etc.
- house mouse - it transmits: salmonellosis, dysentery, tularemia, different mycosis etc;
- field mouse - being a receptive species, plays a very important role in transmitting leptospirosis, encephalitis, Q fever, pseudotuberculosis, tularemia etc.

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# EVALUATION OF SOME WHEAT LINES CONCERNING THE PRESENCE OF GPC-B1 GENE, USING DNA MARKERS

## EVALUAREA UNOR LINII DE GRÂU PENTRU PREZENȚA GENEI GPC-B1, FOLOSIND MARKERII ADN

*Furdi Florina*

**Key-words:** wheat, segregant lines, GPC (Grain Protein Content) gene, DNA fingerprint.

### ABSTRACT

*Câteva linii segregante de grâu, având în ascendență *Triticum dicoccoides*, au fost evaluate în trei repetiții, pentru depistarea prezenței genei *Gpc-B1*.*

*În urma evaluării repetate a liniilor luate în studiu, s-a constatat existența a două genotipuri care au prezentat amprenta ADN specifică prezenței genei HGPC (High Grain Protein Content) precum și existența unor genotipuri care nu amplifică. Majoritatea genotipurilor însă nu au prezentat gena *Gpc-B1*.*

*Some wheat segregant lines, ascending of *Triticum dicoccoides*, were evaluated considering three replications in order to assess the presence of *Gpc-B1* gene.*

*As a result of repeated evaluation of the studied wheat lines, it has been found the presence of two genotypes showing the specific DNA fingerprint which indicates the presence of HGPC (High Grain Protein Content) gene as well as the existence of several genotypes without amplification. Nevertheless, most of the studied genotypes demonstrated the absence of *Gpc-B1* gene.*

### INTRODUCTION

Grain Protein Content (GPC) of wheat is an important factor for nutritional value and represents one of the major factors with strong influence on bread and pasta quality. The high grain protein content gene (*Gpc-B1*) transferred from *Triticum turgidum* ssp. *dicoccoides* into durum wheat and into hexaploid backgrounds is a valuable resource for increasing GPC (1, 3). To the present there have been identified a series of molecular markers linked with *Gpc-B1* gene (2, 4). The *Xucw71* marker is successfully used for detection of this gene.

### MATERIALS AND METHODS

The biological material representing wheat segregant lines ascending from *T. dicoccoides* (table 1), and obtained at I.N.C.D.A. Fundulea, was evaluated in order to detect the presence of HGPC gene in three replications.

The evaluation phases were the following:

- germination of wheat grains;
- DNA isolation from vegetal tissue (leaf);
- agarose gel electrophoresis 0,7% and UV light imaging using BrEt staining, in order to detect the presence of DNA (all genotypes showed the DNA presence in this phase);
- amplification of DNA samples using PCR;
- agarose gel electrophoresis 2% and UV light imaging using BrEt staining in order to emphasise the DNA amplification; the marker used was PCR marker from Promega (not all genotypes shown the presence of 900 bp DNA fragment as it was expected in this phase);
- cutting of amplified samples using BsaMI restriction enzyme;

Table 1

Wheat lines ascending from *T. dicoccoides*

Nr.crt.	Genotip	Nr. crt.	Genotip	Nr. crt.	Genotip
1.	GDR517	16.	GDU5366	31.	GDU5528
2.	GDR524	17.	GDU5396	32.	GDU5529
3.	GDR525	18.	GDU5417	33.	GDU5534
4.	GDR528	19.	GDU5433	34.	GDU5536
5.	GDR532	20.	GDU5437	35.	GDU5421
6.	GDR535	21.	GDU5442	36.	DIN (CONDUR)
7.	GDR539	22.	GDU5457	37.	DIN (GRANDUR)
8.	GDR545	23.	GDU5464	38.	DDD2-7
9.	GDR546	24.	GDU5473	39.	DDD2-9
10.	GDU5334	25.	GDU5482	40.	DDD2-14
11.	GDU5344	26.	GDU5486	41.	DDD2-15
12.	GDU5348	27.	GDU5488	42.	DDD2-18
13.	GDU5349	28.	GDU5498	43.	DDD3-8
14.	GDU5352	29.	GDU5505	44.	DDD3-14
15.	GDU5355	30.	GDU5512		

- agarose gel electrophoresis 2% and UV light imaging using BrEt staining, in order to emphasise expected DNA fragments after enzyme digestion (all amplified samples have presented two different DNA fragments either at 500 and 400 pb or at 500 and 300 pb);

- gel photographing.

A pair of CAPS primers (*Xucw71*) with the following sequences was used for DNA amplification:

1. F (forward): TGG ACT TTC TAT TTC TCC GTA CC

2. R (reverse): TCA ACC CTT TTA AGC AAT TTG AA.

The amplification reactions were performed in 20 µl volumes, containing: primers 0.16 µM each, dNTP 200 µM each, 1 x Taq buffer, Taq polymerase 2.5 U, DNA 1 µl/reaction, distilled water till 20 µl.

The PCR and restriction conditions:

1. Denaturing step: 5 min. at 94°C;

2. Touchdown from 53°C to 48°C (six cycles): a) Denaturation: 30 s at 94°C, b) Annealing: 30 s at 53, 52, 51, 50, 49, 48°C in each cycle, c) Extension at 72°C for 40 seconds;

3. 37 cycles of: 94°C 30 s, 48°C 30 s, 72°C 45 s;

4. Extension step: 5 min. at 72°C;

5. Digestion with BsaM I enzyme: 15 µl of PCR product, 0.5 µl of BsaM I, 1.5 µl of water;

6. Incubation 65°C, 3 hours.

The final products were separated on a 2% agarose gel and visualized by UV illumination, in the presence of ethidium bromide.

## RESULTS

As a result of repeated evaluation of lines ascending from *T. dicoccoides*, it has been observed the presence of some genotypes that remained unamplified: GDR517, GDR528, GDR545, GDU5355, GDU5366, GDU5396, GDU5482, GDU5486, GDU5421, DIN (CONDUR), DIN (GRANDUR), DDD2-7, DDD2-9, DDD2-14, DDD2-15, DDD2-18, DDD3-14.

At the first evaluation, none of the genotypes that showed amplification using PCR had the fingerprint specific HGPC gene, the DNA fragments being visualized at 500 and approximately 300 bp for each genotype (fig. 1. and 2). It is known from specific literature

that genotypes carrying HGPC gene show after cutting one fragment of 500 bp and another of 400 bp.

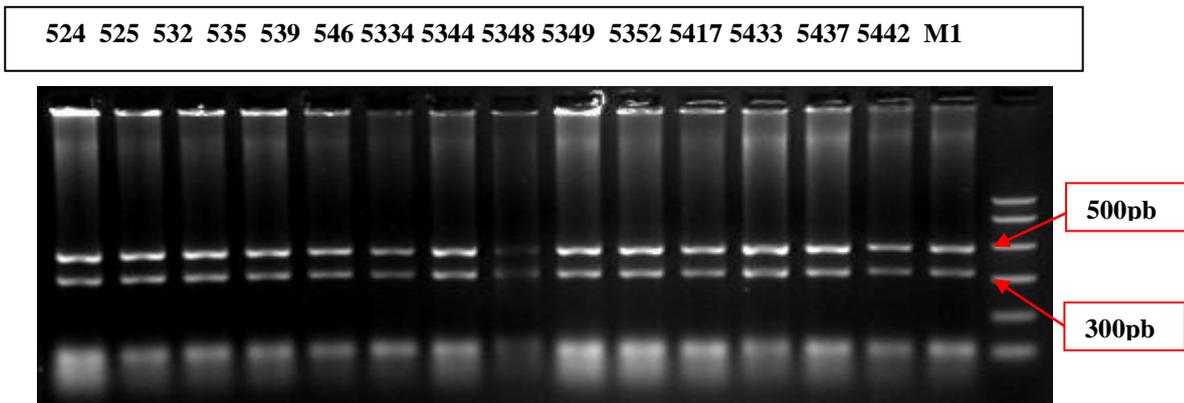


Fig. no. 1. PCR amplification products after digestion with BsaM I restriction enzyme

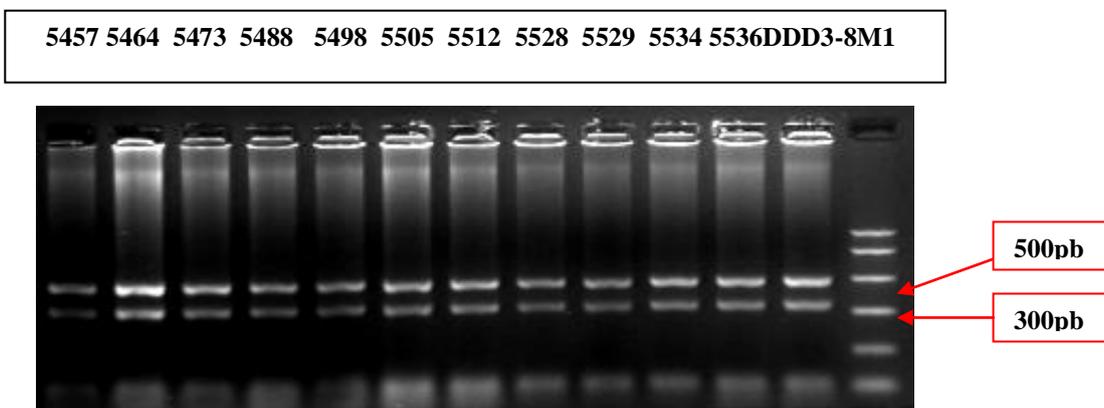


Fig. no. 2. PCR amplification products after digestion with BsaM I restriction enzyme

In case of the second evaluation, in order to verify the DNA fingerprints, I have submitted to analysis the following genotypes: CONDUR, GRANDUR, GDU5334, GDU5344, GDU5348, GDU5349, GDU5352, GDU5355, GDU5366. The obtained results showed differences for GDU 5334 and GDU5349 genotypes, which presented the electrophoretic fingerprint specific for genotypes that contain HGPC gene.

For the third evaluation, I have obtained the following results: (fig. 3 and 4).

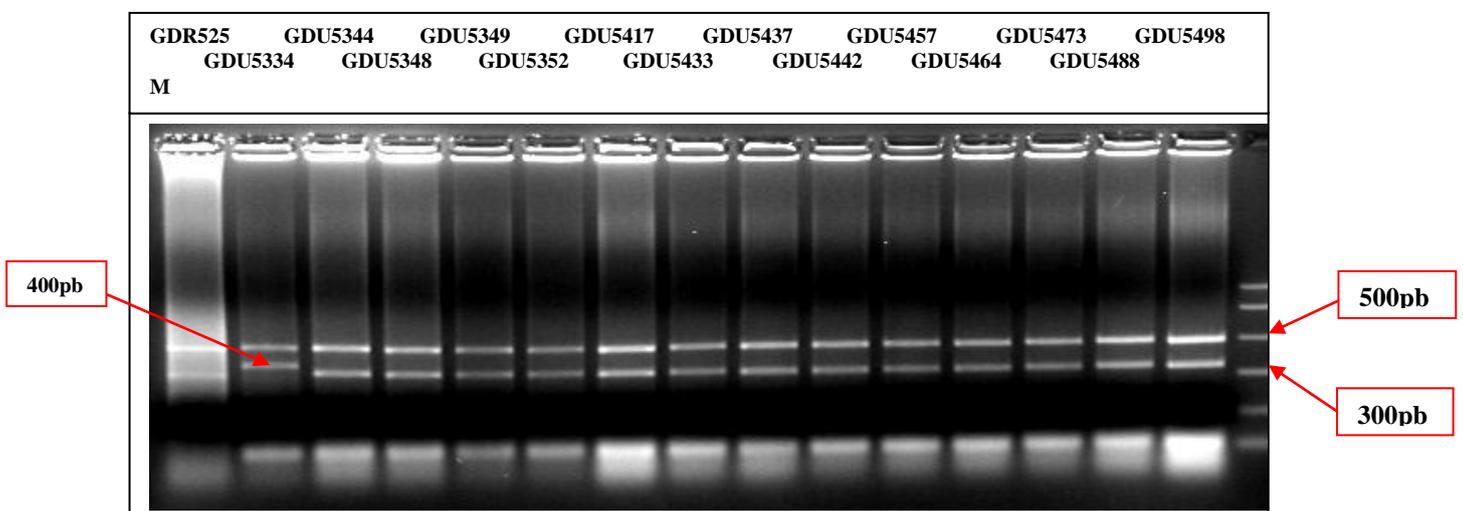
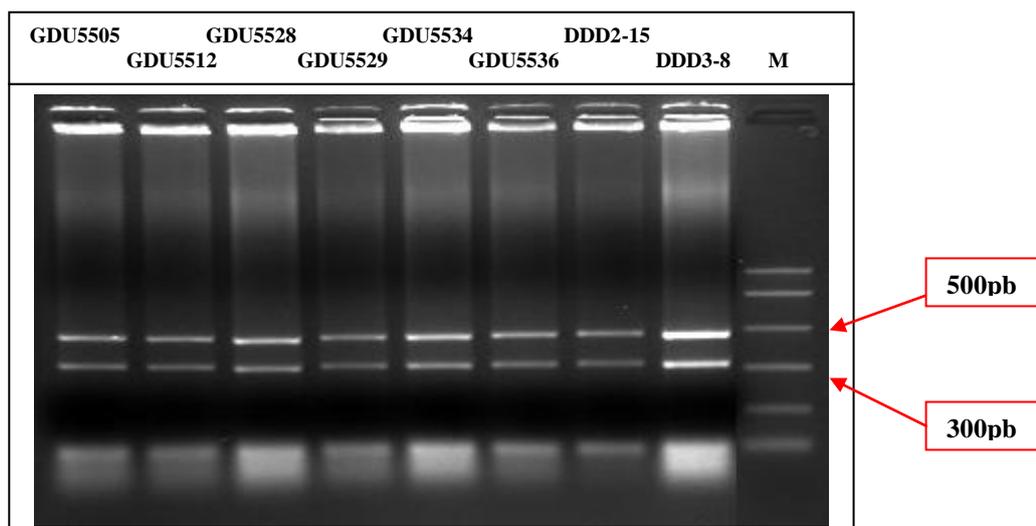


Fig. no. 3. PCR amplification products after digestion with BsaM I restriction enzyme



#### products after digestion with BsaM I restriction enzyme

This time only GDU 5334 genotype showed the DNA fingerprint specific for genotypes containing HGPC gene as it may be observed in fig. 3, this genotype presenting the DNA fragment at 500 bp and the second at 400 bp.

The evaluations have been carefully conducted in order to avoid any possible sample contamination.

## CONCLUSIONS

As a result of performed analysis, it has been observed one genotype that showed the presence of HGPC gene in two of the three replications (representing 66% of all studied cases) and one genotype that indicated the presence of the gene in one of all three replications (representing 33% of all studied cases), these two genotypes representing 4.54% of total studied genotypes. The rest of the studied genotypes (representing 95.46% of the total) have presented DNA fingerprint specific for the absence of HGPC gene, which confirms the difficulty of hereditary transmission of this gene to the progenies.

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# THE BEHAVIOUR OF SOME CORN LAND RACES MANTAINED BY SIB AND INBREEDING POLLINATION

## COMPORTAREA UNOR POPULATII LOCALE DE PORUMB IN CONDITIILE CONSANGVINIZARII SI POLENIZARII SIB

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**Keywords:** corn landraces, pollination, inbreeding, Sister&Brother methods

### **ABSTRACT**

*Interacțiunea dinamică dintre selecția naturală și preferințele agricultorilor au condus la crearea și conservarea diversității genetice, a formelor primitive de porumb introduse în țara noastră. Aceste populații locale sunt cele mai potrivite genotipuri pentru cultivarea in situ în ecosisteme marginale sau agro-ecosisteme-specifice. În ciuda diversității bogate a acestora, sunt preferați noi hibrizi, majoritatea proveniți din import. În fondul genetic al cultivarelor de porumb primitive, defectele sunt asociate cu caractere valoroase. Particularități ca rezistența la cădere, frângerea și randamentul de boabe scăzut, par să fie factorii importanți care determină selecția hibrizilor în detrimentul soiurilor primitive. După experiențe nereușite prin introducerea de hibrizii noi unii fermieri doresc să se reîntoarcă la cultivare vechi, care însă din păcate au dispărut. În lucrările noastre, pentru a conserva populațiile locale de porumb, specie alogamă, s-au aplicat două metode. În condiții experimentale ex situ s-a aplicat metoda consangvinizării și metoda „frate și soră” (SIB). A fost analizată fertilitatea știuletelui la cele două tipuri de descendenți. Metoda de polenizare a evidențiat reacția particulară a genotipului asociată cu „centrul de evoluție” al acestora. Comparativ cu metoda consangvinizării, descendența obținută prin polenizare SIB/SIB greutatea boabelor/știulete a fost semnificativ mai mare. Populațiile provenite din zona comunei Balșa 24/2 au fost mai productive decât cele din Acmaru. La acestea greutatea boabelor/știulete a avut valori relativ mari de 139 g/știulete în cazul consangvinizării și 186 g/știulete la polenizarea SIB (d = 47 g/știulete).*

*Dynamic interaction between natural selection and farmer's agriculture choice has lead to conservation of genetic diversity among primitive varieties, so called landraces. Landraces are the most suitable genotypes for cultivation in in situ areas which are marginal or specific agro-eco-systems. Despite their valuable diversity, imported hybrids are often preferred for growth. In the genetic background of landraces defects are associated with valuable characters. In comparison to new hybrids, landraces display some features like stem break, plant lodging and grains low output which turn the balance for cultivation in the favor of hybrids. Sometime farmers are looking back to reuse landraces but often they already lost. In order to preserve our own collection of corn landraces, an allogamous species, we applied two breeding methods. In the experimental conditions the inbreeding (I) and the sister and brother (SIB) methods were used. The further analyzed cobs originated from out pollinated descendants. The pollination method of ascendants emphasized in the descendants the genotype particular reaction. In comparison with the inbreeding 50% of the SIB descendants revealed a higher amount and weight of grains. The Balsa cultivar 24/2 gave best results regarding high kernel weight/cob (I=139g/cob; SIB= 186g/cob).*

## INTRODUCTION

Due to historical events (Iorga, 1920, mentioned by Butnaru, 1972) corn culture for food occupies the first place from 17<sup>th</sup> to the first part of the XX Century (Radianu, 1920). In the last times corn grains and whole plants were used for feed and silage. Romania occupies first place in Europe by the corn cultured surface and by the yields/ha obtained (Pârșan P., 2006).

Even if is a high temperature loving plant, corn diversification spread to a large altitude and latitude. Its high plasticity associated with allogamy generated hundred and hundred of landraces. The large corn spreading comes from its high yield, being a now a food safety culture.

The corn diversity represented by diverse sources, some of them disappeared during time or some of them adapted to the local conditions when cultivated for a long time under natural and artificial selection pressure, developed in ecotypes or landraces (Muresan, et al., 1973).

The first land races belonged to flint corn, some of them *alba* sub variety.

Our University had have traditionally played an important role in land races identification, evaluation and conservation (Butnaru, 1972). Besides the corn landraces conservation we also included some time other neglected species (Butnaru, 1994). Despite their major importance, *ex situ* conservation of these landraces has not always been favorable for large gene pools preservation due to financial poverty.

Although there is a lot of work going on experimental fields, conservation is rarely seen as the main priority. In this case the out-crossing species are in a major danger. The corn landraces, the subject of this study were maintained in *ex situ* conditions by SIB pollination for more than 20 years. In the field gene bank conditions the landraces were kept by inbreeding (I) and the sister and brother (SIB) pollination.

Our main goal was to identify a suitable method to **maintain** in the field at normal standards the corn land races traits. The successive pollination SIB/SIB and inbreeding/inbreeding or inbreeding/SIB and SIB/inbreeding methods revealed different behavior in the further out-pollinated descendants. In extreme conditions, when the numbers of individuals are small it is possible to apply inbreeding for efficient gene poll conservation??

## MATERIALS AND METHODS

The landraces in this study were collected in Hunedoara County, from which six populations from Bacaia and Acmarium Districts, located in Metalliferous Mountain sites. The landraces analyzed in **Table 1** and the pollination methods applied are shown in **Fig. 1**.

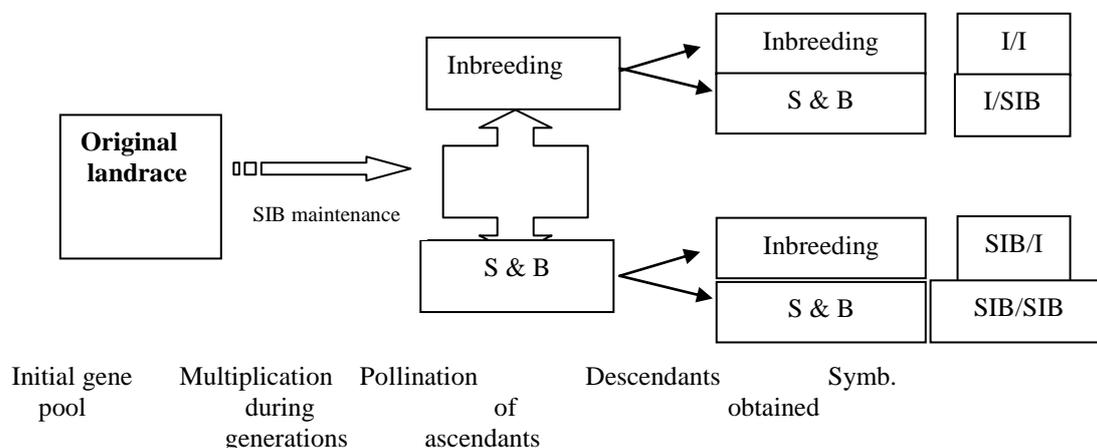
**Table 1**

The corn landraces origin and name			
District	Landraces	District	Landraces
Bacaia	493-8R/24/1	Acmarium	666/31
	493-8R/24/2		666/2
	493-8R/24/3		667/33
	493-10R/25/1		667/2
	493-12R/27/1		668/35
	493-12R/27/2		668/35/1

The number of plants SIB pollinated was in concordance to population size.

In all sampled landraces minimum 10 cobs were pollinated and the seeds obtained were stored separately. When multiplication was required, 50 seeds per genotype were sown and core descendants were made.

Different types of plants Sister&Brother (SIB) and inbreeding (I) were used as ascendants (maintainer) and in their population a divergent pollination was applied (**Fig. 1**). The biometrical data from out-pollinated plants of each genotype were collected and analyzed.



**Fig. 1: The experimental scheme and the analyzed descendant's symbols**

To evaluate the natural fecundation, kernel abortion, or other stigmas/pollen defects out-pollination was method of choice. To evaluate the cob shape/seed output, all cob parameters were determined. In this work only the seed weight per cob is shown and discussed.

To evaluate the differences among particular descendants factorial analysis was applied (Ceapoiu, 1968).

## RESULTS AND DISCUSSION

*Ex situ* conservation of germplasm, evaluated prior collection in different *in situ* areas, is needed now more than ever before. Land races breeding is necessary not only for marginal areas but also because of the impact of climate change (Thuiller et al., 2005).

### The general productivity of landraces conserved by different pollination methods

Our work was dedicated to maintain corn land races collected from the hilly and mountains Vest part of Romania. The *ex situ* experimental obtained data are summarized in Fig. 2.

The analysis of average yield grains/cob in Bacaia and Acmaru landraces pointed out completely different responses for self- or out controlled- pollination (SIB). The difference was high ( $d = 23.5\text{g/cob}$ ) pointing out the Bacaia land race as the best (Fig. 2).

Generally the most suitable keeping method was SIB/SIB. The reaction was in the normal rate (Jensen, 1983). Between I/SIB and SIB/SIB methods the difference was without significance ( $d = 9\text{g/cob}$ ). SIB followed by self-pollination (SIB/I) determined a deeper depression then inbreeding followed by SIB (I/SIB). The observations are in concordance with literature reports (Has, 2004; Goldman, 1999; Bernardo, 1996). The self-pollination was improper for multiplication but in many cases it was the best method to identify favorable alleles (Dudley, 1988).

In extreme case, when the climate conditions are unfavorable it is useful to practice

self-pollination to create diverse gene complexes and then to use those by SIB pollination for proper gene pool extension.

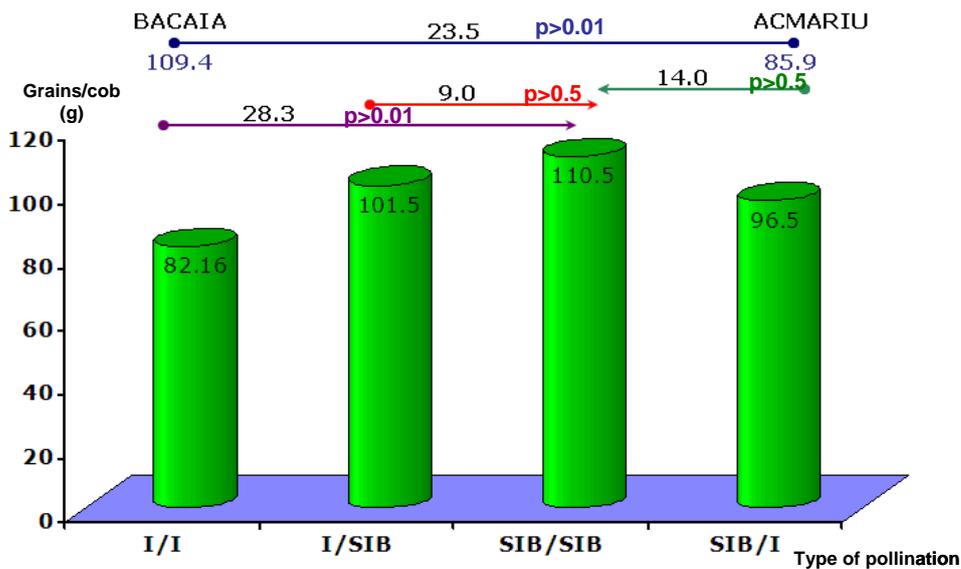


Fig. 2 Differences between land races centers of origin and type of field maintenance. I - inbreeding; SIB - Sister&Brother

### Variation in grain weight/cob among landraces originated in different agro-ecosystems and different types of pollination

The particular reaction of each group of landraces, originated in Bacaia and Acmarium are shown in Fig.3.

Comparison of self-pollination generation as maintainer and different types of pollination applied work in descendant population revealed particular response.

If the ascendant was an inbred generation (I/I or SIB) the plant reacted in different ways: different types of pollination

- the successive self-pollination (I/I) determined a severe inbreeding depression in Acmarium landraces. In comparison to Bacaia (I/I) the difference was high and significant (d = 44.9 g/cob);

- the Acmarium inbred descendants pollinated with a mixed pollen revealed a high recovery (d = 39.4 g/cob).

The average of grain/cob peculiarity in case of inbreeding followed by SIB pollination pointed out a specific behavior. The Bacaia landraces displayed a similar phenotypical expression as in I/I; the difference was small (d = 0.4 g/cob).

It seems that in *ex situ* conditions the gene activity can be changed and the typical effect of out-pollination is not "efficient enough" due to reaching a satisfactory level of homozygosity (Ladd and Palule, 1983).

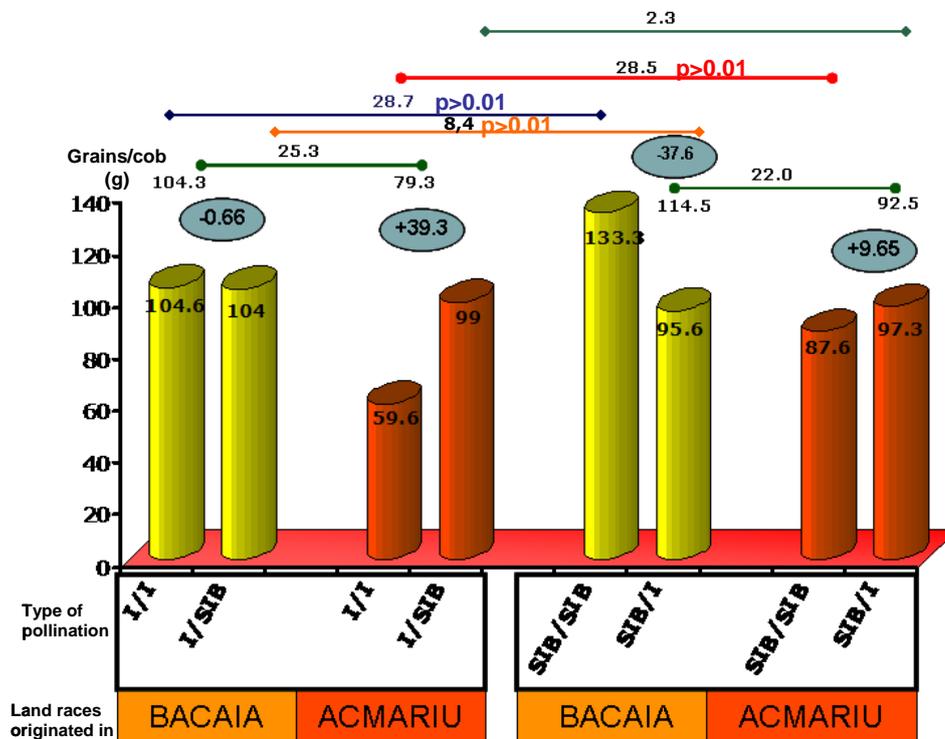
If the ascendant was a SIB generation (SIB/SIB or SIB/I) the Bacaia and Acmarium landraces plants reacted also differently. The difference between the two areas imprinted a particular evolution of gene pool.

If the SIB pollination was followed by a pollination with a mixed pollen the Bacaia landraces group pointed out the best behavior; an average of 133.33 g/cob. In the same type of pollination the Acmarium landraces revealed the lower yield of grains/cob (87.68 g/cob).

If SIB pollination was followed by self pollination the Bacaia grains/cob average was 95.66 g/cob differentiated significantly from successive mixed pollination. For same type of pollination the average of grain/cob yield was higher, well differentiated (d = 9.65 g/cob).

We presume that landraces build in Acmarium area require a successive different

pollination SIB and self breeding to maintain equilibrium between alleles. The Acmarium landraces pointed out a low homeostasy and the *ex situ* cultivation affected the plant fertility.



## CONCLUSIONS

The experimental results conducted to partial answers to our questions.

The best method to a normal balance between alleles in analyzed landraces is SIB, utilization of mixed pollen. But for Bacaia landraces group self breeding is also favorable.

The successive pollination SIB/SIB and inbreeding/inbreeding or inbreeding/SIB and SIB/inbreeding methods conducted to different expression of yield/cob trait.

In unfavorable conditions, inbreeding/inbreeding could be efficient for particular landraces like Bacaia landraces group but unfavorable for others as Acmarium group.

It is necessary to investigate more landraces, genotypes with particular allele architecture, to know and to apply the proper method to maintain their gene background.

## ACKNOWLEDGEMENTS

This work was supported by ANSTI Grant 11354/2001 - 2005, Identification, collection and *ex situ* evaluation of Metalliferous Mountain landraces (Gallia Butnaru Director).

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# ASPECTE PRIVIND RĂSPÂNDIREA PALTINULUI DE MUNTE ÎN ROMANIA

## ASPECTS CONCERNING THE SPREADING OF SYCAMORE MAPLE IN ROMANIA

*Hernea Cornelia, Adam I.*

**Keyword:** paltin de munte, areal

### **ABSTRACT**

*Paltinul de munte este una dintre speciile nobile, care cel mai adesea apare diseminat în arboretele din regiunea de dealuri și munte. Are un important rol silvicultural dar și economic datorită lemnului său extrem de valoros. Specia este răspândită pe aproape pe întreg teritoriul țării întâlnindu-se din regiunea de munte până la câmpie.*

*Analiza răspândirii paltinului de munte în fondul forestier natural ne arată faptul că specia se întâlnește mai ales pe soluri aparținând clasei cambisoluri urmate de cele aparținând clasei luvisoluri, celelalte clase de soluri sunt slab reprezentate.*

*Distribuția paltinului de munte pe etaje fitoclimatice pune în evidență răspândirea speciei din etajul subalpin până în câmpia forestieră, preponderent însă paltinul de munte apare în etajul montan de amestecuri.*

*Sycamore maple represent one of the noble species and it is often disseminated in stands found in hilly and mountain regions. He has an important forestry and economical role because their extremely valuable wood. The specie is widespread all over the country, from the mountain to the field lands.*

*Analysis of the Sycamore maple spread shows us that this specie is found mostly on the soil belongs to the cambisols class followed by the soils belongs to the luvisols class. Other classes of soils are poorly represented.*

*Distribution of Sycamore maple on the altitudinal plant belt put in evidence the presence of the specie from subalpine forest field to the plain lands. Mostly the Sycamore maple appears in mountain of mixed stands.*

### **INTRODUCTION**

Sycamore maple is a height tree which is in the first floor of vegetation and contributes to raising the stands amount because their extremely valuable wood, to strengthen the spruce stands and it is also a very good soil ameliorator.

### **MATERIALS AND METHODS**

In order to study the spreading of Sycamore maple in our country has been used database of national forest fund. Data processing is done for all Forest Administration taking into account the stands with Sycamore maple in their composition. The recorded areas were effective areas determined by multiplying the compartment areas, the percentage of specie participation in stand composition and crown density of the stand.

### **RESULTS AND DISCUSSIONS**

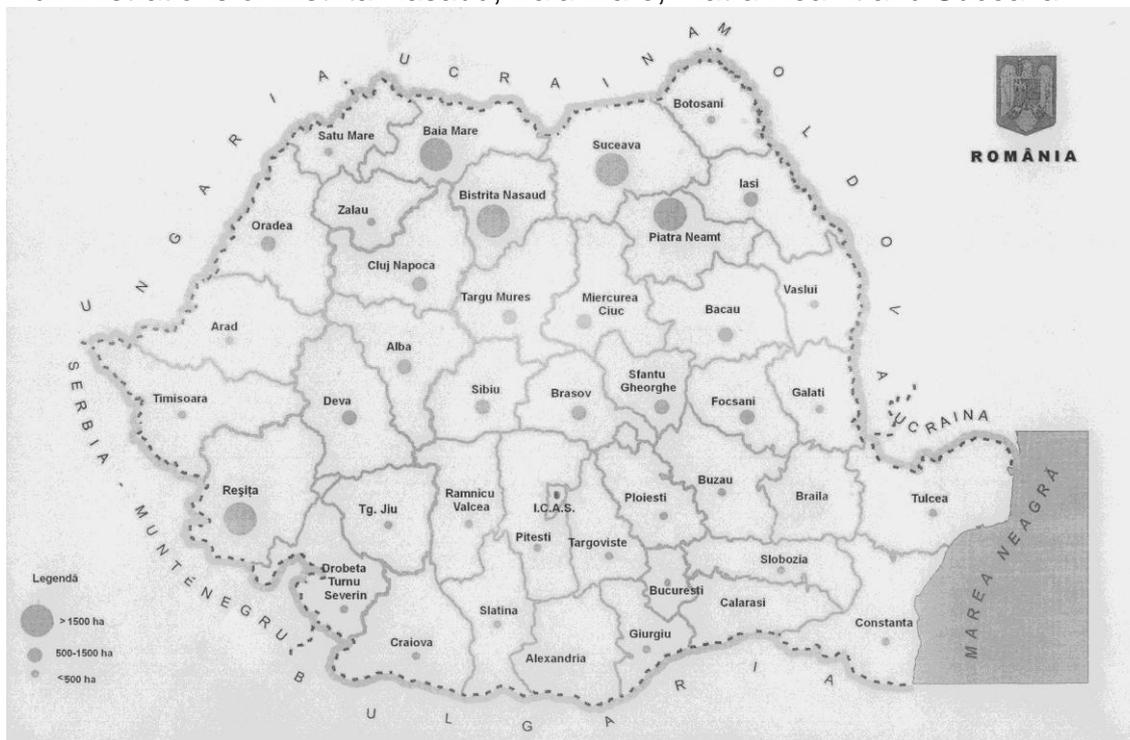
In our country the total area with Sycamore maple is 5482.0 ha. Because the quite large environmental magnitude of Sycamore maple, the specie is spreading in almost Forest Administration (F.A.) except the Forest Administration of Braila and Calarasi.

To have a picture of Sycamore maple spreading in Forest Administrations because the great difference between the area occupied with this specie (0.4ha F.A. Giurgiu and

3,329.1ha F.A. Suceava) there have been established following class sizes with the effective area occupied by Norway maple:

- effective areas < 500 ha;
- effective areas between 500 – 1,500 ha;
- effective areas > 1,500 ha;

As show in table 1 and figure 1 the highest area occupied by Sycamore maple is in Forest Administrations of Bistrita Nasaud, Baia Mare, Piatra Neamt and Suceava.



**Fig. 1 Distribution of Sycamore maple in terms of Forest Administration County and size classes of covered areas**

**Distribution of Sycamore maple in terms of Forest Administration County**

**Table 1**

F.A.	Area (ha)	F.A.	Area (ha)	F.A.	Area (ha)
Alba	879,6	Craiova	6,3	Reșița	2007,5
Alexandria	5,9	Deva	962,9	Satu Mare	112,0
Arad	356,2	Dr. Tr. Severin	367,8	Sf. Gheorghe	619,4
Bacău	1358,0	Focșani	1015,5	Sibiu	924,7
Baia Mare	2571,2	Galați	50,4	Slatina	1,3
Bistrița-Năsăud	2274,4	Giurgiu	0,4	Slobozia	2,6
Botoșani	345,4	Iași	786,1	Suceava	3329,1
Brăila	-	ICAS	295,2	Târgoviște	59,6
Brașov	1175,5	Miercurea Ciuc	547,1	Târgu Jiu	251,4
București	5,2	Oradea	858,8	Târgu Mureș	1211,5
Buzău	425,0	Piatra Neamt	2861,2	Timișoara	216,4
Călărași	-	Pitești	236,9	Tulcea	29,7
Cluj Napoca	639,8	Ploiești	201,5	Vaslui	375,3
Constanța	10,3	Rm. Vâlcea	495,1	Zalău	122,3
Total					27994,5

These are followed by others twelve Forest Administrations with a area between 500 and 1,500 ha. Without doubt that these repartition in classes in artificial, some of Forest Administration is found very close to one class for exemple Forest Administration Ramnicu Valcea – 495,1 ha and Forest Administration Miercurea Ciuc – 547,1 ha.

Analysis the actual area occupied by Sycamore ample shows that on nationally level this specie is found on 30 types of soils belonging an seven classes of soil (table 2).

**Distribution of stands with Sycamore maple in their composition on soil classes**

**Table 2**

No.	Class of soil	Actual area	
		(ha)	%
1.	Cernisols	696,9	3
2	Luvisols	5352,1	19
3	Cambisols	20719,6	74
4	Spodisols	669,0	2
5	Umbrisols	3,2	-
6	Andisols	58,4	-
7	Pelisols	495,0	2
Total		27994,5	100

In analysing the distribution of Sycamore maple in national forest fund, besides the distribution of soil classes, an important role it has the distribution of specie on the altitudinal pant belt (Table 3)

**Distribution of stands with Norway maple in their composition on altitudinal plant belt**

**Table 3**

Nr. crt.	Altitudinal plant belt		Surface (ha)	% participation
	Cod	Name		
1	FSa	Subalpin	15,2	-
2	FM <sub>3</sub>	Mountain of Norway spruce	999,5	4
3	FM <sub>2</sub>	Mountain of mixed stand	13098,3	47
4	FM <sub>1+</sub> FD <sub>4</sub>	Mountain-premountain of European beech stands	5063,8	18
5	FD <sub>3</sub>	Hilly stand with sessile oak stand, European beech stand, European beech- sessile oak mixed stand	6367,6	23
6	FD <sub>2</sub>	Hilly stand with Quercus sp. (sessile oak, Turkey oak, Hungarian oak and mixed stands) and hill mixed hardwood forest	1435,2	5
7	FD <sub>1</sub>	Hilly stand with common oak (and Turkey oak, Hungarian oak, sessile oak and mixed stand of them)	729,5	3
8	CF	Forest plane	147,9	-
9	Ss	Silvosteppe	137,5	-
Total			27994,5	100

Sycamore maple is spread from subalpine belt to forest plane. Obviously the spread of this specie in the two altitudinal belt is sporadically. Analysing the table 3 we can see that the specie is spread mainly in Mountain mixed stand belt where occupied 13,098,3ha represented 47% of total area occupied by specie. Sycamore maple occupied also a large area in Hilly stand with sessile oak stand, European beech stand, European beech- sessile oak mixed stand represented 23% of total area occupied by specie. On the third position we find Mountain-premountain of European beech stands wich reперesent 18% of total area.

A detailed analyse was made in Mountain of mixed stand (table 4).

**Distribution of stands with Sycamore maple in their composition in FM<sub>2</sub> altitudinal plants belt on types of forest site**

*Table 4*

Forest site	Area		Forest site	Area	
	Ha	%		Ha	Ha
3120	70,2	1	3332	5470,7	42
3121	0,7	-	3333	6457,3	49
3210	22,2	-	3334	0,6	-
3220	45,4	1	3510	29,0	-
3311	34,4	-	3610	10,8	-
3312	11,7	-	3640	29,4	-
3321	167,8	1	3650	0,3	-
3322	544,0	4	3720	0,4	-
3323	47,3	-	3730	8,7	-
3331	110,7	1	3740	36,7	1
			Total	13098,3	100

In Mountain of mixed stand altitudinal belt Sycamore maple is spread mainly in two types of forest sites: 3.3.3.2. Mountain of mixed stands, Bm, with *Asperula –Dentaria* (42%) and 3.3.3.3. – Mountain of mixed stands Bs, with *Asperula-Dentaria* (49%)

### CONCLUSIONS

Analysis the Sycamore maple spread in natural forest fund shows that the specie meets throughout the country except Forest Administration Brala and Calarasi.

As regards the distribution of types of soil, specie meets mainly on soil belonging to the class cambisols (74%) followed by the class luvisols (19%), other classes of soil are poorly represented.

The sycamore maple on the altitudinal plants belt put into evidence the spread of the species in the Mountain of mixed stand altitudinal plants belt. The species is found also in the subalpine altitudinal belt as forestry plain too.

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# CERCETĂRI AUXOLOGICE ASUPRA SPECIEI ROBINIA PSEUDOACACIA VAR. OLTENICA

## AUXOLOGICAL RESEARCH CONCERNING ROBINIA PSEUDOACACIA VAR. OLTENICA

*Hernea Cornelia, Netoiu C., Corneanu Mihaela*

**Keyword:** Robinia pseudoacacia, auxology, growing

### ABSTRACT

*Salcamul este o specie originara din America de Nord care la noi in tara si-a gasit o noua patrie pe nisipurile din Oltenia. In anul 1966 a fost identificat Robinia pseudoacacia var. Oltenica de catre ing. E. Barlanescu. Aceasta varietate se remarca prin cresteri mari si o productivitate a arboretelor superioara salcamului comun.*

*In vederea punerii in evidenta a cresterii speciei Robinia pseudoacacia var oltenica s-a recurs la analiza unui arbore mediu. In acest sens s-au efectuate masuratori pe runde extrase din 2 in 2 metri din fusul unui arbore si s-a construit profilul longitudinal al acestuia. Pe baza masuratorilor efectuate pe profilul longitudinal al arborelui s-au calculat, volumul arborelui la diferite varste si cresterile medii anuale, medii pe perioada precum si cele procentuale.*

*Cecetarile au pus in evidenta ritmul sustinut de crestere in primii 15 ani, in special in primii 5 ani.*

*Robinia pseudoacacia are native to North America. In our country it was introduced on the sands of Oltenia where the species found a new home. A variety of black locust was identified by engineer E. Barlanescu in 1966 and was called Robinia pseudoacacia var Oltenica. This variety is remarkable for their height growth and the stands productivity compare with common black locust.*

*In order to assist the growth of the species, an average tree was analyzed.*

*In this regard a lot of measurement was made on cross section for each two meters on the tree trunk and the longitudinal profile of the tree was built. Based on measurements made there have been calculated the volume of the tree for different ages, the mean annual increment, the mean periodic increment and percent increment.*

*The researches put in evidence a very sustainable rate of growth for the first 15 years, especially the first five ones.*

### INTRODUCTION

*Robinia pseudoacacia var. Oltenica was identified and reported in 1966 by engineer E. Barlanescu, in a population of southern Oltenia, the territory OS Calafat, point "Grindul cu bani."*

*Characteristic for the trees are very straight trunks, natural pruning, yellow wood. It is a species quickly increasing, especially in hot and dry areas of the country. Black locust is a species which is developing acceptably under conditions of degraded land, poor soil, superficial soil, eroded soil. The growth of this species is much lower than one on the fertile soil, but far exceeding other forest species, which can be used under conditions similar.*

### MATERIALS AND METHODS

*In order to recover the longitudinal profile of the tree, one tree was cut down and cross section was made for each 2m on the trunk tree. On this cross section annual rings*

were counting and diameter were measure for different ages, multiple of five years. Have been established tree height, tree top length, diameter at the base of the top tree, diameter at the base of the stump. It was determined cross-sectional areas, the volume and rate of steam form on the basis of relations:

$$\gamma = \frac{\pi}{4} d^2; \quad v_r = v_{cioata} + l * \sum \gamma_i + v_{virf}; \quad v_{cioata} = \gamma_{0.15} * 0.30; \quad v_{virf} = \frac{1}{3} g l'; \quad f_{1.3} = \frac{v_a}{w_{1.3}}$$

Where:

- d – diameter (cm);
- l – segment length (2m);
- $\gamma_{0.15}$  – area on the section from middle of the stump;
- hg – section area from the base of tree top;
- l' – tree top length;
- $v_a$  - tree volume;
- $w_{1,3}$  - cylinder volume. A cylinder with the same height and a common cross section at 1.30 m like a tree;
- $p_y$  - the percentage increment
- $y_{(t+n)}$  - the item value at the end of the period
- $y_t$  - the item value at the beginning of the period
- n - number of years for a period.

There has been calculated increment in basal diameter ( $d_{1.3}$ ), in the basal area ( $g_{1.3}$ ), height (h) and volume (v). The mean annual increment, the periodic increment and the mean periodic increment have been calculated for each item. The percentage increment in basal diameter ( $d_{1.3}$ ), in the basal area ( $g_{1.3}$ ), height (h) and volume (v) have been determined.

$$p_y = \frac{y_{(t+n)} - y_t}{y_{(t+n)} + y_t} * \frac{200}{n}$$

- $p_y$  - the percentage increment for the item;
- $y_{(t+n)}$  - the item value at the end of the period;
- $y_t$  - the item value at the beginning of the period;
- n - number of years for a period.

## RESULTS

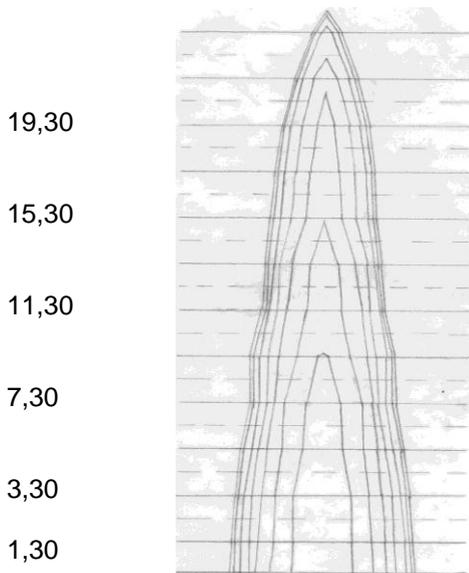
Following measurements made were set diameters for ages 5, 10, 15, 20, 25, 30 and 31 years (Table 1).

Based on measurements made has been reconstituted longitudinal profile of the tree for ages analyzed (Fig. 1) and established tree height, tree top length, the diameter of the top and the diameter of the middle height of stump (Table 2). These items are necessary to calculate the basal areas, volumes and coefficients of the form (Table 3).

**Diameters measured on cross section**

**Table 1**

Section		Rings no.	Average diameter at the age of .... years (cm)							
No.	height		31	30	25	20	15	10	5	
1	2	3	5	6	7	8	9	10	11	
1	1,30	30	24,79	24,17	22,23	19,90	17,59	13,32	8,46	
2	3,30	30	23,61	23,22	21,68	19,88	17,14	13,37	8,40	
3	5,30	29	22,05	21,29	19,44	17,40	15,07	11,18	5,88	
4	7,30	26	20,11	19,50	17,73	15,27	13,57	9,98	4,93	
5	9,30	26	19,52	19,16	17,17	15,07	12,35	7,42	1,30	
6	11,30	24	16,90	16,50	14,86	12,40	9,91	4,68		
7	13,30	24	16,57	16,22	14,31	12,11	9,23	4,10		
8	15,30	20	14,24	13,84	12,00	8,99	4,74			
9	17,30	19	13,59	13,21	11,35	8,03	3,92			
10	19,30	18	11,80	11,34	9,41	6,20	2,48			
11	21,30	15	8,53	8,14	6,13	3,05				
12	23,30	10	3,74	3,51	2,10					



Auxological research shows the dynamics of tree increment. It was found, so the first 15 years the increment in height and diameter are very active. After 15 years the increment is reduced very much (Table. 4) To highlight the increment rate were calculated the percentage increment for the items (Table 5). For all items taken in study the increment is high at ages of 10 and 15 years old and very height at the age of 5 years.

**Fig. 2 Tree longitudinal profile**

Items measured on longitudinal profile of the tree

Table 2

Item	Average diameter at the age of.... (cm)						
	31	30	25	20	15	10	5
Total height, m	24,20	24,10	23,60	22,20	20,70	15,10	9,50
Top tree length, m	1,90	1,80	1,30	1,90	0,40	0,80	1,20
Diameter from base of the top tree, cm	6,00	5,60	4,00	2,40	0,80	0,80	2,00
Diameter from half height of stump	25,60	24,80	22,80	20,80	18,20	13,80	9,00

Calculation of basal area, volume and coefficients of the form

Table 3

Cross section			Age...						
No.	Height (m)	Area (symbol)	31	30	25	20	15	10	5
Cross section area									
1	1,30	$\gamma_1$	482	459	388	311	243	139	56
2	3,30	$\gamma_2$	438	423	369	310	231	140	55
3	5,30	$\gamma_3$	382	356	297	238	178	98	27
4	7,30	$\gamma_4$	317	298	247	183	145	78	19
5	9,30	$\gamma_5$	299	288	231	178	120	43	
6	11,30	$\gamma_6$	224	214	173	121	77	17	
7	13,30	$\gamma_7$	216	207	161	115	67	13	
8	15,30	$\gamma_8$	159	150	113	63	18		
9	17,30	$\gamma_9$	145	137	101	51	12		
10	19,30	$\gamma_{10}$	109	101	70	30	5		
10	21,30	$\gamma_{11}$	57	52	29				
$\Sigma \gamma$			2828	2685	2179	1600	1096	528	157
Volume, dm <sup>3</sup>									
Trunk volume ( $\Sigma \gamma$ ) dm <sup>3</sup>			565,6	537,0	435,8	320,0	219,2	105,6	31,4
Stump volume (Vc) dm <sup>3</sup>			154,3	144,8	122,4	101,9	78,0	44,8	19,1
Tree top volume (Vf)			17,9	14,8	5,4	2,9	0,1	0,1	1,3
Tree Volume (Va)			737,8	696,6	563,7	424,8	297,3	150,6	51,7
Cylinder volume (W1,3) dm <sup>3</sup>			1166,4	1106,2	915,7	690,4	503,0	209,9	53,2
Coefficient of the form $f_{1,3} = V_a / W_{1,3}$			0,633	0,630	0,616	0,615	0,591	0,717	0,972

Calculation of increase at different ages

Table 4

e age of ...years	D				g				h				v				f			
	Diameter at 1,30 m ...	Increment (cm)			Basal area	Increment (cm <sup>2</sup> )			Tree height	Increment (m)			Tree volume (dm <sup>3</sup> )	Increment (dm <sup>3</sup> )			Coefficient of form	Coef. of forms variation		
		Mean annual	Periodic	Mean periodic		Mean annual	Periodic	Mean periodic		Mean annual	Periodic	Mean periodic		Volume	Period current	Period average		Volume	Period current	Period average
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
5	8,46	1,69	4,86	0,97	56,00	11,20	83,00	16,60	9,5	1,90	5,6	1,12	51,7	10,35	98,9	19,77	0,972	0,194	-0,255	-0,051
10	13,32	1,33	4,27	0,85	139,00	13,90	104,00	20,80	15,1	1,51	5,6	1,12	150,6	15,06	146,7	29,34	0,717	0,143	-0,126	-0,025
15	17,59	1,17			243,00	16,20			20,7	1,38			297,3	19,82						
20	19,90	1,00	2,33	0,47	311,00	15,55	77,00	15,40	22,2	1,11	1,4	0,28	424,8	21,24	138,9	27,78	0,615	0,123	0,001	0,000
25	22,23	0,89	1,94	0,39	388,00	15,52	71,00	14,20	23,6	0,94	0,5	0,10	563,7	22,55	132,9	26,59	0,616	0,123	0,014	0,003
30	24,17	0,81			459,00	15,30			24,1	0,80			696,6	23,22						
31	24,79	0,80			482,00	15,55	23,00	23,00	24,2	0,78	0,1	0,78	737,8	23,80			0,633	0,127		

## The percentage increment calculation

*Table 5*

e	Diameter		Basal area		Height		Volume	
Age .... Years	d <sub>1,3</sub> (cm)	increment % p <sub>id</sub>	g <sub>1,4</sub> (cm <sup>2</sup> )	increment % p <sub>ig</sub>	h (m)	increment % p <sub>ih</sub>	v (dm <sup>3</sup> )	increment % p <sub>iv</sub>
1	2	3	4	5	6	7	8	9
5	8,46	40,00	56,00	40,00	9,5	40,00	51,7	40,00
10	13,32	8,93	139,00	17,03	15,1	9,11	150,6	19,54
15	17,59	5,53	243,00	10,89	20,7	6,26	297,3	13,1
20	19,90	2,46	311,00	4,91	22,2	1,4	424,8	7,06
25	22,23	2,21	388,00	4,41	23,6	1,22	563,7	5,62
30	24,17	1,67	459,00	3,35	24,1	0,42	696,6	4,22
31	24,79	0,51	482,00	0,98	24,2	0,08	737,8	1,15

## CONCLUSIONS

The longitudinal tree profile analyzes and the calculation of the basal areas, volume and increment of various items (periodic and mean periodic increment, mean annual increment and percentage increment) put in evidence the increment for the first 10-15 years. At this age of 15 years old the tree has reached the height of 20.7 m, for the next 15 years the increment in height was only 4.5 m. A similar situation is registered in the case of diameter, at the age of 15 years tree has reached the diameter of 17.59 cm and d at the age of 31 years the diameter was 24.79 cm. The increment of the tree was put in evidence better by percentage increment. There has been put in evidence the very active increment in the first 5 years of life followed by a sustained increment in the next 10 years. In the last period the increment was diminished greatly.

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# CONDIȚIILE CLIMATICE ȘI PRODUCȚIA DE ARAHIDE

## AGROMETEOROLOGY AND GROUNDNUT PRODUCTION

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Cuv. cheie: condiții climatice, producție, arahide  
Key words: agrometeorology, production, groundnut

### ABSTRACT

*Prezenta cercetare este mai mult o lucrare de documentare legată de influența condițiilor climatice asupra formării producției de arahide. Se cunoaște faptul că arahidele sunt plante tropicale care solicită o perioadă lungă de căldură, dar și suficientă umiditate, atât în sol, cât și atmosferică.*

*Precipitațiile reprezintă cel mai important factor climatic, care afectează producția de arahide, aproximativ 70% din recoltă se obține în zonele tropicale semi-aride unde cantitatea de precipitații este foarte mică. Cantitățile mici de precipitații și perioadele lungi de secetă din timpul perioadei de creștere au fost și sunt încă principalul motiv pentru care se obțin producții medii reduse în majoritatea regiunilor. Seceta persistentă și precipitațiile insuficiente reprezintă cele mai mari obstacole pentru producția de arahide.*

*Producția de arahide este semnificativ influențată de precipitațiile căzute în perioada iulie-septembrie.*

*În România, producția de arahide s-a dovedit a fi vulnerabilă de la un an la altul datorită variației inter-aniuale a precipitațiilor căzute. Cercetările efectuate la S.D. Tâmburești au stabilit că variațiile înregistrate în producția de arahide se datorează variației largi a cantităților de precipitații căzute în perioada de creștere. S-a observat că precipitațiile lunare mai mari de 50 cm permit obținerea unei producții rezonabile în această regiune.*

*The present research is more like a documentary paper linked to the influence of climatic conditions on groundnut production formation. It is known the fact that groundnuts are tropical plants and requires a long period of heat and also enough humidity, both in the soil and atmospherically.*

*Rainfall is the most significant climatic factor affecting groundnut production, as 70% of the crop area is under semi-arid tropics characterized by low and erratic rainfall. Low rainfall and prolonged dry spells during the crop growth period were reported to be main reasons for low average yields in most of the regions. Persistent droughts and insufficient rainfall represent one of the greatest constraints on groundnut crop.*

*Groundnut production is significantly determined by rainfall during July to September.*

*In Romania groundnut yields were reported to be vulnerable from year to year because of large inter-annual variation in rainfall. Further experience made to Tamburesti Research Station established that the variation in groundnut yield arises to a large extent from the variation in the total rainfall during the growing season. It was observed that seasonal rainfall up to 50 cm is required to sustain a successful groundnut crop in this region.*

### INTRODUCTION

#### **I. Importance of the crop in various climates. General.**

Groundnut (*Arachis hypogaea* L.) is an annual legume which is also known as peanut, earthnut, monkeynut and goobers. It is the 13th most important food crop and 4th most important oilseed crop of the world. Groundnut seeds (kernels) contain 40-50% fat,

20-50 % protein and 10-20 % carbohydrate. Groundnut seeds are a nutritional source of vitamin E, niacin, folic acid, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine and potassium. Groundnut kernels are consumed directly as raw, roasted or boiled kernels or oil extracted from the kernel is used as culinary oil). It is also used as animal feed (oil pressings, seeds, green material and straw) and industrial raw material (oil cakes and fertilizer). These multiple uses of groundnut plant make it an excellent cash crop for domestic markets as well as for foreign trade in several developing and developed countries.

Cultivated groundnut originates from South America (Weiss 2000). It is one of the most popular and universal crops cultivated in more than 100 countries in six continents (Nwokolo 1996). It is grown in 25.2 million hectares with a total production of 35.9 million metric tons (FAO, 2006). Major groundnut growing countries are India (26%), China (19%) and Nigeria (11%). Its cultivation is mostly confined to the tropical countries ranging from 40° N to 40° S. Major groundnut producing countries are: China (40.1%), India (16.4%), Nigeria (8.2%), U.S.A (5.9%) and Indonesia (4.1%).

## **MATERIALS AND METHODS**

Being a documentary research, present paper presents the obtained results of other researchers and the data of our own research upon ten groundnut varieties cultivated to Tamburesti R.S.

The experimented varieties were both Romanian and foreign.

## **RESEARCHES RESULTS**

### **II. Agroclimatology of the crop**

Groundnut is essentially a tropical plant and requires a long and warm growing season. The favorable climate for groundnut is a well-distributed rainfall of at least 500 mm during the crop-growing season, and with abundance of sunshine and relatively warm temperature. Temperature in the range of 25 to 30°C is optimum for plant development (Weiss 2000).

Once established, groundnut is drought tolerant, and to some extent it also tolerates flooding. A rainfall of 500 to 1000 mm will allow commercial production, although crop can be produced on as little as 300 to 400 mm of rainfall. Groundnut thrives best in well-drained sandy loam soils, as light soil helps in easy penetration of pegs and their development and their harvesting. The productivity of groundnut is higher in soils with pH between 6.0-6.5.

#### **II. 1. Rainfall or soil moisture**

Rainfall is the most significant climatic factor affecting groundnut production, as 70% of the crop area is under semi-arid tropics characterized by low and erratic rainfall. Low rainfall and prolonged dry spells during the crop growth period were reported to be main reasons for low average yields in most of the regions. Persistent droughts and insufficient rainfall represent one of the greatest constraints on groundnut crop.

Groundnut production is significantly determined by rainfall during July to September.

In Romania groundnut yields were reported to be vulnerable from year to year because of large inter-annual variation in rainfall. Further experience made to Tamburesti Research Station established that the variation in groundnut yield arises to a large extent from the variation in the total rainfall during the growing season. It was observed that seasonal rainfall up to 50 cm is required to sustain a successful groundnut crop in this region.

Moisture use of 350-380 mm was found to be optimum for getting maximum yield and moisture use either less than or more than this amount reduced pod yield. However, it

was showed poor relationship between groundnut yield and seasonal rainfall, highlighting the higher importance of rainfall distribution to groundnut yield than the quantum of rainfall. The importance of rainfall distribution to groundnut yield is well appreciated, but experimental evidence is poorly documented.

Results from a series of experiments showed that early stress or lack of rainfall/soil moisture during 29-57 days after sowing (DAS) did not influence pod yield significantly, where as pod yields were increased by 150 kg/ha/cm of water applied during seed filling stage (93-113 DAS). Pod yield of groundnut and rainfall received during pod formation to maturity were positively correlated in a rainfed crop grown at Tamburesti R.S. in sandy soils.

## **II. 2. Growth stages and water use**

The growth stages of groundnut were described and defined by Boote (1982). This widely adopted system describes a series of vegetative (V) and reproductive(R) stages. The total water use by a groundnut crop is controlled by climatic conditions besides agronomic and varietal factors (table 1).

The water requirement of the crop ranged from 500 to 700 mm for the total growing period. The growing period of the crop is divided into five stages. The stages, their duration and crop coefficients of individual stages are presented in table 2. The data from table show that mid season stage (pod formation and filling) requires higher water as indicated by the high crop coefficient value. In a field experiment on a sandy soil, a bunch variety in two summer seasons in Tamburesti R.S, water use recorded for three treatments with applied irrigation of 0.9, 0.7 and 0.5 of cumulative pan evaporation were 434, 391 and 356 mm, respectively (Bandopadhyay et al.2005). Maximum average Kc value of 1.19 occurred around 9 weeks after sowing in the same experiment.

## **II. 3. Temperature**

Temperature was identified as a dominant factor for controlling the rate of development of groundnut (Cox 1979). Every crop has its cardinal temperatures (i) base (T<sub>b</sub>);, (ii) optimum (T<sub>o</sub>) and (iii) maximum temperatures (T<sub>m</sub>). These are defined respectively as: (i) temperatures above which growth and development begins, (ii) temperatures at which growth and development are maximum, and (iii) temperatures above which growth and development ceases. It were reported cardinal temperatures for seed germination in 14 contrasting genotypes of groundnut, which are shown in table 3. These values showed that T<sub>b</sub> is not varying much across genotypes (ranges from 8-11.5°C), whereas optimum temperatures (29-36.5°C) and maximum temperatures (41-47°C) are varying much. Base temperature was reported to be highest during reproductive phase (3-10°C higher) than during vegetative phase.

Optimum temperatures for different growth and developmental processes of the crop are presented in table 4. Optimum temperatures for different processes ranged between 23 to 30°C. Optimum temperatures for germination and leaf appearance was observed to be higher than for other processes. From the experience made to the present it was reported that the optimum temperature for vegetative growth of groundnut plants were in the range of 25-30°C while optimum temperatures for reproductive growth lower (20-25°C).

The duration of the crop is very much influenced by temperature. Not only the duration of crop, but also the growth and yield traits, were influenced by temperature. As groundnut pods are developed under the soil it is important to understand the influence of soil temperature. Prasad et al. (2000) reported that exposure to high air and or high soil temperature (38/22°C) significantly reduced total dry matter production, partitioning of dry matter to pods and pod yields in two cultivars. High air temperature had no significant effect on total flower production but significantly reduced the proportion of flowers setting pegs (fruit-set) and in contrast high soil temperature significantly reduced flower production, production of pegs forming pods and 100 seed weight. Furthermore, the

effects of high air and soil temperatures were mostly additive. Higher temperature, promoted greater vegetative growth and higher photosynthesis in 3 genotypes of groundnut, but the reproductive growth was decreased, due to greater flower abortion and decreasing seed size (Talwar et al. 1999; Prasad et al., 2003).

The interactive effects of temperature and other environmental factors are less understood and need further attention.

Temperature (expressed as degree day) and rainfall during the reproductive period positively influenced the pod yield and together they explained 86% of yield variation (AICRPAM, 1997). Temperature and light intensity affected flower numbers of groundnut varieties and these changes were also well correlated with growth related changes in leaf number and pod dry weight (Bagnall and King, 1991). In crop models, the optimum temperature for canopy photosynthesis was between 24-34°C (daytime mean temperature) with linear reductions below 24°C down to 5° 0C and with linear reductions above 34°C up to 45°C (Boote et al.,1986).

**Table 1**

**Summary of reported values of total water use (mm) of groundnut**

Reference	Total water use (mm)	Remarks
Ali et al. (1974)	530	Irrigated at 60% water depletion
Angus et al. (1983)	250	Rainfed
Charoy et al. (1974)	510	Rainfed
Cheema et al. (1974)	337 597	Rainfed
Kadam at al. (1975)	342	Irrigated at 40% water depletion
Kassam et al. (1975)	438	Rainfed
Reddy et al. (1980)	560	Rainfed
Reddy et al. (1978)	417	Irrigated
Reddy et Reddy (1977)	505	Irrigated at 25%water depletion
Keese et al. (1975)	500-700	Irrigated at 50%water depletion
Samples (1981)	450-600	Irrigated at 50%water depletion
Nageswara Rao et al. (1985)	807-831	Irrigated at 7-10 day interval

(Source: Sinakumer and Sharma, 1986)

**Table 2**

**Stage wise crop coefficients (Kc ) in groundnut**

Crop stage	Duration (days)	Crop coefficients
1. Initial stage	15-35	0.4-0.5
2. Development stage	30-45	0.7-0.8
3. Mid season stage	30-50	0.95-1.1
4. Late season stage	20-30	0.7-0.8
5. Harvest stage	-	0.55-0.6

**Table 3**

**Base (T<sub>b</sub>), optimum (T<sub>o</sub>) and maximum (T<sub>m</sub>) temperatures of 10 groundnut cultivars for seed germination**

Cultivars	T <sub>b</sub>	T <sub>o</sub>	T <sub>m</sub>
Tamburesti	10	36.5	42
Venus	10.5	34	44
Solar	11.5	29	41
T242 line	9	29	39
T25 line	8-11.5	29-36.5	41-47
Jelud	11	29	42
Black Brazilian	11	35.5	37
Jumbo-Virginia	11	34	45
Spanish 9184	8.5	29	42
Velican	12	36.5	46

**Table 4****Optimum temperature for vegetative and reproductive growth and development of groundnut**

Trait	Optimum temperature(°C)	Reference
Seed germination	28-30	Mohamed et al., 1988
Seedling growth	28	Leong and Ong, 1983
Leaf appearance and leaf area development	28-30	Fortanier, 1957; Cox, 1979
Branching and stem growth	28	Leong and Ong, 1983; Ketring, 1984
Flower production	25-28	Leong and Ong, 1983
Pollen production	23	Fortanier, 1957; Wood, 1968; Cox, 1979
Pollen viability	23	Prasad et al., 1999, 2000; Kakani et al., 2002
Peg viability	23	Prasad et al., 1999
Pod formation, pod growth and seed yield	23-26	Williams et al., 1975; Cox, 1979; Dryer et al., 1981; Prasad, 1999; Prasad et al., 2003
Root growth	23-25	Ahring et al., 1999; Prasad et al., 2000
Harvest index	23-27	Prasad et al., 1999; Craufurd et al., 2002; Prasad et al., 2003
Nitrogen fixation	25	Nambiar and Dart, 1983

Source: Leong and Ong 1983

#### II. 4. Photoperiod or day length

Early studies in controlled environments showed that phenology of groundnut is not affected by day length (Fortanier, 1975). However, later studies showed that pod yield is significantly influenced by day length (Ketring, 1979; Witzemberger et al., 1988). It is now well established that long days promote vegetative growth at the expense of reproductive growth and increased crop growth rate, decreased partitioning of photosynthesis to pods and decreased duration of effective pod filling phase (Ketring 1979, Witzemberger et al., 1988; Nigam et al., 1994 and 1998).

Some contradictory results on the influence of day length on the duration of reproductive growth were reported. While Sengupta et al., 1977 found that a day length shorter or longer than 10 h delayed flowering, Ketring (1979) did not observe any effect of day length (8,12,16h) on flower initiation. The contrasting results might have been obtained due to cultivars differences, which are known to vary in response to photoperiod.

In a study of Bagnall and King (1991), flower, peg and pod numbers were consistently enhanced by short day treatments for a range of groundnut varieties.

Flower and peg number at 60-70 days from emergence were approximately doubled by 12-h days exposure compared with plants in 16-h days. Pod number and therefore yield was more influenced by photoperiod than was flower or peg formation. Bell et al. (1991) while studying the effects of photoperiod on reproductive development of groundnut in a cool subtropical environment observed that number of pegs, pods and total pod weight per plant were reduced in long (16 or 17h) photoperiods, but no effect of photoperiod was evident on time to first flower. It was further observed that the photoperiod responses were more significant in the environments where daily accumulations greater than 34-35° C were observed. Nigam et al., (1994) studied the effect of temperature and photoperiod and their interaction on plant growth as well as partitioning of dry matter to pods in three selected groundnut genotypes grown in growth chambers. It was observed that photoperiod did not significantly affect partitioning of dry matter to pods under low temperature regime (18/22°C) but at higher temperatures (26/30°C) partitioning to pods was significantly greater under short days (9 h) and this study provided evidence of genotypic variability for photoperiod temperature interactions. In a field study on the effect of photoperiod on seed quality (Dwivedi et al., 2000), shelling percentage and palmitic acid increased under short day (8 h) treatment compared to

normal day (12 h) treatment while oil content, oleic and linolenic fatty acids and their ratio were unaffected.

## CONCLUSIONS

1. Groundnut thrives best in well-drained sandy loam soils, as light soil helps in easy penetration of pegs and their development and their harvesting.

2. Moisture use of 350-380 mm was found to be optimum for getting maximum yield and moisture use either less than or more than this amount reduced pod yield.

3. The duration of the crop and also the growth and yield traits, is very much influenced by temperature. As groundnut pods are developed under the soil it is important to understand the influence of soil temperature.

4. Temperature and light intensity affected flower numbers of groundnut varieties and these changes were also well correlated with growth related changes in leaf number and pod dry weight.

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**Foto. 1. A growing plant with pods formation and seeds (Tamburesti variety)**

# CONȚINUTUL DE AMINOACIZI LA UNELE GENOTIPURI DE ARAHIDE

## AMINOACIDS CONTENT TO SOME GROUNDNUTS GENOTYPES

*Paula Iancu, Soare, M., Elena Bonciu*

**Cuv. cheie:** aminoacizi, arahide

**Key words:** amino acids, groundnuts

### ABSTRACT

Lucrarea de față prezintă conținutul de aminoacizi la opt genotipuri de arahide cultivate pe solul nisipos din sudul Olteniei.

Genotipurile studiate au prezentat valori diferite. Unele genotipuri au înregistrat valori mai ridicate ale conținutului în aminoacizi esențiali și neesențiali, iar altele valori mai reduse ale acestora, comparativ cu martorul experienței, media soiurilor.

Conținutul de aminoacizi a variat deci, în funcție de genotip. Conținutul total de aminoacizi cel mai ridicat este înregistrat la soiul Braziliene negre (26,219 g/100g s.u.), iar raportul dintre aminoacizii esențiali și cei neesențiali a prezentat valori mai ridicate la soiul Jumbo-Virginia (44,84%), comparativ cu martorul experienței (41,76%).

Dintre aminoacizii esențiali, lizina și metionina prezintă importanță deosebită, aceștia înregistrând valori mai ridicate la toate genotipurile experimentate, comparativ cu martorul experienței.

Present paper present the amino acids content to eight groundnut genotypes cultivated on the sandy soils from southern Oltenia.

The experimented genotypes presented different values. Some genotypes registered increased values of the amino acids (essential and non-essential) and others registered decreased values, comparative with the experience control, varieties average.

The amino acids content varied with genotype. The most increased values of the total amino acids registered Black Brazilian variety (26.219 g/100g d.m.) and the report between essential and non-essential amino acids presented higher values to Jumbo-Virginia variety (44.84%), comparative with the experience control (41.76%).

Among the essential amino acids, lysine and metionine presents great importance, these amino acids registering increased values to all experimented genotypes comparative with the experience control.

### INTRODUCTION

Groundnut (*Arachis hypogaea L.*) is an important oilseed crop and commonly called as poor man's nut. Groundnut kernels contain 42 per cent to 50 per cent oil, 26 per cent protein, 18 per cent carbohydrates and also rich source of riboflavin, thiamine, nicotinic acid and vitamin E. Groundnuts for edible purpose require considerable processing and sorting to ensure high quality. However, there are certain advantageous conditions for which there exists a very good potential for export of agricultural products. Vast land resources, diversified climatic and soil conditions, good experience in farming are factors for boosting agricultural export (Nasurudeen, P. and V. Balakrishnan, 1996).

India is the largest producer of groundnut. Less than 2 per cent of the groundnut crop is traded internationally with export sales averaging close to US \$ 1 billion dollars per year. There is, therefore, scope for export growth in groundnuts (Narasimhan, 1999). The use of edible groundnut kernels is generally referred as confectionery groundnut, export quality groundnut, large/bold seeded groundnut and Hand Picked Selection (HPS)

groundnut. In confectionery groundnut, quality is considered to be more important than the yield. The European Union and other countries have enforced stringent standards for kernels of large, uniform in shape and size, bright dark tan or light rose colour, high protein content, low oil and high oleic/linoleic acid (O/L) ratio with free aflatoxin, and this has had a significant effect on the export of groundnut. The export of agricultural commodities earns not only foreign exchange but provides the much needed competitiveness in production, productivity and quality when compare to its potential of competitive countries in the global market. Agricultural export will help to realize economics of scale, which benefits the domestic consumer also. Most of the edible groundnuts are not cultivated for export purposes. In other words, producers do not usually grow the groundnut varieties best adapted to specific export market. Confectionery groundnut with premium edible grade has great demand all over the world.

There is growing demand for protein throughout the developing world. Groundnuts are good sources of proteins and have high-energy value (average 564 calories/100 g seed), thus in the developing countries groundnut is very important crop to meet the demand of oil and protein in daily diet. Groundnut germplasm collection at ICRISAT demonstrated protein content ranges between 15 to 34 percent depending upon the cultivar, location and year. The genetic variability in the mechanism of protein synthesis during development of seed suggests that there is potential for the development of groundnut cultivars possessing nutritionally desirable proteins by manipulating protein synthesis.

## **MATERIALS AND METHODS**

For the study it was used eight groundnuts genotypes (six varieties and two lines): Tamburesti, Venus, Solar, Spanish 9184, Jumbo-Virginia and Black Brazilian varieties and T242 and T25 lines.

The sow was made in the field on a sandy soil, low fertile (0.5% humus). At the rising up it were made determinations concerning the plant survival dynamic and at harvest the variability of yield elements and the analysis of chemical composition.

The structure and the amino acid content were determined from acid hydrolyzed with automatic amino acid analyser Microtechiva T339 type.

All the extraction runs and analysis were carried out in triplicate and randomized order with the mean values being reported. Multiple comparisons of the various means were carried out by least significant difference (LSD) test.

## **RESEARCH RESULTS**

The essential amino acids are: valine, methionine, isoleucine, leucine, threonine phenylalanine, histidine, lysine and arginine.

Among these, arginine presents the highest values to all genotypes, being followed by phenylalanine and valine.

Metionine and lysine are the most important amino acids. Methionine registered close values, between 262 mg/100g d.m. (Tamburesti variety, control) and 311 mg/100g d.m. (Jumbo-Virginia variety).

The non-essential amino acids are: asparagine, tyrosine, serine glucine, praline cysteine, glycine and alanine.

Groundnuts present a higher percent of non-essential amino acids.

To the experimented genotypes the report between AA and AAE presented a relative variability, between 41.76% to Tamburesti variety (control) and 44.84 to Jumbo-Virginia variety.

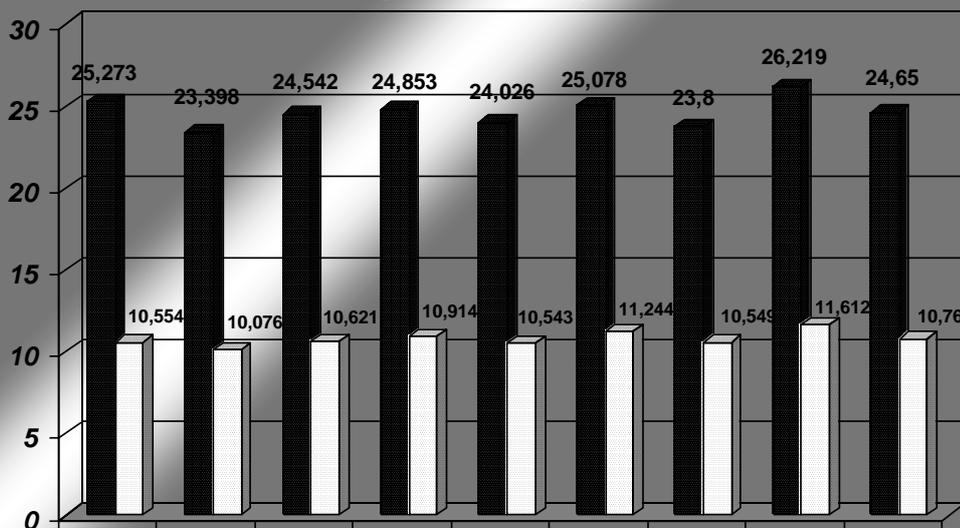
Table 1

## The amino acids content to some groundnut genotypes (mg/100g)

AMINO ACID	VARIETY								Average (Ct.)
	Tamburesti	Venus	Solar	T242	Spanish 9184	Jumbo-Virginia	T25	Black Brazilian	
Asp	3028	2888	3175	3054	2832	3116	3001	3314	3051
Tyr	1120	1169	1075	1182	1073	1087	1064	1241	1126
Ser	1041	1011	1089	1165	1003	1123	1088	1165	1085
Glu	5419	4366	4577	4405	4329	4688	4433	4790	4625
Pro	1242	1203	1108	1306	1267	1152	1095	1239	1201
Cys	329	315	298	330	324	299	284	321	312,5
Gli	1525	1347	1456	1509	1563	1403	1397	1563	1470
Ala	1015	1023	1143	988	1092	966	889	974	1010
<b>Val*</b>	<b>1143</b>	<b>1120</b>	<b>1089</b>	<b>1086</b>	<b>1105</b>	<b>1183</b>	<b>1121</b>	<b>1247</b>	<b>1136</b>
<b>Met*</b>	<b>262</b>	<b>269</b>	<b>295</b>	<b>278</b>	<b>274</b>	<b>311</b>	<b>292</b>	<b>281</b>	<b>282,7</b>
<b>Iso*</b>	<b>862</b>	<b>824</b>	<b>907</b>	<b>941</b>	<b>823</b>	<b>902</b>	<b>893</b>	<b>978</b>	<b>891,2</b>
<b>Leu*</b>	<b>1685</b>	<b>1572</b>	<b>1493</b>	<b>1558</b>	<b>1652</b>	<b>1621</b>	<b>1497</b>	<b>1642</b>	<b>1590</b>
<b>Tre*</b>	<b>734</b>	<b>736</b>	<b>787</b>	<b>802</b>	<b>795</b>	<b>862</b>	<b>807</b>	<b>902</b>	<b>803,1</b>
<b>Phe*</b>	<b>1316</b>	<b>1301</b>	<b>1369</b>	<b>1421</b>	<b>1294</b>	<b>1436</b>	<b>1325</b>	<b>1498</b>	<b>1370</b>
<b>His*</b>	<b>623</b>	<b>674</b>	<b>703</b>	<b>725</b>	<b>601</b>	<b>733</b>	<b>729</b>	<b>887</b>	<b>709,4</b>
<b>Lys*</b>	<b>927</b>	<b>1034</b>	<b>904</b>	<b>987</b>	<b>1114</b>	<b>1024</b>	<b>933</b>	<b>956</b>	<b>984,8</b>
<b>Arg*</b>	<b>3002</b>	<b>2546</b>	<b>3074</b>	<b>3116</b>	<b>2885</b>	<b>3172</b>	<b>2952</b>	<b>3221</b>	<b>2996</b>
T AA,g	25,273	23,398	24,542	24,853	24,026	25,078	23,800	26,219	24,65
<b>TAAE*,g</b>	<b>10,554</b>	<b>10,076</b>	<b>10,621</b>	<b>10,914</b>	<b>10,543</b>	<b>11,244</b>	<b>10,549</b>	<b>11,612</b>	<b>10,76</b>
AA/AAE%	41,76	43,06	43,28	43,91	43,88	44,84	44,32	44,29	43,67
Glu/AA,%	21,44	18,66	18,65	17,72	18,02	18,69	18,63	18,27	18,76
LYS/AA,%	3,67	4,42	3,68	3,97	4,64	4,08	3,92	3,65	4,00

TAA and TAAE are expressed in g/100g D.M.

**TAA and TAAE report to some groundnut genotypes  
(average 2005-2007)**



■ TAA,g	25,273	23,398	24,542	24,853	24,026	25,078	23,8	26,219	24,65
□ TAAE*,g	10,554	10,076	10,621	10,914	10,543	11,244	10,549	11,612	10,76

## CONCLUSIONS

1. The contents of amino acids in groundnut seed vary according to type of groundnut, cultivar, location, year and length of maturation period of seed. With advancing the maturity of groundnut seed, amount of free amino acids decreases, while protein content increases.

2. The limiting amino acids in groundnut are lysine and methionine, but there are reports, which indicate that lysine, methionine and threonine are equally limiting.

3. Proteins are large complex organic compounds which perform an essential role in the structure and functioning of organisms. The amino acid composition of proteins from different sources varies widely.

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# MECHANICAL MEANS OF RODENTS CONTROL

## MIJLOACE MECANICE DE COMBATERE A ROZĂTOARELOR

*Ioana Marius, Frăsin Loredana Beatrice*

**Keyword:** rodents, mechanical means, adjustable snap traps, glue traps, wired live traps, water traps.

**Cuvinte cheie:** rozătoare, mijloace mecanice, capcane cu arc, capcane adezive, curse de sârmă, curse cu apă.

### ABSTRACT

*Mechanical means are used in the maternity areas of dairy farms, in alimentary products industry, in kitchens, restaurants, hospitals, zoological gardens and other areas where toxic baits cannot be used.*

*The advantages of this kind of control means are the following: it is allowed an evaluation of removed rodent number, it disappears the decomposition problem of the rodent bodies in inaccessible places, it is not dangerous both for man and other animals, it is not possible that other animals feed from the poisoned bodies.*

*Mechanical means are also used to capture some individuals and to establish the present rodent species, the sex-age ratio for to assess the prognosis and to organise the control.*

*Mijloacele mecanice se folosesc în maternitățile din cadrul fermelor zootehnice, fabrici de produse alimentare, bucătării, restaurante, spitale, grădini zoologice și alte zone în care utilizarea momelilor toxice nu este indicată.*

*Avantajele acestui tip de mijloace de combatere sunt următoarele: permit o evaluare a numărului de rozătoare îndepărtate; nu apare problema descompunerii cadavrelor de șobolani în locuri inaccesibile; nu prezintă pericol nici pentru om și nici pentru animale; nu este posibil ca alte animale să se hrănească din cadavrele otrăvite.*

*Mijloacele mecanice sunt utilizate de asemenea pentru capturarea unor exemplare și stabilirea speciilor de rozătoare prezente și a raportului dintre sexe și vârste, în vederea stabilirii prognozei și organizării combaterii.*

### INTRODUCTION

Fight against rodents is difficult, because it assume knowledges about the species that is to be eradicated, about its way of life and feeding and for a successful control it is recommended to use simultaneously as many methods as possible.

The means of rodent control can be systematised in: mechanical means, biological means, electrical means and chemical means.

Mechanical means are used in maternity areas of dairy farms, in alimentary products industry, in kitchens, restaurants, hospitals, zoological gardens and other areas where toxic baits cannot be used.

The advantages of these control means are the following:

- they allow an evaluation of removed rodent number;
- it disappears the decomposition problem of the rodent bodies in inaccessible places;
- they are not dangerous both for man and other animals;
- it is not possible that other animals feed from the poisoned bodies;

- they can be used simultaneously with the chemical control means.

The main problem of these traps is that rats usually suffer of neophobia (fear of new things and events), just a small part of them being captured in this way.

The main mechanical means of rodent control are:

- adjustable snap traps
- glue traps
- wired live traps
- water traps

Mechanical means are also used to capture some live individuals for to establish the present rodent species, the sex-age ratio for to assess the prognosis and to organise the control.

### **Adjustable snap traps**

They were invented in 1895 by John Mast from Lancaster, Pennsylvania, U.S.A. The classical model has been improved in time to ensure a longer life, a greater efficiency and maximum safety in use. They can be used for both mice and rats.

Their advantages are the following:

- they are cheap, easy to install and to manipulate;
- there is no danger of unpleasant odours from the hidden rodent bodies in inaccessible places (as it could happen when toxic baits are used).

The disadvantage of the adjustable snap traps is that they capture only one single rodent at a time. This is the reason for they had to be checked often. More recently there were designed multiple adjustable snap traps which have the advantage of capturing more than one rodent, enlarging the period of checking. These traps are installed in boxes with two entrances set in locations that interrupt normal rodent pathways.

Adjustable snap traps are preferred instead of toxic baits in places with low degree of infestation.

The classical model has a part of wood or plastic, as a support, which sustain a metal part formed by a spring, a trigger and a bait support.

These traps are set along walls, on rodent pathways, perpendicular on wall and with the active part close to the wall. They can be used with or without baits, in this last case acting on rodent passage.

Because rodents are very prudent with new objects, the snap traps must be placed at first with baits but without being set, to deceive their vigilance. From the moment when the baits are eaten the traps will be set. Baits must be sticky to release the trap mechanism even on light touch.

It is recommended an intensive use of traps for 2-3 weeks, followed by a break of 1-2 weeks, because the rodents could learn to avoid them.

The modern designs of the adjustable snap traps are more efficient, more compact, more resistant and easier to set.

## Glue traps

This type of traps is more efficient for mice than for rats (these one could escape). They are placed on rodent pathways to and from the feeding and watering places.

The common model has a plate, covered with a special glue which doesn't freeze or flow on high temperatures. They are bought "ready-to-use" and contain a non-toxic pheromone bait. The traps are placed in boxes with 2 entrances to protect the glue.

They cannot be used in areas with much dust, with excessive heat or cold because their efficiency is low. This type of traps is used in alimentary products industry, in kitchens, restaurants, hospitals, zoological gardens and other areas where toxic baits cannot be used.

## Wired live traps

Wired live traps are manufactured of galvanized steel wire and reinforced to resist corrosion. They are more efficient than the adjustable snap traps and the glue traps, but more expensive. There are several models and dimensions of wired live traps, that could be classified depending on the following criteria:

- ✓ working principle
  - wired live traps with baits - which are released the moment when rodents try to eat the bait;
  - wired live traps without baits – which are set on the rodent pathways, and are released the moment rodent are passing through.
- ✓ rodent species
  - wired live traps for mice;
  - wired live traps for rats.
- ✓ number of entrancies
  - wired live traps with one entrance;
  - wired live traps with two entrancies.
- ✓ number of trapped rodents
  - wired live traps that can capture one rodent at one set;
  - wired live traps that can capture several rodents at one set (certain models can capture over 10 rodents at one set);

The design is similar to the adjustable snap trap design. Thus, wired live traps without baits are released the moment when rodent pass over a support due to their weight. The others are released the moment when rodents try to eat the baits.

Before beeing set-up, wired live traps must be tested to check if they work and they are fast enough.

It is also recomendado to set wired live traps without baits for a few days because rodent must get used with them. They can be hidden, especially those set outside (with leaves and branches).

Wired live traps must be washed and disinfected after each use to avoid spread of diseases.

### **Water traps**

Water traps are designed only for mice in areas with small rodent populations.

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# OBSERVATIONS ON THE EFFICACY OF SOME INSECTICIDES IN THE WHEAT BUGS - EURYGASTER SPP. CONTROL

## OBSERVAȚII PRIVIND EFICACITATEA UNOR INSECTICIDE ÎN COMBATEREA PLOȘNIȚELOR CEREALELOR – EURYGASTER SPP.

Ioana M. , Frăsin Loredana Beatrice

Key word: wheat bug, insecticides, efficacy.

Key word: ploșnițele cerealelor, insecticide, eficacitate.

### ABSTRACT

One of the dangerous pests of wheat is *Eurygaster spp.* It attacks all the aerial organs of wheat, producing important damages, and wheat bug control has a special importance for wheat production, both from qualitative and from quantitative point of view. In this respect, 9 insecticide products, from different chemical groups, were tested. The best efficacies, of over 90%, had the following insecticides: Sumi-Alpha 2.5 EC, Ordatox 25 CE and Fastac 10 EC.

Printre dăunătorii periculoși ai grâului se numără și *Eurygaster spp.* Atacă toate organele aeriene ale grâului producând pagube însemnate, iar combaterea ploșnițelor cerealelor are o importanță deosebită pentru producția de grâu, atât din punct de vedere cantitativ cât și calitativ. În acest sens, s-au testat nouă produse insecticide, din diferite grupe chimice. Dintre acestea, cele mai bune eficacități, de peste 90%, au avut insecticidele: Sumi-Alpha 2.5 EC, Ordatox 25 CE și Fastac 10 EC.

### INTRODUCTION

The wheat bug - *Eurygaster spp.* is spread allover the territory of our country, mainly in the south-eastern part, outside the Carpathian arch. The species was reported in 1938 and represented only 5.3% of the total of bugs which were wheat pests (Radulescu and Gruică, 1942). However, the insect extended gradually area, due to its great ecological plasticity, reaching 65.5% in 1970 and 90% after 1980 of total bugs in Romania. As a consequence, the spread area of the wheat bug extended very much, from 2 counties (Constanța and Tulcea) in 1963, to 22 counties (in the south-eastern part of the country) in 1986 (Ghizdavu et al., 1997).

In these conditions, protecting the wheat crops against the attack of the wheat bug is one of the most important stage in the cultivation technology of wheat.

During vegetation, the wheat crops are attacked both by the overwintered adults and by individuals from the first generation (larvae and adults) which feed all on the aerial organs of the plant (Popov et al., 1990).

The species, present in Romania, which form the population of this pest are: *Eurygaster integriceps*, *Eurygaster austriaca* și *Eurygaster maura*. In the attack zone the prevailing species is *Eurygaster integriceps* which represents over 88% of the entire populations of *Eurygaster* (Mustățea et al., 1980).

## MATERIALS AND METHODS

Observations were effectuated in the wheat fields of the Phitosanitary Unit of Dâmbovița County, on 100 m<sup>2</sup> parcels. There were tested 9 insecticides which were compared three times to the untreated sample (parcel with the same area).

The value for the frequency of attack was determined as a consequence of direct observations, using the metric frame, and was calculated using the following formula:

$$F\% = \frac{n}{N} \times 100$$

where:

- F% = frequency of attack;  
n = number of attacked plants or organs;  
N = total number of analysed plants or organs.

**The efficacy of the experimented products was calculated using Abott's formula:**

$$E\% = \frac{N - a_2}{N - M} \times 100$$

where:

- E** = product efficacy;  
**a<sub>2</sub>** = number of attacked leaves to the treated sample;  
**N** = total number of analysed leaves;  
**M** = number of attacked leaves to the untreated sample.

Treatments were effectuated using MET 2500 (25-30 l for each parcel).

## RESULTS AND DISCUSSIONS

The best efficacies from the 9 tested products, as one can see from table 1, had Sumi-Alpha 2.5 EC applied in a rate of 0.4 l/ha and Ordatox 25 CE applied in a rate of 2.5 l/ha. The active ingredient for these products are esfenvalerate 2.5% for the first and fosmet 25% for the second.

A very good efficacy had also the insecticide Fastac 10 EC-0.15 l/ha with alfacipermetrine as active ingredient.

These results represent the average of the efficacies resulted after treatments effectuated to control both the overwintered adults and III<sup>rd</sup> age larvae.

Treatments were applied, after warning, against the overwintered adults between 12 and 17 May 2007 and against the III<sup>rd</sup> age larvae between 3 and 12 June 2007.

Good efficacy, of over 80%, had also the products Supersect 10 EC (cipermetrine 100g/l), Fury 10 EC (zeta-cipermetrine 10%) and Karate 2.5 EC (lambda-cihalotrine 25 g/l).

Crt. no.	Product	Active ingredient	Rate (l/ha)	No. of analysed plants	No. of attacked plants	No. of attacked plants to the untreated sample	Frequency of attack (%)	Efficacy
1.	Fury 10 EC	zeta-cipermetrine 10%	3.5	200	16	115	8.00	86.09
2.	Supersect 10 EC	cipermetrine 100 g/l	0.2	450	17	164	3.78	89.63
3.	Sinoratox 35 CE	dimethoate 42.5 %	3.5	200	12	35	6.00	65.71
4.	Onefon 30 VUR	triclорfon 30%	3.3	200	15	48	7.50	68.75
5.	Oradox 25 CE	fosmet 25%	2.5	450	12	274	2.67	95.62
6.	Decis 2,5 EC	deltamethrin 25g/l	0.3	100	9	74	9.00	87.84
7.	Sumi-Alpha 2,5EC	esfenvalerate 25 g/l	0.4	100	3	74	3.00	95.94
8.	Fastac 10 EC	alpha-cipermetrine 100 g/l	0.15	100	6	74	6.00	91.89
9.	Karate 2,5 EC	lambda-cihalotrine 25 g/l	0.3	100	14	74	14.00	81.08

## CONCLUSIONS

The wheat bug is spread in Romania in the entire country, the wheat fields being attacked both by the overwintered adults and by individuals from the first generation, which produce damages to all aerial parts of the plant.

Wheat crops protection against the wheat bug attack is one of the most important stage in the cultivation technology of wheat.

From the 9 insecticide products tested, very good efficacies in the wheat bug control had Sumi-Alpha 2.5 EC, Oradox 25 CE and Fastac 10 EC with the following biological efficacies: 95.94%, 95.62% and 91.89%.

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# AIRBORNE POACEAE POLLEN IN URBAN ENVIRONMENT FOR 2000-2004

## POLENUL AEROPURTAT AL POACEELOR ÎN MEDIUL URBAN PENTRU ANII 2000-2004

*Nicoleta Ianovici*

**Key words:** *aeroallergens, allergogenic plants, airborne pollen*

### ABSTRACT

*Poaceae pollens are known as very potent aeroallergens. The aim of this study was to present and to compare the characteristics of airborne Poaceae pollen in urban environment in Timisoara. Measurements were performed with the volumetric method. Analysis of the pollen concentrations and the pollen distribution was performed on the basis of the data collected in Timisoara in the seasons of 2000–2004. Pollen seasons were defined as the periods in which 90% of the total catch occurred during year. The majority of Poaceae species have constant periods of pollen release. The airpollen season is long and lasts from the beginning of May until the middle of September. The highest pollen count was noted in 2001. The maximum pollen concentrations were recorded in May for all investigated years. The urban ecosystem hosts a rich reservoir of strongly allergogenic plants. The present study show the high level of the biologic air pollution in Timișoara area with airborne pollens of Poaceae.*

*Grăuncioarele de polen provenind de la Poaceae sunt cunoscute ca puternici aeroalergeni. Obiectivul acestui studiu a fost de a prezenta și de a compara caracteristicile polenului aeropurtat de Poaceae în mediul urban din Timisoara. Măsurătorile au fost efectuate cu metoda volumetrică. Analiza concentrațiilor de polen și distribuția acestuia a fost efectuată pe baza datelor colectate în Timisoara în sezoanele 2000-2004. Sezoanele polinice au fost definite ca perioade în care a avut loc 90% din captura totală din timpul anului. Majoritatea speciilor de Poaceae au perioade constante de eliberare a polenului. Sezonul de aeropolen este lung și durează de la începutul lunii mai până la mijlocul lunii septembrie. Cea mai mare cantitate de polen a fost observată în 2001. Concentrațiile maxime de polen au fost înregistrate în luna mai pentru toți anii investigați. Ecosistemul urban adăpostește un bogat rezervor de plante puternic alergogene. Prezentul studiu arată nivelul ridicat al poluării biologice al aerului în zona Timișoarei cu polen aeropurtat de Poaceae.*

### INTRODUCTION

*Poaceae pollen is the major cause of pollinosis in many parts of the world (Friedhoff et al., 1986). Although its frequency differs regionally, grass-induced pollinosis is the most common pollen allergy also in Europe. The grass family comprises more than 600 genera and over 10 000 species, of which more than 400 herbaceous, wind-pollinated plants are found in Europe. The most abundant airborne grass pollen originates from tall meadow grasses such as *Phleum pratense*, *Dactylis glomerata* or *Alopecurus pratensis*. *Secale cereale* is another potent source of allergens (Laffer et al., 1992). In Holland and France, as many as 80% of pollinosis sufferers are allergic to antigens of grass pollen (Weeke & Spiekma, 1991). However, with very few exceptions, all grass- pollen types show a very high degree of cross reactivity (Martin, 1987; Weeke & Spiekma, 1991; Singh & Kumar, 2003). *Poaceae* allergens induce mostly nasal and conjunctival symptoms. The allergy inducing proteins from grass pollen have been comprehensively studied and on the basis of the structural similarities have been divided into 7 groups. Group 1 comprises glycoproteins of the molecular weight of 27 kDa. They are localised in sporoderm, in the vicinity of starch grains and in cytoplasm of the pollen grain. The best known allergen is*

Lol p 1. Groups 2 and 3 comprise non-glycosylated proteins of the molecular weight of 11 kDa, and the amino acid sequence close to that of Lol p 1, the allergens of group 4 have the molecular weight of 57 kDa, together with those of group 5–30 kDa. The allergens of group 6 are cytochromes, and those of group 7 are prophyllins of the molecular weight 14 kDa (Negri, 1992; Reindl et al., 2000; Weerd et al., 2002). Up to 95% of patients allergic to grass pollen possess IgE specific for group 1 allergens and 80% for group 5 allergens, the two groups that constitute the major grass-pollen allergens (Valenta et al., 1993). The antigens of grass pollen, like those of the other allergenic pollen grains, are rapidly released when allergen-carrying pollen comes into contact with the oral, nasal, or eye mucosa, thereby inducing the appearance of hay-fever symptoms in sensitized patients.

## MATERIALS AND METHODS

Pollen samples were collected by Hirst volumetric method during the period 2000-2004. Silicone fluid was used as the adhesive substance and glycerine-gelly stained with basic fuchsin as the mounting medium. Sampling tape was divided into 48 mm segments, each corresponding to 24 hours. Five horizontal scans were performed over each segment at a magnification of 400X, pollen was determined and counted and the results expressed as the daily pollen concentration (PG/m<sup>3</sup>). Daily pollen concentrations, pollen index (annual sum of daily pollen concentrations), maximum concentrations, number of days during which pollen is recorded in the atmosphere and atmospheric pollen season are presented and compared. Our bulletins were provided weekly on the following websites: <http://www.pollinfo.ini.hu>, <http://www.nspolen.com/nspolen>.

## RESULTS AND DISCUSSIONS

The study was focused on the analyses of the fluctuations observed in airborne pollen records from an urban area located in the west part of Romania. The Romanian pollen seasons show 3 main parts: tree season (February–April), grass season (May–July), weed season (July–October). The *Poaceae* sporomorphs occur abundantly over the majority of the area of România from the second half of May until the second decade of August.

The results of pollen count for all years are presented in table 1. Monthly variations of total pollen grains recorded in the atmosphere of Timișoara during the years 2000-2004 are presented in table 2.

The pollen grains are monoporate, with operculum, ball- or egg-shaped, usually of thick intine (Hyde & Adams, 1958). The diameter of the pollen grains of the most allergenic species varies from 20–30 μm. This size of the sporomorphs facilitates their dispersal (Puc & Puc, 2004).

The determination of the atmospheric pollen season (APS) is important for data comparison between different years and is often used for development of pollen forecast models since it eliminates incidental occurrence through localised flowering at the start of the season, as well as the contribution of long distance transported pollen. The beginning and end of the seasons were established by the 90% method, i. e. the pollen season was defined as the period in which 90% of the annual total catch occurred (Jato et al., 2006). The pollen seasons determined by the method of 90% lasted in Timișoara from 111 days in 2004 to 152 days in 2000. Five year average pollen season duration were 129,6 days. The longest pollen season was observed in the year 2000. The maximum pollen concentrations were recorded in May for all investigated years.

The mean annual pollen count obtained during the period studied (2000-2004) was 2408,4 pollen grains, the lowest value being recorded in 2003 and the highest in 2001.

*Poaceae* air pollen constitutes between 8,9 % and 19,48 % of the annual total of pollen grains. Pollen index and maximum concentrations of grass pollen in the observed region were lower compared to other regions in Europe. As the family *Poaceae* is represented by many taxa, the pollen seasons were long and the diagrams in subsequent years had many peaks.

**Table 1.**

**Selected values characterizing *Poaceae* pollen seasons in Timisoara during 2000-2004**

	2000	2001	2002	2003	2004
First identification of the air pollen	13 IV	16IV	17 IV	29 IV	19 IV
Last identification of the air pollen	21 X	10 X	6X	2 X	9 X
<i>Poaceae</i> pollen in the air plankton	192 days	178 days	173 days	157 days	174 days
Atmospheric Pollen Season – the 90% method	152 days	128 days	135 days	122 days	111 days
Annual total of pollen grains	2471	2939	2230	2199	2203
Pollen Index (PI)	19,48%	18,79%	11,12%	8,9%	12,74%
<i>Poaceae</i> air pollen on the peak days	64 PG/m <sup>3</sup> / 12V	63 PG/m <sup>3</sup> / 28V	69 PG/m <sup>3</sup> / 4V	49 PG/m <sup>3</sup> / 26 V	57 PG/m <sup>3</sup> / 30 V
Pollen concentrations higher than 20 PG/m <sup>3</sup>	32	57	42	45	39
Pollen concentrations higher than 30 PG/m <sup>3</sup>	9	34	21	13	18

**Table 2.**

**Monthly pattern of *Poaceae* airborne pollen (%), Timișoara, Romania**

	April	May	June	July	August	September	October
2000	4,72%	<b>24,54%</b>	16,54%	12,72%	20,27%	18,05%	3,16%
2001	6,91%	<b>32,74%</b>	21,47%	18,67%	14,10%	5,62%	0,49%
2002	9,09%	<b>41,74%</b>	11,96%	7,70%	22,26%	6,85%	0,40%
2003	0,55%	<b>36,94%</b>	19,23%	15,95%	20,82%	6,51%	0,00%
2004	1,80%	<b>31,70%</b>	25,70%	26,50%	10,70%	3,40%	0,20%

In sensitive persons the symptoms of pollinosis occur after some threshold pollen count value, which for grass is 30 grains in 1 m<sup>3</sup> per 24 h. From among the five *Poaceae* pollen periods analysed, the lowest day pollen count of 49 PG/m<sup>3</sup>/24 h was noted in 2003. The highest pollen count was noted in 2002 and equal to 69 PG/m<sup>3</sup>/24 h. Diurnal grass pollen counts were over the threshold value during 9-34 days of its 4-6 months long flowering season, which means severe pollen release in the air. The grass pollen count in the air of Timișoara showed a tendency to decrease; however, this observation needs to be confirmed by long-term studies. Year-to-year variations of grass pollen parameters correspond to results obtained in the studies cited above. On the basis of results of the aeropalinological studies carried out all over the world, attempts have been undertaken to establish tendencies of pollen count changes on the macro-region scale. The increasing tendency of grass pollen count in the air has been noted in Genoa (Voltolini et al., 2000) and in Stockholm (El-Ghazaly et al., 1993), while a tendency towards decreasing pollen count of *Poaceae* has been observed in Brussels (Detandt & Nolard, 2000). In the long-term observations conducted in Denmark, The Netherlands, Belgium and Great Britain, no distinct trends have been established (Spieksma et al., 2003). In Szczecin, a tendency towards increasing grass pollen count was observed during the years 2000–2003 (Puc & Puc, 2004). Analysis of the duration of the pollen seasons against the intensity of pollen release of *Poaceae* leads to the conclusion that shorter pollen seasons are characterised by higher annual sums of sporomorphs, and vice versa in longer pollen seasons when the annual pollen sums are lower. Such differences are most probably caused by phenology of florescence of many grass species.

The majority of *Poaceae* species have stable pollen release periods, but because of the high number of grass species the pollen season is relatively long. In northern, central and eastern Europe the main grass flowering period starts at the beginning of May and finishes at the end of July. In the Mediterranean area, flowering usually starts and ends 1 month earlier. Pollination occurs about 2–3 weeks earlier at sea level than in mountainous regions. As mentioned above, pollen season tends to vary from year to year because of fluctuations in climatic factors, but maximum atmospheric concentration of grass pollen usually occurs 1–2 months after the start of the main flowering season (D'Amato et al., 2007). On the whole, in Europe, grass flowering notoriously peaks in June. The frequency of allergic sensitization to grass pollen does not seem to be decreasing (Emberlin, 1997). In Central Europe it usually starts from the middle of May, and is particularly intense in June and the first half of July. The pollen count can reach very high values of 4,000–5,000 grains in 1 m<sup>3</sup> per 24 h (Weeke & Spiekma, 1991). The florescence of a spike usually lasts a few days, while pollen release of a single flower lasts only a few minutes. On sunny days, the majority of grasses open anthers in the morning to make use of the uplifting effect of convection currents. The anthers open again in the afternoon (Puc & Puc, 2004). That is why the allergy symptoms are enhanced on sunny and windy days (Hofman & Michalik, 1998).

The concentration of airborne grass pollen influences the degree of symptoms in pollinosis patients (D'Amato et al., 2007). In London (UK), the lowest atmospheric concentration of grass pollen able to induce the appearance of hay-fever symptoms was shown to be 10–50 PG/m<sup>3</sup> (Davies & Smith, 1973). In Cardiff, 10% of pollinosis patients experienced symptoms in the presence of 10 grass PG/m<sup>3</sup>, and again in London a concentration of more than 50 PG/m<sup>3</sup> induced symptoms in all pollinosis patients (Hyde, 1972). In Bilbao (Spain), 100% of pollinosis patients experienced symptoms when the pollen count was above 37 PG/m<sup>3</sup> (Antepara et al., 1995). In Turku (Finland), a count of less than 30 PG/m<sup>3</sup> was significantly correlated with nasal symptoms at the start of the grass-pollen season (Rantio-Lehtimäki et al., 1991). Djukanovic et al (1996) provided evidence that natural exposure to grass pollen may exacerbate asthma, and, so, induce an inflammatory response involving T cells, mast cells and eosinophils. The threshold concentrations at which symptoms of allergy to grass pollen are observed are influenced by the degree of air pollution. In areas of high air pollution the allergy threshold pollen value is 30 PG/m<sup>3</sup>, while in the areas of low air pollution it is 71 PG/m<sup>3</sup> (Rantio-Lehtimäki et al., 2001). The difference can be attributed to the chemical properties of allergens and the presence of substances facilitating allergy-inducing properties in the air, such as ozone, sulphur oxides, nitrogen oxides, dusts (Puc & Puc, 2004). In the highly industrialized areas and in big cities they are the major allergens, and in other areas they are the minor allergens (Vieths, 1997). Prophillines can be responsible for the cross-reactions between the allergens of grass pollen and the allergens of edible vegetables (Ree, 1992). Masuch *et al.*, studying the allergy inducing properties of *Lolium perenne*, have shown that the presence of ozone increases the concentration of the allergen Lol p 5 in the pollen grains of this grass (Masuch et al., 1997). Schoene et al. have found that in the presence of ozone the number of pollen grains of *Lolium perenne* containing amyloplasts decreases and vacuolization of the grains with amyloplasts is stronger (Schoene et al., 1997). Ozone has also been shown to have an irritating effect on the mucous membrane of the airways. This compound forms as a result of complex photochemical reactions and its concentration is particularly high in big cities in summer in the few hours after the morning rush hour (Kehrl et al., 1999). For the above reasons it is important to monitor the pollen count in city agglomerations.

Parameters of *Poaceae* pollen (annual sums of daily averages, maximum daily pollen concentration per year, duration of pollen season, number of days exceeding

threshold value of clinical symptoms) show that Timișoara are not that strongly polluted by grass pollen as by *Ambrosia artemisiifolia* pollen.

## CONCLUSIONS

As the family *Poaceae* is represented by many taxa, the pollen seasons were long and the diagrams in subsequent years had many peaks. The high weight of the grasses which contribute with a considerable airborne allergens pollen quantify requires an elaborate study of them and of the allergological implications for our geographic area, as well as of the possible correlations with the meteorological factors. An important problem in the prophylactic of pollinosis is a correct prognosis of the beginning of the pollen season. A part of this study was financed by a Romanian National grant PREVALERG (041-011/2007).

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# STUDIUL VARIABILITĂȚII UNOR POPULAȚII LOCALE DE ARDEI LUNG (*CAPSICUM ANNUUM* VAR. *LONGUM*), COLECTATE DIN VESTUL ROMÂNIEI

## STUDY OF VARIABILITY IN SOME LANDRACES OF LONG PEPPER (*CAPSICUM ANNUUM* VAR. *LONGUM*) COLLECTED FROM WEST ROMANIA

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Friskan Ilijana*

Key words: long pepper, landraces, variability

### ABSTRACT

*Studiul a evaluat germoplasma locală de ardei lung în privința unor caractere morfologice componente ale capacității de producție. Au fost evaluate 8 populații locale colectate din județele Arad, Timiș și Bihor, alături de soiul Kapia de Kurtovo folosit ca martor. Au fost evaluate lungimea și diametrul fructelor, greutatea medie a fructelor, grosimea și greutatea pulpei fructului, numărul și greutatea semințelor din fruct. Studiul a stabilit că puține populații au fructe mai mari decât ale soiului Kapia de Kurtovo, excepție făcând populația Becheiu Mic. Variabilitatea constatată recomandă populațiile studiate pentru ameliorarea acestei varietăți, unele populații putând fi prelucrate direct prin selecție sau ca forme parentale în programele de hibridare.*

*The aim of this study was the evaluation of local long pepper germplasm concerning some identification morphological traits and yield capacity. 8 landraces were collected from counties Arad, Timis and Bihor, cultivar Kapia from Kurtovo being used as a control. Main evaluated traits were the fruit length and diameter, average fruit weight, pulp thickness, pulp weight, Number of seeds and seed weight from fruit. This study highlights the fact that a small number of genotypes presented bigger fruits in comparison to the control, exception being the landrace Begheiu Mic, having bigger fruits than Kapia de Kurtovo. Detected variability recommends the use of local long pepper germplasm in breeding processes of this variety, some of the populations can be directly exposed to selection, and some can be used as parental lines in breeding programs.*

### INTRODUCTION

The field preservation of local forms started declining as a consequence of the released of the market of new bred varieties with high yielding potential and that are intensely commercialized by breeders. In addition, the increased yield potential requires the use of sophisticated technologies. In the regions with less fertile soils and with economical deficiencies such forms do not express their maximum productiveness. Moreover, the old cultivated forms show high adaptability to local climate and soil conditions and do not require special crop care (Balkaya et Karaagac, 2006; Lebeda et Boukema, 2001; Maggioni, 2004)

These forms are extremely important for the breeding process considering that they present important genes such as resistant genes to different biotic and abiotic stress factors. Nevertheless, these local populations evolved as a consequence of long-term

guided selection and preferential multiplication, which led to improvement of yield characters and its quality (Coetzee et al., 1999; Kracteva, 2007; Silva et al., 2001). In case of paper, the variability of characters was wide. In Romania, pepper is cultivated on large areas and serves for various food purposes. In private gardens, there are usually cultivated local landraces (Madoșă, 2004; Madoșă et al., 2007).

## MATERIALS AND METHODS

Biologic material consisted from local landraces of long pepper (*Capsicum annuum* L. var *longum*) collected from counties Arad, Timis and Bihor. These landraces constitute a small collection of 8 populations: 4 from Timiș county, 3 from Bihor county and one from Arad county. These cultivars were compared to the old cultivar Kapia de Kurtovo, a famous cultivar from West Romania.

The aim of this study was the evaluation of some morphological traits with a major importance in yield breeding. The experiment was conducted in a comparative culture, in a randomized block design, in three replicates. Studied characters were subjected to biometric measurements, based on obtained values, and calculating the main statistic indexes concerning their values and variability: mean and mean deviation, variability coefficient. (Ciulca, 2004)

## RESULTS OF RESEARCH

The evaluated traits referred to few yield capacity components: fruit length, fruit diameter and fruit weight; fruit quality components: pulp thickness and weight; and elements of cultivar multiplication: seed number per fruit and seed weight per fruit.

Fruit length ranged between 9,15 cm in landrace Lovrin and 14,23 cm in landrace Begheiu Mic. Landraces Brănești, Pocola, Vinga and Rieni also presented longer fruits in comparison to the control. The biggest fruit diameter was achieved by local landrace Vinga (4,58 cm), and the smallest recorded value had the landrace Rieni (only 2,80 cm). Values superior to the control were achieved by landraces Ceica and Begheiu Mic. These elements had influence over fruit average weight. The heaviest fruits were reported in landraces Begheiu Mic (70,39 g) and Vinga (61,74 g), also being the only landraces with fruit weight values superior to Kapia de Kurtovo. Landrace Temerești had the smallest values of fruit weight.

Evaluated quality elements were related to fruit pulp content. Although production is evaluated by fruit weight, the only part used is the pulp, this being the reason for determination fruit pulp thickness and weight. Regarding the pulp thickness, the control landrace is notably superior. Lovrin is the only landrace close to the value of the control, the others being inferior. Landrace Ceica had the thinnest pulp. Pulp weight had values between 59,64 g in landrace Begheiu Mic and 28,49 g in landrace Temerești. Fruit yielding in pulp is more eloquent as a quality element. The best yielding was achieved by landrace Vinga (87,29%), notably superior comparing to the control. Only three landraces recorded values inferior to the control, the others being superior.

Seed production was evaluated by seed number per fruit and their weight. Seeds were the most numerous in landrace Ceica (318,16 seeds) and less numerous in landrace Rieni (168,33 seeds). Concerning the number and the seed size, weight ranged from 0,74 g in landrace Temerești and 1,65 g in landrace Ceica.

Table 1

Results regarding the value of some fruit morphological parameters in local long pepper landraces

No.	Landrace	Fruit length (cm)		Fruit diameter (cm)		Fruit weight (cm)	
		$\bar{x} \pm S_x$	S%	$\bar{x} \pm S_x$	S%	$\bar{x} \pm S_x$	S%
1	Kapia de Kurtovo (control)	11,16±1,93	17,30	4,26±0,49	11,54	60,58±10,40	17,17
2.	Lovrin	9,15±1,24	13,64	3,80±0,21	5,52	40,60±4,64	11,43
3.	Temerești	10,96±1,03	9,45	3,00±0,21	7,30	35,72±6,44	18,03
4.	Begehiu Mic	14,23±1,16	8,20	4,45±0,25	5,81	70,39±7,56	10,74
5.	Brănești	11,80±1,06	9,03	3,43±0,36	10,52	42,83±5,29	12,36
6.	Pocola	13,78±0,97	7,10	3,33±0,23	7,01	43,24±5,64	13,06
7.	Vinga	12,15±0,89	7,35	4,58±0,29	6,38	61,72±7,84	12,70
8.	Ceica	10,31±1,16	11,32	4,61±0,32	7,04	54,52±5,98	10,97
9.	Rieni	12,18±1,43	11,80	2,80±0,21	7,82	39,20±4,62	11,80

Table 2

Results regarding the value of some quality and seed production parameters in local long pepper landraces

No.	Landrace	Pulp thickness (cm)		Pulp weight (g)		No.seeds/ Fruit		Seed weight/fruit	
		$\bar{x} \pm S_x$	S%	$\bar{x} \pm S_x$	S%	$\bar{x} \pm S_x$	S%	$\bar{x} \pm S_x$	S%
1.	Kapia de Kurtovo (control)	0,51±0,09	19,03	48,74±9,40	18,90	249,33±17,61	5,98	1,33±0,15	12,35
2.	Lovrin	0,43±0,05	11,91	31,13±4,73	15,19	263,83±44,35	16,81	1,37±0,38	28,30
3.	Temerești	0,38±0,11	30,49	28,49±5,84	20,50	215,50±13,96	6,48	0,74±0,41	56,14
4.	Begehiu Mic	0,33±0,05	15,49	59,64±7,46	12,51	172,66±23,61	13,67	1,07±0,17	16,10
5.	Brănești	0,31±0,04	12,89	34,56±4,55	13,18	156,16±32,65	20,91	0,82±0,18	22,69
6.	Pocola	0,31±0,04	12,89	34,90±4,90	14,06	178,00±25,62	14,39	1,09±0,15	14,55
7.	Vinga	0,31±0,04	12,89	53,88±5,97	11,08	189,33±57,39	30,31	1,06±0,52	49,25
8.	Ceica	0,26±0,05	19,36	38,22±3,54	9,03	318,16±77,80	24,45	1,65±0,38	23,26
9.	Rieni	0,31±0,04	12,89	32,01±3,75	11,73	168,33±21,27	12,63	0,76±0,17	22,34

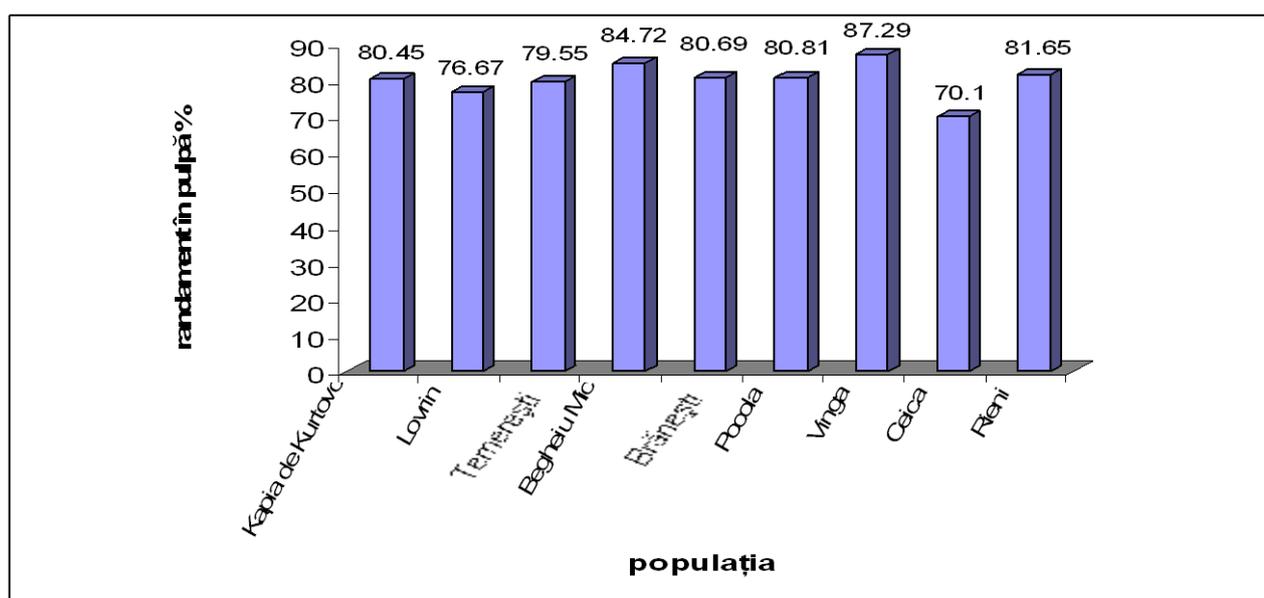


Figure 1. Fruit pulp yielding in long pepper landraces

## CONCLUSIONS

1. Evaluated germplasm presents an important variability for breeding process, regarding all analyzed characters
2. Longer fruits in comparison to the control were presented by local landraces Brănești, Pocola, Vinga and Rieni.
3. The biggest fruit diameter was recorded in Vinga local landrace (4,58 cm), and the smallest in local landrace Rieni (only 2,80 cm). Values smaller than the control were also presented by local landraces Ceica and Begheiu Mic.
4. The heavier fruits were reported in local landraces Begheiu Mic (70,39 g) and Vinga (61,74 g), exceeding the control Kapia de Kurtovo.
5. The best pulp yielding was reported in local landrace Vinga, and only three landraces were inferior to the control, the rest being superior.
6. Seed production was evaluated by seed number/fruit and their weight. Seeds were more numerous and the fruit weight was the highest in local landrace Ceica. The seeds were less numerous in landrace Rieni and the smallest weight was presented by landrace Temerești.

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# ANALIZA METODELOR DE INTEGRARE A PRINCIPIILOR DE MEDIU ÎN MANAGEMENTUL FERMELOR DIN N-E ROMÂNIEI

## ANALYSIS OF THE METHODS FOR THE ENVIRONMENTAL PRINCIPLES INTEGRATION WITHIN THE MANAGEMENT OF FARMS SITUATED IN NORTH-EASTERN PART OF ROMANIA

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**Cuvinte cheie:** bune practici agricole, idicatori de agro-mediu, managementul durabil al solului

### ABSTRACT

*Studiile noastre au urmarit in principal analiza modalitatilor de integrare a bunelor practici de agro-mediu in fermele mari si mijlocii din regiunea de N-E a Romaniei.*

*Aceasta analiza a fost efectuata in baza datelor colectate din 114 unitati agricole din regiunea de N-E a Romaniei. Datele statistice au fost obtinute anul trecut prin realizarea de anchete structurale in agricultura. Our studies focused on analyzing the integration practices of environmental principles for the management of several farms situated in the region North-East of Romania. This analysis was made on the basis of the data collected on 114 agricultural units from North-East region of Romania.*

Statistical data were obtained through structural agricultural surveys, which have been provided last year.

### INTRODUCTION

Together with the classical pollution factors, agriculture is also a potential pollution source for the eco-systems, which can be explained by the excessive, repeated application of chemical fertilizers and chemical phyto-sanitary treatments, using substances with remanent toxic effect that are not biodegradable. In this way, negative effects have been reported upon the entire soil-plant-people-environment system, manifested through the following:

1. pollution of environment, soil, water and agricultural products as a result of the large number of chemical treatments, applied every year, while in the case of certain diseases, even several times during the same vegetation period;
2. destruction of useful flora and fauna, in parallel with the increase of populations from certain species that have been inoffensive so far;
3. emergence of phyto-pathogenic strains that are resistant to the action of chemical substances, by the selection of certain resistance or tolerance genes to chemical substances;
4. possibility of animal intoxication due to the consumption of fodder with pesticide residues;
5. intoxication of humans through the consumption of food with toxic residues with cumulative negative effects on people's health in time.

Taking these facts into consideration, as a method of agriculture protection, of environment protection implicitly against self-pollution by the excessive application of chemicals, the organic farming practice development is imperiously needed, which targets maximum productivity without altering environment quality.

As regards soil pollution, an overall picture of this phenomenon reveals that in the last 45 years worldwide, about 11% of the soil resources of the planet have been subject to degradation up to the level at which even its bio-productive functions have been altered. The specialists from Western Europe consider that about 25% of the Earth surface is subject to this threat.

As soil is exhausted, the rich countries will be obliged to import food so as to satisfy even the population's minimum needs. At the same time, the humus losses will determine an increased consumption of fertilizers and fuels for tillage. On the longer run, soil erosion will result in the increase of food prices, malnutrition, and mostly probably to the maintenance of certain endemic hunger areas.

In this respect, the sustainable soil management needs to introduce certain generalized modifications in the agricultural practice in order to stop pollution and soil erosion, by implementing the measures specified in the Code of good agricultural practice.

## MATERIAL AND METHOD

Our studies were developed under the project CEEEX no. 56/2006 on the theme: *"Modeling the response of agricultural holdings to the integration of economic and environmental principles through the sustainable management of soil resources"*, regarding the integration of economic and environmental principles and actions and the development of certain scenarios on the sustainable soil management.

The analysis of the implementation possibilities of the integrated pest control methods in the soil management was based upon the information obtained on the basis of the Structural Agricultural Surveys that were conducted in the counties: Vaslui, Iasi, Botoșani, Bacău, Neamț and Suceava. The data collected from 114 agricultural holdings were centralized and analyzed in order to characterize the "agricultural holding" system, the production technologies and the soil and environment management quality.

The results of these analyses will serve the design of certain scenarios regarding the response of agricultural holdings to the integration of economic and environmental principles in the sustainable management of soil resources.

## RESULTS AND DISCUSSIONS

The next table presents the distribution of the investigated farms in the territory by counties, by the production structure and ownership form.

**Table 1:**

**Distribution of investigated farms in the territory**

County	Total farms out of which:	Crop production	Animal production	Mixed profile	Legal entities	Physical entities
Vaslui	20	2		18	17	3
Iași	20	5		15	17	3
Botoșani	18	7	4	7	10	8
Bacău	20	4	3	13	17	3
Neamț	14	1	2	11	12	2
Suceava	22	2	1	19	17	5
Total region	114	21	10	83	90	24

Out of total investigated farms, 21 are specialized in crop production, 10 farms in animal production and 83 are mixed farms (Figure 1.).

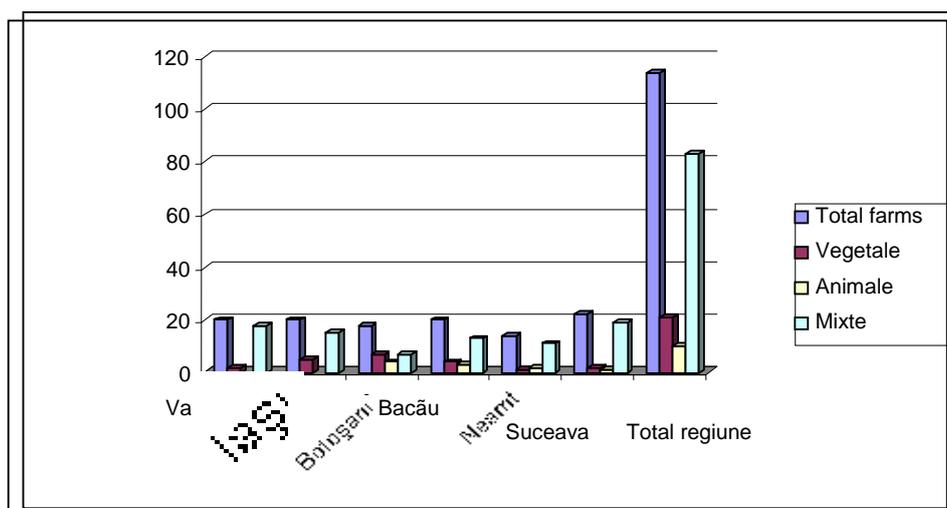


Figure 1. Distribution of agricultural holdings by activity type

The situation of arable land areas on the investigated holdings is the following:

- 63 farms located in the plain-hill areas, covering 3009.82 ha arable land in total;
- 35 farms located in the hill area totalling 1793.97 ha arable land;
- 16 farms located in the mountain area, totalling 88.18 ha arable land; total farms subject to the survey: 114 farms with 4891.97 ha arable land (Figure 2).

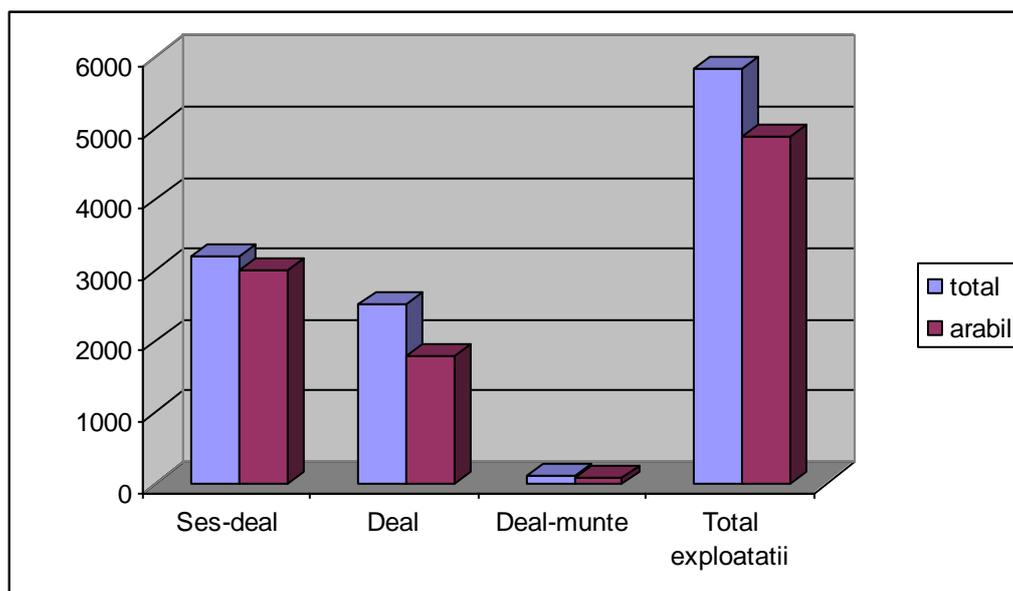


Figure 2. Distribution of total agricultural land areas by relief units.

As regards the agricultural production methods that are used, out of the total number of investigated farms, only 3 farms in the county Iași are under reconversion to organic farming (physical entities), the remaining 111 farms being conventional farms.

The analysis of data referring to the agricultural practices used by these farms reveals that 83.53% of total arable land was tilled with plough or disk, while disk harrowing was practiced on 78.83% of total. For weed and pest control mainly chemical and mechanical methods were used (Figure 3).

The chemical weed control was performed on 24.17% of total arable land, by herbicidation on 61.55% and by manual weeding on 2.44%. Weed control by insect-

fungicides was applied on 20.64 % of total arable land. The high percentage of the chemical control methods is explained by the economic efficiency of this practice, determined by the fast and maximum effect of the utilized substances.

Referring to the fertilization methods, chemical fertilizers were applied on about 78.48% of total arable land, both chemical and organic fertilizers were applied on 13.36%, while only organic fertilizers were applied on 4.51% of total arable land. One quarter of the interviewed farmers applied nitrogen-based chemical fertilizers twice a year, the remaining only once a year. Only 11 farms bought manure, from 20 to 300 tons per year (about 600 tons/year/total farms). This was spread directly in the field under solid form.

It is worth noticing that the decision regarding the application of chemical or organic fertilizers was based on the following: only on 11 farms the decision was based upon the soil analysis, 13 farms respected the farms fertilization plans, in 18 cases the information from the consultancy services was taken into consideration, 6 farms followed the information from the chemical plants, while 76 cases made the decision according to their own experience.

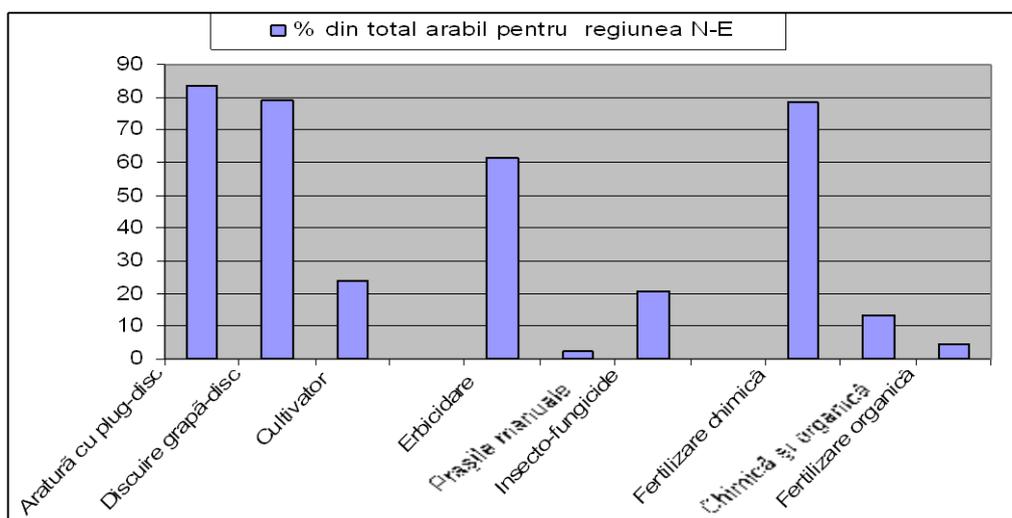


Figure 3. Situation of agricultural practices used in the region

As regards the integrated pest control methods, the centralization of the field data reveals that out of the total area of 4891.97 ha arable land, chemical control was applied on 1957.67 ha, accounting for 40.02%. The pest resistant varieties were cultivated on about 1171.82 ha, i.e. on 23.95% of total arable land. The biotech methods were applied on 15.52% of total arable land. The biological control was applied on only 0.09% of total arable land, while the cultural methods on 1.67% of total arable land (Figure 4).

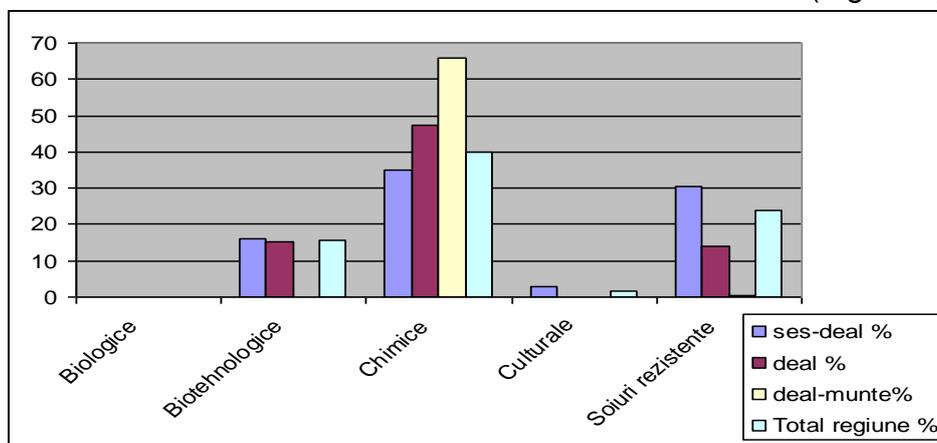
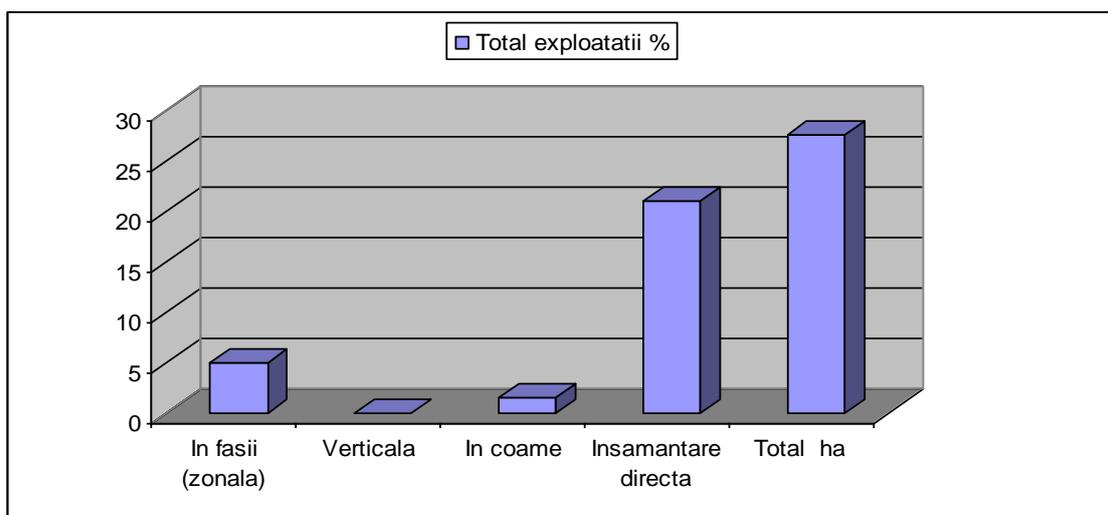


Figure 4. Share of integrated pest control methods (% of total arable land)

The situation of minimum soil conservation tillage and of the soil erosion control methods is presented in Figures 5 and 6.



**Figure 5. Situation of minimum soil conservation tillage**

Direct sowing was applied on 1031.9 ha, i.e. on 21.09%, while strip tillage on 241.02 ha (about 4.09% of total arable land). No vertical tillage techniques were applied, while ridge plowing was applied on 1.57%.

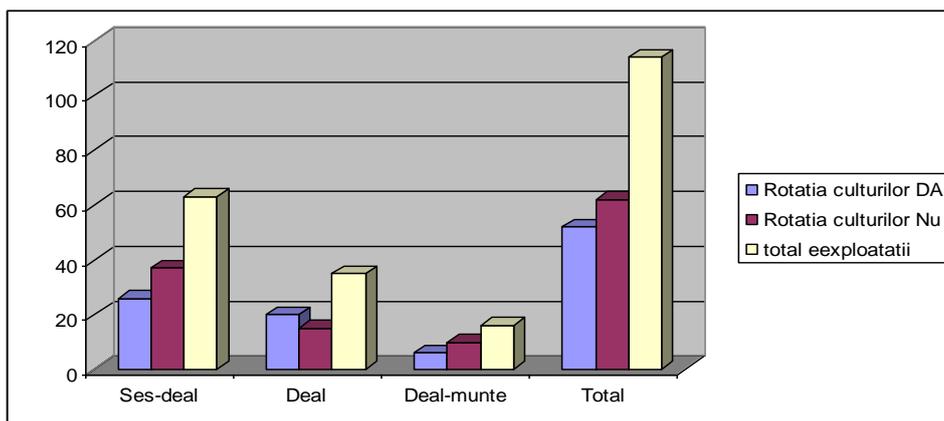
The situation of soil erosion control works by relief units is presented in Table 2.

**Table 2: Soil erosion control methods**

Soil erosion control methods	Area (ha)			Total region	
	Plain-hill	Hill	Hill-mountain	ha	%
Winter crops	679.2	234.55	6.18	919.93	18.8
Intermediary crops	0	10.92	0	10.92	0.22
Spring works	31.98	5.5	0.95	38.43	0.78
Autumn works	954.58	1207.01	76.91	2238.5	45.75
Slopes over 12% cultivated with row crops	29.6	20.5	0	50.1	10.24
Total ha	1695.36	1478.48	84.04	3257.88	66.59

It can be noticed that on all the relief units the autumn works were applied on the largest areas (45.75%) for the winter crops (18.8%) and row crops (10.24%).

As regards crop rotation it can be noticed that on 52 farms out of total investigated farms this beneficial technique has been used, while on 62 farms this technique has not been used (Figure 6).



**Figure 6. Distribution of the crop rotation farms in the territory**

The land areas used under crop rotation totaled 277.06 ha, which represent about 56.66% of total arable land (Table 3). The average number of crops under crop rotation was 4-5 crops on the large farms and 2-3 crops on the small-sized farms, with an average rotation period from 2 to 4 years.

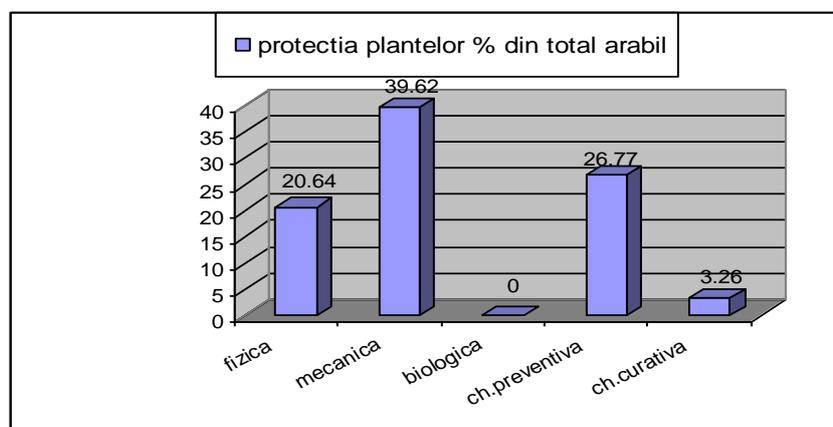
**Table 3**

**Arable land area used under crop rotation**

Area under crop rotation	Total farms	
	Ha	%
Plain-hill	1467.45	48.75
Hill	1222.6	68.15
Hill-mountain	82.01	93
Total	2772.06	56.66

As regards the crop protection measures, out of the total arable area of 4891.97 ha / total farms, weeds were removed manually on 1009.71 ha (weeding or hoeing), while the mechanical method was applied on 1938.06 ha (Figure 7).

In order to reduce the number of predators or parasites, no biological methods were used, only chemical methods. The preventive or curative chemical methods used to avoid insect infestation and weed development were applied on 1309.44 ha, while the curative chemical methods were applied on 159.71 ha out of total arable land.



**Figure 7. Situation of methods used for crop protection**

## CONCLUSIONS

Our investigations on the 114 farms from the region North-East of Romania revealed that the organic and the environmental practices have not been well implemented in the soil management practices. Organic fertilization and the mechanical weed control are applied on quite small areas, compared to the areas where chemical treatments are applied, even on the 3 farms in the conversion period.

Out of total arable land, chemical fertilizers were applied on about 78.48%, both chemical and organic fertilizers were applied on 13.36%, while only organic fertilizers were applied on 4.51% of total arable land. One quarter of the investigated farmers apply nitrogen fertilizers twice a year, the remaining farmers only once a year. Only 11 farmers buy manure (about 600 tons /year/total farms).

The excessive application of chemical fertilizers (2-3 times per year) without taking into consideration an evidence of soil treatments and analyses, may result in a series of soil and water pollution problems, even in the pollution of agricultural products in the future. The use of large amounts of pesticides each year are harmful for the fauna and flora on the respective areas, generating great health risks both for people and for animals. They may even induce cancer when their toxic, remanent and non-biodegradable effect is not taken into consideration.

In order to diminish the water, soil and agricultural products pollution risks, the following recommendations should be followed:

1. use of low toxicity fungicides;
2. respect of doses and diminution of the number of treatments;
3. application of treatments only at warning;
4. use of selected products and of low remanence products;
5. use of complex products;
6. handling of chemicals and application of treatments only by specialized staff.

The economic efficiency of crops will be ensured by the diminution of chemical treatment applications and the correct use of crop management, biological and biotechnological techniques that do not affect the agro-eco-system integrity.

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# DETERMINAREA EFECTULUI TRATAMENTULUI CU AGENȚI MUTAGENI CHIMICI ASUPRA SOIEI, ÎN CULTURĂ *IN VITRO*

## DETERMINING THE EFFECT OF TREATMENT WITH CHEMICAL MUTAGEN AGENTS ON SOYBEAN, IN CULTURE *IN VITRO*

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**Key words:** genetic variability, *in vitro* mutagenesis, mutagen generator, soybean.

### **ABSTRACT**

*Inducerea mutațiilor in vitro la soia, folosind agenți mutageni chimici conduce la crearea variabilității genetice care poate fi utilizată în ameliorarea speciei*

*In vitro mutation induction on soybean, using chemical mutagen agents leads to genetic variability, which can be used on the improvement species.*

### **INTRODUCTION**

The *in vitro* method for cells and tissues cultures is one of the most efficient techniques for achieving soma-clonal variations. It was demonstrated that soybean shows a good response to mutagen stimuli, the regeneration being made by forming bipolar structures and roots or by organogenesis, trunks and roots forming (CORNEANU, 1989)

The efficiency of the treatment with chemical mutagen agents can be established according to several parameters: the mutagen agent, its concentration and the treatment used, establishing the new economic potential achieved after the mutagen treatment applied (SAVATTI and collaborators, 2004).

### **MATERIAL AND METHODS**

The research of inducing and selecting mutations *in vitro* was carried on using as biological material the Diamant type soybeans, created at SCDA Turda, and as mutagen factors two chemical alkylating agents were used: DE= diethyl sulphate și DM = dimethyl sulphate, in two concentrations introduced in an aseptic medium.

100 drawings were carried on for each variant. Each experimented variant was placed in three repetitions for the ulterior statistic data processing.

The vegetal material was obtained from seeds selected from the above mentioned type, previously disinfected with calcium hypochlorite 7% for 30 minutes and then washed 5-6 times with distilled water. The inoculation of seeds on medium for germination MS ½ for two days allowed the development of the embryo for about 0.3 cm. The embryo was then placed on M<sub>1</sub>, M<sub>2</sub>, M<sub>3</sub>, M<sub>4</sub> mutagen media and M, control medium. The embryos were kept on these media for 12, respectively 48 hours in the conditions of the growing room, after which they were removed and subcultivated on media abbreviated V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, media with a balanced hormonal balance, both as the rate of hormones concentration and its nature, in order to show more clearly the possible mutagen effect (table1).

Table 1

Aseptic media used in inducing mutations *in vitro* at soybean

Contents of media	Type of media / concentration		
	For germination (MS 1/2)	Mutagen (M <sub>1</sub> , M <sub>2</sub> , M <sub>3</sub> , M <sub>4</sub> )	Culture (V <sub>1</sub> , V <sub>2</sub> , V <sub>3</sub> )
Macro elements	MS 1/2	MS	LS
Microelements	MS 1/2	MS	LS
FeEDTA	MS 1/2	MS	MS
Mezo-inozitol	50 mg/l	100 mg/l	252 mg/l
<i>Vitamins:</i>			
Thiamine HCl	0,1 mg/l	1 mg/l	
Pyridoxine HCl	10,1 mg/l	1 mg/l	
Nicotinic Acid	0,1 mg/l	1 mg/l	
Saccharose	20 g/l	20 g/l	
Agar	6 g/l	6 g/l	
pH	5,7	5,8 (MB)	5,6 (MB)
Diethyl sulphate (DE)	-	M <sub>1</sub> =MB+DE-2 ppm M <sub>2</sub> =MB+DE-0,2 ppm	-
Dimethyl sulphate (DM)	-	M <sub>3</sub> =MB+DM-2 ppm M <sub>4</sub> =MB+DM-0,2 ppm	-
<i>Hormones:</i>			
Bentiladenine (BA)	-	-	V <sub>2</sub> =MB+BA-0,5 mg/l
Naphtilacetic acid (ANA)	-	-	ANA-0,5 mg/l
Zeatine (Z)	-	-	V <sub>3</sub> =MB+Z-0,5 mg/l
Indolil butyric acid (AIB)	-	-	AIB-0,5 mg/l

MS – media after Murashige-Skoog – 1962

LS = media after Linsmaier-Skoog – 1965

MB = basic media

The meristematic explants were observed under the following aspects: the ability of regeneration *in vitro*, neo-formation of plantlets completely conformed (number of neo-plantlets, branching, the length of neo-plantlets) and neo-formation of roots (number, length, thickness, nodules), as well as some macroscopic somatic modifications, signalled after the mutagen treatment.

## RESULTS AND DISCUSSION

The observations were done after 30 days for the embryos subculture on V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub> media. The soybean embryos, kept for 12 hours on mutagen media did not show visible differences as compared to the witness. The phenotypical similitude to the non-treated biological material is due to the reduced period with mutagen factors.

The mutagen agents influence a few quantitative characters in the first generation (M<sub>0</sub>) in the conditions of the *in vitro* culture. The morphological anomalies from M<sub>0</sub> can affect all the organs, but most frequently the leaves and trunk.

The results of treatment with mutagen factors for 48 hours are shown in table 2.

Table 2

The effect of mutagen factors on Diamant type, in culture *in vitro*, at a 48 hours treatment

Mutagen Media	Concentration	Variant	Neo-formation				Observations: phenotypical modifications
			Plantlets		Roots		
			no	height (cm)	no	length (cm)	
M	Witness	V <sub>1</sub>	7	8,5	1	1,2	Normal evolution, well developed roots
		V <sub>2</sub>	5	2,5	1	1,1	Normal evolution
		V <sub>3</sub>	5	3,0	1	1,0	Normal evolution
M <sub>1</sub>	DE/0,2 ppm	V <sub>1</sub>	6	1,5	1	2,4	Thick roots, several secondary branches, tissue mass, uniform evolution
		V <sub>2</sub>	-	-	1	0,3	Neo-plantlets branches non-uniform evolution
		V <sub>3</sub>	5	0,8	1	2,2	Non-uniform evolution
M <sub>2</sub>	DE/2,0 ppm	V <sub>1</sub>	4	6,3	5	3,4	No branches, plants with a reddish colouring
		V <sub>2</sub>	-	-	-	-	Tissue mass, no differentiate neo-plantlets
		V <sub>3</sub>	3	1,0	1	2,4	Thick roots, nodules, branches at the basis, non-uniform evolution
M <sub>3</sub>	DM/0,2 ppm	V <sub>1</sub>	3	7,3	1	4,5	Interesting evolution, long roots, real, reddish leaves
		V <sub>2</sub>	-	-	-	-	No evolution
		V <sub>3</sub>	3	0,8	4	2,4	Slow evolution, the explants hardly raise
M <sub>4</sub>	DM/2,0 ppm	V <sub>1</sub>	1	6,0	1	4,5	Long, pubescent roots
		V <sub>2</sub>	-	-	-	-	No evolution
		V <sub>3</sub>	1	0,3	-	-	Several branched roots, real leaves

M = MB – witness (after Murashige-Skoog 1962)

M<sub>1</sub> = MB+DE 0,2ppmM<sub>2</sub> = MB+DE 2,0 ppmM<sub>3</sub> = MB+DM 0,2 ppmM<sub>4</sub> = MB+DM 2,0 ppmV<sub>1</sub> = MS1/2 (after Murashige-Skoog 1962)V<sub>2</sub> = MB+BA-0,5 mg/l+ANA-0,5 mg/lV<sub>3</sub> = MB+Z-0,5 mg/l+AIB-0,5 mg/l

BA = benzyl adenine

Z = zeatyne

AIB = indolil butyric acid

ANA = alpha- naphtil- acetic acid

## CONCLUSIONS

The analysis of the treatment with chemical mutagen factors such as diethyl sulphate (DE) and dimethyl sulphate (DM) on the Diamant type, cultivated *in vitro*, was done taking into account its effect on the *in vitro* culture and on the morphological variation of M<sub>0</sub> and M<sub>1</sub> offspring.

Diethyl sulphate and dimethyl sulphate induce phenotypical modification on the soybean cultivated *in vitro*, but the effect, in most cases, is not homogenous, caused by the type of the explants, the concentration of mutagen substances, the period of treatment, genotype, and the mutants' individualization being performed in the ulterior generations of multiplication.

The occurrence of some morphological modifications under the influence of chemical mutagen agents, possibly mutant, opens favourable perspectives for selecting and fixing some quantity and quality characters and fulfilling some improvement objectives.

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# DETERMINAREA DOZEI OPTIME A AGENȚILOR MUTAGENI CHIMICI ÎN FUNCȚIE DE CONCENTRAȚIA SOLUȚIEI MUTAGENE ÎN PROCESUL DE AMELIORAREA LA SOIA

## DETERMINING THE BEST DOSE OF CHEMICAL MUTAGEN AGENTS DEPENDING ON THE CONCENTRATION OF MUTAGEN SOLUTION IN THE PROCESS OF SOYBEAN AMELIORATION

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**Key words:** Lethal dose, genetic variability, in vitro mutagenesis, soybean, mutagen agent.

### **ABSTRACT**

*Pentru compararea și aprecierea sensibilității la agenți mutageni trebuie utilizată doza letală DL50. In order to compare and appreciate the sensitivity of mutagen agents DL50 lethal dose must be used.*

### **INTRODUCTION**

Starting from the idea that the method of cells and tissues cultures *in vitro* is at present one of the best techniques used for obtaining soma-clonal variations, several experiences of inducing artificial mutations at soybean were initiated (Murashige, Skoog, 1962; Raicu and colab., 1984, 1990).

*In vitro* techniques allow the easy application of treatment with mutagen agents on a great number of tissues and cells, permitting a fast isolation of some recessive mutants in the conditions of cultivating some haploid cells.

For appreciating and comparing the sensitivity of mutagen agents to plants, DL50 is widely used, generally considered as a critic dose, at which 50% of the individuals treated live and grow up to maturity. In several experiments, the dose of chemical mutagen agents oscillates depending on the concentration of the mutagen solution for the same period of treatment.

### **MATERIAL AND METHOD**

The material used was constituted of soybeans types Diamant and Agat, created at SCDA Turda, Cluj County. As mutagen substances two alkylant agents were used, DE= diethyl sulphate and DM= dimethyl sulphate, in two concentrations introduced in an aseptic medium.

In various experiments the dose of the chemical mutagen agents oscillates depending on the concentration of the mutagen solution for the same period of treatment. The effects of the treatments with mutagen agents, as regards viability, are conditioned by several factors.

As a first finding, taking into account the viability or lethality of the results, one can notice the direct correlation of the effect the concentration of mutagens has in the culture medium. It can be seen that all the concentrations administered have a connection to the plants' viability. The effect is obvious, being in direct proportion to the growth of mutagens concentration.

Thus, it is compulsory to have the best concentrations, but this thing can be established exactly very rarely. In practice, preliminary experiments are used in order to

establish an adequate dose and method of treatment not to imply a too drastic lethality and thus to produce an appropriate percentage of mutations.

## RESULTS AND DISCUSSIONS

In the following lines we present some stages necessary to fulfilling the proposed wish taking into account the lack of information in the literature referring to soybean (tables 1 and 2).

**Table 1**

**The effect of treatment with chemical mutagen agents on the viability of plants and on the determination of the lethal dose DL50% at Diamant type**

Type	Mutagen factor	Concentration	No. treated explants	Viable explants	% viable explants	Non-viable explants	% Non-viable explants
Diamant	DE Diethyl sulphate	v <sub>0</sub> – not treated	100	100	100	-	-
		v <sub>1</sub> = 0,001	100	98	98	2	2
		v <sub>2</sub> = 0,01	100	86	86	14	14
		v <sub>3</sub> = 0,1	100	76	76	24	24
		v <sub>4</sub> = 0,02	100	78	78	22	22
		v <sub>5</sub> = 0,2	100	54	54	46	46
		v <sub>6</sub> = 2,0	100	48	48	52	52
		v <sub>7</sub> = 3,0	100	32	32	68	68
Diamant	DM Dimethyl sulphate	v <sub>0</sub> – not treated	100	100	100	-	-
		v <sub>1</sub> = 0,001	100	95	95	5	5
		v <sub>2</sub> = 0,01	100	76	76	24	24
		v <sub>3</sub> = 0,1	100	71	71	29	29
		v <sub>4</sub> = 0,02	100	70	70	30	30
		v <sub>5</sub> = 0,2	100	58	58	42	42
		v <sub>6</sub> = 2,0	100	51	51	49	49
		v <sub>7</sub> = 3,0	100	30	30	70	70

The results shown above emphasize the decreasing of neo plantlets' viability, conditioned by the genotype and concentration of the mutagen agent used. DL50%, for both genotypes studied is situated at a concentration of 0,2 ppm when using DE (diethyl sulphate) as mutagen agent, the number of plantlets being of 54% at Diamant type and 56% at Agat type. It can be seen a slow difference between the percentage of viable explants between the genotypes, with greater values for Agat type.

As regards the second mutagen agent used DM (dimethyl sulphate), values closed to DL50% are reached for both genotypes studied, at a concentration of 0,2 ppm, respectively 58% viable neo plantlets at Diamant type and 50% viable explants at Agat type.

In this case too it can be noticed the similar behaviour of both types studied.

**Table 2**

**The effect of treatment with chemical mutagen agents on the viability of explants and on the determination of the lethal dose DL50% at Agat type**

Type	Mutagen factor	Concentration	No. treated explants	Viable explants	% viable explants	Non-viable explants	% Non-viable explants
Agat	DE Diethyl sulphate	$v_0$ – not treated	100	100	100	-	-
		$v_1 = 0,001$	100	92	92	8	8
		$v_2 = 0,01$	100	87	87	13	13
		$v_3 = 0,1$	100	80	80	20	20
		$v_4 = 0,02$	100	83	83	17	17
		$v_5 = 0,2$	100	56	56	44	44
		$v_6 = 2,0$	100	50	50	50	50
		$v_7 = 3,0$	100	38	38	62	62
Agat	DM Dimethyl sulphate	$v_0$ – not treated	100	100	100	-	-
		$v_1 = 0,001$	100	92	92	8	8
		$v_2 = 0,01$	100	80	80	10	10
		$v_3 = 0,1$	100	76	76	14	14
		$v_4 = 0,02$	100	77	77	23	23
		$v_5 = 0,2$	100	56	56	44	44
		$v_6 = 2,0$	100	48	48	52	52
		$v_7 = 3,0$	100	31	31	69	69

## CONCLUSIONS

Following the effects of different concentrations applied, it can be noticed the fact that a strong contribution of the mutagen agent determines a pronounced lethality of plants, while a weaker dose will reduce the incidence of mutations obtained, but having a benefic effect on the viability of the biological material.

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# BIODEGRADAREA HIDROCARBURILOR DIN PETROL PRIN UTILIZAREA UNUI PRODUS NATURAL ABSORBANT SI A POPULATIEI BACTERIENE PENTRU A CRESTE BIODISPONIBILITATEA ACESTORA

## PETROLEUM HYDROCARBONS BIODEGRADATION BY A NATURAL ABSORBANT PRODUCT AND A SOIL MICROBIAL POPULATION TO ENHANCE THEIR BIOAVAILABILITY

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**Keywords:** natural absorbant product, soil microbial population, petroleum hydrocarbons, contaminated soils.

### **ABSTRACT**

*The release of hydrocarbons into the environment, whether accidental or due to human activities, is a main cause of soil pollution. Many bioremediation technologies have been developed to remove these contaminants, as some biological treatments are cheaper than chemical and physical treatments and do not cause problems to the soil structure. Petroleum hydrocarbons can act as source of carbon and energy for the growth of soil microorganisms. One main factor that influences the extent of their biodegradation is their bioavailability and this is a priority research objective in the bioremediation field.*

*In this paper are presented the preliminary results concerning the bioremediation of contaminated soils using a natural hydrocarbon absorbent product to enhance their bioavailability.*

*Aparitia hidrocarburilor in mediul inconjurator se datoreaza activitatilor umane sau accidentale si reprezinta principala cauza a poluarii solului. In ultima perioada s-au dezvoltat o serie de tehnologii de remediere a solurilor pentru indepartare acestor contaminanti precum tratamentele biologice care sunt mai ieftine comparative cu cele chimice si fizice si nu are efecte negative asupra structurii solului.*

*Several petroleum aliphatic and polycyclic aromatic hydrocarbons can act as source of carbon and energy for the growth of soil microorganisms. One main factor that influences the extent of their biodegradation is their bioavailability and this is a priority research objective in the bioremediation field.*

*In this paper are presented the preliminary results concerning the bioremediation of contaminated soils using a natural hydrocarbon absorbent product to enhance their bioavailability.*

### **INTRODUCTION**

Soil pollution is defined as the appearance in soils of persistent toxic compounds, chemicals, salts, radioactive materials, or disease causing agents, which have adverse effects on plant growth and animal health (Pepper, 1996). One of the most important classes of organic pollutants in the environment is crude oil constituents of petrochemicals.

The microbiological decontamination of oil-polluted soil has been assessed to be an efficient and economic alternative to physiochemical treatment even though the rate of hydrocarbon biodegradation in soils is affected by other physicochemical and biological parameters (Bartha, 1986).

A huge number of bacterial and fungal populations possess the capability to degrade organic pollutants. Biodegradation is defined as the biologically catalyzed reduction in complexity of chemical compounds (Alexander, 1994).

Bioremediation technologies involve the activity of microorganisms, primarily bacteria and fungi, to detoxify environmental pollutants and transform them into simpler, less toxic compounds (Lemos, 2002). Although hydrocarbons in general are biodegradable, the main limiting factor to their effective and complete degradation is their scarce bioavailability to soil microorganisms, due to limited solubility in aqueous media, especially for high molecular weight compounds (Atlas, 1981).

The capacities of aerobic microorganisms are of particular relevance for the biodegradation of such compounds and are exemplarily described with reference to the degradation of aliphatic and aromatic hydrocarbons. The most rapid and complete degradation of the majority of pollutants is brought under aerobic conditions (Riser-Roberts, 1998). The microbial decontamination of crude oil polluted soils was often claimed to be an efficient, economic alternative to physical and chemical methods (Snape, 2001).

## MATERIALS AND METHODS

The purpose of the present study was to investigate possible methods to enhance the rate of biodegradation of hydrocarbons from crude oil. Enhancement of biodegradation was achieved through the treatment with ECOSOL and bacterial inoculation. The objective was to simulate conditions of a major spill.

To achieve data concerning the bioremediation of polluted soil with petroleum hydrocarbons was realized a greenhouse experiment. It was used for this experiment a cambic chernozem. At the beginning of the experiment, the soil was contaminated / polluted with crude oil and treated with the natural hydrocarbon absorbent (ECOSOL). After 21 days from pollution, the soil was inoculated with bacteria.

ECOSOL is an absorbent natural product, meant to facilitate quick and efficient biodegradation of hydrocarbons from contaminated soils. Accelerates bio-stimulation and favors the development of existing bacteria from the soil, with strong effects in crude oil degradation. It is obtained from vegetal fibers from celluloid waste, all treated and with additives, being used in order to bring soils back to normal fertility levels.

The chemical characteristics of the natural biodegradable product are:

- ✓ Total nitrogen: 0,935%;
- ✓ Organic carbon: 23,72%;
- ✓ Phosphorous: 0,39%
- ✓ Potassium: 3,32%;
- ✓ Sodium: 4,97%.

The inoculum was developed from microorganisms that occur naturally in the soil with the addition of crude oil. The microorganisms use the petroleum hydrocarbons as a source of carbon. It was stimulated the growth of the microbial population by adding the fibers provided from celluloid wastes.

Bacteria used in this study were of two types: (a) indigenous hydrocarbon utilizing bacterial populations and (b) a hydrocarbon degrading bacterial population inoculum. The bacterial inoculum applied in this experiment contained bacterial stem isolated, purified and tested in laboratory for their capacity to degrade the petroleum hydrocarbons, as: *Pseudomonas*, *Mycobacterium* (*M. roseum* și *M. phley*), *Arthrobacter* (*A. globiformis*, *A. citreus*), *Bacillus megaterium*, and *Streptomyces griseus*.

## RESULTS AND DISCUSSIONS

The obtained results show that the biodegradation takes time. A decrease was recorded in time and this agrees with the observation existing in scientific literature.

Chemical parameters such as moisture content, pH, total organic carbon, nitrogen, phosphorus and hydrogen were determined using characteristic methods.

In table 1 are presented some chemical characteristics of the soil used in all the experimental variants, like soil reaction, organic carbon content, total nitrogen content, C/N ratio and total petroleum hydrocarbons at the beginning of the experiment.

Table 1

**Chemical characteristics of the soil from variants at the beginning of the experiment**

Experimental variant	pH	Organic C (%)	Total N (%)	C/N ratio	TPH mg kg <sup>-1</sup>
V <sub>1</sub> , control (unpolluted soil)	8,14	3,11	0,358	10,13	0,00
V <sub>2</sub> , polluted soil with 5% crude oil	8,15	7,41	0,308	28,07	3,68
V <sub>3</sub> , polluted soil with 10% crude oil	8,15	10,78	0,273	46,07	9,40
V <sub>4</sub> , polluted soil with 5% crude oil + 50 g ECOSOL	8,23	8,60	0,269	37,30	5,36
V <sub>5</sub> , polluted soil with 5% crude oil + 50 g ECOSOL + bacterial inoculum	8,27	8,67	0,315	32,11	4,37
V <sub>6</sub> , polluted soil with 5% crude oil + 100 g ECOSOL	8,35	8,81	0,341	30,14	4,69
V <sub>7</sub> , polluted soil with 5% crude oil + 100 g ECOSOL + bacterial inoculum	8,41	8,80	0,379	29,09	4,54
V <sub>8</sub> , polluted soil with 10% crude oil + 100 g ECOSOL	8,30	10,33	0,310	38,88	9,29
V <sub>9</sub> , polluted soil with 10% crude oil + 100 g ECOSOL + bacterial inoculum	8,43	13,79	0,272	59,15	9,86
V <sub>10</sub> , polluted soil with 10% crude oil + 200 g ECOSOL	8,59	10,55	0,278	44,27	9,84
V <sub>11</sub> , polluted soil with 10% crude oil + 200 g ECOSOL + bacterial inoculum	8,49	10,03	0,275	42,55	9,54

In the soil contaminated with crude oil, the organic carbon contents were higher than the control at all concentrations of contamination and at all treatments applied. As it can be observed in the table, the organic carbon content increases with crude oil concentration in the experimental variants where the soil was polluted with 5% crude oil, respectively 10% crude oil, comparatively with the control.

In the experimental variants V<sub>4</sub>, V<sub>5</sub>, V<sub>6</sub> and V<sub>7</sub>, the organic carbon content increase comparatively with V<sub>2</sub>, even it is the same concentration of petroleum hydrocarbons, because of the treatment with different quantities of ECOSOL. Therefore, in the experimental variant V<sub>2</sub> was recorded a value by 7,41%, comparatively with 8,60% and 8,67% in the experimental variants treated with 50g ECOSOL and 8,81%, respectively 8,80% in the experimental variants treated with 100g ECOSOL.

In the experimental variants V<sub>8</sub>, V<sub>9</sub>, V<sub>10</sub> and V<sub>11</sub>, the organic carbon content increase comparatively with V<sub>3</sub>, even it is the same concentration of petroleum hydrocarbons, because of the treatment with 100g, respectively 200g ECOSOL.

The total nitrogen contents fluctuate in the experimental variants contaminated with crude oil, treated with ECOSOL and bacterial inoculum.

In the soil contaminated with crude oil, the C/N ratios were higher than the control at all concentrations of contamination and at all treatments applied. As it can be observed in the table, the C/N ratio increases with crude oil concentration in the experimental variants where the soil was polluted with 5% crude oil, respectively 10% crude oil, comparatively with the control. In the experimental variants V<sub>4</sub>, V<sub>5</sub>, V<sub>6</sub> and V<sub>7</sub>, the C/N ratios increase comparatively with V<sub>2</sub>, even it is the same concentration of petroleum hydrocarbons, because of the treatment with different quantities of ECOSOL.

Therefore, in the experimental variant V<sub>2</sub> was recorded a value by 28,07, comparatively with 43,37 and 32,11 in the experimental variants treated with 50g ECOSOL and 30,14, respectively 29,09 in the experimental variants treated with 100g ECOSOL.

In the experimental variants V<sub>8</sub>, V<sub>9</sub>, V<sub>10</sub> and V<sub>11</sub>, the organic carbon content increase comparatively with V<sub>3</sub>, even it is the same concentration of petroleum hydrocarbons, because of the treatment with 100g, respectively 200g ECOSOL.

The obtained results revealed that the total petroleum hydrocarbons concentrations were higher on contaminated soils compared to the control suggesting the presence of more petroleum hydrocarbons.

In table 2 are presented some chemical characteristics of the soil used in all the experimental variants, like soil reaction, organic carbon content, total nitrogen content, C/N ratio and total petroleum hydrocarbons at the end of the experiment, after three months of bioremediation.

*Table 2*

**Chemical characteristics of the soil from variants at the end of the experiment after 3 months**

Experimental variant	pH	Organic C (%)	Total N (%)	C/N ratio	TPH mg kg <sup>-1</sup>
V <sub>1</sub> , control (unpolluted soil)	8,12	3,54	0,464	8,90	0,00
V <sub>2</sub> , polluted soil with 5% crude oil	8,16	7,15	0,342	24,39	3,35
V <sub>3</sub> , polluted soil with 10% crude oil	8,14	7,52	0,311	28,21	8,12
V <sub>4</sub> , polluted soil with 5% crude oil + 50 g ECOSOL	8,27	8,13	0,314	30,21	4,73
V <sub>5</sub> , polluted soil with 5% crude oil + 50 g ECOSOL + bacterial inoculum	8,20	7,65	0,334	26,72	3,65
V <sub>6</sub> , polluted soil with 5% crude oil + 100 g ECOSOL	8,32	7,83	0,334	27,35	3,77
V <sub>7</sub> , polluted soil with 5% crude oil + 100 g ECOSOL + bacterial inoculum	8,37	7,99	0,374	24,92	3,36
V <sub>8</sub> , polluted soil with 10% crude oil + 100 g ECOSOL	8,31	13,13	0,373	41,07	7,97
V <sub>9</sub> , polluted soil with 10% crude oil + 100 g ECOSOL + bacterial inoculum	8,41	8,68	0,328	30,87	8,01
V <sub>10</sub> , polluted soil with 10% crude oil + 200 g ECOSOL	8,41	8,04	0,296	31,69	8,07
V <sub>11</sub> , polluted soil with 10% crude oil + 200 g ECOSOL + bacterial inoculum	8,42	8,43	0,423	23,25	7,56

The total petroleum hydrocarbons concentration decreases in three months with 8%, respectively 12% in the polluted soil with 5%, respectively 10% crude oil. As it can be observed, total petroleum hydrocarbons decrease in time with 12% in the case of V<sub>4</sub> experimental variant comparatively with the inoculated variant V<sub>5</sub> in which the decrease was by 17%. The total petroleum hydrocarbons concentration decreases with 20% in V<sub>6</sub> experimental variant and with 25% in the inoculated variant V<sub>7</sub>.

In the experimental variants polluted with 5% crude oil, conditioned with 50 g ECOSOL, respectively 100 g ECOSOL, the decrease were by 10%, respectively 20%. In the experimental variants polluted with 5% crude oil, inoculated with bacteria, conditioned with 50 g ECOSOL, respectively 100 g ECOSOL, the decrease were by 17%, respectively 25%.

Total petroleum hydrocarbons concentration decrease in time with 15% in the case of V<sub>8</sub> experimental variant comparatively with the inoculated variant V<sub>9</sub> in which the decrease was by 20%. The total petroleum hydrocarbons concentration decreases with 18% in V<sub>10</sub> experimental variant and with 22% in the inoculated variant V<sub>11</sub>.

In the experimental variants polluted with 10% crude oil, conditioned with 100 g ECOSOL, respectively 200 g ECOSOL, the decrease were by 15%, respectively 20%. In the experimental variants polluted with 10% crude oil, inoculated with bacteria, conditioned with 100 g ECOSOL, respectively 200 g ECOSOL, the decrease were by 18%, respectively 25%.

## CONCLUSIONS

These are the preliminary results, therefore the experimental research will continue in Green House on the same polluted soil. The plant that will be used in the experiment is maize. The plant will be cultivated to follow the growth and behaviour in function with the concentrations of total petroleum hydrocarbons, the treatment with ECOSOL, soil microbial population and bacterial inoculum to enhance their bioavailability.

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# THE EVALUATION OF BIOACTIVE COMPOUNDS IN BREWING WORT IN CONNECTION WITH PROCESS PARAMETER

## EVALUAREA COMPUȘILOR BIOACTIVI DIN MUSTUL DE BERE ÎN CORELAȚIE CU PARAMETRII DE PROCES

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**Key words:** *Humulus lupulus* L., hop active compounds,  $\alpha$ -acids, iso- $\alpha$ -acids, beer matrix

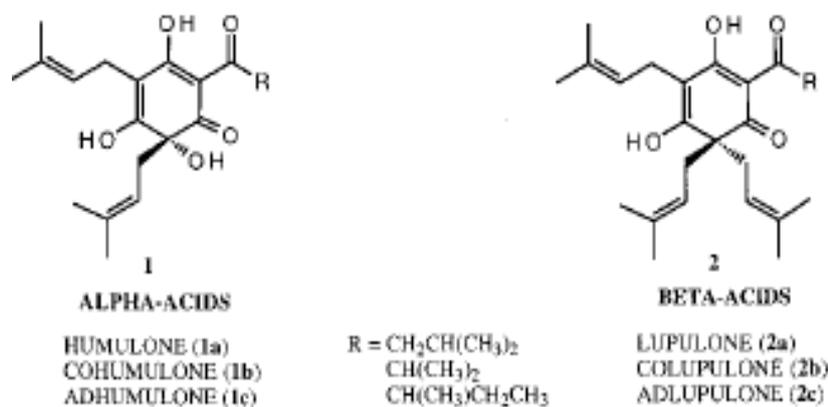
### ABSTRACT

*The tastes of varying beer typ are derivated from a judicious choise of row materials. Hops (*Humulus lupulus* L.), in particular, account, in adition for the bitter taste, for a delicate hoppy flavor in beer. Perhaps the most important class of hop compounds are the hops bitter acids, which are distinguished as alpha acids. The rate of isomerization of alpha acids to iso-alpha acids (the bittering compounds in beer) was characterized over a representative pH, wort concentration, time boiling and temperature range during the boiling portion of the brewing process. Because of the complex wort matrix and interfering interactions occurring during real wort boiling (i.e., trub formation and  $\alpha$ -acids/iso- $\alpha$ -acids complexation), this investigation on  $\alpha$ -acid isomerization was performed in wort solution as a function of time (60–120 min), pH variation (5.1-5.8) and wort original gravity ( 10-14°Plato). Precise understanding of isomerization kinetics allows improved accuracy in hopping rate calculation to achieve target concentrations of bitter compounds in wort, despite varying pH as the kettle approaches boiling, or as wort encounters a lag time prior to entering a heat exchanger for cooling. Also, understanding of isomerization is essential if novel regimes are to be explored for potential bioactive compounds (Xanthohumol) in final products. The experiments demonstrate that the rate of isomerization depending of beer matrix, the performers of wort kettle and the variety of hops.*

*Profilul sensorial al diferitelor tipuri de bere depinde de caracteristicile materiilor prime. Hameiul (*Humulus lupulus* L.) influențează gustul amar și aroma delicată, florală a berii. Hameiul are o compoziție complexă, dar, probabil cea mai importantă clasă de compuși sunt acizii amari, care sunt denumiți  $\alpha$  acizi. Randamentul de izomerizare al alfaacizilor în izoalfaacizi amari este influențat de pH-ul mediului, de concentrația mustului de bere, de timpul și temperatura de fierbere a mustului de bere în timpul procesului tehnologic de obținere a berii. Deoarece mustul de bere are o matrice foarte complexă, în comparație cu berea, experimentele privind determinarea condițiilor optime de izomerizare a alfaacizilor au realizate în condiții de durată variabilă a timpului de fierbere, (60-120 min), prin variația pH-lui (5,1-5,8) și aconcentrației mustului primitiv (10-14 °P). Elucidarea mecanismelor de izomerizare permite o dozare eficientă a hameiului în cazanul de fierbere și asigură o consistență a calității și cantității acizilor amari în berea produs finit. Înțelegerea mecanismelor de izomerizare este de asemenea importantă pentru valorificarea și altor compuși biologic activi din hamei( Xantohumolul) prin adaptarea unor regimuri de fierbere novatoare. Experimentele au demonstrate că randamentul de izomerizare depinde de matricea berii, de performanțele cazanului de fierbere și tipul de hamei utilizat.*

## INTRODUCTION

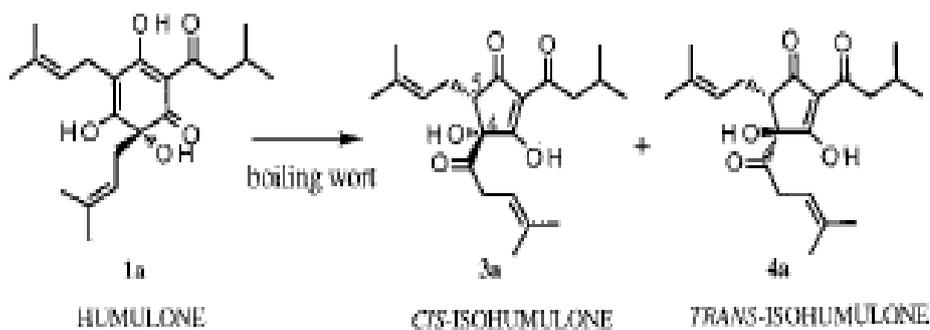
The most important class of hop compounds are the hop bitter acids, which are distinguished as alpha-acids or humulones (1) and beta-acids or lupulones (2) as are presented in figure 1. The two series comprise, in fact, three constituents differing in the nature of the side chain for humulone (1a)/lupulone (2a), cohumulone (1b)/colupulone (2b) and adhumulone (1c)/adlupulone (2c). The relative proportion of the individual constituents depend strongly on the hop variety and the condition of growing.



**Figure 1 Structures of humulones and lupulones**

The transformation of the humulones during wort boiling is a very complex chemical reaction. The most important is the thermal isomerization of the alpha acids or humulones (1) to the iso- $\alpha$ -acids or izohumulones (3+4) via an acyloin- type ring contraction (figure 2). Each humulones gives rise to two epimeric izohumulones, which are known as *cis*-isohumulones (3) and *trans*-isohumulones (4).

The isomerization of alpha-acids to iso- $\alpha$ -acids during wort boiling suffers from low yield, which are no more than 30%. The transfer of alpha acids from the vegetative hop material, the restricted solubility on the aqueous matrix and the neutral wort (pH= 5-5,5) are critical factors. The improving hop utilization is very important for beer quality and financial performances of the brewing.



**Fig.2 Conversion of the humulones to the izohumulones**

## MATERIAL AND METHODS

Material. The experiments were conducted using two hops varieties: Magnum and Perle from romanian cultivars. Magnum is a newer variety derived from Hallertau with a robust aroma and a strong but clean bitterness. The  $\alpha$ -acids rating is usually 12-14%. Perle is an aroma typ cultivar bred in Germany from English Northern Brewer. It is a very versatile hop combining good bittering potential with a highly acceptable aroma that is pleasant and slightly spicy. Its alpha acid ranges from 7-9.5%.

Methods for analyses of hop active bittering compound in hop varieties used in experiment consist of determination of alpha acid concentration by Lead Conductance Value (LCV) according to method 7.4 from Analytica EBC. Alpha-acids form lead salts which are insoluble in methanol. A solution of lead acetate / acetic acid is titrated into a methanol solution of hop extract while monitoring conductance; initially there is no change in conductance as a yellow lead salt of the  $\alpha$ -acids precipitates. Then the conductance increases: extrapolation of the two straight line curves gives the end point. For determination of hops bittering concentration it was used a Titration system with automatic sample changer from Schott Instruments.

The traditional and internationally approved method for bitterness determination in beer involves the extraction of iso-alpha acids from acidified beer into iso-octane, followed by a centrifugation step, and photometric measurement at a wavelength of 275 nm against a reference of pure iso-octane (European Brewery Convention, 2006, Analytica-EBC, 7.8.). The optical density of the acidified solvent extract is multiplied by a factor to produce an analytical value, measured as Bitterness Units (BU): BU = Optical Density at 275 nm x 50. The apparatus for determination of bittering units is an UV-VIS spectrophotometer type UV 1700 from Shimadzu Instruments.

For improving hop utilization, the brewing trials are conducted to identify the critical point of isomerization: pH, temperature, wort boiling time and wort concentration ( $^{\circ}$  Plato).

## RESULTS AND DISCUSSIONS

The qualitative and quantitative characteristics of **Magnum and Perle** hops pellets varieties are presented in table 1. Value for determination of % alphaacids are the means of five replicates.

*Table 1.*

**Alpha acid content (w/w) in Magnum and Perle hop pellets**

Hop Varieties	Moisture content %	Lead Acetate Titer	Mass sample (g)	Volum lead acetate (ml)	Alphaacids (dry matter) (%)	SD (%)
Magnum	7,59	1,9974	10,00	7,65	13,253	0,269
Perle	7,03	1,9974	10,00	1,98	7,790	0,178

During wort boiling insoluble  $\alpha$ -acids are converted to soluble and bitter iso- $\alpha$ -acids. To increase conversion of  $\alpha$ -acids you have to control the wort boiling parameters: slightly alkaline conditions, divalent metal ions (especially  $Mg^{2+}$ ) as a catalyst, boiling times.

In the context of wort boiling, conditions are much more difficult to control and many other reactions can occur. Humulones have many double bonds and harsh conditions such as boiling in the presence of air results in a number of reactions and a complex mixture of products, some of which are bitter tasting and some are not. The brewing trials were carried off to improve the isomerization of alpha acids into iso-alpha acids during wort boiling process. The results are presented in table 2 and 3.

**Table 2**

**Beer analysis in brewing trial with Magnum Hop Variety**

Hop Variety		Process Parameter	Bitter units (BU)	Hop Utilisation (%)	Original Gravity (°P)	Wort Colour (EBC)
Magnum	Boiling time	60 min	20(±0,87)	25,00	12,02 (±0,24)*	6,3(±0,8)
		90 min	21(±0,79)	26,25	12,04(±0,27)	6,4(±1,2)
		120 min	22(±0,83)	27,50	12,03(±0,22)	6,5(±1,1)
	Conc.	10°P	24(±0,81)	30,00	-	6,4(±0,8)
		12°P	23(±0,78)	28,75	-	6,5(±0,5)
		14°P	23(±0,80)	27,50	-	6,5(±0,7)
	pH	5,1	22(±0,83)	27,50	12,10 (±0,25)	6,4(±0,6)
		5,5	28(±0,85)	35,00	12,06 (±0,20)	6,5(±0,6)
		5,8	33(±0,87)	41,25	12,05 (±0,24)	6,5(±0,9)

\* Standard deviation is given in parantheses

**Table 3**

**Beer analysis in brewing trial with Perle Hop Variety**

Hop Variety		Process Parameter	Bitter units (BU)	Hop Utilisation (%)	Original Gravity (°P)	Wort Colour (EBC)
Perle	Boiling time	60 min	18(±0,75)	22,50	12,08 (±0,26)	6,5(±0,8)
		90 min	19(±0,77)	23,75	12,04(±0,37)	6,5(±0,9)
		120 min	20(±0,81)	25,00	12,02(±0,26)	6,7(±1,2)
	Conc.	10°P	20(±0,83)	25,00	-	6,5(±0,9)
		12°P	20(±0,74)	25,00	-	6,7(±0,9)
		14°P	19(±0,84)	23,75	-	6,(7±0,6)
	pH	5,1	20(±0,73)	25,00	12,09 (±0,32)	6,5(±0,8)
		5,5	24(±0,75)	30,00	12,02 (±0,40)	6,7(±0,5)
		5,8	26(±0,77)	32,50	12,03 (±0,34)	6,9(±0,9)

The results of laboratory experiments demonstrate that the hop varieties with high alpha (Magnum) acids contents have a better utilization in wort kettle than low alpha hops (Perle). This yield, increase with boiling time, wort concentration and pH. Unfortunately, the high pH value is not a good decision because a lot of unlikable reactions could be develop for other wort chemical compounds (proteins and poliphenols).

## CONCLUSIONS

The boiling wort process is important for the production of bittering compounds from the isomerisation of hop alpha acids. Isomerisation is a chemical process which involves molecules being converted from one configuration to another. Alpha acids are dubbed iso-alpha acids once isomerised but they contain the same amount of atoms, merely in a different configuration. The isomerisation reaction is favored by alkaline conditions with a pH of around 9 being optimal, but these conditions are never met during the boil and this explains the notoriously poor level of hop utilization during the brewing process which rarely exceeds 40%. Wort becomes steadily more acidic during the boil due to the formation of break material so the extraction of bittering compounds becomes less efficient as the boil goes on. Along with specific pH conditions, magnesium or another divalent ion and a vigorous boil are required to carry out the isomerisation reaction.

The gravity of the wort can further influence the isomerisation reaction with high gravity worts impeding the progress of the isomerisation step. The loss of precious bittering compounds is bad enough, but the brewers can expect to further lose what little bittering has been achieved through adsorption to yeast and filter material and also some will be scrubbed by CO<sub>2</sub> production during fermentation. The pH is the most important parameter in hop utilisation. The high isomerisation is achieved at 5,8, but unfortunately this pH level is not allowed for wort boiling in normal boiling run. In this situation the brewers have to choose the optimum pH for beer quality, which is 5,1-5,2, even the hop utilisation is lower.

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# THE EVALUATION OF QUALITY PARAMETERS OF ROMANIAN HOPS VARIETIES

## EVALUAREA PARAMETRILOR DE CALITATE ALE UNOR SOIURI DE HAMEI ROMANESTI

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**Key words:** *Humulus lupulus* L.,  $\alpha$ - acids,  $\beta$ -acids, soft resins, hard resins, LCV, cohumulone, colupulone

### ABSTRACT

The hops varieties are classified according to their use in the brewing industry: bitter and aroma. The evaluation of quality parameters of 2008' Romanian hop harvest was made according with LICSA-USAMV Cluj-Napoca procedures and Analytica EBC, the international standards for brewing industry. The study were conducted to analyze two bitter hops varieties: Magnum and Brewers Gold and two aroma hops: Perle and Aroma, from Saschis and Seleus farms from Sighisoara region. The group called bitter acids has a high content of  $\alpha$ -acids ( 8-13 % w/w), its content in  $\beta$ -acids is in the range of 4-6,5 % w/w , and cohumulone ratio in the interval of 19-24 % rel., according with Analytica EBC 7.7. The aroma hops has low content of  $\alpha$ -acids (5-7 % w/w),  $\beta$  acids content in the range of 3,8-5,2 % w/w and cohumulone ratio is in the interval of 21-32 % rel, according with Analytica EBC 7.7. The analysis of hop resins were done according with Analytica EBC 7.5 to determine the total resins ( % w/w), soft resins ( % w/w), LCV (%w/w),  $\beta$  – fraction ( % w/w) and hard resins( % w/w).

Soiurile de hamei sunt clasificate în funcție de utilizarea lor în industria berii în: soiuri de aromă și soiuri amare. Evaluarea parametrilor de calitate ai hameiului românesc din recolta 2008 s-a realizat conform procedurilor LICSA ( Laborator de Incercări pentru Calitatea și Siguranța Alimentului) și Analytica EBC, culegere de standarde internaționale pentru industria berii, recunoscute pe plan mondial. Au fost folosite pentru analize două soiuri de hamei amar: Magnum și Brewers Gold și două arome: Perle și Aroma, recoltate din fermele Saschis și Seleuș din regiunea Sighișoarei. Hameiul amar a avut o concentrație ridicată de  $\alpha$ -acizii (8-13 % m/m), un conținut de acizi  $\beta$  de 4-6,5 % m/m, raportul humulonă/cohumulonă este în intervalul 19-24 % rel., în conformitate cu Analitica EBC 7.7. Soiuri de hamei aromate au un conținut scăzut de  $\alpha$ - acizi amari (5-7 % m/m), un conținut de acizi  $\beta$  de 3,8-5,2 % m/m, raportul humulonă/cohumulonă este în intervalul 21-32 % rel., în conformitate cu Analitica EBC 7.7.

Analiza rășinilor de hamei a fost realizată conform Analytica 7.5 pentru determinarea rășinilor totale ( % m/m), rășinilor moi ( % m/m), Valoarea Conductometrică a Hameiului (LCV) ( % m/m), fracțiunea  $\beta$  ( % m/m) și rășinilor dure ( % m/m).

### INTRODUCTION

Hop cones used for brewing are the dried seed cases of the plant *Humulus lupulus*. The hop cones consist of a central string or stalk, and between 20 and 50 petals. At these base of the petals the resin, known as lupulin, is produced as a sticky yellow powder exuded from the surface of the leafy petals. The hop plant is a perennial with separate

male and female plants. All commercial hops, used for flavoring beers of all sorts, grow on the female plants and will contain seeds if male plants are allowed to produce pollen near them. The plants grow up strings or trellis wires during the summer and the hops are harvested and dried in September. In Romania, the individual farmers' hops are blended, re-dried and packed into baled in large lots or processed directly from the farmers' lots. There is a great deal of variation between hops from the different farmers. Brewers are largely interested in the total resins and the essential oils which represent the brewing value of the hop. Both are contained in the yellow dust that is to be found around the base of each petal on the hop flower. This material, produced in small glands, is called the lupulin and is essentially the only portion of the hop a brewer need be concerned with. The rest of the hop's leafy matter may perform an important role in the brewery as a separation aid. The leafy material acts as a filter screen which aids in clarifying the wort after it has been boiled. The other components, particularly protein and polyphenols, are soluble in boiling wort, although it should be remembered that greater quantities of protein and polyphenols are derived from malt.

The total resins are further sub divided into hard resins, soft resins and uncharacterized soft resins. Soft resins consist of alpha ( $\alpha$ ) and beta ( $\beta$ ) acids and it is those that the brewer is interested in.

Alpha acids consist of more than 50% of the soft resins and are largely thought of as the primary source of bitterness in beer. Not directly, though, as they are insoluble in wort and must first be isomerized by heat to become soluble. Unfortunately it requires around 45 minutes of boiling for 30% of the potential alpha-acid from the hops to isomerize and solubilize. This amount drops dramatically as the boiling time diminishes. Basically, alpha-acids are a class of compounds known as humulones. They consist of a complex hexagonal molecule with several side chains, with ketone and alcohol groups. Examples include humulone, cohumulone, adhumulone, posthumulone, and prehumulone. Each different humulone differs in the make up of the side chain, for instance, humulone has a side chain of isovalerate attached, while cohumulone has isobutyrate as its side chain. These side chains can become detached during extended storage under poor conditions and result in cheesy flavors associated sometimes with old hops. It has become accepted dogma among brewers to think of each of these humulones to have different bitter characteristics. There are some that swear that the bitterness associated with cohumulone is "harsher" than that from humulone. Other studies have shown no difference in sensory impact when each of the different humulones are compared. Nevertheless, the humulone:cohumulone ratio is now quoted in hop analyses and new varieties are being bred with low cohumulone levels in mind. Historically, the most highly prized hop varieties - including noble hops such as Hallertau, Tettnang and Saaz - also happen to be those that have low cohumulone levels.

Beta acids they oxidize during storage. The alpha:beta ratio is considered important in gauging how a hop will provide bitterness to beer as the hops age. The bittering potential from alpha-acids reduces with time but the bittering potential from oxidized beta-acids increases. In a hop with a 2:1 ratio of alpha:beta the bittering potential may remain fairly constant. The oxidation reaction will take place to an even greater extent during kettle boiling., and again the chemistry will be discussed during the wort boiling article. Beta-acids consist of lupulone, colupulone, adlupulone and other substances, and like alpha-acids differ in the structure of the side chains. Again there is a difference of opinion in the brewing world as to the character of bitterness derived from beta-acids compared to that of alpha-acids. In Germany oxidized beta-acid bitterness is preferred while in Japan it is considered too "harsh."

Uncategorized soft resins: researchers have discovered that this fraction contains a portion of hop aroma compounds chemically bound to sugars. The upshot of the research

suggested that maybe these compounds find their way into beer and yeast transform them into beer flavor compounds. Until the research is published, however, these compounds remain officially "uncategorized".

## MATERIAL AND METHOD

Qualitative characteristic of four hops varieties were determined by analyses of hop resins. Hop resins were analysed by conductometric and spectrophotometric methods according to Analytica EBC 7.5. The bitter substances are distributed between an acidic aqueous methanolic phase and diethylether. The lead conductance value of the extracted bitter substance is determined by direct conductometric titration of the ether phase utilizing the ability of  $\alpha$ -acids to form the lead salts. The bitter substances extracted by diethylether are subsequently fractionated according to their varying solubility in cold methanol and hexane as total and soft resins. The hard resins content is obtained as the difference between the total and soft resins. The  $\beta$  fraction is calculated as the difference between the soft resin and the Lead Conductance Value.

The study were conducted to analyze two bitter hops varieties: Magnum and Brewers Gold and two aroma hops: Perle and Aroma. All samples were obtained from Saschis and Seleus farms from Sighisoara region.

## RESULTS AND DISCUSSION

Composition of hop resins in bitter varieties is summarised in table 1.

*Table 1*

**Composition of hop resins in Magnum and Brewers Gold varieties in 2008 harvest**

Variety	Analysis of hop resins				
	Total Resins (% w/w)	Soft Resins (% w/w)	LCV (%w/w)	$\beta$ -fraction (w/w)	Hard resins (w/w)
Magnum	26,7	23,8	12,8	12,1	2,9
Brewers Gold	21,1	18,3	8,6	9,7	2,8

Composition of hop resins in aroma varieties is summarised in table 2.

*Table 2*

**Composition of hop resins in Magnum and Brewers Gold varieties in 2008 harvest**

Variety	Analysis of hop resins				
	Total Resins (% w/w)	Soft Resins (% w/w)	LCV (%w/w)	$\beta$ -fraction (w/w)	Hard resins (w/w)
Perle	17,3	16,2	7,2	9,0	1,1
Aroma	15,8	14,1	5,0	9,1	1,7

The composition of the hop resins in romanian cultivars in 2008 is different from similar composition of hops resins in foreign countries, especially because of climatic condition of this year. The  $\alpha$ -acids content, expressed as LCV value (lead conductance value) is in the range 8,6-12,8 for bitter cultivars, and the ratio  $\alpha/\beta$  is higher than 1.0. For aroma hops the content of  $\alpha$ -acids are lower, and the ratio  $\alpha/\beta$  is lower than 1, typical for these hops. Aroma hops are used in breweries at the last portion of hopping to tune the final sensory profile of beers.

## CONCLUSION

All aroma hops varieties are characterised by a relatively low content of  $\alpha$ -acids that not the usually exceed the limit of 7% w/w. All bitter hops are the  $\alpha$ -acids content in the interval of 8-13 % w/w. The high content in Magnum varieties is unusually because this varieties is not a high alpha hops. This findings has genetic coherence in the origin of the individual varieties.

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# BIOCENOZELE PARAZITOIDE ȘI SEMNIFICAȚIA LOR ÎN PĂSTRAREA ECHILIBRULUI NATURAL

## PARASITOID BIOCOENOSES AND THEIR SIGNIFICANCE INTO KEEPING OF NATURAL EQUILIBRIUM

*Gheorghe Mustață, Mariana Mustață*

**Keywords:** producers, phytophagous consumers, parasitoids, parasitoid biocoenoses, natural equilibrium.

### ABSTRACT

*Pornind de la analiza complexelor rețelelor trofice pe care le realizează speciile de insecte parazitoide care limitează, pe cale naturală populațiile de *Brevycorine brassicae* L., *Uroleucon cichorii* Koch., *Pieris brassicae* L. *Pieris rapae* L., *Plutella xylostella* L. și *Delia radicum* constatăm că avem de a face cu adevărate biocenoze parazite, așa cum le-a denumit P. Jourdheuil (1960), sau mai bine zis de **biocenoze parazitoide**.*

*Biocenozele parazitoide sunt formate din producători, consumatori fitofagi și parazitoizi primari, secundari, terțiari și chiar cuaternari, care reprezintă tot atâtea forme de consumatori zoofagi. that these are all forms of consumer zoofagi Piramidele trofice ale biocenzelor parazitoide nu se aseamănă nici cu cele de tip prădător și nici de tip parazit, ci au caracteristici proprii.*

*Biocenozele parazitoide au toate caracteristicile acestui nivel de organizare: integralitate, echilibru dinamic, autoreglare, existența programelor, evoluție istorică, heterogenitate etc. și au un rol foarte important în păstrarea echilibrului natural.*

*Starting from the analysis of the trophic networks realized by some species of parasitoid insects limiting, on natural way, the populations of *Brevycorine brassicae* L., *Uroleucon cichorii* Koch., *Pieris brassicae* L. *Pieris rapae* L., *Plutella xylostella* L. and *Delia radicum*, we discovered that they are true **parasitic biocoenoses** (as they were named by Jourdheuil P., 1960). Or better said of **parasitoid biocoenoses**.*

*Parasitoid biocoenoses are formed of producers, phytophagous consumers and primary, secondary and even tertiary and quaternary parasitoids, representing all forms of zoophagous consumers. The trophic pyramids of the parasitoid biocoenoses are not like any of those of predatory parasitic type, but they have specific characteristics.*

*The parasitoid biocoenoses have all the characteristics of this organization level: integrity, dynamic equilibrium, self-regulation, programs, historical evolution, heterogeneity etc. They have a very important role in the keeping of natural equilibrium.*

### INTRODUCTION

Biocoenoses represent levels of organization characteristic to biological systems. They are open systems which present a certain historical evolution since they have been formed over millions of generations, in geological time. There are no plant species that do not become the target of some species of phytophagous animals. From ecological point of view plants represent the so-called **producers**, since they succeed to synthesize organic substances starting from CO<sub>2</sub>, H<sub>2</sub>O and mineral substances that they process them with the help of sunlight, being photosynthesing organisms. Organic substances of vegetal nature become a source of food for the so-called phytophagous consumers (Mustață Gh., 1974). These convert the organic substance of vegetal nature into organic substances of

animal nature with different qualities, depending on each species. Phytophagous organisms realize the function of a genuine key industry precisely through this transformation of organic substances of vegetal nature. In their turn the phytophagous consumers become the target of the zoophagous consumers, forming in this way more or less complex trophic chains because the zoophagous consumers may be of different orders until the top of consumers. Zoophagous consumers may be predators, parasites or parasitoids.

In the biocoenoses of parasitoid type one can meet primary, secondary, tertiary and even quaternary parasitoids (Mustață Gh., 1974, 1992, 2003; Alam M.M., 1992; Klrk A.A., Kfir R., 2004).

Watching the complexity of trophic networks formed by the parasitoid species limiting the populations of some harmful insects to some culture plants, such as *Brevycorine brassicae* L., *Uroleucon cichorii* Koch., *Pieris brassicae* L., *P. rapae* L., *Plutella xylostella* L., *Delia radicum* L. etc. we can find out that it is a matter of true biocoenoses of parasite type as P. Jourdheuil would name them since 1960.

Since we do a net difference between parasites and parasitoids we are forced to use the term biocoenosis of parasitoid type (Mustață Gh., 1974, Mustață Gh., Mustață Mariana, 2001). The parasite species form together with their hosts biosystems that do not lead to the death of the host, because the host death would put them in the impossibility of continuing the existence. Instead, the parasitoid species keep alive the hosts up to nearly their complete development, but ultimately they cause their death. In this way the insects behave that use other insects as host.

The parasitoid insects use as host the eggs, larvae, pupae (nymphae) or even adults of other species of insects, thus restricting their populations on a natural way. As a result of their action the parasitoid insects can be used by people in combating on biological way of some insects harmful to plants (Löhr Bernard, Kfir R., 2004; Krk A.A., Kfir R., 2004).

Some parasitoid species are reared in special laboratories and launched in nature in order to limit the populations of harmful insects. The biological combat is used successfully in many developed countries of the world. It is a natural, ecological weapon with an increased efficiency in relation to chemical weapon, but it requires a more sophisticated methodology, so more intelligence.

As in nature no species can live alone, we recognize that complex biocoenoses are formed in which each species depends on the entire complex, the biological principle „**everything depends on everything**” functions perfectly.

In this situation we realize that we can not intervene in the combat of some harmful insects. If you do not know exactly which is the structure and function of the biocoenoses in which we desire to act, whether we use the biological combat or the chemical weapon.

To intervene in nature without making in advance, an ecological analysis really scientific one can result in serious consequences or we could even commit an ecological "crime". In this respect we intend to present the structure, function and the role of biocoenoses of parasitoid type in keeping the natural balance.

## MATERIAL AND WORKING METHODS

As in our research we have studied for nearly four decades the complexes of parasitoids that control, on natural way, the populations of some harmful species to plants of culture, we proposed to select from the results of our research some convincing examples that can help to understand the role of the parasitoid biocoenoses in keeping the natural balance.

In this respect, we selected the parasitoid complexes that control the populations of *Brevycorine brassicae* L., *Uroleucon cichorii* Koch., *Pieris brassicae* L., *P. rapae* L., *Plutella xylostella* L., and *Delia radicum* L. We could put into discussion other species, too, but we consider that in order to ensure the understanding of issues raised, these data are sufficient.

To illustrate the way in which we can appreciate the role of each species (the contribution of each species) to the limitation of the host populations we have made the synecological analysis of the parasitoid species selecting from our research data only in some species.

In this respect for *Brevycorine brassicae* we selected some data published Mustăță Gh., 1974, 1974-1975, Mustăță Gh., Mustăță Mariana, 2001, 2003, for *Uroleucon cichorii* (Mustăță Gh. and coll., 1991), *Pieris brassicae* and *P. rapae* (Mustăță Gh., 1974, Mustăță Gh., Costea Gabriela, 2000, Mustăță Gh., Mustăță Mariana, 2000, 2003), *Plutella xylostella* (Mustăță Gh., 1974, 1979, 1992, 1992-1993, Mustăță Gh., Costea Gabriela, 2000, Mustăță Gh. and coll., 2002) and *Delia radicum* (Mustăță Gh., 1978).

## RESULTS AND DISCUSSION

Following the parasitoid complexes acting in some colonies of **aphids** we were impressed by the large number of species that participate in the realization of the trophic networks.

In the colonies of *Brevycorine brassicae* L. we have identified 5 species of primary parasitoids from the family Aphidiidae, 10 species of secondary parasitoids belonging to the families Charipidae, Encyrtidae and Megaspilidae and 2 species of tertiary parasitoids belonging to the family Pteromalidae (Fig. 1). The two species of tertiary parasitoids, *Pachyneuron aphidis* Bché. and *Asaphes vulgaris* Walk., can act also as secondary and quaternary parasitoids.

The efficiency of primary parasitoids is much limited by the action of the hyperparasitoids, so that the number of the parasited aphids is low enough, between 5-10% (Mustăță Gh., 1974, 1974-1975).

As regards the complex of parasitoids in the colonies of *Uroleucon cichorii* Koch. from the crops of andives (*Cichorium intybus* L. ssp. *sativum* (DC) Janchen var. *foliosum* Heg. impresses by the number of species. In a crop of andives in Bacău I have found a strong attack of the species *Uroleucon cichorii*. The plants (in the second year) were black of the colonies of this aphid, but in colonies many predatory and parasitoid species were acting. The degree of parasitization of the individuals of *Uroleucon cichorii* amounted to 30-35% (which is very rare for aphids, at least to us). Of the thousands of mummys collected (Mustăță Gh. and coll., 1991) appeared not less than 34 species of parasitoids, namely: 3 species of primary parasitoids (Family Aphidiidae), 28 species of secondary parasitoids (Charipidae 25, Encyrtidae 1, and Megaspilidae 2) and 3 species of tertiary parasitoids (Family Pteromalidae). The latter act also as secondary or quaternary parasitoids (Fig. 2).

I searched the complexes of parasitoids limiting the populations of *Pieris brassicae* L., *P. rapae* L., *Plutella xylostella* L. and *Delia radicum* in some crops of cabbage in Moldavia and Dobrudja

An important number of primary parasitoids act in the populations of *Pieris brassicae* and *Pieris rapae*, limiting the populations of these harmful species in an extent of 70-80% or even more (Mustăță Gh., 1974, Mustăță Gh., Costea Gabriela, 2000, Mustăță Gh., Mustăță Mariana, 2000). Some species of primary parasitoids are in their turn limited by a number of species of secondary parasitoids (Fig. 3). In the last decade the number of secondary parasitoids not only increased, but also have a high efficiency (Mustăță Gh. and coll., 2002). *Cotesia glomerata* and *Hyposoter ebeninus* are often

parasited in a proportion of 30-40% or even more, which raises major problems for the human economy.

The species *Plutella xylostella* L. is controlled in the conditions of Romania by an impressive number of primary parasitoids, which carried out the parasitic percentages of 70-80% and in some crops even 90-95% (Mustață Gh., 1974, 1992, 1992-1993). Practically, the complex of primary parasitoids keeps *P. xylostella* under the threshold of economic damage in many crops of Moldavia and Dobrudja. How can we explain this phenomenon, especially that in Moldavia and Dobrudja there were not carried out rearings of entomophags and their launch in nature? The existence of a number so large of primary and secondary parasitoids (Fig. 4) led us to believe that *P. xylostella* has its genetic world center in this area of Europe. This fact was confirmed by some prestigious researchers. In the case of this complex of parasitoids I also found out the increase of the number of secondary parasitoids and their effectiveness in limiting the populations of primary parasitoids. We also raise for discussion the complex of parasitoids identified by us in some populations of *Delia radicum* L. (Mustață Gh., 1978).

In our research we have identified a total of 26 species of primary parasitoids controlling the populations of this species injurious to crops of cabbage (Fig. 5). These parasitoids belong to the families: Ichneumonidae, Cynipidae and Braconidae.

The conjugation of action of the primary parasitoids resulted in high percentages of parasitization of larvae of *Delia radicum* of 40-45% or even higher.

What is really interesting is the fact that in our research we have not reported the presence of secondary parasitoids. What is worth to mention is the fact that in previous years we have made some collections of larvae, but the degree of parasitization has been reduced below 10%. It is as if many among the species of primary parasitoids have parasited other hosts in the earlier years of our investigations, but giving them a pretty big biomass of larvae of *Delia radicum* has become a preferred species by these primary parasitoids.

As we can find out, the injurious species that we have raised for discussion are controlled by an impressive number of parasitoid species. A natural question appears: These species of parasitoids always accompany their hosts (in time and space?). We checked this issue in the research carried out on the colonies of *Brevycorine brassicae* and the complex of parasitoids they control. Searching the presence of the euconstant and eudominant species controlling the colonies of *B. brassicae* we found out that they are present in the colonies of this aphid from the south to the north of Moldavia, with oscillations between certain limits (Fig. 6) (Mustață Gh., 1974-1975).

It is as if these species would depend on each other in their existence. In fact, they really depend on, and depend on the millions of years, so they formed real biocoenotic complexes. Jourdheuil P. (1960) believes that these complexes are parasitary biocoenoses.

The concept of biocoenosis is well defined since 1877 by Möbius, being developed by Roger Dajos (1971) and understood by all.

Biocoenosis represents the living component of an ecosystem, the totality of populations occupying a biotope and that depend in their existence on each other. Nobody is able to really search all the species populating a biotope from micro- to macroorganisms. But we can make evident the essential aspects and to intuit perfectly the structure and the functionality of a biocoenosis.

The crop of cabbage on a particular field may be an agrobiocoenosis. No this we can fully investigate, but we can individualize certain fragments that are corresponding to some biocoenoses.

It is not the case to nominate all the species of weeds which compete with the cabbage in a crop. Considering that *Brassica oleracea* var. *capitata* L. represents the

producer, we found out that the entire crop of cabbage becomes the target of attack of over 50 species of injurious insects in Moldavia. Certainly, that these enter into competition with each other to win a place as the best within the host population

We can not investigate the natural enemies that control the populations of each phytophag. It is practically impossible. We have nominated a few species of pests of the cabbage and we saw how many parasitoid species control their existence. The colonies of *Brevycorine brassicae* are controlled by more than 30 predatory species and 25 parasitoid species. As regards the complex of entomophags of the species *Uroleucon cichorii*, the situation is more complex, too.

Let us stop on the species *Brevycorine brassicae* and let us analyse its interrelations only with the parasitoid species (Fig. 1).

*Brevycorine brassicae* represents the phytophagous consumer. It feeds on with *Brassica oleracea* var. *capitata*, which is the producer. *Brevycorine brassicae* is followed in its colonies by 5 species of primary parasitoids, which represent zoophagous consumers of order I. These species enter the competition to find the largest possible number of hosts.

The primary parasitoids become the target of the attack of secondary parasitoids. They are bound by *B. brassicae* only by their hosts, the larvae of primary parasitoids. The females of secondary parasitoids do not lay eggs in *B. brassicae*, if it is not attacked by the one among the species of primary parasitoids. The secondary parasitoids represent the zoophagous consumers of order II.

The species *Asaphis vulgaris* and *Pachyneuron aphidis* function in this biocoenotic complex as tertiary parasitoids, so as zoophags of order III. As we can see these species may act as secondary parasitoids and even as quaternary parasitoids because they are parasited between them. Why this instability? Though they opt for many species of secondary parasitoids, they change their position in the trophic network, parasiting also other species from other trophic levels. These species act depending on the biomass that are offered. If one of the parasitoid species has an exponential development, regardless of its position in the trophic network, then this species is preferred. If *Asaphis vulgaris* finds more easily, larvae of *Pachyneuron aphidis*, it prefers the latter and becomes quaternary parasitoid, and if it meets larvae of *Diaeretiella rapae*, then it acts as secondary parasitoid.

We might think that in time (over millions of years) the tertiary parasitoids will specialize only for certain species and could remain on a certain level of the trophic network. It would be wrong to think so. In fact, these species form a true buffer system within this complex, being a mechanism of self-adjustment so that it can not be an exponential development of a species.

The situation is also similar in the colonies of *Uroleucon cichorii*. In this way we can understand the other complexes we've put in discussion

Within these complexes we find all the links characteristic to a biocoenosis: producers phytophagous consumers, zoophagous consumers of different orders (represented by primary, secondary, tertiary and quaternary parasitoids). These biocoenoses are called parasitoid biocoenoses.

In fig. 7 we have made a trophic pyramid specific to the colonies of *Brevycorine brassicae*. As we can find out this trophic pyramid is very complex, with many levels.

If we analyse carefully the numerical relations characteristic to this trophic pyramids, we can find out that it does not fit into any type of trophic pyramids of predatory type, neither in those of parasitic type. The parasitoid biocoenoses have their own characteristics: the number of individuals lowers to the top of the pyramid, but the body mass of individuals also decreases.

Regarding the trophic networks characteristic to these biocoenotic complexes we realize that they are made up of interminable trophic chains that converge or diverge in certain trophic nodes ensuring the circuit of the substances and of energy.

In the case of the parasitoid biocoenoses characteristic to the colonies of aphids in a single host, it is developing a single parasitoid, which explains us the numerical relations analysed. In the species of *Pieris* in a host can develop several larvae of primary and secondary parasitoids.

In this situation the number of individuals may increase from basic to the top of the trophic pyramid. As we can find out, the complexes analyzed by us have all the characteristics of a biocoenosis, being biocoenoses of particular type – parasitoid biocoenoses.

We were remembering about the mechanisms of self-adjustment characteristic to cybernetic systems. Also in the biocoenoses analysed we can find out the existence of some cybernetic mechanisms of feed-back type which do not permit the exponential development of some species (Fig. 8).

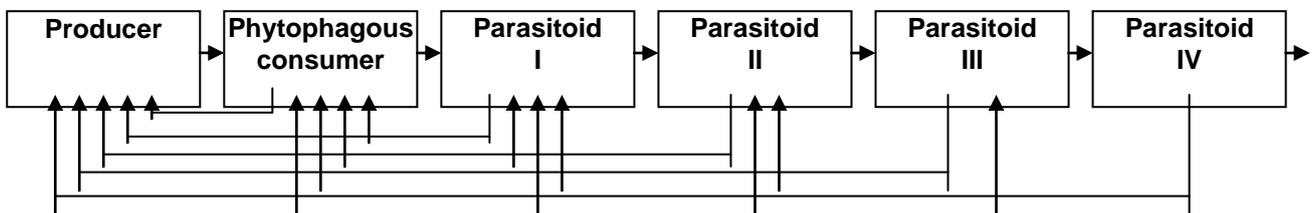


Fig. 8 Cybernetic loops characteristic to some parasitoid biocoenoses of parasitoid type

The trophic networks of the parasitoid biocoenoses in the colonies of aphids are particularly complex. We can not imagine that we could achieve the combat of *Uroleucon cichorii* by rearing of some aphids and the launch of them in nature, let's suppose of *Aphidius funebris*. The secondary parasitoids and the buffer system would reduce the populations of it very quickly and it would cancel the benefit action for the human economy. The impressive number of parasitoid species of this parasitoid biocoenosis raises a problem. Have all the species the same value within the biocoenotic complex? To evaluate the role of each species in limiting its hosts it is necessary a sinecological analysis. As we can see from Table 1, the species have very different values in terms of abundance, constancy, dominance and the ecological significance index (Mustață Gh. and coll., 1991). If the species *Aphidius funebris* has its relative abundance of 2164 individuals, *Charips carpenteri* only 5, 10 species are euconstant, 11 species constant, 4 species are accessory and have the maximum significance Index ( $W_5$ ), two species are dominant, also two species are subdominant, 4 species are recedent and the rest (24 species) are subrecedent.

The euconstant species are found in almost all the samples collected, while the accidental species usually prefer other hosts. Not finding the favourite hosts, the females have accepted to lay the eggs in them, too. The accessory species behave in a similar way, however, they are present with several individuals in these parasitoid biocoenoses. These are usually polyphagous species, preferring the hosts which offer them a bigger biomass of larvae. Passing from one host to another, they perform, in fact, a buffer system by which, in nature, it is avoided the exponential development of a species. This is the second functional buffer system by which nature provides its balance.

The parasitoid biocoenoses of the species *Brevycorine brassicae* and *Uroleucon cichorii* have both the trophic network and the trophic pyramid particularly complex. The existence of the primary, secondary, tertiary and quaternary parasitoids proves the fact that the biocoenosis has matured to the stage of Climax. Here there should be a system to function perfectly and should not be permitted the exponential development of a

species. However, the complex of parasitoids does not seem to function efficiently because it does not control well the populations of the respective species of aphids. What actually happens? The parasitoid species seem not to allow the exponential development of a species regardless of the trophic level on which it is. The existing mechanisms function well, but in a system which is found for long in the imbalance. The imbalance is determined by the fact that the aphid - the producer achieves an exponential development due to huge biomass provided by the host plant. It is as if the complex of parasitoids would remain functional only in a host with a much smaller number of individuals. The imbalance was caused by man.

How should function these biocoenotic complexes ?

Suppose that in a space totally isolated is found a crop of cabbage. The respective crop was discovered by one of the species of *Brevycorine brassicae*, *Pieris brassicae*, *Plutella xylostella* or *Delia radicum*. Having provided a consistent biomass the phytophagous species could multiply so much that it could compromise the whole crop. Destroying the host plant in totality the existence of the phytophag is put in danger because other plants are no longer available. The situation would be saved if a species, or more species of primary parasitoids would find themselves the crop of cabbage, controlling the population of the phytophagous insect. Reducing the population of the phytophagous insect, the existence of the host plant is saved. The parasitoids of order I could but to endanger the existence of the phytophag, as it happens in the case of the species *Plutella xylostella*, which is reduced in some crops to 80-90% or even more (Mustață Gh., 1974). It could take place the extinction of the species *P. xylostella*. This is not because the secondary parasitoids have entered in the respective biocoenotic complex. They limit much the multiplying of the primary parasitoids ensuring the existence of the phytophagous species. In the situation in which the primary parasitoids are too much limited, existing the danger of their extinction, then the tertiary parasitoids enter into the complex. They begin to act like a buffer system which ensures the avoidance of exponential development of a species or the extinction of another.

Among the species analyzed by us we find out that *Delia radicum* is controlled by no fewer than 26 species of primary parasitoids. The degree of parasitation may increase from one generation to another. Is it possible to get to the extinction of this species even in a specific area? We do not believe that it is possible. The self-adjustment mechanisms and the buffer mechanisms will come into action that should restore the equilibrium.

We found out this thing in our research in the case of the parasitoid biocoenoses of the species *Putella xylostella*. In the years '70-'80, we discovered the existence of a very large number of primary parasitoids that were acting together in reducing the populations of *Plutella xylostella*, leading to, as we've shown, the percentage of high parasitation (Mustață Gh., Mustață Mariana, 2003). At the beginning of the years '90, we started to register the penetration into the complex of a number of increasingly large, from one year to another, of secondary parasitoids. In the last decade we found out that some species of secondary parasitoids have become euconstant and eudominant in this biocoenosis of parasitoid type. The fate of *P. xylostella* began to improve. For us it seemed alarming the high efficiency of some secondary parasitoids. Understanding well the mechanism we were expecting to the appearance of some tertiary parasitoids or another buffer system to ensure a balance among species. To our surprise the species *Oomyzus sokolovskii* appeared, acting both as primary and secondary parasitoid. So the system starts to get maturity and tend to Climax.

We can not to remain impressed by the large number of parasitoid species acting in these biocoenotic complexes. But if we are calmly, or stay a little upset when grasping that some species are accidental or accessory within these complexes. If we analyze the situation, however, say in the colonies of *Brevycorine brassicae* from south to north of

Moldavia, we find out that the euconstant and constant, eudominant and dominant species are found almost constantly in the colonies of this aphid. The parasitoid biocoenosis, like any other type of biocoenosis, has an evolution, it can change its configuration from one period to another and from one area to another. Some new species can penetrate, and some can disappear, or some of the euconstant and eudominant species can become auxiliary or accidental, recedent or subrecedent. These species seem to have a certain role in preadaptation of the biocoenoses of parasitoid type.

We want to put in discussion other issues, too. We mention the fact that it would be risky for us to rear in laboratories one of the species of Afidiidae in the colonies of *Uroleucon cichorii* or *Brevycorine brassicae* and to launch it in the field to combat the respective aphid. We could not succeed because the secondary and tertiary parasitoids (the buffer system) would cancel, in several generations, our effort.

Not the same thing happens in the case of the biocoenotic complexes of the species *Plutella xylostella*, *Pieris brassicae*, *Delia radicum* etc.

In this situation we can intervene successfully in the combat on biological way of a pest species.

We mentioned the fact that in some cabbage crops attacked by *P. xylostella* or the species of *Pieris* whose populations were parasited at the rate of 70-80% or more, the growers of cabbage were intervening with chemicals to combat the pest. Which pest? The pest was put out of danger. Such an action constitutes a true ecological crime.

We must understand that we can not afford to act in a biocoenosis to make combating of pests by chemical or biological way, if we do not make a competent ecological analysis of the respective biocoenosis, if you do not really know what is happening there.

We learned to classify the animal organisms in injurious and useful, to act in nature through the point of view of the human economy. In nature, all the species have the same importance. In the economy of nature there is no useful or injurious species. Each species has its precise role in the biocoenotic complex of which it is part. In nature **everything depends on everything**, here's a principle that must be understood and applied.

## CONCLUSIONS

In this paper we proposed that, based on our research for nearly four decades on some pest insects and the complex of natural enemies which limit their populations, to elucidate the role of the parasitoid biocoenoses in keeping the natural balance.

We presented the complexes of parasitoids controlling the populations of the species: *Brevycorine brassicae* L., *Uroleucon cichorii* Koch., *Pieris brassicae* L., *P. rapae* L., *Plutella xylostella* L. and *Delia radicum* L. Analyzing these complexes of parasitoids and their hosts we found out that they represent biocoenotic complexes of particular type – parasitoid biocoenoses. We analyzed the characteristics of these biocoenoses of parasitoid type and tried to elucidate their role in keeping the natural balance.

On the basis of the research carried out and the experience accumulated we draw the attention of those interested that we can not allow to intervene in a biocoenosis to combat an injurious species (using biological or chemical weapon) if we do not achieve an ecological analysis truly scientific. Without such an analysis our intervention is blind and it can turn into an ecological crime.

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**Sinecological analysis of the species from the biocenotic complex of the  
*Uroleucon cichorii* species**

**Table 1.**

Nr. crt.	Species	Abundance	Constance		Dominance		Index of ecological significance	
1	<i>Aphidius funebris</i>	2164	100	C <sub>4</sub>	38,87	D <sub>5</sub>	38,87	W <sub>5</sub>
2	<i>Asaphes suspensus</i>	808	100	C <sub>4</sub>	14,64	D <sub>5</sub>	14,64	W <sub>5</sub>
3	<i>Charips pusillus melanothorax</i>	455	100	C <sub>4</sub>	8,22	D <sub>4</sub>	8,22	W <sub>4</sub>
4	<i>Pachyneuron aphidis</i>	385	100	C <sub>4</sub>	6,97	D <sub>4</sub>	6,97	W <sub>4</sub>
5	<i>Asaphes vulgaris</i>	221	100	C <sub>4</sub>	4,00	D <sub>3</sub>	4,00	W <sub>3</sub>
6	<i>Praon dorsale</i>	187	95	C <sub>4</sub>	3,22	D <sub>3</sub>	3,05	W <sub>3</sub>
7	<i>Charips curvicornis</i>	92	90	C <sub>4</sub>	1,67	D <sub>2</sub>	1,50	W <sub>3</sub>
8	<i>Charips victrix victrix</i>	77	85	C <sub>4</sub>	1,38	D <sub>2</sub>	1,18	W <sub>3</sub>
9	<i>Charips leunisii</i>	61	70	C <sub>3</sub>	1,10	D <sub>2</sub>	0,77	W <sub>2</sub>
10	<i>Charips microcerus</i>	59	70	C <sub>3</sub>	1,07	D <sub>2</sub>	0,74	W <sub>2</sub>
11	<i>Ephedrus campestris</i>	53	80	C <sub>4</sub>	0,96	D <sub>1</sub>	0,76	W <sub>2</sub>
12	<i>Alloxysta campyla</i>	52	75	C <sub>3</sub>	0,94	D <sub>1</sub>	0,70	W <sub>2</sub>
13	<i>Charips melanogaster</i>	51	65	C <sub>3</sub>	0,92	D <sub>1</sub>	0,59	W <sub>2</sub>
14	<i>Alloxysta semiclausa</i>	48	70	C <sub>3</sub>	0,87	D <sub>1</sub>	0,43	W <sub>2</sub>
15	<i>Dendrocerus bicolor</i>	46	85	C <sub>4</sub>	0,83	D <sub>1</sub>	0,70	W <sub>2</sub>
16	<i>Charips perpusillus</i>	40	60	C <sub>3</sub>	0,72	D <sub>1</sub>	0,43	W <sub>2</sub>
17	<i>Alloxysta subaperta</i>	34	60	C <sub>3</sub>	0,62	D <sub>1</sub>	0,37	W <sub>2</sub>
18	<i>Alloxysta perplexa</i>	33	65	C <sub>3</sub>	0,60	D <sub>1</sub>	0,39	W <sub>2</sub>
19	<i>Alloxysta nigrita</i>	22	55	C <sub>3</sub>	0,40	D <sub>1</sub>	0,22	W <sub>2</sub>
20	<i>Alloxysta ulrichii</i>	19	55	C <sub>3</sub>	0,34	D <sub>1</sub>	0,22	W <sub>2</sub>
21	<i>Dendrocerus carpenteri</i>	19	45	C <sub>2</sub>	0,34	D <sub>1</sub>	0,15	W <sub>2</sub>
22	<i>Alloxysta ulrichii homotoma</i>	17	45	C <sub>2</sub>	0,31	D <sub>1</sub>	0,13	W <sub>2</sub>
23	<i>Charips dolichocerus</i>	16	25	C <sub>1</sub>	0,29	D <sub>1</sub>	0,07	W <sub>1</sub>
24	<i>Aphidencyrthus aphidivorus</i>	15	55	C <sub>3</sub>	0,27	D <sub>1</sub>	0,12	W <sub>1</sub>
25	<i>Charips recticornis recticornis</i>	14	15	C <sub>1</sub>	0,25	D <sub>1</sub>	0,12	W <sub>1</sub>
26	<i>Charips flavicornis</i>	13	30	C <sub>2</sub>	0,24	D <sub>1</sub>	0,07	W <sub>1</sub>
27	<i>Charips tscheki</i>	9	35	C <sub>2</sub>	0,16	D <sub>1</sub>	0,05	W <sub>1</sub>
28	<i>Charips arcuatus</i>	7	20	C <sub>1</sub>	0,13	D <sub>1</sub>	0,02	W <sub>1</sub>
29	<i>Charips cabrerai</i>	7	25	C <sub>1</sub>	0,13	D <sub>1</sub>	0,032	W <sub>1</sub>
30	<i>Charips castaneiceps</i>	7	20	C <sub>1</sub>	0,13	D <sub>1</sub>	0,026	W <sub>1</sub>
31	<i>Charips pusillus unicolor</i>	6	15	C <sub>1</sub>	0,11	D <sub>1</sub>	0,016	W <sub>1</sub>
32	<i>Charips cameruni</i>	5	20	C <sub>1</sub>	0,09	D <sub>1</sub>	0,018	W <sub>1</sub>
33	<i>Charips carpenteri</i>	5	20	C <sub>1</sub>	0,09	D <sub>1</sub>	0,007	W <sub>1</sub>
34	<i>Charips victrix infuscatus</i>	5	15	C <sub>1</sub>	0,05	D <sub>1</sub>	0,007	W <sub>1</sub>

Fig. 1 The trophic network specific for parasitoid biocoenoses from certain aphids colonies

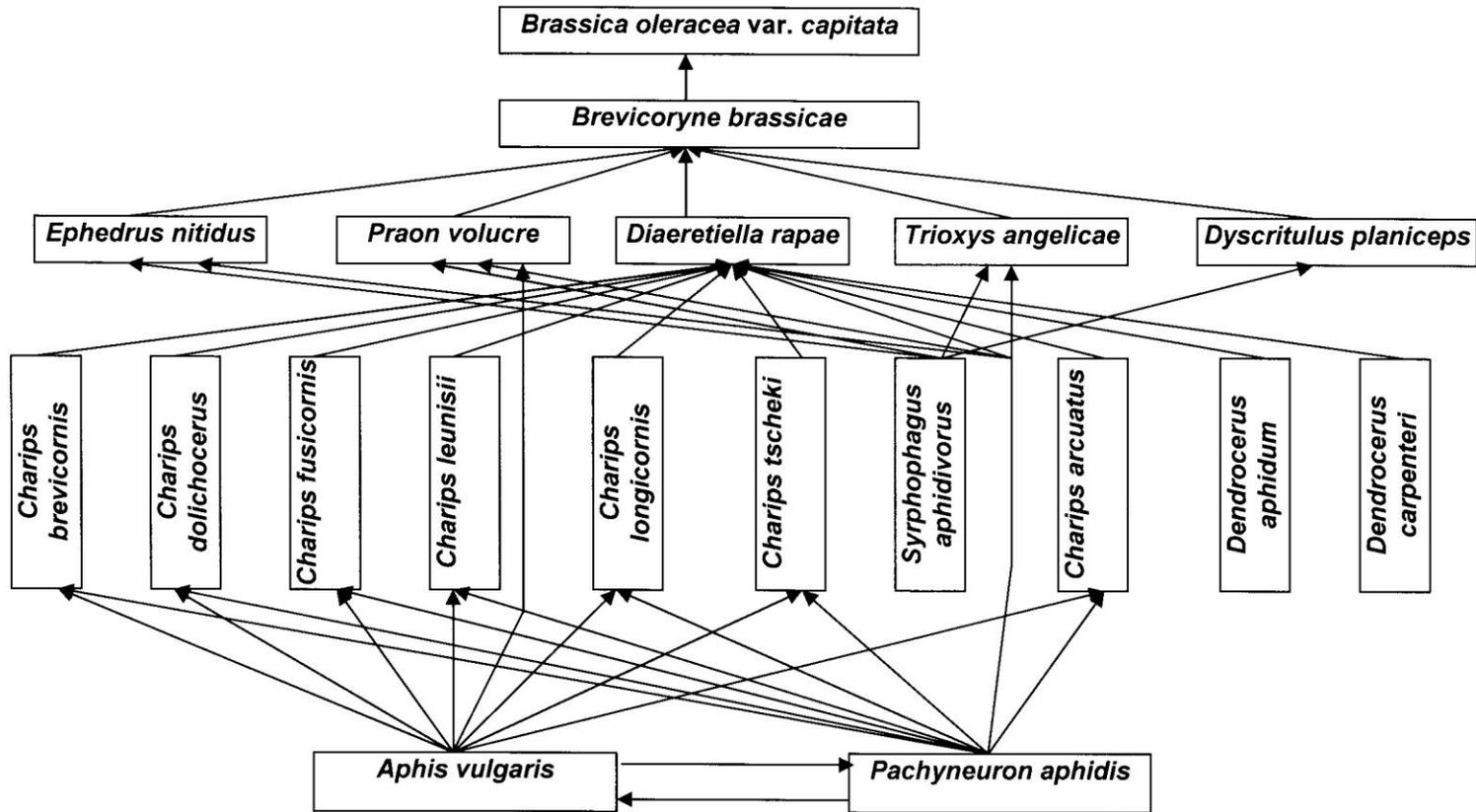


Fig. 2. The parasitoid complex of the *Uroleucon cichorii* Koch. populations

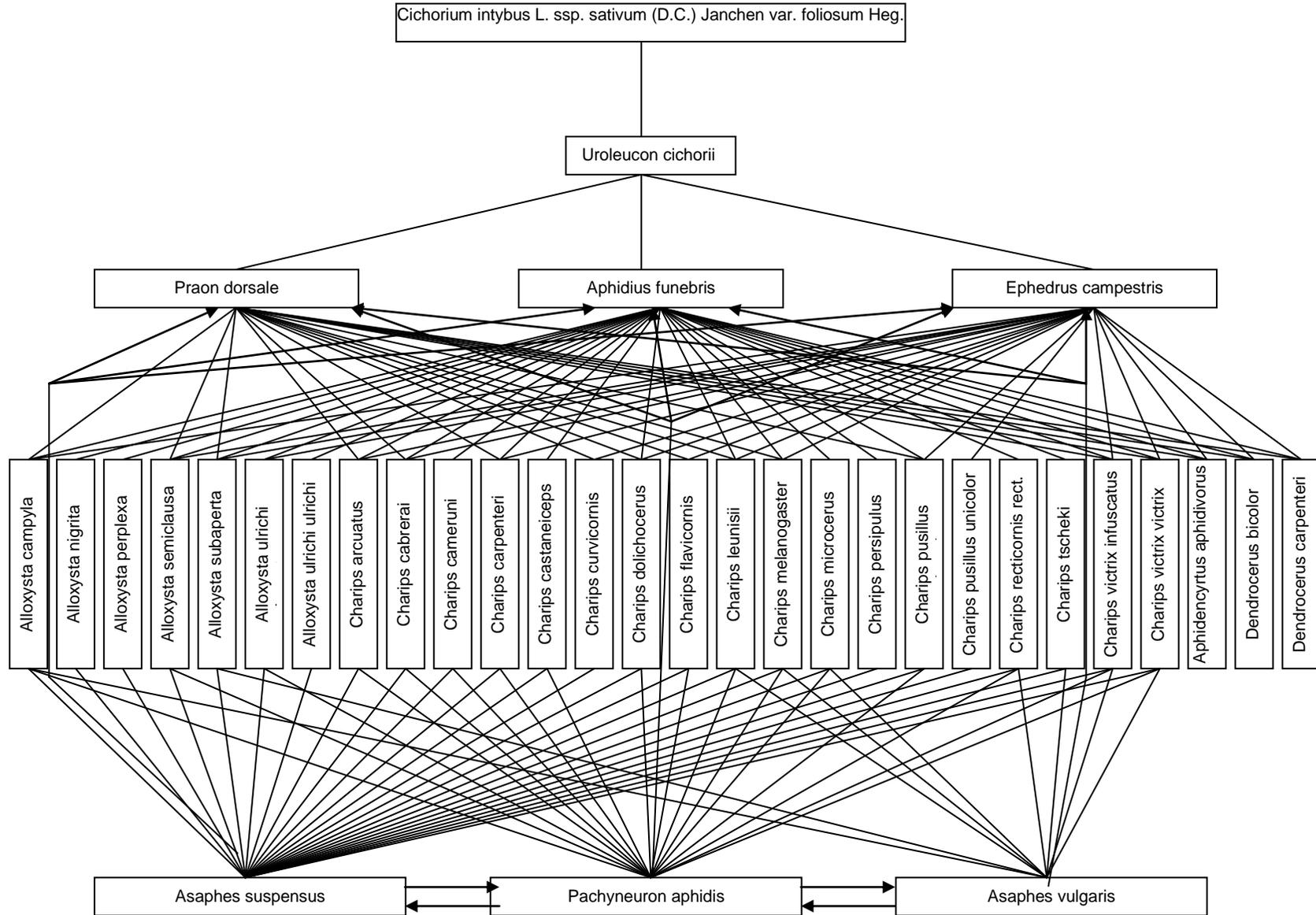
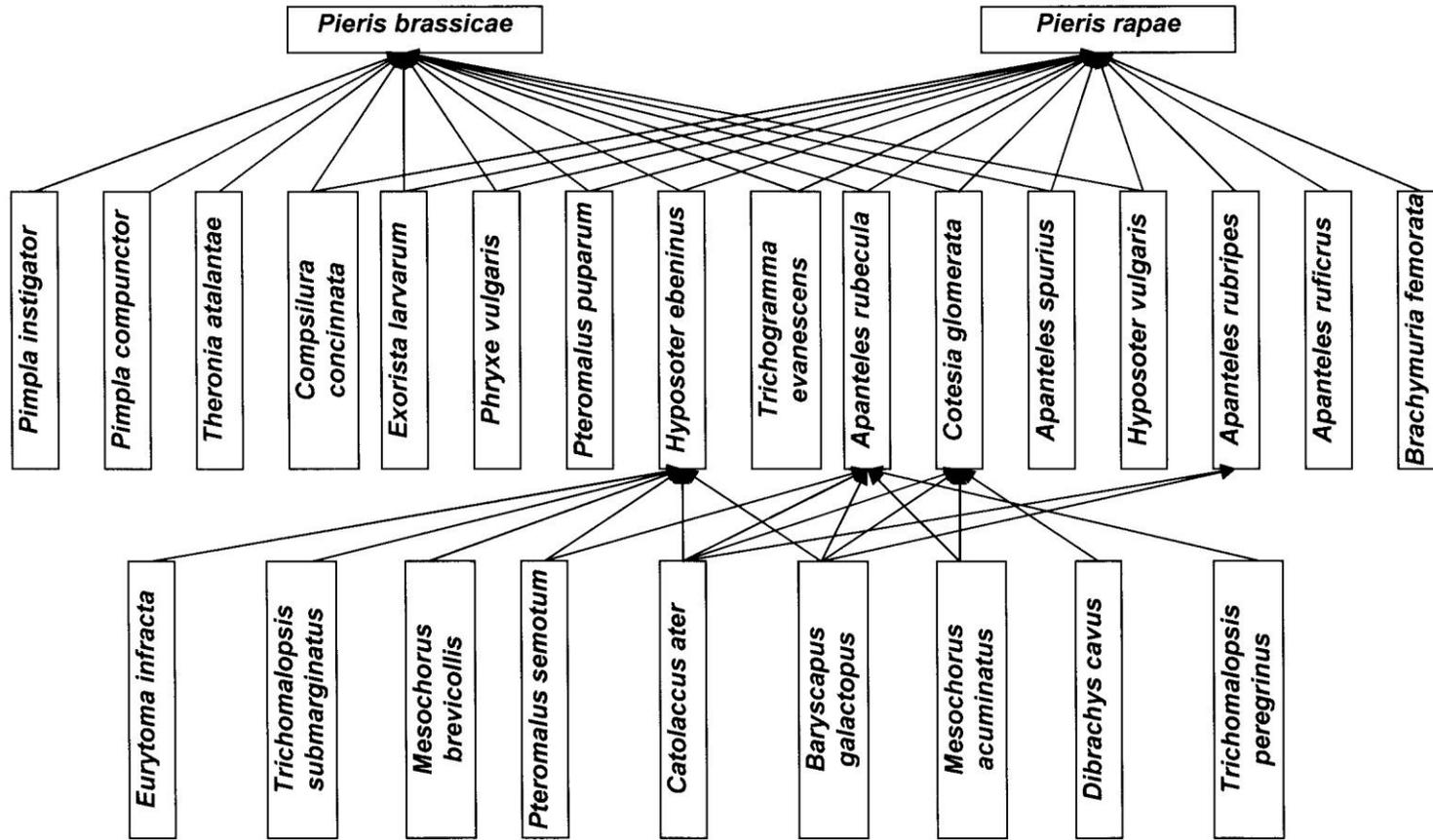


Fig. 3 The trophic network specific for *Pieris* populations



**Fig. 4 The trophic network specific for *Plutella xylostella* populations**

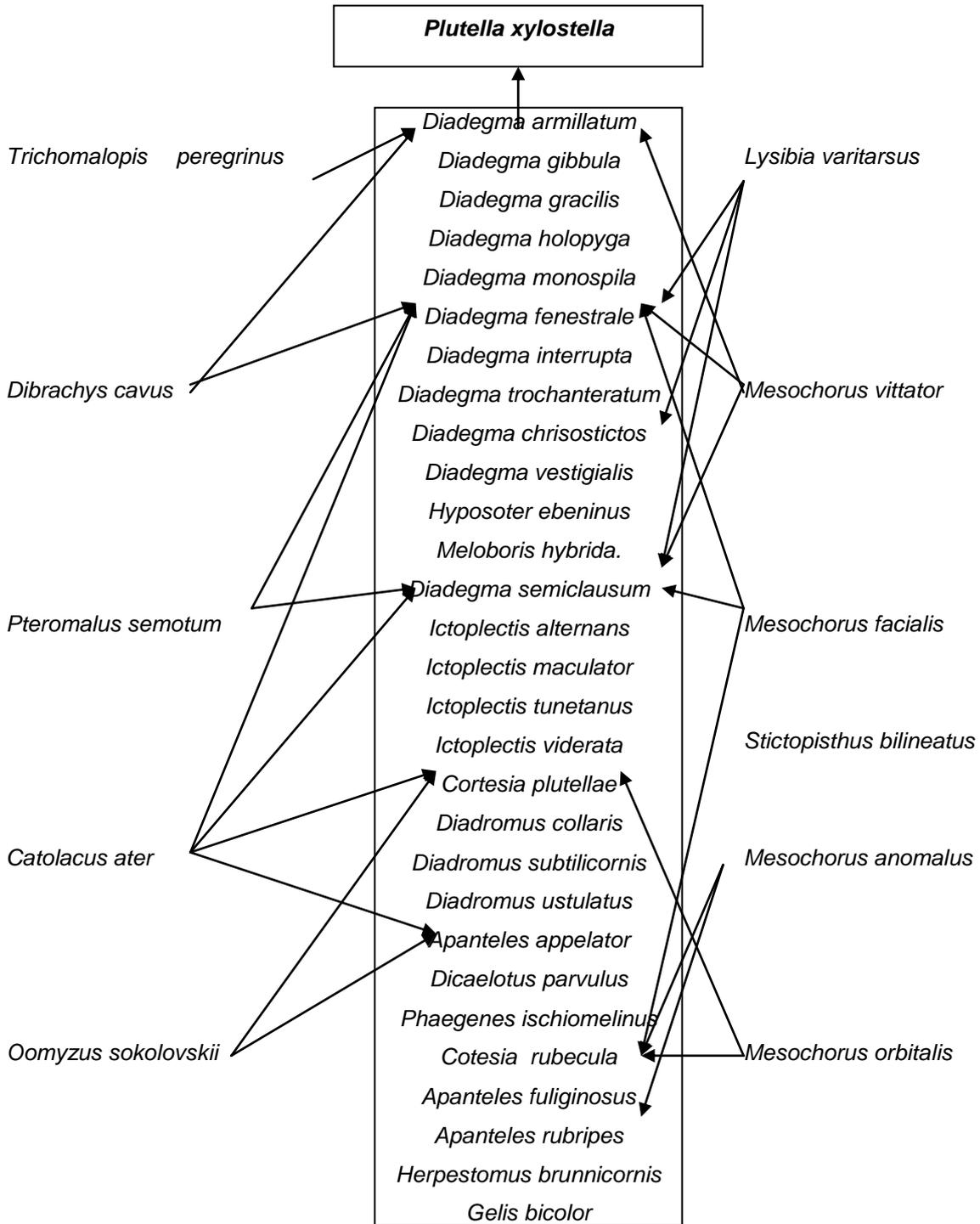


Fig. 5. The parasite complex controlling the *Delia radicum* L. populations

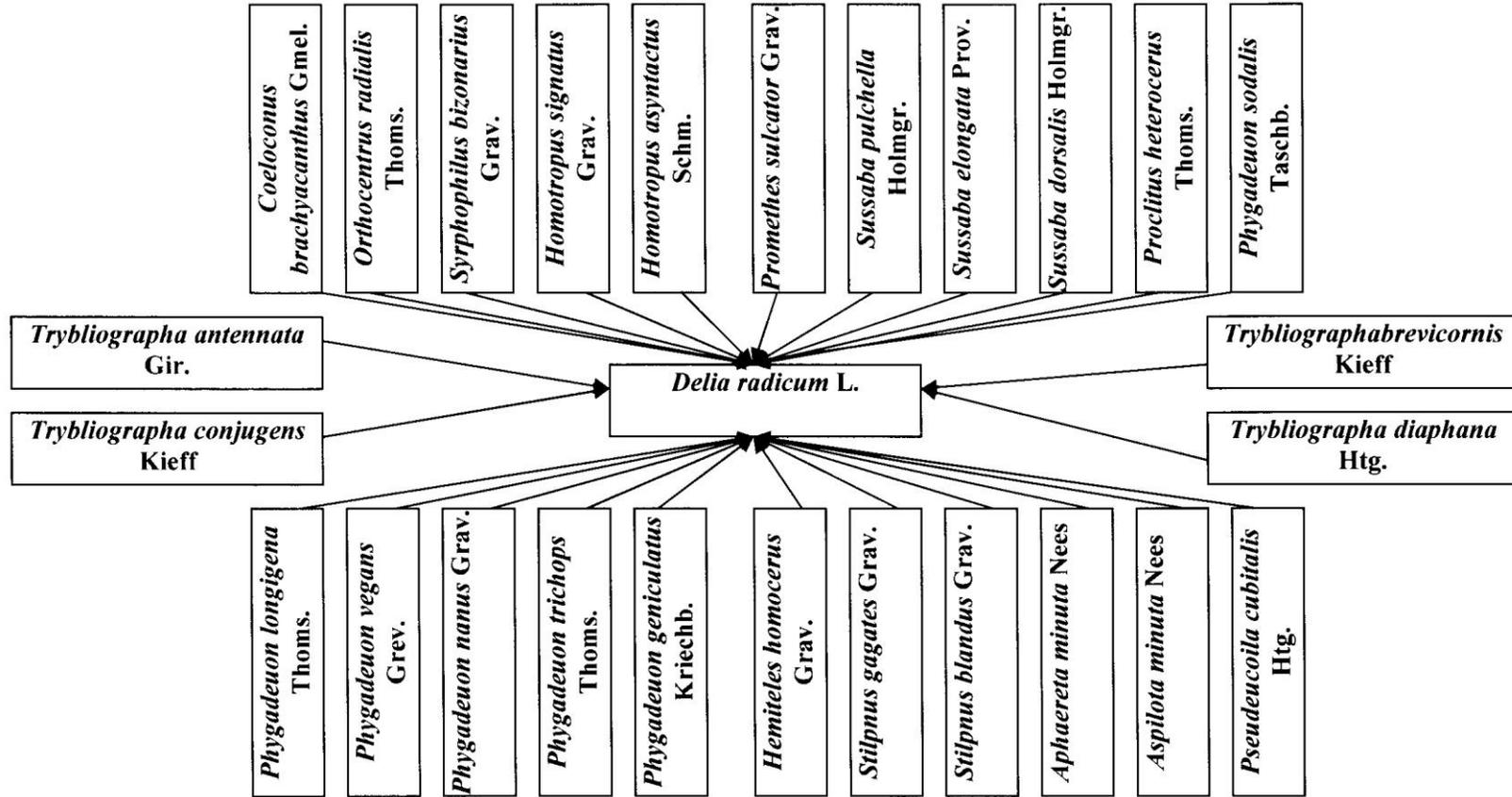


Fig. 6 The dynamic of parasitoid species of *Brevicoryne brassicae* L., complex in Moldavia

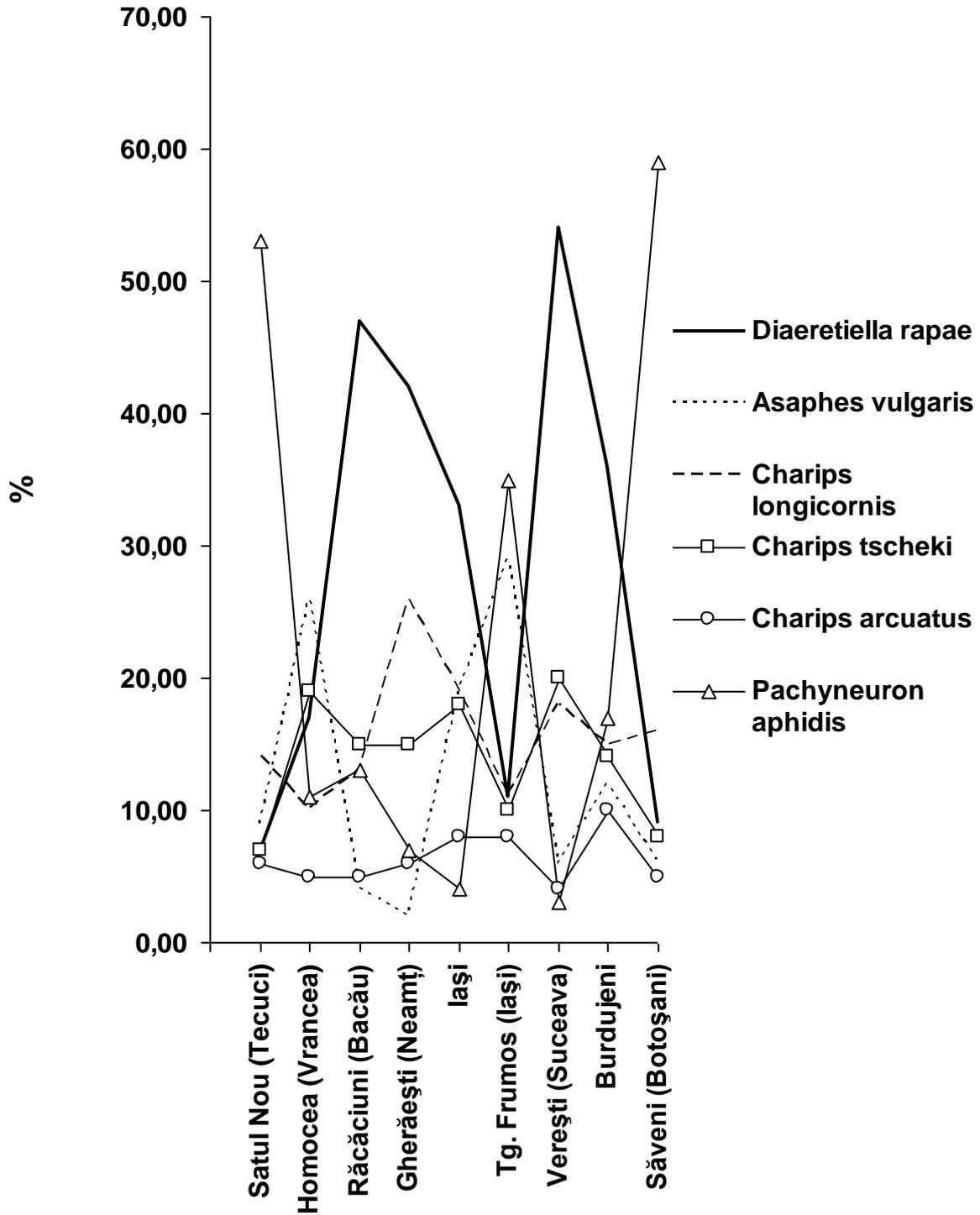


Fig. 7 The trophic pyramid of *Brevicoryne brassicae* L. biocoenotic complex

# Decomposers

**Consumers V**  
(Parasitoid IV)

**Consumers IV**  
(Parasitoid III) - *Asaphes*  
-

**Consumers III**  
(Parasitoid II) - *Charips* -

**Consumers II**  
(Parasitoid I)  
- 5 species secondary parasitoids -

**Consumers I**  
*Brevicoryne brassicae* L.  
Phytophag species

**Producers**  
*Brassica oleracea* var *capitata* L.

# STUDIUL COMPARATIV PRIVIND PRODUCȚIA ȘI ELEMENTELE ACESTEIA LA HIBRIZII DE PORUMB AUTOHTONI ȘI STRĂINI, ÎN CONDIȚIILE DE LA SCDA ȘIMNIC

## THE COMPARATIVE STUDY REGARDING YIELD AND MAIN YIELD COMPONENTS OF AUTOCHTHONOUS AND FOREIGN CORN HYBRIDS IN ARDS SIMNIC AREA FIELD CONDITIONS

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**Key words:** inbred line. maize, plant characters

### ABSTRACT

*În perioada 2005-2007, la SCDA Șimnic a fost testat un material la porumb reprezentat de 13 linii consangvinizate (7 românești și 6 străine) și 8 hibridi (5 românești și 3 străini) rezultați din aceste linii.*

*Liniile consangvinizate folosite au fost: RF408, RF406, RF403, RS235,RS151, RS64,RS13, K5361, K8112, K9340, K7448, K4432 și K7619.*

*Hibridii folosiți au fost: F376 (RF408xRF406), Olt (RF408xRF403), HSS1 (RS235xRS151), HSS2 (RS64xRS235), HSS3 (RS64xRS13), Laureat (K5361xK8112), Mikado (K9340xK7448) și Luce (K4432xK7619)*

*Comparația producției realizate și principalele elemente ale acesteia la 5 hibridi autohtoni (F376, Olt, HSS1, HSS2 și HSS3), față de 3 hibridi străini (Laureat, Mikado și Luce) a dus la constatarea unei superiorități a hibridilor străini care, în medie pe 3 ani în două condiții de cultură (irigat și neirigat), au depășit hibridii autohtoni la producția de boabe cu o diferență distinctă semnificativă de 11,5 % datorită vigorii vegetative mai mari, exprimată prin suprafața foliară.*

*S-a constatat că liniile consangvinizate autohtone, în condițiile date, au realizat o prolificitate bună de 110,1 știuleți la 100 plante, iar la hibridii respectivi aceasta a scăzut simțitor, ajungând la 99,8 știuleți la 100 plante, aceeași situație consemnându-se și la liniile străine, care au prezentat o prolificitate de 105,6 știuleți la 100 plante, iar la hibridii respectivi aceasta a scăzut la 101,5 știuleți la 100 plante.*

*În cazul hibridilor, în special a celor autohtoni, s-a observat o diminuare a caracterului număr mediu de știuleți pe plantă comparativ cu formele lor parentale.*

*During three years (2005-2007) to ARDS Simnic area were tested 13 corn inbred lines ( 7 romanian lines and 6 foreign lines) and also 8 hybrids (5 romanian hybrids and 3 foreign hybrids) resulted from these lines.*

*These inbred lines were: RF408, RF406, RF403, RS235,RS151, RS64,RS13, K5361, K8112, K9340, K7448, K4432 and K7619.*

*The tested hybrids were: F376 (RF408xRF406), Olt (RF408xRF403), HSS1 (RS235xRS151), HSS2 (RS64xRS235), HSS3 (RS64xRS13), Laureat (K5361xK8112), Mikado(K9340xK7448) and Luce (K4432xK7619).*

*The comparation, during three years in different cropping systems (irrigated and rainfed), among five romanian hybrids yields and its components beside three foreign hybrids lead to a superiority of foreign hybrids. These foreign hybrids exceeded romanian*

*hybrids yield with a distinct significant difference (11,5%) due to a higher vegetative vigour, expressed as foliar surface.*

*In experimental conditions, it was observed that autochthonous inbred lines recorded a good prolificity of 100,1 corn cobs per 100 plants, beside to romanian hybrids prolificity which decreased, recording 99,8 corn cobs per 100 plants. A similar situation it was recorded to foreign inbred lines which also showed good prolificity of 105,6 corn cobs per 100 plants and that of foreign hybrids which decreased to 101,5 corn cobs per 100 plants.*

*For hybrids situation, especially for autochthonous hybrids, it was observed a decrease of corn cobs average number per plant beside to parental forms.*

## **INTRODUCTION**

Undoubtedly, corn is the most studied plant, especially from genetic point of view. The biological characters of this vegetal species represent the most serious reason of theoretical and experimental genetic researches of corn. The particular advantages for genetic research are represented by: the natural diversity of species, plant morphology and physiology, unsexed reproduction, great number of available gametes for descending generations (each corn plant has ability to form approximately 14-15 million pollen grains and minimum 400-500 female gametes), the cytogenetic structure of somatic cells and corn gametes.

Heterosis is one of the most important biological phenomena, which has a special practical significance. Numerous studies have emphasized the superior performances for the F1 hybrids, as a result of genetic, phenotypic, physiologic, metabolic, molecular differences among parental crossed forms (Copândean Ana and Căbulea, 2004). The hybrid vigor phenomenon, termed heterosis was remarked accidentally in the XX<sup>th</sup> century when the researchers crossed free-pollinated corn populations. This study importance is more significant as only 36% (911 499 hectares) of the land sowing with corn in Romania (2 531 941 hectares in 2007 year) represent the surface seeded with F1 hybrids. This rate represents an increase with 3% comparatively with the surface seeded with F1 hybrids in 2006 year (33% - 855 335 hectares) when the total surface seeded with corn was 2 591 923 hectares That means in 2007 year was recorded an increase of the surface seeded with F1 hybrids only with 56 164 hectares comparatively with 2006 year. Therefore, we consider that heterosis is still a current study for romanian researchers.

## **MATERIAL AND METHODS**

The main objective of this paper is focus on the comparative study of some autochthonous and foreign corn hybrids in ARDS Simnic field conditions. The study used F376 and Olt hybrids, because in the last few years these and the other three hybrids created to ARDS Simnic using inbred lines resulted by local corn populations (HSŞ1, HSŞ2 and HS3) have performed the best in the central and south Oltenia area. In this study were also used, as foreign material, other three hybrids: Laureat, Mikado and Luce, which are recommended by KWS Company being the most suitable corn hybrids for this area.

The material is represented by 13 inbred lines (7 romanian lines and 6 foreign lines) and 8 hybrids (5 romanian hybrids and 3 foreign hybrids) resulted from these lines. The inbred lines used in this study were: RF 408, RF406, RF403, RS235, RS151, RS64, RS13, K5361, K8112, K9340, K7448, K4432 and K7619. The hybrids used in this study were: F376 (RF408 x RF406), Olt (RF408 x RF403), HSS1 (RS235 x RS151), HSS2 (RS64 x RS235) and HSS3 (RS64 x RS13), Laureat (K5361 x K8112), Mikado (K9340 x K7448) and Luce (K4432 x K7619).

The methodology used for material evaluation (inbred lines – parental forms and the resulted hybrids) was focus on testing in experimental units with two row-plots and three replications. The trials were hand planted with 2-3 seed rate/hole using a planter. The plants were counted at 4-6 leaves stage, recording a good stand of 50 000 plants/acre for rain fed conditions and 60 000 plants/acre for irrigated conditions. The trial was placed triple balance lattice.

The results were focus on specific characters, as follows: plant characters (the height of plants, the main corn cob insertion height, corn cobs number/plant, the leaves number/plant, the leaves surface, the ramifications number/ear, the second basis knot diameter, amount of utile temperature degrees (SGUT) from emergence till flowering stage and amount of utile temperature degrees (SGUT) from emergence till silk stage.

The variance analysis was calculated for each plant, ear and performance characters and the limit differences estimation was realized comparatively with the average, used as control.

For the estimation of differences significance comparatively with the average was use test **t** values (Ceapoiu, 1968).

## RESULTS AND DISCUSSION

**Inbred lines** (table 1). **Plant height.** For this character was observed a very representative variability within the studied lines set and the differences were statistical assured for most cases. Thus, most romanian lines (RF408, RS235, RS64 and RS151) exceeded the average (control value) with distinct and very significant distinct differences or at least were at the control level, as RF406. These inbred lines were used in different combinations, especially as maternal forms. The lines Rf406 and Rs13, used exclusively as paternal forms, recorded very significant distinct height level, inferior to that of the control value. On the other hand, the foreign inbred lines showed different height level inferior to that of the control value, excepting K9340 and K7448 line, which exceeded significantly the trial average. This aspect shows, one more, that foreign studied lines were obtained using modern breeding methods, as haploidy followed by the material diploidisation, resulting 100 homozygote lines and further a maxim depression expressed in this case by very high decrease of plants height. Comparatively, the romanian lines obtained using classical breeding methods (repeatable inbreeding, SIB pollinations, the second cycle selection) undoubtedly, show a residual heterosis, expressed by shorter height.

**The main corn cob insertion height.** The studied lines present also great variability for this character and the differences were positive and negative significant comparatively with the control. In this case, is desirable to put the results close or below the average value, because a higher corn cob insertion could have a negative influence to stalk break and lodging resistance. For insertion height the obtained values are statistical assured. Thus, the lines RS235, RS151, Rs64 and K4432 recorded significant superior values comparatively with the control value and those of the lines RF406, RF403, K8112, K7448 and K7691. In case of foreign studied lines was observed lower height insertion, which was presented only to parental forms used for cross-breeding.

**The corn cobs number per plant (prolificacy)** For this character didn't exist differences statistical assured, but it was observed that the values of the lines obtained to ARDS Simnic were superior to those of the other studied lines, excepting RS13 line (exclusively used as parental form). For three lines obtained to ARDS Simnic, the results showed the trajectory followed by lines selection focus on better prolificacy correlated with a superior drought tolerance.

**The leaves number per plant.** It was observed that the differences were statistical assured, but the values weren't always correlated with higher plants length, as we

expected. The precocious lines K5361 and K8112 recorded significant distinct values inferior to the control value. This is happen due to pronounced depression, as a result of breeding method (haploidy), expressed in this case through accented depression of plants vigor.

**The leaves surface.** For most cases, this character recorded statistical assured differences comparatively with the control, which were closely correlated with plant leaves number. Thus, the lines RF403, K5361 and K8112 recorded significant differences inferior to the control value (similar situation as leaves number character) and the lines RS64, K9340 and K4432 recorded also significant differences superior to the control value. It is remarkable the value of the line RS151, which exceeded the control value with very significant distinct differences, even the plant leaves number are below the experience average. This aspect illustrate a very accented leaves growth and also a very intensive photosynthetic activity reflected by the high yield level (54,7 q/ha).

**The ramifications number per ear.** For this character all studied lines presented very significant distinct differences positive for the lines: RF406, RF403, RS235, RS151, RS64, RS 13 and negative for the lines: RF408, K5361, K8112, K9340, K7448, K4432, K7619, comparatively with the control value. It is to observe that romanian lines, excepting RF408 line, are distinguished by foreign lines recording numerous ramifications per ear. This type of ear could determine better drought and heat tolerance, especially for spreading out the pollen for longer period, but could have also negative effect to the yield, because the plants consume great amount of synthesized elements.

The line RF408 was the only one which is clearly different not only as the ear aspect, but also as the phenotypic plant aspect. This line is possible to include in genotype genes preceded from different germplasm sources, other than romanian local populations.

**The second basis knot diameter.** Analyzing this character can be observed that delayed foreign lines show a remarkable lightness and the selection of these lines taking account a superior stalk break and lodging resistance, based on excellent stem flexibility and also reduced resistance to header combine action. Therefore, the hybrids Mikado and Luce are recommended for grain and fodder. The lines K9340, K7448, K4432 and K7619 are remarkable through significant inferior differences comparatively with the control value. On the other side are situated two inbred lines used as parental forms for romanian valuable hybrids, as follows: RF406 and RF403.

#### **SGUT (emergence till flowering stage) and SGUT (emergence till silk stage)**

Considering the data recorded between flowering and silk stages we classify the studied lines in three groups: earliness lines (K5361), intermediate lines (K8112, RF406, RF403, RS235, RS151, RS13) and delayed lines (RF408, RS64, K9340, K7448, K4432, K7619).

**Hybrids (table 2). Plant height.** For this character four studied hybrids showed statistical assured differences. Thus, the hybrid HSS<sub>1</sub>, which include in the pedigree the line RS13 (the shortest line) and Laureat (the most precocious studied hybrid) were remarkable through their inferior height, comparatively with the control value, recording distinct and very distinct significant differences. On the other side is placed the delayed hybrid Mikado, which has an impressive height, exceeding the control with very significant distinct differences. The hybrid HSS<sub>2</sub>, which include in the pedigree the lines RS64 and RS235 (lines with impressive habitus) over crossed also the control value with significant differences.

Table 1

## Analyze of variance for plant traits at inbred lines

Inbred lines	Plant height (cm)	The main maize cob insertion height.	Prolificacy	The leaves number per plant	The leaves surface	The ramifications number per ear.	The second basis internode diameter	SGUT (emergence till flowering stage)	SGUT (emergence till silk stage)
RF 408	242***	87***	1,15	13,9	41,75 <sup>o</sup>	4,8 <sup>ooo</sup>	2,89	825	851
RF 406	204	55 <sup>ooo</sup>	1,05	13,9	49,91**	8,8***	3,12**	803	838
RF 403	171 <sup>ooo</sup>	58 <sup>ooo</sup>	1,03	12,6 <sup>ooo</sup>	35,19 <sup>ooo</sup>	12,7***	3,20***	804	808 <sup>o</sup>
RS 235	232***	82**	1,17	13,8	42,88	8,9***	2,96	813	838
RS 151	219**	94oo95***	1,14	13,9	51,12***	14,3***	2,91	814	839
RS 64	242***	80	1,17	16,5***	64,62***	10,3***	2,78	872*	872
RS 13	168 <sup>ooo</sup>	74	0,99	14,4	45,79	12,8***	2,88	825	829
K 5361	187 <sup>oo</sup>	60 <sup>ooo</sup>	1,08	12,8 <sup>oo</sup>	28,92 <sup>ooo</sup>	4,0 <sup>ooo</sup>	2,95	715 <sup>ooo</sup>	773ooo
K8112	173 <sup>ooo</sup>	72	1,02	12 <sup>ooo</sup>	37,40 <sup>ooo</sup>	4,4 <sup>ooo</sup>	2,71	804	829
K9340	214*	72	1,05	17,1***	49,90**	4,4 <sup>ooo</sup>	2,56 <sup>ooo</sup>	851	887*
K7448	217*	68 <sup>oo</sup>	1,09	14,3	41,02 <sup>oo</sup>	4,8 <sup>ooo</sup>	2,50 <sup>ooo</sup>	877**	911***
K4432	197	86***	0,96	16,6***	49,22**	4,4 <sup>ooo</sup>	2,62 <sup>oo</sup>	898***	918***
K7619	169 <sup>ooo</sup>	68	1,14	14,2	45,76	4,3 <sup>ooo</sup>	2,41 <sup>ooo</sup>	905***	868
Mean	202,7	75,5	1,08	14,3	44,88	7,6	2,81	831	851
DL5%	10,68	4,21	0,13	0,83	2,84	0,39	0,17	32,06	32,63
DL1%	14,51	5,72	0,18	1,13	3,86	0,53	0,23	43,57	44,35
DL 0,1%	19,44	7,66	0,24	1,52	5,17	0,71	0,31	58,35	59,40

Table 2

## Analyze of variance for plant traits at hybrids

Inbred lines	Plant height (cm)	The main maize cob insertion height.	Prolificacy	The leaves number per plant	The leaves surface	The ramifications number per ear.	The second basis internode diameter	SGUT (emergence till flowering stage)	SGUT (emergence till silk stage)
F376	278,3	106,1	0,96	16,5 <sup>000</sup>	73,99*	7,4	2,87***	766	811
OLT	262,7	103	1,00	16,5 <sup>000</sup>	65,35 <sup>000</sup>	7,2	2,75***	777	810
HSS1	275,2	118,5***	1,04	17,7***	78,98***	15,5***	2,18 <sup>000</sup>	777	795
HSS2	283,58*	116,4**	1,01	16,5 <sup>000</sup>	71,17	11,3***	2,70**	766	799
HSS3	249,2 <sup>000</sup>	100,9 <sup>00</sup>	0,97	16,5 <sup>000</sup>	51,80 <sup>000</sup>	11,00***	2,62	748 <sup>0</sup>	785
LAUREAT	257,5 <sup>000</sup>	92,7 <sup>00</sup>	0,99	16,5 <sup>000</sup>	51,28 <sup>000</sup>	5,5 <sup>000</sup>	2,49 <sup>0</sup>	723 <sup>00</sup>	758 <sup>00</sup>
MIKADO	305,6	121,9***	1,01	17,3***	90,87***	6,6	2,59	861***	872**
LUCE	269,7	108,5	1,04	16,4 <sup>000</sup>	86,67***	4,2 <sup>000</sup>	2,36 <sup>000</sup>	871***	871**
<b>Mean</b>	<b>272,7</b>	<b>108,5</b>	<b>1,00</b>	<b>16,8</b>	<b>71,27</b>	<b>8,6</b>	<b>2,57</b>	<b>786</b>	<b>813</b>
DL5%	10,43	4,20	0,10	0,85	2,40	0,20	0,07	36,22	38,20
DL1%	14,46	5,82	0,13	1,18	3,33	0,28	0,10	50,20	52,94
DL 0,1%	20,09	8,09	0,19	1,64	4,62	0,38	0,14	69,74	73,55

**The main corn cob insertion height.** For this character six studied hybrids recorded statistical assured differences and their parental forms presented also similar values, excepting the hybrid HSS3, which recorded significant distinct values inferior to the control value, comparatively with the parental forms (RS64 and RS13). The hybrids Olt and Laureat values were situated below the experience average. The hybrid Mikado was also remarkable for this character recording values which exceeded the control value with very significant distinct differences. Similar values were recorded by the hybrids HSS2 and HSS3, which include lines with high corn cob insertion.

**The corn cobs number per plant (prolificacy).** This character had the lowest variability and the differences weren't statistical assured for all studied hybrids, comparatively with the average value.

**The leaves number per plant.** This character showed statistical assured differences for all studied hybrids. Is remarkable the hybrid HSS1, which exceeded the control value with very significant distinct differences, despite the parental forms recorded values at the average level. Beside this hybrid stands out the hybrid Mikado, which has higher leaves number per plant, exceeding the control value with very significant distinct differences. All the other hybrids are situated to the control level and the differences aren't statistical assured.

**The leaves surface.** For all hybrids with short vegetative cycle as Laureat and HSS3, this character recorded very diminished values, comparatively with the control value. It is remarkable the delayed hybrid Olt, which recorded good yields over crossing other hybrids with superior foliar surface, despite the reduced values for this character. This aspect can be due to very intense photosynthetic activity. The delayed hybrids Mikado and Luce and also the semi-delayed hybrid HSS1 are remarkable through their increased foliar surface, exceeding the control value with very significant distinct differences.

**The ramifications number per ear.** Analyzing the results of inbred lines (the parental forms) can be observed the high influence of maternal form. Thus, for romanian valuable hybrids (F376 and Olt) and foreign hybrids, this character values are lower comparatively with those recorded by the experimental hybrids created to ARDS Simnic, which recorded very significant distinct values superior to the control value. This aspect has negative effect to these hybrids yields, because the plants consume more nutrients to form ample ear.

**The second basis knot diameter.** For this character the values recorded by the foreign hybrids ranged among reduced limits, excepting the delayed hybrid Mikado. The value of this character recorded by Mikado is higher, comparatively with those of the parental forms, which are situated below the average. Among romanian hybrids is remarkable the hybrid HSS1, which recorded the lowest value of this character (2,18 cm). The hybrids F376, Olt and HSS2 presented values which exceeded the control value with very significant distinct differences, respectively significant distinct differences (the same tendency like parental forms).

## CONCLUSIONS

For the plant height was observed a very representative variability within the studied lines set and the differences were statistical assured for most cases. The studied lines present also great variability for the main maize cob insertion height and the differences were positive and negative significant comparatively with the control. For the prolificacy didn't exist differences statistical assured, but it was observed that the values of the lines obtained to ARDS Simnic were superior to those of the other studied lines, excepting RS13 line. It was observed that the differences between the leaves number per plant were statistical assured, but the values weren't always correlated with higher plants length, as

we expected. For most cases, the leaves surface recorded statistical assured differences comparatively with the control, which were closely correlated with plant leaves number. All studied lines presented very significant distinct differences positive for the lines: RF406, RF403, RS235, RS151, RS64, RS 13 and negative for the lines: RF408, K5361, K8112, K9340, K7448, K4432, K7619, comparatively with the control value, for the ramification number per ear. Analyzing the character the second basis internode diameter can be observed that delayed foreign lines show a remarkable lightness and the selection of these lines taking account a superior stalk break and lodging resistance, based on excellent stem flexibility and also reduced resistance to header combine action.

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# OBSERVAȚII ASUPRA CĂTORVA FITOCENOZE ALE ASOCIAȚIEI *SALICETUM ALBAE* ISSLER 1926 em. SOÓ 1957, DIN PERIMETRUL LACULUI DE ACUMULARE SURDUC

## OBSERVATIONS OVER SOME PHYTOCOENOSES OF THE ASSOCIATION *SALICETUM ALBAE* ISSLER 1926 em. SOÓ 1957, FROM THE PERIMETER OF THE SURDUC LAKE

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**Cuvinte cheie:** *Salicetum albae* Issler 1924 s.l., Surduc

**Key words:** *Salicetum albae* Issler 1924 s.l., Surduc

### ABSTRACT

*Asociația Salicetum albae ISSLER 1926 em. SOÓ 1957 este semnalată în țară, în principal în lunca Dunării, dar mai există unele mențiuni și în luncile câtorva râuri. În Banat nu este o asociație comună (MORARIU & DANCIU, 1970, VICOL, 1972, DIHORU et al., 1973, COSTE, 1975, COSTE et al., 1999). Fitocenozele analizate au fost identificate în perimetrul lacului de acumulare Surduc, unde se dispun sub formă de pâlcuri. Premisa studiului ține de valoarea conservativă mare pe care o dețin aceste fitocenoze. Pe lângă importanța peisageră, au rol în protecția solurilor împotriva eroziunii și constituie de asemenea, adăpost pentru multe specii de păsări de apă. Frecvent, la adăpostul sălcetelor sunt cantonate fitocenoze acvatice.*

*The association Salicetum albae ISSLER 1926 em. SOÓ 1957 is to be found in the country especially in the everglade of the Danube, but it can also be found in other river meadows. In Banat it's not a common association (MORARIU & DANCIU, 1970, VICOL, 1972, DIHORU et al., 1973, COSTE, 1975, COSTE et al., 1999). The phytocoenoses analyzed were found in the perimeter of the Surduc accumulation lake, where they are placed as patches. The premise of the study is the great conservative value which is held by this phytocoenoses. Besides the landscape value, they contribute to the soils protection against erosion and they also are a shelter for many species of aquatic birds. Frequently, at the shelter of the willows are quartered aquatic phytocoenoses.*

### INTRODUCTION

The drainage works performed in Banat for the extension of the cultivated areas determined decrease of the edified willow vegetation in the river meadows, channels or lakes. Willows generally vegetate in alluvial clay soils, rich in sand and gravel with a reduced content of humus. In Banat they were preserved in the shape of groups, on non-representative areas. The riverside coppice of willows and poplar trees are helped by muds and well oxygenated waters, which represent an important starting point in their emergence and development. In the cleared areas, the willows hardly regenerate. Due to the moist substratum and the occasional stagnant water, it is noticed an explosion of hygrophil and meso-hygrophil species in their structure. The existence and sequencing of these phytocoenoses is dependent upon the altitude, location, the duration and frequency of floods, as well as on the human influence.

### MATERIALS AND METHODS

The studies were performed in the period 2006-2007, in the perimeter of the accumulation lake Surduc and they implied on field sampling which were subsequently processed in the laboratory. The methodology of study adopted is the one of the Central-European floristic phytocoenologic school. The association is analyzed from the point of

view of the chorology, of the floristic structure and sin-morphology, sin-ecology, cenotaxonomy, sin-dynamics, and of the conservative importance and value.

## RESULTS OF THE STUDY

*Chorology* (SANDA, 2002): Within the country the association is present in river meadows but especially in the everglade of the Danube: Dihoru, 1975 (Siriu), Barabaş, 1974 (Reservoir Tazlăului), Lupu, 1979 (Moldova), Mititelu *et al.*, 1972 (Prutului meadow), Mititelu *et al.*, 1970 (Adjud), Pop, 1968 (Câmpia Crişurilor), Doniţă *et al.*, 1966 (Danube Delta), Peia, 1979 (Depression Almaşului), Borza, 1959 (Valea Sebeşului), Sămărghiţan, 2001 (Valea Gurghiului), Oroian, 1998 (Mureşului Pass), Drăgulescu, 1995 (Valea Sadului), Toniuc *et al.*, 1981 (forest Caiafele), Sanda, Popescu, 1981 (Chilia Veche) etc.

For Banat it is signaled by Vicol, 1972 (Valea Timişului), Coste, 1975 (Locvei Mountains), Morariu & Danciu, 1970 (Moldova Veche), Dihoru *et al.*, 1973 (Valea Mraconiei), Coste *et al.*, 1999 (Cenad). We have identified the association in the perimeter of the accumulation lake Surduc.

*Floristic structure and sin-morphology*: In the 4 phytocoenoses studied, we identified 21 species (table 4), corresponding to a relatively reduced specific diversity (see table 5). The edifying and dominant species is *Salix alba* L. Among the species characteristic for the association, also present in our phytocoenoses, we mention the following: *Polygonum hydropiper* L., *Rubus caesius* L., *Lysimachia vulgaris* L., *Stachys palustris* L., *Lythrum salicaria* L., *Bidens tripartita* L., *Equisetum arvense* L. In the synthetic chart there are also presented other species: *Echinochloa crus-galli* (L.) Beauv., *Carex riparia* Curtis, *Eleocharis palustris* (L.) Roemer et Schultes, *Iris pseudacorus* L., *Leontodon autumnalis* L., *Lycopus europaeus* L., *Oenanthe aquatica* (L.) Poiret, *Polygonum mite* Schrank, *Rorippa amphibia* (L.) Besser. Except for the species *Rubus caesius* L., it is noticed that the shrub stratum is practically absent, while the herbaceous stratum is well represented in the species. From the floristic structure of our phytocoenoses lack poplar species as well as other representatives from the genus *Salix*, characteristic for the association.

*Sin-ecology*: The association develops in conditions of excess of humidity, forming true willow and poplar forests, with high densities, along Danube and in the Delta. It bears floods of up to 1,5 m, for a long time. It prefers waters rich in oxygen but also muds. The height of the vegetation is usually between 3 – 10 m; there are also imposing specimens, with remarkable sizes, of over 15 m. These communities are presented in the shape of compact groups of trees or are disposed in the shape of bands or clumps. On lands where the water stagnates for a longer time, in the association structure appear more marsh species. In Surduc, willow groves are present in several depression areas, especially flooded in spring, disposed in the shape of clumps. The specimens are not very high (max. 7m). As mentioned earlier, the herbaceous stratum is well represented with species.

Regarding the structure of our phytocoenoses, from the study per categories of bioforms, geo-elements and ecological indexes (tables 1, 2, 3; figures 1, 2, 3) results that the association is mostly formed of hemicryptophyte species (33,33 %) and helohydrophytes (23,80 %); EurAsian (61,90 %), hygrophil and meso-hygrophil (with the same participation – 33,33 %); micro-mesothermic (66,66 %); amphotolerant (47,61 %) and weakly-acid neutrophil (42,85 %).

Table 1

The statistics of bioforms

bioforms	Th	HH	H	G	MM	M	total sp.
no. sp.	4	5	7	3	1	1	21
%	19,04	23,80	33,33	14,28	4,76	4,76	100%

Table 2

The statistics of the floristic elements

geo-elements	Eua	Circ	Cosm	Eur	total sp.
no. sp.	13	1	6	1	21
%	61,90	4,76	28,57	4,76	100%

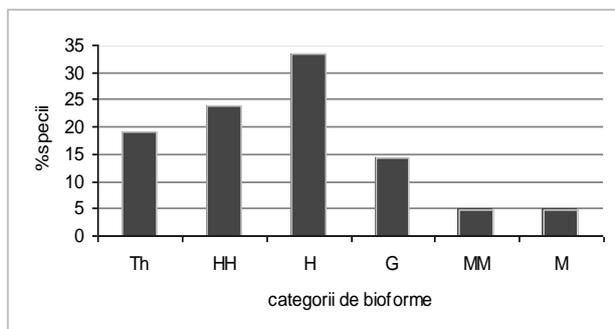


Figure 1 – Spectrum of bioforms

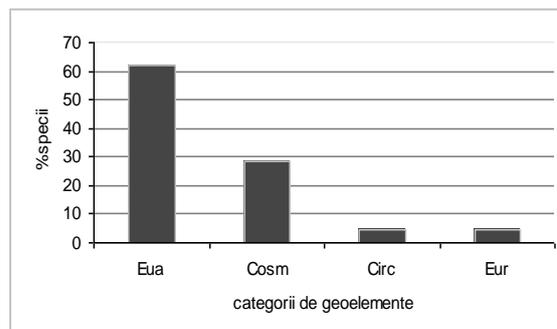


Figure 2 – Spectrum of geo-elements

Table 3

The balance of the ecologic categories

index	value	0	1-1,5	2-2,5	3-3,5	4-4,5	5-5,5	6	total sp.
U	no. sp.	-	-	-	4	7	7	3	21
	%	-	-	-	19,04	33,33	33,33	14,28	100%
T	no. sp.	6	-	-	14	1	-	-	21
	%	28,57	-	-	66,66	4,76	-	-	100%
R	no. sp.	10	-	-	2	9	-	-	21
	%	47,61	-	-	9,52	42,85	-	-	100%

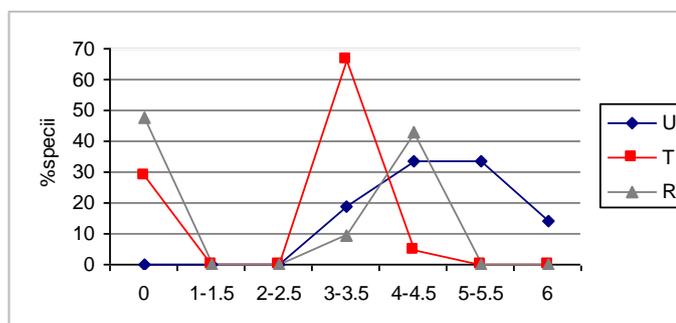


Figure 3 – Spectrum UTR

**Cenotaxy:** The association described belongs to the class SALICETEA PURPUREAE Morr 1958, order *Salicetalia purpureae* Morr 1958, alliance *Salicion albae* (Soó 1930 n.n.) Müller et Görs 1958. Frequently used synonyms: *Salicetum albae – fragilis* Issler 1926 em. Soó 1957 = *Salix alba – Polygonum hydropiper* Doniță et Dihoru 1961 = *Hydroherbo – Salicetum albae* Doniță et al. 1966 = *Salici – Populetum* (Tx.1931) Mejer Drees 1936 = *Populetum albae* (Br. – Bl. 1931 p.p.) Borza 1937 = *Saliceto – Populeto – Alnetum* Slavnič 1952

**Sin-dynamics:** The association phytocoenoses are installed directly on alluvial soils and remain for a long time as coppice of willows or willows and poplars, unless significant fluctuations are recorded in the hydric regime. The tendency to evolve under soil drainage condition is towards forest associations. Sometimes, in the herbaceous stratum *Rubus* is

dominant, which can cover completely the soil, other times the degraded phytocoenoses are followed with *Agrostis*.

**Table 4**

**Synthetic chart with phytocoenoses from the association *Salicetum albae* Issler 1926 em. Soó 1957**

					Survey number	1	2	3	4
					Altitude (m)	194	194	194	194
					Surface (m <sup>2</sup> )	5	4	10	5
					General coverage (%)	95	90	95	100
Biof.	Floristic el.	U	T	R					
MM-M	Eua	5	3	4	<i>Salix alba</i> L.	3.5	4.5	4.5	3.5
Th	Eua	4,5	3	0	<i>Bidens tripartita</i> L.	-	+	1.4	-
HH	Eua (Med)	5	4	4	<i>Carex riparia</i> Curtis	-	-	+	-
Th	Cosm	4	0	3	<i>Echinochloa crus-galli</i> (L.) Beauv.	+	1.3	-	+
G-HH	Cosm	5	0	4	<i>Eleocharis palustris</i> (L.) Roemer et Schultes	+1	-	-	-
G	Cosm	3	3	0	<i>Equisetum arvense</i> L.	-	-	+	+
G-HH	Eur	3,5	0	0	<i>Iris pseudacorus</i> L.	-	-	+1	-
H	Eua	3	0	0	<i>Leontodon autumnalis</i> L.	-	-	+	-
HH	Eua	5	3	0	<i>Lycopus europaeus</i> L.	-	-	+	+
H-HH	Eua	5	0	0	<i>Lysimachia vulgaris</i> L.	-	-	+	-
H-HH	Cosm	4	3	0	<i>Lythrum salicaria</i> L.	+1	-	-	+1
HH	Eua	6	3	0	<i>Oenanthe aquatica</i> (L.) Poiret	-	-	+	-
Th	Eua	5	3	4	<i>Polygonum mite</i> Schrank	-	-	+	-
Th	Eua (Med)	4,5	3	4	<i>Polygonum hydropiper</i> L.	1.5	+	-	-
H	Cosm	3,5	0	4	<i>Potentilla reptans</i> L.	-	-	+	-
HH	Eua (Med)	6	3	4	<i>Rorippa amphibia</i> (L.) Besser	-	-	+	-
H (N)	Eua (Med)	4,5	3	4	<i>Rubus caesius</i> L.	+	+1	+3	-
M	Eua	5	3	3	<i>Salix cinerea</i> L.	-	-	-	2.5
H (G)	Circ (bor)	4	3	4	<i>Stachys palustris</i> L.	+	+1	+	-
H	Eua	4	3	0	<i>Symphytum officinale</i> L.	-	-	+3	-
HH	Cosm	6	3,5	0	<i>Typha latifolia</i> L.	+	-	-	-
					no. of species/survey	8	6	15	6

Origin of the surveys: R<sub>1-4</sub>, Surduc (2006-2007)

**Table 5**

**Several characteristics regarding some phytocoenoses of *Salicetum albae* Issler 1926 em. Soó 1957, described in Romania**

author/authors, year	region/area studied	no. of species in the synthetic table
POP, 1968	Câmpia Crişurilor	33
GRIGORE, 1971	Timiş-Bega	38
ARDELEAN, 1999	Valea Crişului Alb	54
ARDELEAN & KARÁCSONYI, 2002	Valea Ierului	68
NEACŞU <i>et al.</i> , 2006-2007	accumulation lake Surduc	21

**Table 6**

**The categorization of the association *Salicetum albae* Issler 1926 em. Soó 1957 according to the system NATURA, 2000 and the correspondence with other classification systems**

Habitat name and code in Romania		Correspondent					Observations
Name	Code	NATURA 2000	EMERALD	PALEARCTIC	EUNIS	Associations	
Danube forests of White willow ( <i>Salix alba</i> ) with <i>Rubus caesius</i>	R 4407	92AO <i>Salix alba</i> and <i>Populus alba</i> galleries	144.66 Ponto-Sarmatic mixed poplar riverine forest	44162 Pontic willow galleries	G1.114 2 Ponto-sarmatic steppe willow galleries	<i>Salicetum albae</i> Issler 1926 em. Soó 1957	High conservative value

*Importance:* It has landscape significance, it protects against erosion, soils; the biomass represents a source of wood, and also a shelter for birds. It is often cultivated near villages and in osieries. The wood is used for fire, for some light constructions, for manufacturing matches, for fences or wicker. The bark and leaves contain tannin and are used for tanning of hides and skins. The bark also has a medicinal use, the salicine has antifever and anti-rheumatic properties.

*The conservative value* is high (table 6).

## CONCLUSIONS

1. The association studied is not so frequent in Banat due to the hydro-improving works executed in the region. We have identified some phytocoenoses in the perimeter of the accumulation lake Surduc.
2. In the synthetic chart of the association 21 species are present. The edifying species is *Salix alba* L. Among the species characteristic for the association we encounter: *Polygonum hydropiper* L., *Rubus caesius* L., *Lysimachia vulgaris* L., *Stachys palustris* L., *Lythrum salicaria* L., *Bidens tripartita* L., *Equisetum arvense* L.
3. From the analysis of the phytocoenoses it is noticed that in the spectrum of bioforms are predominant the hemicryptophyte species (33,33 %) and the helohydatophytes (23,80 %). The analysis of the phyto-geographic elements shows that most species are Eurasian (61,90 %). As to the value of the humidity index most species are hygrophil and meso-hygrophil (with the same participation – 33,33%), related to the temperature are well represented the micro-mesothermic species (66,66 %), and about the soil reaction, the amphotolerant species are predominant (47,61 %), followed by the weakly-acid neutrophil ones (42,85 %).
4. The phytocoenoses have landscape significance, they play a part in soil protection against erosion and it also represents a shelter for many species of aquatic birds. Frequently, at the shelter of the willows are quartered aquatic phytocoenoses. All these aspects demonstrate the high conservative value of the communities of *Salix alba* L.

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# BIODIVERSITATEA FLOREI UNOR LACURI DE ACUMULARE DIN JUDEȚUL TIMIȘ

## THE BIODIVERSITY OF THE FLORA OF SOME ACCUMULATION LAKES IN TIMIS COUNTY

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**Cuvinte cheie:** biodiversitate, floră, Timiș

**Key words:** Biodiversity, flora, Timis

### ABSTRACT

*În lucrare sunt prezentate rezultatele obținute în urma studiului întreprins asupra biodiversității florei din patru lacuri de acumulare din județul Timiș (Surduc, Pișchia, Liebling, Sânanđrei). Au fost identificate în acest sens, 285 de specii aparținând la 62 de familii botanice. Analiza florei s-a realizat pe categorii de bioforme, geoelemente și ținând cont de comportamentul ecologic al speciilor. Au mai fost avute în vedere, unele aspecte legate de conservarea unor specii.*

*In this paper are presented the results obtained due to the study over the flora biodiversity from four accumulation lakes in Timiș county (Surduc, Pișchia, Liebling, Sânanđrei). In this respect there were identified 285 species from 62 botanical families. The floristic analysis was performed on categories of bioforms, geological elements and considering the ecologic behavior of the species. There were also taken into consideration some aspects concerning the conservation of some species.*

### INTRODUCTION

We consider the accumulation lakes studied (Surduc, Pișchia, Liebling, Sânanđrei), presented below, to be representative for Timis County considering the surfaces occupied, but especially the diversity of the flora and vegetation.

The accumulation Surduc founded in 1975, is located on river Gladna, at the confluence with the rivulet Minisel, between the localities Surducu Mic, Fârdea and Mâtnicu Mic, 90 km from Timișoara. It stretches on 364 hectares, and the water volume is of 14110 mil. m<sup>3</sup>, being considered the largest accumulation in the Western Piedmonts. The lake is situated in a floodable depression, 198 meters high and with the coordinates 45° 45' N, 22° 09'. The main purpose of the accumulation is to supply potable water to Timisoara area and also a protection role against floods. As major habitat, the accumulation is situated in the category of fresh water/humid areas habitat (ecological area of Carpathian Mountains). The legal status is of Protected (mixed) area – Lake Surduc (2.748), a regulation made through law no. 5/2000 H.C.J. no. 19/1995. The land is a state property, managed by the Romanian National Water Administration, Banat Waters Agency – Timisoara. The man-made activities performed within the protected area are mainly represented by: fishing, hydro-technical and tourist arrangements, tourism, recreation, traffic ways.

The accumulation Murani – Pișchia was founded in 1971 by building a dam on the course of the rivulet up the locality Murani, on the spot of a marshy valley stretching on several kilometers. The accumulation is located at the altitude of 130 m and at coordinates 45° 54' N, 21° 20' E. The water volume is of 6.240 mil.m<sup>3</sup> and the surface of 200 hectares (95 hectares of water crystal). The goal of the accumulation was to diminish the effects of floods. At the beginning the accumulation had a non-permanent character, subsequently becoming permanent retention. On the left side, the lake borders on Pischia forest, and on the right side it is bordered by soft hills cultivated with cereal crop. The water is not very

deep, and up the river it is maintained an extended area of moist hayfield. As major habitat type, the reservation is situated in the category of habitats of fresh water / humid areas, marshes-turfaries (from the ecological area of Hungarian Plain). The region was declared a Natural Ornithologic Reserve (no. 2743) "Murani – Pișchia Marshes" (with the mention "Specific Habitat for aquatic fauna – *Ixobrychus minutus*: little bittern"), by law no. 5/2000, H. C. J. no. 19/1995. At present, the reserve is administered by the Local Council of the commune Pișchia, after in the past it was taken over from a trading company which would exploit it for fishing. The anthropic activities performed within the protected area are: pasturage, recreation fishing, pisciculture, hydro-technical arrangements, tourism, and other recreational activities.

The accumulation Liebling is located on the course of the rivulet Lanca Birda, altitude 94 m, coordinates 45° 87' N, 21° 21' E. It has a surface of 60 hectares. At present, it is administered by A.J.V.P.S. (County Association of Sportive Hunters and Fishermen) Timis, mainly for fishing and recreation.

The accumulation Sânanđrei, founded in 1971, is situated on the course of the rivulet Valea Lacului, on the right side of Timisoara-Arad road, at 13 km, 117m altitude and coordinates 45° 54' N, 21° 35' E. The water volume is of 1.372 mil. m<sup>3</sup>, and the surface of 50 hectares. At present, the lake is granted to a trading company which exploits it mainly for fishing and recreational purposes.

## MATERIALS AND METHODS

The studies of the flora were performed in two stages: a field stage and another one in the laboratory. In the field stage, we made trips in several periods of the year in order to find all species. The laboratory phase implied determining the plants collected which could not be identified on the field. For determination we have used reference books, among which we mention: "\*\*\*\*1952-1976, *Flora României*" (vol. I – XIII), "*Flora mică ilustrată a României*" (PRODAN & BUIA, 1963), "*Flora ilustrată a României. Pteridophyta et Spermatophyta*" (CIOCÂRLAN, 2000) etc. After the evaluations we drew up the summary of the vascular flora.

The analysis of the flora had in view several aspects: biologic (types of bioforms), phyto-geographical (geographical spread of the species) and ecological (the value of the UTR index). The categories of bioforms and geological elements, as well as the value of the ecological indexes are those proposed by SANDA *et al.* (1983).

## RESULTS OF THE STUDIES

The synopsis of the flora from the four accumulation lakes studied numbers 285 species, belonging to 62 botanical families. Their distribution is presented in table 1.

**Table 1**  
Synthetic chart with the distribution of the floras from the accumulations Surduc, Pișchia, Liebling, Sânanđrei

No.	species	Surduc	Pișchia	Liebling	Sânanđrei
1.	<i>Abutilon theophrasti</i> Medik.	-	+	-	+
2.	<i>Achillea millefolium</i> L.	+	+	+	+
3.	<i>Adonis aestivalis</i> L.	-	+	-	-
4.	<i>Agrimonia eupatoria</i> L.	+	+	+	+
5.	<i>Agrostis capillaris</i> L.	+	-	-	-
6.	<i>Agrostis stolonifera</i> L.	+	+	+	-
7.	<i>Alisma lanceolatum</i> With.	-	-	+	-
8.	<i>Alisma plantago-aquatica</i> L.	+	+	-	-
9.	<i>Alopecurus aequalis</i> Sobol.	+	-	+	-
10.	<i>Alopecurus pratensis</i> L.	+	+	+	-
11.	<i>Althaea officinalis</i> L.	-	+	+	-
12.	<i>Amaranthus blitum</i> L.	-	+	-	-
13.	<i>Amaranthus retroflexus</i> L.	-	+	-	+
14.	<i>Ambrosia artemisiifolia</i> L.	+	+	+	+

15.	<i>Anagallis arvensis</i> L.	+	+	+	-
16.	<i>Apera spica-venti</i> (L.) Beauv.	+	-	-	-
17.	<i>Arctium lappa</i> L.	+	-	+	+
18.	<i>Aristolochia clematidis</i> L.	-	-	+	+
19.	<i>Artemisia vulgaris</i> L.	+	-	+	+
20.	<i>Asarum europaeum</i> L.	-	-	+	-
21.	<i>Asclepias syriaca</i> L.	+	+	-	-
22.	<i>Astragalus glycyphyllos</i> L.	-	-	+	-
23.	<i>Atriplex patula</i> L.	-	+	-	+
24.	<i>Berteroa incana</i> (L.) DC.	-	+	-	-
25.	<i>Bidens tripartita</i> L.	+	+	+	+
26.	<i>Bolboschoenus maritimus</i> (L.) Palla	-	-	+	+
27.	<i>Bromus arvensis</i> L.	+	+	-	+
28.	<i>Bromus sterilis</i> L.	-	+	-	+
29.	<i>Butomus umbellatus</i> L.	+	+	+	-
30.	<i>Calamagrostis arundinacea</i> (L.) Roth.	-	+	+	+
31.	<i>Calamagrostis canescens</i> (Weber) Roth.	-	-	+	-
32.	<i>Calamagrostis epigeios</i> (L.) Roth.	-	-	-	+
33.	<i>Caltha palustris</i> L.	+	-	-	-
34.	<i>Calystegia sepium</i> (L.) R.Br.	+	+	+	+
35.	<i>Campanula abietina</i> Griseb.	+	-	-	-
36.	<i>Capsella bursa-pastoris</i> (L.) Medik.	-	+	+	+
37.	<i>Cardaria draba</i> (L.) Desv.	-	-	+	-
38.	<i>Carduus acanthoides</i> L.	-	+	-	-
39.	<i>Carex acutiformis</i> Ehrh.	+	+	-	-
40.	<i>Carex distans</i> L.	+	-	+	-
41.	<i>Carex hirta</i> L.	+	+	-	+
42.	<i>Carex lasiocarpa</i> Ehrh.	+	-	-	-
43.	<i>Carex melanostachya</i> Bieb. ex Willd.	-	+	-	-
44.	<i>Carex riparia</i> Curtis	+	+	+	+
45.	<i>Carex sylvatica</i> Hudson	-	-	+	-
46.	<i>Carex vulpina</i> L.	-	+	+	-
47.	<i>Centaurea apiculata</i> Ledeb.	-	-	-	+
48.	<i>Centaurea pannonica</i> (Heuffel) Simonkai	+	+	+	+
49.	<i>Centaurium erythraea</i> Rafin.	+	-	-	-
50.	<i>Cerastium glomeratum</i> Thuill.	+	-	-	-
51.	<i>Ceratophyllum demersum</i> L.	+	-	+	-
52.	<i>Chenopodium album</i> L.	+	+	-	+
53.	<i>Chenopodium polyspermum</i> L.	+	+	-	-
54.	<i>Cichorium intybus</i> L.	+	+	+	+
55.	<i>Cirsium arvense</i> (L.) Scop.	+	+	+	+
56.	<i>Cirsium canum</i> (L.) All.	-	-	+	-
57.	<i>Cirsium palustre</i> (L.) Scop.	+	-	+	-
58.	<i>Clematis integrifolia</i> L.	-	+	-	-
59.	<i>Conium maculatum</i> L.	-	-	+	-
60.	<i>Consolida regalis</i> S.F. Gray	-	+	-	+
61.	<i>Convolvulus arvensis</i> L.	+	+	+	+
62.	<i>Conyza canadensis</i> (L.) Cronq.	-	+	-	+
63.	<i>Coronilla varia</i> L.	-	+	+	+
64.	<i>Crataegus monogyna</i> Jacq.	-	+	-	-
65.	<i>Crepis paludosa</i> (L.) Moench.	-	-	-	+
66.	<i>Crepis setosa</i> Haller	-	+	-	-
67.	<i>Cruciata glabra</i> (L.) Ehrend.	-	+	+	-
68.	<i>Cuscuta epithymum</i> L.	-	-	-	+
69.	<i>Cynodon dactylon</i> (L.) Pers.	-	+	-	+
70.	<i>Cyperus flavescens</i> Jacq.	-	+	-	-
71.	<i>Cyperus fuscus</i> L.	+	-	+	-
72.	<i>Dactylis glomerata</i> L.	-	+	+	-
73.	<i>Datura stramonium</i> L.	-	-	-	+
74.	<i>Daucus carota</i> L.	+	+	+	+
75.	<i>Deschampsia caespitosa</i> (L.) Beauv.	+	-	-	-
76.	<i>Digitalis lanata</i> Ehrh.	-	+	-	-
77.	<i>Digitaria sanguinalis</i> (L.) Scop.	+	+	-	+
78.	<i>Dipsacus laciniatus</i> L.	-	+	+	+
79.	<i>Echinochloa crus-galli</i> (L.) Beauv.	+	+	+	+
80.	<i>Echium vulgare</i> L.	-	+	-	+
81.	<i>Eleocharis acicularis</i> (L.) Roemer Schultes	+	-	-	-

82.	<i>Eleocharis paustris</i> (L.) Roemer Schultes	+	+	-	-
83.	<i>Elymus hispidus</i> (Opiz) Melderis	-	-	-	+
84.	<i>Elymus repens</i> (L.) Gould.	+	+	+	+
85.	<i>Epilobium tetragonum</i> L.	+	+	-	-
86.	<i>Equisetum arvense</i> L.	+	+	+	-
87.	<i>Eragrostis pilosa</i> (L.) Beauv.	+	-	-	-
88.	<i>Erigeron annuus</i> (L.) Pers.	+	+	-	-
89.	<i>Eriochloa villosa</i> (Thumb.) Kunth	-	+	-	-
90.	<i>Erodium cicutarium</i> (L.) L' Hérit.	-	+	-	-
91.	<i>Eryngium campestre</i> L.	-	-	-	+
92.	<i>Eupatorium cannabinum</i> L.	+	+	-	-
93.	<i>Euphorbia cyparissias</i> L.	-	+	-	+
94.	<i>Euphorbia amygdaloides</i> L.	-	-	-	+
95.	<i>Falcaria vulgaris</i> Bernh.	-	-	-	+
96.	<i>Festuca pratensis</i> Hudson	+	+	+	-
97.	<i>Festuca rubra</i> L.	+	-	-	-
98.	<i>Filipendula vulgaris</i> Moench	-	-	+	-
99.	<i>Frangula alnus</i> Miller	-	-	-	+
100.	<i>Fraxinus ornus</i> L.	+	-	-	-
101.	<i>Galega officinalis</i> L.	-	+	+	-
102.	<i>Galeopsis speciosa</i> Miller.	+	-	-	-
103.	<i>Galinsoga parviflora</i> Cav.	+	-	-	-
104.	<i>Galium album</i> L.	-	+	+	-
105.	<i>Galium aparine</i> L.	-	+	+	+
106.	<i>Galium uliginosum</i> L.	+	-	-	-
107.	<i>Galium verum</i> L.	-	+	+	-
108.	<i>Geranium dissectum</i> L.	+	+	-	-
109.	<i>Geranium pratense</i> L.	-	+	-	-
110.	<i>Geum urbanum</i> L.	+	-	-	-
111.	<i>Glechoma hederacea</i> L.	-	+	+	-
112.	<i>Glyceria maxima</i> (Hartm.) Holmberg	-	+	+	+
113.	<i>Gnaphalium uliginosum</i> L.	+	+	-	-
114.	<i>Gratiola officinalis</i> L.	+	-	+	-
115.	<i>Gypsophila muralis</i> L.	+	+	-	-
116.	<i>Hibiscus trionum</i> L.	-	+	-	-
117.	<i>Holcus lanatus</i> L.	+	-	-	-
118.	<i>Hordeum murinum</i> L.	-	-	-	+
119.	<i>Humulus lupulus</i> L.	-	-	+	-
120.	<i>Hybiscus trionum</i> L.	-	-	-	+
121.	<i>Hypericum perforatum</i> L.	+	+	+	+
122.	<i>Impatiens noli-tangere</i> L.	+	-	-	-
123.	<i>Inula britannica</i> L.	+	+	+	-
124.	<i>Inula salicina</i> L.	-	+	-	-
125.	<i>Iris pseudacorus</i> L.	+	+	+	+
126.	<i>Juglans regia</i> L.	-	-	-	+
127.	<i>Juncus articulatus</i> L.	+	+	-	-
128.	<i>Juncus bufonius</i> L.	+	-	+	-
129.	<i>Juncus effusus</i> L.	+	-	+	-
130.	<i>Juncus inflexus</i> L.	-	+	-	-
131.	<i>Juncus tenuis</i> Willd.	+	+	+	-
132.	<i>Lactuca saligna</i> L.	-	+	-	-
133.	<i>Lactuca serriola</i> L.	-	+	+	+
134.	<i>Lamium purpureum</i> L.	+	-	+	+
135.	<i>Lathyrus nissolia</i> L.	-	+	-	-
136.	<i>Lathyrus pratensis</i> L.	+	-	-	-
137.	<i>Lathyrus tuberosus</i> L.	+	+	+	+
138.	<i>Leersia oryzoides</i> (L.) Swartz	+	-	-	-
139.	<i>Lemna minor</i> L.	+	+	+	+
140.	<i>Leontodon autumnalis</i> L.	+	+	-	-
141.	<i>Leucanthemum vulgare</i> Lam.	-	-	+	-
142.	<i>Linaria vulgaris</i> Miller	+	+	-	+
143.	<i>Lindernia procumbens</i> (Krocker) Philcox	+	-	-	-
144.	<i>Lolium multiflorum</i> Lam.	-	-	-	+
145.	<i>Lolium perenne</i> L.	+	-	+	+
146.	<i>Lotus corniculatus</i> L.	+	+	+	+
147.	<i>Lychnis flos-cuculi</i> L.	+	-	-	-
148.	<i>Lycopus europaeus</i> L.	+	+	+	+

149.	<i>Lysimachia numularia</i> L.	+	+	+	+
150.	<i>Lysimachia vulgaris</i> L.	+	-	+	-
151.	<i>Lythrum hyssopifolia</i> L.	+	+	-	-
152.	<i>Lythrum salicaria</i> L.	+	+	+	+
153.	<i>Malva sylvestris</i> L.	+	+	-	-
154.	<i>Matricaria perforata</i> Mérat	+	+	-	+
155.	<i>Matricharia recutita</i> L.	-	-	+	-
156.	<i>Medicago lupulina</i> L.	-	+	+	+
157.	<i>Medicago sativa</i> L.	-	-	+	+
158.	<i>Melampyrum barbatum</i> Waldst. et Kit.	+	-	-	-
159.	<i>Melilotus albus</i> Medik	-	-	+	-
160.	<i>Melilotus officinalis</i> (L.) Pallas	-	-	+	+
161.	<i>Mentha aquatica</i> L.	+	+	+	-
162.	<i>Mentha longifolia</i> (L.) Hudson	+	+	-	+
163.	<i>Mentha pulegium</i> L.	+	+	-	-
164.	<i>Morus nigra</i> L.	-	-	-	+
165.	<i>Myosotis scorpioides</i> L.	+	-	+	-
166.	<i>Myriophyllum spicatum</i> L.	+	+	-	-
167.	<i>Najas minor</i> All.	+	-	-	-
168.	<i>Nonea pulla</i> (L.) D.C.	-	-	-	+
169.	<i>Oenanthe aquatica</i> (L.) Poiret	+	-	+	-
170.	<i>Oenanthe banatica</i> Heuffel	-	+	-	-
171.	<i>Ornithogalum umbellatum</i> L.	-	+	-	-
172.	<i>Oxalis stricta</i> L.	+	-	-	-
173.	<i>Papaver rhoeas</i> L.	-	-	-	+
174.	<i>Pastinaca sativa</i> L.	-	+	+	+
175.	<i>Peplis portula</i> L.	+	-	-	-
176.	<i>Peucedanum oreoselinum</i> (L.) Moench.	+	-	-	+
177.	<i>Phalaris arundinacea</i> L.	-	+	+	+
178.	<i>Phragmites australis</i> (Cav.) Steudel	+	+	+	+
179.	<i>Phytolacca americana</i> L.	+	-	-	+
180.	<i>Plantago lanceolata</i> L.	+	+	-	+
181.	<i>Plantago major</i> L.	+	+	+	+
182.	<i>Plantago media</i> L.	+	+	-	-
183.	<i>Poa annua</i> L.	+	-	-	-
184.	<i>Poa nemoralis</i> L.	+	-	-	-
185.	<i>Poa palustris</i> L.	-	-	+	-
186.	<i>Poa pratensis</i> L.	-	-	+	-
187.	<i>Polygonum amphibium</i> L.	+	-	+	-
188.	<i>Polygonum aviculare</i> L.	+	+	+	+
189.	<i>Polygonum hydropiper</i> L.	+	+	+	-
190.	<i>Polygonum lapathifolium</i> L.	+	+	-	-
191.	<i>Polygonum mite</i> Schrank	+	+	+	-
192.	<i>Polygonum persicaria</i> L.	+	+	-	+
193.	<i>Populus alba</i> L.	+	+	-	-
194.	<i>Populus nigra</i> L.	-	-	-	+
195.	<i>Portulaca oleracea</i> L.	-	+	-	+
196.	<i>Potamogeton crispus</i> L.	+	+	+	-
197.	<i>Potamogeton natans</i> L.	+	-	+	+
198.	<i>Potamogeton pectinatus</i> L.	-	+	-	+
199.	<i>Potentilla anserina</i> L.	-	+	+	-
200.	<i>Potentilla argentea</i> L.	-	+	-	-
201.	<i>Potentilla reptans</i> L.	+	+	+	+
202.	<i>Potentilla supina</i> L.	-	+	-	-
203.	<i>Prunella vulgaris</i> L.	+	+	+	-
204.	<i>Prunus spinosa</i> L.	-	+	+	+
205.	<i>Pulicaria vulgaris</i> Gaertner	+	+	-	-
206.	<i>Ranunculus aquatilis</i> L.	-	-	+	-
207.	<i>Ranunculus polyanthemos</i> L.	+	-	-	-
208.	<i>Ranunculus repens</i> L.	+	+	+	+
209.	<i>Ranunculus sardous</i> Crantz.	+	+	+	-
210.	<i>Ranunculus trichophyllus</i> Chaix	-	+	-	-
211.	<i>Raphanus raphanistrum</i> L.	-	-	+	-
212.	<i>Robinia pseudacacia</i> L.	-	+	+	-
213.	<i>Rorippa amphibia</i> L. (Besser)	+	+	+	-
214.	<i>Rorippa austriaca</i> (Crantz) Besser	-	+	+	+
215.	<i>Rorippa islandica</i> L.	+	-	-	-

216.	<i>Rorippa sylvestris</i> (L.) Besser	+	-	+	-
217.	<i>Rosa canina</i> L.	-	+	+	+
218.	<i>Rubus caesius</i> L.	+	+	+	+
219.	<i>Rudbeckia laciniata</i> L.	+	-	-	-
220.	<i>Rumex crispus</i> L.	+	+	+	+
221.	<i>Rumex obtusifolius</i> L.	+	+	-	-
222.	<i>Rumex palustris</i> Sm.	-	-	+	-
223.	<i>Salix alba</i> L.	+	+	+	+
224.	<i>Salix cinerea</i> L.	+	+	+	+
225.	<i>Salix fragilis</i> L.	+	-	+	-
226.	<i>Salix purpurea</i> L.	-	+	-	-
227.	<i>Salix triandra</i> L.	-	+	-	-
228.	<i>Salvia pratensis</i> L.	+	+	-	+
229.	<i>Sambucus ebulus</i> L.	-	+	+	+
230.	<i>Sambucus nigra</i> L.	-	-	+	+
231.	<i>Scabiosa ochroleuca</i> L.	-	-	-	+
232.	<i>Schoenoplectus lacustris</i> (L.) Palla	+	+	+	-
233.	<i>Scutellaria hastifolia</i> L.	+	+	+	-
234.	<i>Senecio jacobea</i> L.	+	+	-	-
235.	<i>Setaria pumila</i> (Poir.) Schultes	+	+	+	+
236.	<i>Setaria viridis</i> (L.) Beauv.	-	+	-	-
237.	<i>Silene alba</i> (Miller) E.H.L Krause	-	+	-	+
238.	<i>Sinapis arvensis</i> L.	-	-	+	+
239.	<i>Sisymbrium officinale</i> (L.) Scop.	+	-	-	-
240.	<i>Solanum dulcamara</i> L.	+	+	+	+
241.	<i>Solanum nigrum</i> L.	+	-	-	-
242.	<i>Sonchus arvensis</i> L.	-	+	-	-
243.	<i>Sonchus asper</i> (L.) Hill	-	+	-	-
244.	<i>Sonchus palustris</i> L.	-	+	-	-
245.	<i>Sorghum halepense</i> (L.) Pers.	-	-	+	-
246.	<i>Sparganium erectum</i> L.	+	+	-	-
247.	<i>Spirodela polyrhiza</i> (L.) Schleichen	-	-	+	-
248.	<i>Stachys annua</i> (L.) L.	-	+	-	-
249.	<i>Stachys officinalis</i> (L.) Trev.	+	-	-	-
250.	<i>Stachys palustris</i> L.	+	+	+	-
251.	<i>Stachys recta</i> L.	-	+	-	-
252.	<i>Stellaria graminea</i> L.	+	-	+	-
253.	<i>Stellaria media</i> (L.) Vill.	-	-	+	-
254.	<i>Symphytum officinale</i> L.	+	+	+	+
255.	<i>Syringa vulgaris</i> L.	-	+	-	-
256.	<i>Tanacetum vulgare</i> L.	+	-	-	-
257.	<i>Taraxacum officinale</i> Weber ex Wiggers	-	+	+	+
258.	<i>Teucrium scordium</i> L.	-	+	-	-
259.	<i>Thalictrum flavum</i> L.	-	+	+	-
260.	<i>Thlaspi arvense</i> L.	-	+	+	+
261.	<i>Thlaspi perfoliatum</i> L.	-	-	+	-
262.	<i>Thorilis arvensis</i> (Hudson) Link	-	+	-	-
263.	<i>Tragopogon pratensis</i> L.	-	+	-	-
264.	<i>Trapa natans</i> L.	-	+	+	-
265.	<i>Trifolium arvense</i> L.	-	+	-	-
266.	<i>Trifolium pratense</i> L.	+	+	+	-
267.	<i>Trifolium repens</i> L.	+	+	+	+
268.	<i>Typha angustifolia</i> L.	+	-	+	-
269.	<i>Typha latifolia</i> L.	+	+	+	+
270.	<i>Ulmus laevis</i> Pallas	-	-	-	+
271.	<i>Urtica dioica</i> L.	-	+	+	+
272.	<i>Verbascum phlomoides</i> L.	+	+	-	-
273.	<i>Verbena officinalis</i> L.	-	+	-	+
274.	<i>Veronica anagallis-aquatica</i> L.	+	+	-	-
275.	<i>Veronica persica</i> Poir.	-	-	+	-
276.	<i>Veronica serpyllifolia</i> L.	+	-	-	-
277.	<i>Vicia cracca</i> L.	-	-	+	-
278.	<i>Vicia grandiflora</i> L.	+	-	-	+
279.	<i>Vicia tetrasperma</i> (L.) Schreber	+	-	+	-
280.	<i>Vicia villosa</i> Roth	-	-	+	-
281.	<i>Viola arvensis</i> Murray.	-	-	+	-
282.	<i>Viola elatior</i> Fries	-	-	-	+

283.	<i>Xanthium italicum</i> Moretti	+	-	-	-
284.	<i>Xanthium spinosum</i> L.	-	+	-	+
285.	<i>Xanthium strumarium</i> L.	+	+	+	+
total species/accumulation		153	170	138	112

Regarding the biodiversity, it is observed that the highest floristic diversity is registered by the accumulation lake Pișchia (170 species), and the lowest one – the accumulation lake Sânaandrei (112 species). At Surduc we have inventoried 153 species, and 138 species at Liebling. This distribution is related to the surface and to man's influence exerted around the accumulations studied.

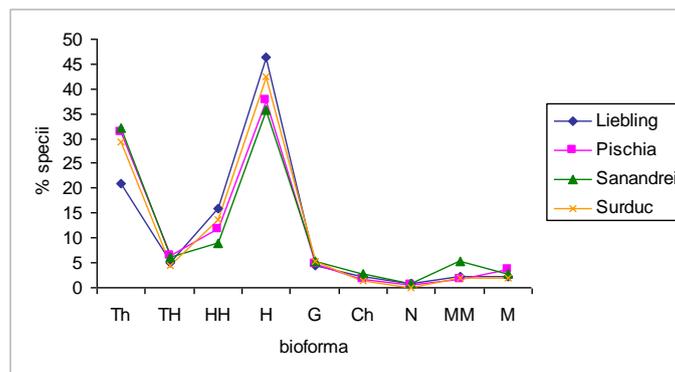


Figure 1 – The spectrum of bioforms for the floras from the accumulations Surduc, Pișchia, Liebling, Sânaandrei

From the comparative analysis of the floras, from the point of view of the distribution of bioforms, geo-elements and the ecological indexes, it is noticed that there is a visible uniformity in the case of the four accumulations.

As biological forms (fig. 1), the hemicryptophytes (H) are obviously the best represented: Liebling – 46,37 %, Surduc – 42,48 %, Pișchia – 37,64 %, Sânaandrei – 35,71 %. Usually they indicate a climate with thermal and hydric deficit and the abundance of herbal formations edified by perennial poaceae. The hemicryptophytes are followed by annual terophytes (Th), with the following participation: Sânaandrei – 32,14 %, Pișchia – 31,17 %, Surduc – 29,41 %, Liebling – 21,01 %. The terophytes suggest a more or less acid climate, with a high degree of anthropization of the flora and vegetation. They are followed by helohydatophytes (HH, aquatic and paludicolous species): Liebling – 15,94 %, Surduc – 13,72 %, Pișchia – 11,76 %, Sânaandrei – 8,92 %.

From these data results that the flora from the accumulations studied is subject to intense anthropic influence; the hemicryptophytes and terophytes having a significant presence, in the detriment of the aquatic and paludicolous species.

Regarding the phyto-geographic elements (fig. 2), the Eurasian species (Eua) (which are in fact the best represented in our country's cormoflora) are predominant: 57,24% – Liebling, 56,47 % – Pișchia, 53,59 % – Surduc, 53,57 % – Sânaandrei. They are followed by cosmopolite species (Cosm): 21,01 % – Liebling, 20,91 % – Surduc, 19,64 % – Sânaandrei, 17,64 % – Pișchia. This category classifies the species with the largest spreading in the world, which generally populate marshes and stagnant waters or ruderal or segetal resorts.

The analysis of the flora per ecologic categories is the following (fig. 3, 4, 5):

- As to the humidity, most species are mesophytes: Liebling – 33,33 %, Surduc – 30,06 %, Sânaandrei – 26,78 %, Pișchia – 25,88 %.

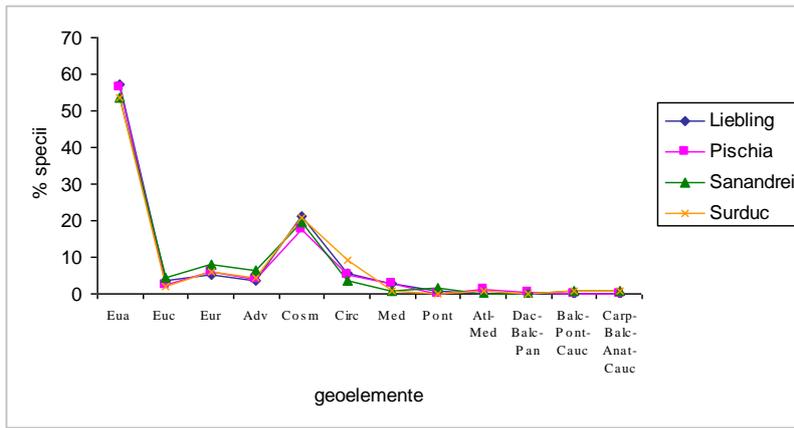


Figure 2 – The spectrum of geo-elements for the floras in the accumulations Surduc, Pișchia, Liebling, Sândreii

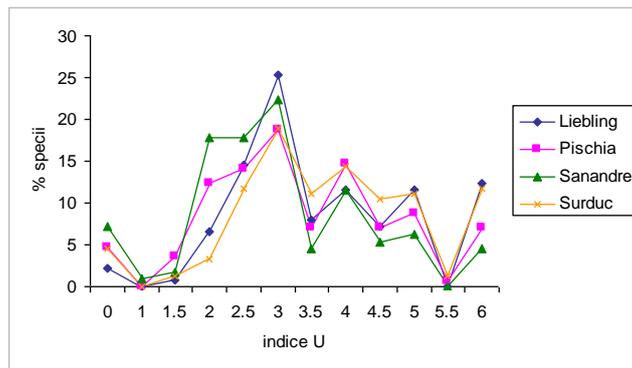


Figure 3 – The humidity spectrum for the floras in the accumulations Surduc, Pișchia, Liebling, Sândreii

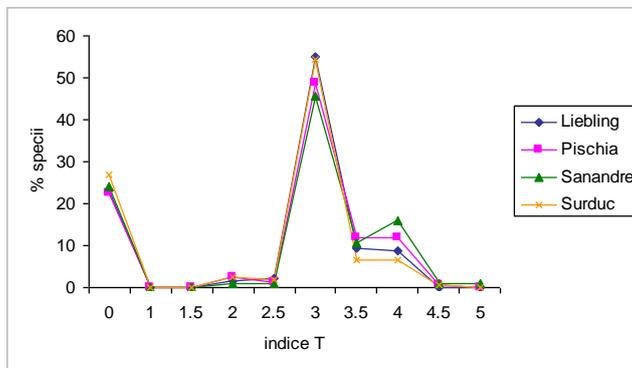


Figure 4 – The temperature spectrum for the floras in the accumulations Surduc, Pișchia, Liebling, Sândreii

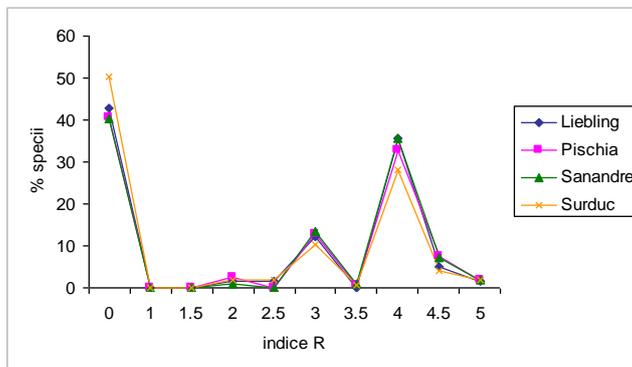


Figure 5 – The soil reaction spectrum for the floras in the accumulations Surduc, Pișchia, Liebling, Sândreii

The presence of ultrahydrophyte, hydrophyte and mesohydrophyte species (which edify the aquatic and paludicolous flora) is the following:

- ultrahydrophytes: 12,31 % – Liebling, 11,76 % – Surduc, 7,05 % – Pișchia, 4,46 % – Sânaandrei;
  - hydrophytes: 12,41 % – Surduc, 10,21 % – Liebling, 9,41 % – Pișchia, 6,25 % – Sânaandrei;
  - mesohydrophytes: 24,83 % – Surduc, 21,76 % – Pișchia, 18,84 % – Liebling, 16,96 % – Sânaandrei.
- As to the temperature, are clearly predominant the mesothermic species: Liebling – 64,49 %, Surduc – 60,81 %, Pișchia – 60,58 %, Sânaandrei – 56,24 %.
  - As to soil reaction, most species are amphotolerant, closely followed by weakly-acid neutrophilic species: Surduc – 50,02 %, Pișchia – 40,58 %, Liebling – 42,753 %. An exception is the accumulation Sanaandrei, where weakly-acid neutrophilic species are predominant – 42,85 %, followed by the amphotolerant ones – 40,17 %.

An overview of the flora identified in the accumulations studied shows that it is invaded by many ruderal and sagetal species (due to their closeness to the road and to the existence in the near-by vicinity of agricultural crops), so that the aquatic and paludicolous species, typical for these ecosystems, have a reduced participation. It also needs mentioning that certain species, whose existence is endangered, are part of habitats with a high conservative value (*Najas minor* All., *Leersia oryzoides* (L.) Swartz, *Trapa natans* L., *Polygonum amphibium* L., *Salix alba* L. etc.). The species *Lindernia procumbens* (Krocker) Philcox, identified in Surduc, is encountered in the list of community – interest species requiring strict protection (acc. to *O.U. no. 57 of June 20<sup>th</sup> 2007 on the regime of protected natural areas, the conservation of natural habitats, of the wild flora and fauna*).

## CONCLUSIONS

1. Subsequent to the study of the flora biodiversity in four accumulation lakes in Timis County, there have been identified 285 species belonging to 62 botanical families.
2. The analysis of the flora per categories of bioforms evinced the fact that most species are hemicryptophytes and annual terophytes, followed by helohydatophyte species.
3. Concerning the geographical distribution, the Eurasian species have the greatest density, followed, as expected, by cosmopolite species.
4. Following the analysis of the ecologic behavior of the species, we have observed that, as to the humidity, most species are mesophilic, as to temperature, most species are mesothermic, and as to soil reaction, amphotolerant species are predominant.
5. From the flora analysis we have observed that it is strongly anthropized, a fact which explains the large density of hemicryptophyte and terophyte species (specific for agricultural crops and meadows), as well as the moderate demand for humidity and the low presence of aquatic and paludicolous species.
6. As in the list of species there are some with a high conservative value and whose existence is endangered, we suggest an adequate management of the accumulation lakes studied, in order to prevent the reduction in flora biodiversity that they shelter.

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# THE IMPROVEMENT OF AERIAL TREATMENTS TECHNOLOGIES WITH ULTRA LOW VOLUME (ULV) AGAINST DEFOLIATOR INSECTS

## PERFECTIONAREA TEHNOLOGIILOR DE APLICAREA A TRATAMENTELOR AERIENE CU VOLUM ULTRAREDUS (ULV) ÎMPOTRIVA DAUNATORILOR FORESTIERI

*Nețoiu Constantin, Tomescu Romică, Bădele Octavian, Săraru Alexandru, I. Bercea*

**Key words:** defoliator insects, aerial treatments, GPS, ULV

### ABSTRACT

*Acumularea unor cunostinte noi despre biologia si ecologia insectelor daunatoare, largirea gamei de pesticide si de echipamente de aplicare aeriana a acestora, precum si existenta unor deficiente actuale cu privire la semnalizarea poligoanelor si a traseelor de zbor, necesita imbunatatirea periodică a metodelor si tehnologiilor de combatere. Lucrarea prezinta rezultatele experimentelor efectuate pentru optimizarea lucrarilor de semnalizare a poligoanelor si traseelor de zbor cu ajutorul sistemului de ghidare prin GPS. De asemenea, se prezinta modul de dispersie a picaturilor de insecticid in coroana arborilor, realizata de noile instalatii de stropire cu volum ultraredus, care echipeaza avioanele ghidate prin GPS. Rezultatele obținute evidentiaza o serie de aspecte cu caracter practic a caror aplicare poate conduce la o eficacitate mai bună a tratamentelor și o eficiență economică corespunzătoare.*

*The accumulation of new knowledge about the biology and ecology of harmful insects, the enlargement of range of pesticides and equipments of aerial application, and also the current deficiencies considering polygons and routes of flights signalize, require the periodic improvement to the methods and the technologies of spraying. The papers presents result of the experiments efectuated for the optimization works of flag the polygons and routes of flights with help to the system of guide through GPS. Also, it is presented the way of dispersion of the drops of insecticides in trees crown realize with new equipements of spraying with the ultra low volume (ULV) which rigged teams the aircrafts guide through GPS. The results obtained shows a series of practical aspects of aerial treatments witch can be used to improve the technical and economical efficiency .*

### INTRODUCTION

The appearance of disturbing factors in the relations among the components of forest ecosystems challenge the ecologic major unbalances. The defoliator insects, as constitutive of zoocenoses, in abaft to such appearance of the unbalances, can produce high outbrakes, with immediate consequences above the trees. Among the forest ecosystems from temperate zone, the species from genus *Quercus*, are most susceptible to such unbalances.

Inside of these oak biocenoses from our country, the producers function revive to the trees from the genus *Quercus* and the one of consumers (fitofagus) revive to the species of defoliators insects, among which *Lymantria dispar* L., *Tortrix viridana* L., *Operophtera brumata* L., *Erannis defoliaria* Cl. and to another species of Geometridae (*Erannis aurantiaria* Hb, *E. marginaria* Charm., *E. leucophearia* Schiff etc.), *Euproctis chrysorrhaea* L., *Malacosoma neustria* L., *Thaumtopoea processionea* L., and in time they proved to be the most dangerous (Simionescu 1992, 2001, Stefanescu 1980).

The damage produced by these defoliator insects decreases the bioaccumulation of the trees and default the stability on a trophic level, then drilling and unsteadiness others

components of the ecosystem. In order to avoid this kind of consequences (economical, ecological the social),it must be taken a series of measures with prevention and control character upon the defoliator insects.

The accumulation of new knowledge about biology and ecology of the insects and also the enlargement range of pesticides and equipments of apply them (Hardy 1987, Ciesla, 2000, Reardon 1991), drove in time to the gradually improvement of the methods and technologies to avio treatment ( Arsenecu 1965, Fratian 1976, 1985, Netoiu 2007).

Also, the existing of a current deficiencies considering polygons and routes of flights signalize requires the introduction of the G P S system in making avio treatments.

In such conditions, the paper proposes to study the possibility of optimization the works of signalization of the polygons and routes of flights by means of the guide through GPS system, as well the way of droplets dispersion of insecticide in the crown of the trees, realized by the new fittings of spraying with the low volume which rigged teams the aircrafts.

## MATERIALS AND METHODES

The experiments considering the determination of the way of dissipation and the sizes of the droplets of insecticides in report with diverse air and technical factors, the optimization of polygons and routes of flights signalize with help systems of guide through GPS, were efectuate in ray of Forest District Slatina, in time of aplication of aerial treatments in production conditions.

Within the framework of the experiment from the forest Stupina, u.a.24 (Forest District Slatina), for the pursuit of the way in which the droplets of insecticides penetrate the crown, it was located an experimental polifactorial device, in four repetitions, with two factors of influence:

A - The level of the crown - with 3 graduations:

- 1 - base the crown;
- 2 - the center of the crown;
- 3 - the top of the crown.

B - The depth of the crown with 3 graduations:

- 1 - exterior the branches;
- 2 - the middle of the branches;
- 3 - internal the branches.

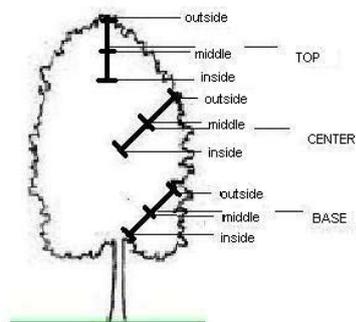


Figure 1. The way of placement of slides in the crown of trees

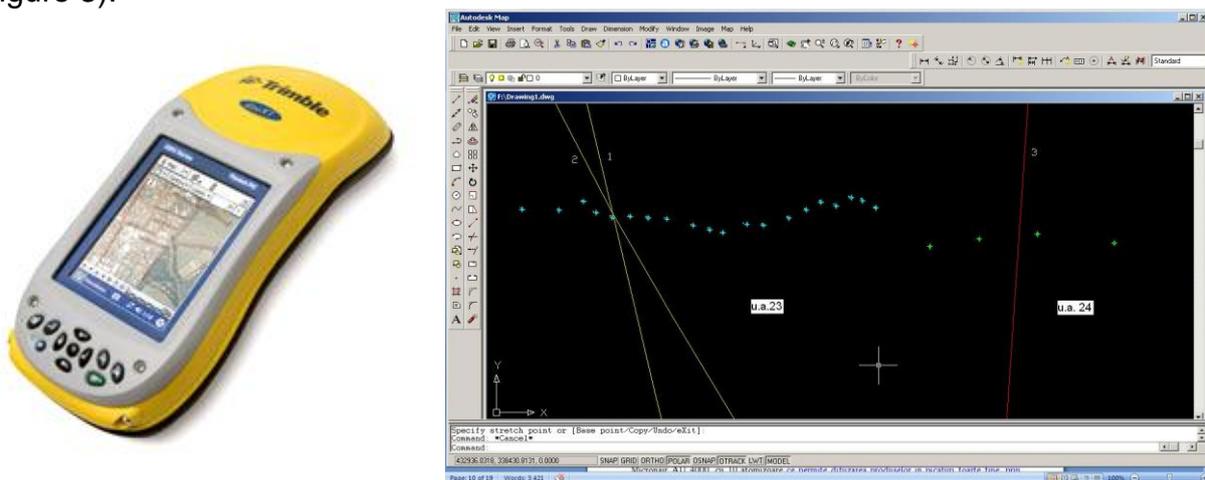
The four repetitions were constituted from 4 trees from the sessile oak species, with heights of cca 16 - 19 m and diameters contained between 24 and 28 cm. In each tree were amplified 9 slides of microscope after excelsior device (figure 1) for droplets insecticides captation.

In the sight of width band of flight determination, depending on the high fly above forest, in the forest Stupina, in u.a. 23, were amplified slides of microscope in 17 young trees, with heights between 1 - 3 m, amplified on a single row to a distance of 10 meters between them.

Slides were placed one on each tree and were replaced with new ones, immediately after the first flight at the height of approx. 20 m from the crown trees. The second flight was conducted at a height of 40 m above the crown.

For the pursuit of flight, each of the trees of ua 23 and ua 24 which on were placed slides were marked and numbered depending on the points taken with the GPS, settling down the position of each of them. Subsequently, loaded with GPS in geographical positions of trees marked, it was installed on board the aircraft type AN2 which with which the treatment was applied after it was set to line option, following the route of the plane's flight from its departure until its return for a new supply (Figure 2).

The two rows of slides, located after experimental devices above, sprayed with insecticide during the flight, were taken in laboratory, being subject of the measurements (Figure 3).



**Figure 2. Marking the position of trees and flight routes with GPS type PROXH to determine how the penetration of particles of pesticide in the crown of trees and strips the width of the flight. Forest Stupina, Forest District Slatina, April 2007.**





**Figure 3. The way of placement, harvesting and transport of the microscope slides, before and after treatment. Forest Stupina, Forest District Slatina, April 2007.**

Treatments were applied with an airplane AN2 equipped with spraying installation type Micronair AU 4000, with 10 sprayers that allows dissemination of products in very fine droplets through the process ULV (Figure 4). As insecticide has been used the product Rimon 10EC, which is an inhibitor for the chitin synthesis in the juvenile stage of caterpillar.



**Figure 4. The plane AN-2 equipped with an spraying installation Micronair AU 4000, with 10 sprayers**

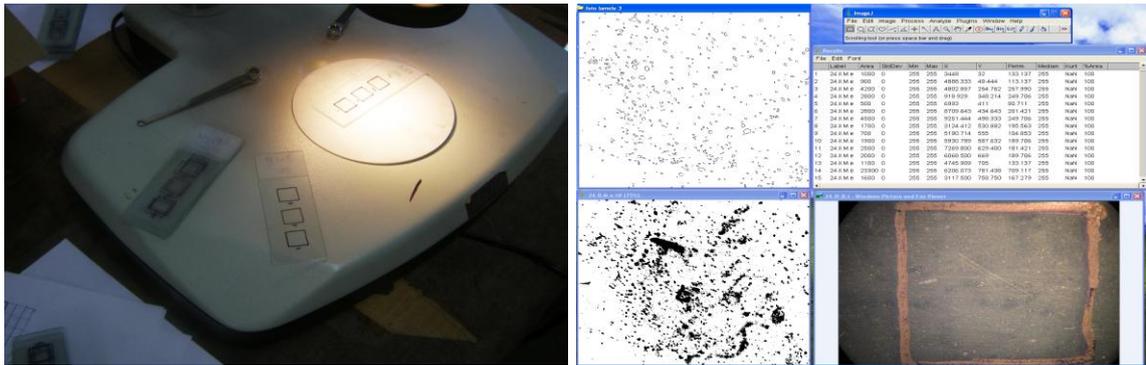
The measurements on slides harvested from land have been effectuated in the laboratory into the dependent variable number of drops per square centimeter and the size drops. These measurements were made in three areas of 1 centimeters square each, randomized located in various parts of the slide.

To analyze the slides were made photographs of them with trinocular type Stemi 2000C (Zeiss), equipped with camera Cannon. Then they were processed with a special software called ImageJ 1.37 (Figure 5).

The software ImageJ, developed by NIH, is a program that has the capacity to make changes to the geometrical image, to calculate distances and angles, to create histograms, to edit and process images of various types, to create figures with points of reference set by the user. In our case it has been worked with file systems gray-scale images with color depth of 8 bit JPEG format, images resulting from slides taken on trinocular.

In view of measurement was a necessary first calibration images for determining the exact resolution in pixels /  $\mu\text{m}$ .

The "Threshold" carried out changes on the contrast pixel reducing or even eliminating the parasites in the image and at the same time turns all colors in black and white on the basis of original brightness of pixels.



**Figure 5. The manner of determining the size and density droplets of insecticide on microscopic slides using software ImageJ**

Statistical processing of data on the density and size of droplets of insecticide on microscopic slides, subject to the above was done using the software Statistica 6, applying variant analysis (ANOVA-MANOVA).

## RESULTS AND DISCUSSION

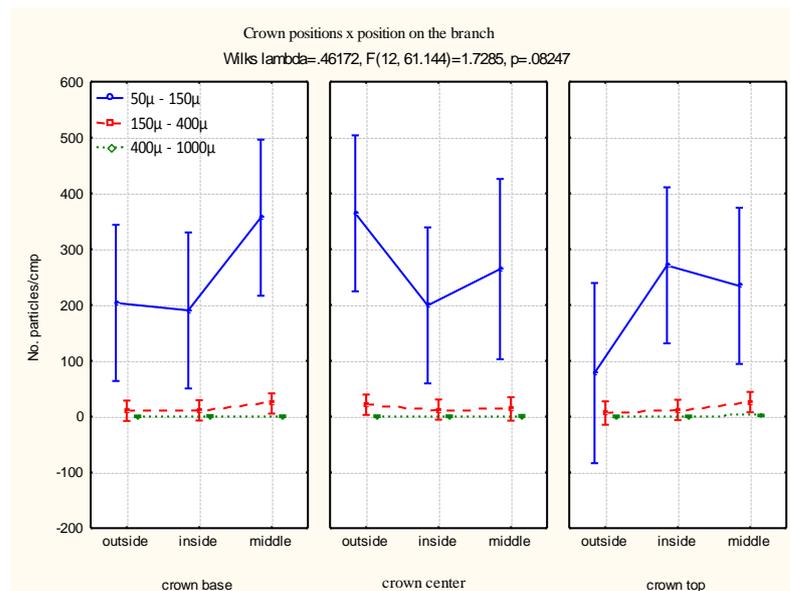
In the experiment regarding on how the penetration of the particles of insecticide solution in the forest crown, processing statistical data analysis after a double version (ANOVA - MANOVA), showed that the number of particles in the categories of size, does not differ significantly in relation to position in the crown of branches and leaves on the branches (Table 1).

### The result of analysis variant on the distribution of insecticide particles inside the crown.

Table 1

Factor	Test	Value	F	Effect	Error	p
Crown positions	Wilks	0,881857	0,49742	6	46,00000	0,806961
Position on the branch	Wilks	0,869086	0,55718	6	46,00000	0,761870
Crown positions x position on the branch	Wilks	0,461717	1,72847	12	61,14378	0,082472

Lack of significant differences between density of insecticide particles on categories diameter at various levels in the crown and inside proves that the installation Micronair realized an uniform throughout in the tree crown, so the likelihood that a larva to eat toxic crystals do not depends on its position in the crown (Figure 7).



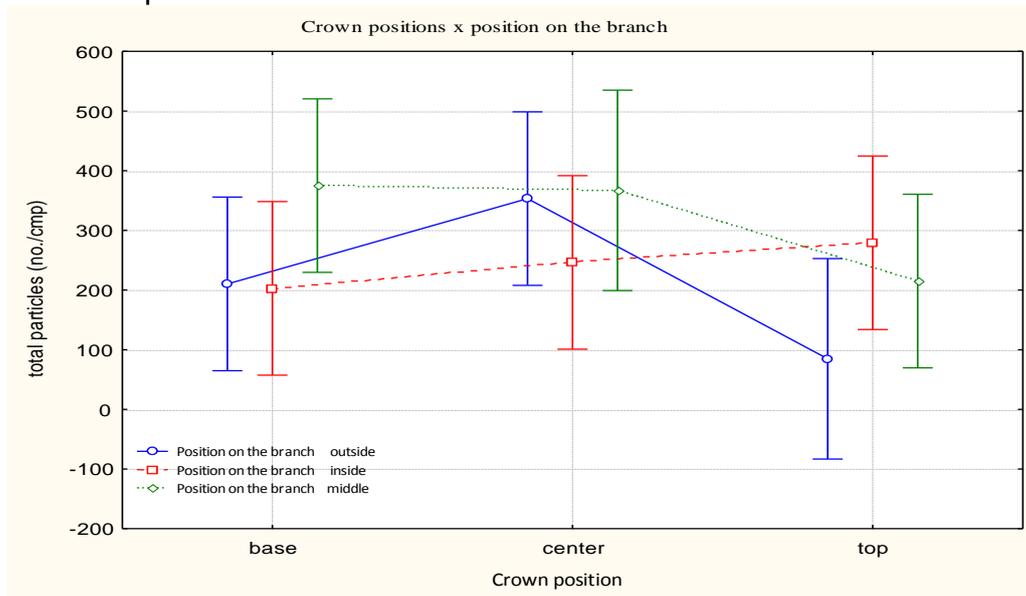
**Figure 7. Distribution of toxicity solution particles on categories of size, inside the crown of trees. Forest Stupina, Forest District Slatina**

Analisising the figure 7 is seen that the installation MICRONAIR AU 4000 sprayed with mostly ultrafine particles, divided relatively uniform in the crown trees of diameters ranging between 50 - 150 $\mu$  (about 200 particles / cm<sup>2</sup>)

The proportion of particulates with diameters ranging between 150 - 400 $\mu$  also regarded as ultra low volume (ULV), is relatively low (about 20 particles/cm<sup>2</sup>) with an uniform distribution in the crown.

The particles with sizes over 400 $\mu$ , considered with low volume (LV), have an insignificant share exceeding the density of 1-2 droplets / cm<sup>2</sup>.

At the foliage situated outside the crown, the density of the particles with ultra low volume (50-400 $\mu$ ) is slightly higher than the foliage found inside the crown, but without significant differences (Figure 8). Considering the relatively ladder crowns form, insecticide solution enters in the interior of the crown too, providing a density of particles high enough for cause the caterpillar death located in this area.



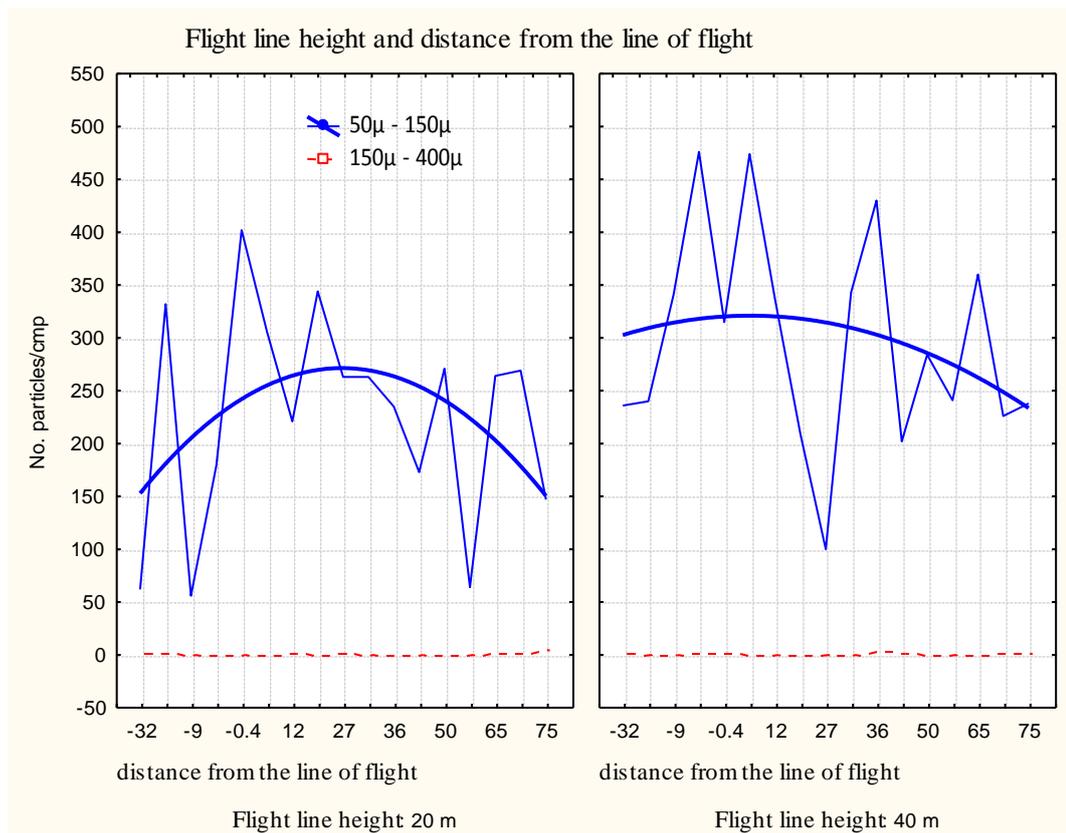
**Figure 8. Distribution of insecticide particles density in the crown of trees, Forest Stupina, Forest District Slatina**

Regarding the influence of flight height on the particles density of insecticide on the width of the band flight, in figure 9 is seen that when increasing the altitude flight of the aircraft from 20 to 40 meters, it manifest a tendency to enlarge the band of the flight, but without registering significant differences (Table 2).

**Analysis variant of particle distribution of insecticide along the band of flight**

*Table 2*

Effect	Test	Value	F	Effect	Error	p
height of the flight line	Wilks	0,756201	2,4180	2	15	0,122965
distance to the flight line	Wilks	0,200700	1,1552	32	30	0,346885



**Figure 9. Distribution of insecticide particles along the band of flight, according to the height a plane flying above the tree crowns.**

## CONCLUSIONS

The accumulation of new knowledge about the biology and ecology of the insects, broadening the range of pesticides and equipment for their spraying, and difficulties encountered in polygons signs and flight routes in the combat forest pests, has called for studying the possibilities of improving methods and technologies to avio combat.

To improve the signalization techniques of the polygons and routes of flight, in the absence of digitized maps of the forest in the area of fighting, it has been used a GPS device, with which has been traced the outlines of the forest area of combat.

On the map were drawn in ArcGIS flight routes from 60 in 60 meters. This map was recharged in GPS device, which was installed on board of the plane with which was made the treatment. With the GPS monitor located on board of the plane, the pilot was conducted in pursuit of flight routes, previously established in the form of digital. In this way, it was eliminated the classic manual operation of signaling from the ground, carrying out a uniform coverage of the flight area.

For the processing of statistical data on the penetration of particles of insecticide in the crown of trees, by analyzing variant was observed that the number of particles on the categories of size, does not differ significantly in relation to the position in the crown of branches and leaves on branches

The installation MICRONAIR 4000, divided particles mainly with diameters ranging between 50 –150  $\mu$  relatively uniform in the crown trees (about 200 particles /  $\text{cm}^2$ ). The proportion of particulates with diameters ranging between 150- 400  $\mu$  is relatively low (about 20 particles /  $\text{cm}^2$ ) with uniform distribution in the crown. The particles size over 400 $\mu$  also considered to be low volumed (LV) have an insignificant share, not overtaking the density of 1-2 drops /  $\text{cm}^2$ .

The experiment regarding the particles spreading across the lines of flight showed that these are dispersed to a distance of approx. 75-80 m to the flight line with an appropriate coverage in terms of density and particles size.

The partial results of research on polygons signs and routes of flight, offer the possibility that, in coming years, they will be extended to the forest production by scanning the base plans of forests in the flight area, bringing them into geographical coordinates (Stereo 70) by vectorized and loading such data in the memory of the GPS on board aircraft used in applying treatments. In this way the pilot can guide light in the land and charting the precise flight lines, which can then be the basis for the reception of treatments.

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# ACIDOPHILOUS *PICEA* FORESTS OF THE MONTANE TO SUBALPINE LEVELS IN THE CĂPĂȚÂNII MOUNTAINS (ROMANIAN CARPATHIANS) AND THE ANTHROPIC IMPACT ON THE FOREST VEGETATION

## PĂDURILE ACIDOFILE DE MOLID (*PICEA*) DIN ETAJUL MONTAN PÂNĂ ÎN CEL SUBALPIN ÎNTÂLNITE ÎN MUNȚII CĂPĂȚÂNII ȘI IMPACTUL ANTROPIC ASUPRA VEGETAȚIEI FORESTIERE

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**Keywords:** plant association, forest, ecology, chorology, floristic composition, phytosociological relevés, dendrogram, mountains, anthropic impact

**Cuvinte cheie:** asociație vegetală, pădure, ecologie, corologie, compoziție floristică, relevu fitosociologic, dendrogramă, munte, impact antropic

### ABSTRACT

*The Căpățâni Mountains are part of the Parang Mountains, the researched area lying between: to the East, the Olteț rivulet, to the West the Olt river, to the South the subCarpathian area of Oltenia, to the North the Latoritei Mountains, the Valley of Lotru and the Depression of Loviste. In the South part, at the borderline with the subCarpathian area, there is a stretch of mesozoic limestone which composes wild gorges (Olteț, Galbena, Costești, Cheia, Bistrița). In the South-East, we can notice a limestone peak, i.e. Buila-Vaturarița, which reminds us of Piatra Craiului. The Southern orientation of the slopes and the presence of the limestone layer allow for the growth of a great diversity of plants.*

*The wooden vegetation is represented by forests, water meadows and boscsages situated in the Căpățâni Mountains, the largest area being occupied by the forests. In this paper, we present one plant association, within VACCINIO PICEETEA Br.-Bl. 1939 Class: Hieracio rotundati-Piceetum Pawł. et Br.-Bl. 1939 (syn.: Luzulo sylvaticae-Piceetum Wraber 1953).*

### REZUMAT

*Munții Căpățâni fac parte din Masivul Parang și se încadrează între următoarele limite: în partea de est pârăul Olteț, la vest râul Olt, în partea de sud regiunea Subcarpatică a Olteniei, iar în partea de nord Munții Latoritei, Valea Lotrului și Depresiunea Loviștei.*

*În Munții Căpățâni vegetația lemnoasă este reprezentată prin păduri, zăvoaie și tufărișuri, pădurile ocupând cea mai mare suprafață. În lucrarea de față se prezintă pădurile de molid din Munții Căpățâni pe care le-am încadrat în asociația vegetală Hieracio rotundati-Piceetum Pawł. et Br.-Bl. 1939 (syn.: Luzulo sylvaticae-Piceetum Wraber 1953) ce aparține clasei VACCINIO PICEETEA Br.-Bl. 1939.*

### INTRODUCTION

The Căpățâni Mountains are part of the Parâng Mountains, the researched area lying between: to the East, the Olteț rivulet, to the West the Olt river, to the South the subCarpathian area of Oltenia, to the North the Latoritei Mountains, the Valley of Lotru and the Depression of Loviste. In the South part, at the borderline with the subCarpathian area, there is a stretch of mesozoic limestone which composes wild gorges (Olteț, Galbena, Costești, Cheia, Bistrița). In the South-East, we can notice a limestone peak, i.e. Buila-

Vaturarița, which reminds us of Piatra Craiului. The Southern orientation of the slopes and the presence of the limestone layer allow for the growth of a great diversity of plants.

The wooden vegetation is represented by forests, water meadows and boscsages situated in the Căpățâanii Mountains, the largest area being occupied by the forests. In this paper, we present one plant association, within *VACCINIO PICEETEA* Br.-Bl. 1939 Class: *Hieracio rotundati-Piceetum* Pawł. et Br.-Bl. 1939 (syn.: *Luzulo sylvaticae-Piceetum* Wraber 1953).

## MATERIALS AND METHODS

For the study of the vegetal carpet in the upper basin of the Luncavat River, we have used methods of phyto-sociologic research characteristic to the Central European phyto-sociologic School, which was based on the principles and methods elaborated by J. Braun-Blanquet (1926) and adapted by A. Borza (1934) to the particularities of our country's vegetation. The basic coenotaxonomic unit which was used to study the vegetation was the vegetal association. The associations were identified and distinguished according to the characteristic, edifying, dominant and differential species. The name of the vegetal association was given taking into account the regulations stated by the Phytosociologic Nomenclature Code (2000).

As for the classification of the vegetal associations, we have used synthesis papers on the Romanian vegetation, elaborated by G. Coldea (1986, 1991), D. Ivan – coordinator (1992), V. Sanda et al. (1997) as well as other recent belonging to the authors: E. Oberdorfer (1992), L. Mucina, G. Grabherr & T. Ellmauer (1993), J. S. Rodwell, J. H. J. Schaminée, L. Mucina, S. Pignatti, J. Dring, D. Moss (2002).

We gave a special attention to the calculation of the quantitative index *Bray-Curtis* and to performing the dendograms, by using the Group-Average method (UPGMA) in the program SYN-TAX 2000 (for the associations with minimum 10 surveys).

The vegetal associations were analyzed and characterized from the chorologic, ecologic point of view and according to the aspect of the floristic composition and physiognomy, syndinamically and economically.

## RESULTS AND DISCUSSIONS

**Ass. *Hieracio rotundati-Piceetum*** Pawł. et Br.-Bl. 1939 (Syn. *Piceetum carpaticum* Soó 1930, *Piceetum montanum* auct. roman.) (Table no. 1)

**Corology.** The Carpathians' spruce fir forests represent the wooden vegetation found on the upper mountain level, vegetating on slopes with different exposure and inclinations, on grounds with *districambusoils* (acid brown soils). They are an widely spread association in the Căpățâanii Mountains, under the form of a range between 1100-1870 meters altitude. They can be found in the Luncavăț Valley, the Curpenilor Valley, Capatana Valley, Blajului Valley, Balotei Valley, Cașăriei Mount, Darjala Mount, Ursulet Mount, Balota Mount, Piatra Rosie Mount, Roman's Mount, Sec Spring, Cheia Valley, Olănești Valley (11), Bistiței Valley (10), Costești Valley (10), Zăvidanu Peak (12), Corșoru Peak (12), Buciumu Peak (12), Buila Vânturarița Mount.

**Ecology.** The analysis of the phtyocoenoses of this association, according to the main ecologic indexes points out the preponderant mesophilic character of the phtyocoenoses (73,01% %). In comparison with the temperature requests, micromesothermic species prevail (46,03%), which are then followed by the microthermic species (36,50%). From the soil reaction preference point of view, one can notice that the highest percentage is held by the poorly acido-neutrophyle (31,74%) and acidophyle species (19,04%) (fig. 1).

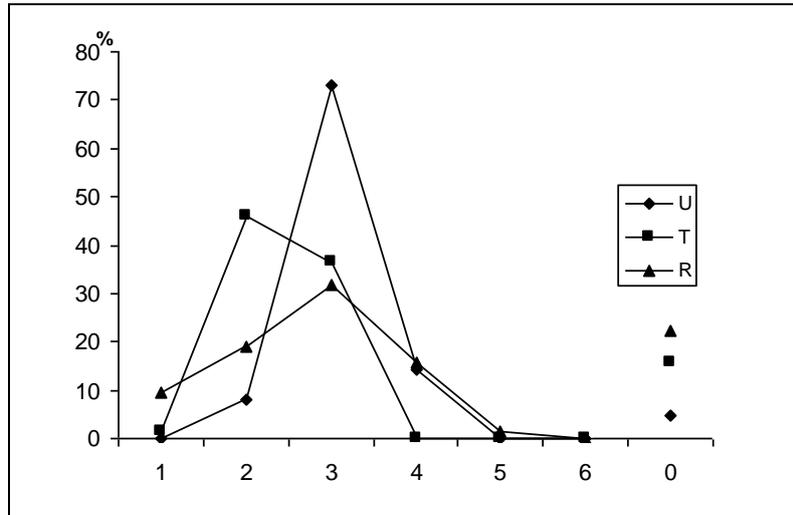


Fig. 1. Ecologic indexes for the ass. *Hieracio rotundati-Piceetum* Pawl. et Br.-Bl. 1939 in the Căpățâni Mountains

**Physiognomy and floristic composition.** The arboreous layer is characterized by a unification of the cornice between 60-80%. Besides *Picea abies*, this cornice is also composed of: *Sorbus aucuparia*, *Fagus sylvatica* and *Abies alba*. The shrubs' layer is less developed and is represented by few species as: *Spiraea chamaedrifolia*, *Sambucus racemosa*, *Rubus hirtus*, *Daphne mezereum* and *Rubus idaeus*. The following species are frequently found in the composition of the grassy layer: *Calamagrostis arundinacea*, *Hieracium rotundatum*, *Soldanella hungarica* ssp. *major*, *Homogyne alpina*, *Deschampsia flexuosa*, *Luzula luzuloides*, *Saxifraga cuneifolia*, *Oxalis acetosella*, *Dryopteris dilatata*, *Huperzia sellago*. In certain abstracts (1-4), it can be noticed the abundance of the dominant species *Calamagrostis arundinacea*, which determined us to include them in the sub-association *calamagrostetosum* (Br.-Bl. et Sisig 1939) Coldea 1990. Also, in the most parts of the abstracts, it can be noticed the *Vaccinium myrtillus* species, which is very well represented and we considered them a facies of this association.

In the last years, large areas with spruce fir forests have been cut-off in the Căpățâni Mountains.

It is worth mentioning that, in the last two years, in the spruce fir forests of the upper basin of the Luncavat, it was noticed a drying phenomenon of the spruce fir trees on large areas, because of unknown causes until present.

The bioforms spectrum shows the predominance of the megaphanerophytes (42.76%), followed by camephytes (20.28%) and hemicriptophytes (13.96%).

The most numerous floristic elements are the eurasian (28.57%), followed by the circumpolar (22.22%) and europeans (15.87%).

From the caryologic point of view, the highest percentage is represented by the polidiploid species (58.73%), followed by diploids (38.09%) and diplo-poliploids (3.17%) (figure 73). The diploidy index is 0.54.

In the dendrogram of the *Hieracio rotundati-Piceetum* association (figure 2), it can be noticed the grouping of two clusters, with well individualized branches, the first one grouping the relevés - 1, 11, 2, 5, 3, 6, 4 și 10, and the second one with the relevés - I: 7, 8 and 9. The values of the quantitativ index Bray – Curtis is between 0.36 and 0.22, which indicates a high level of homogeneity of the floristic composition from the

phytocoenoses of this association. In the first cluster one can notice the segregation of the first relevé in which the spruce fir tree has the highest value (5) of the abundance-dominance. In the second cluster, the coupling of the 7, 8 and 9 relevés can be explained by the relatively high abundance-dominance (2 respectively 1-2), of the *Soldanella hungarica* ssp. *major*, taxa as well as the *Homogyne alpina* (AD: +-1, respectively 1) species, in comparison with the relevés - of the first cluster.

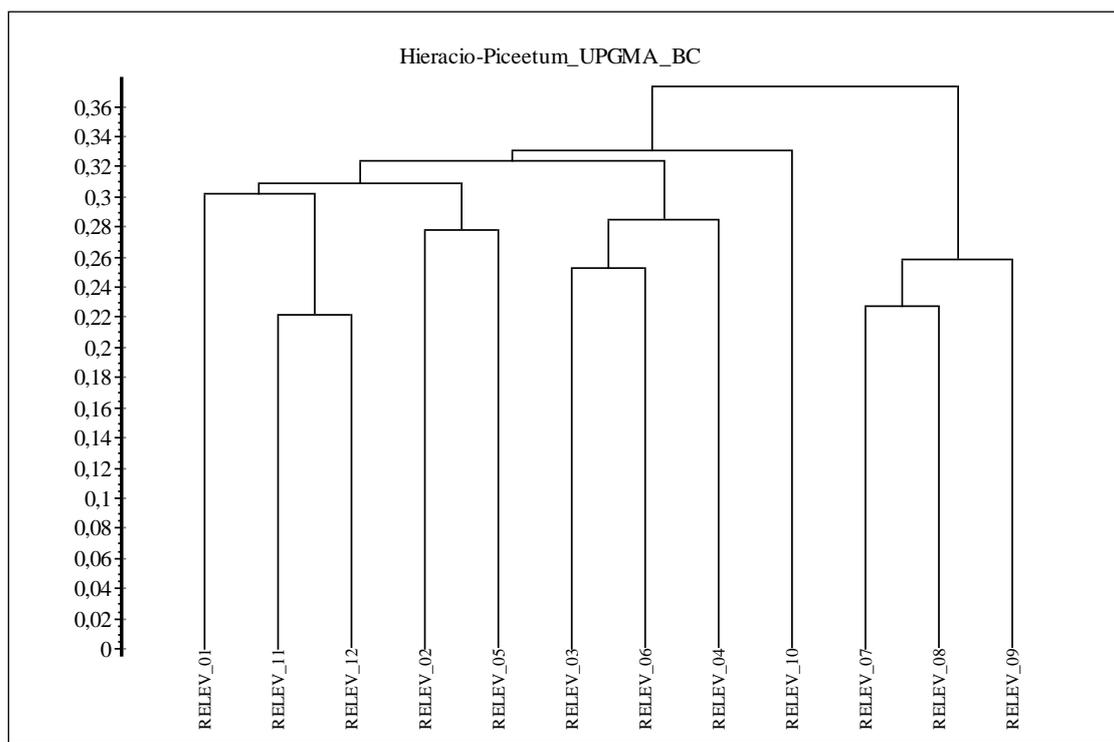


Fig. 2. Dendrogram for the ass. *Hieracio rotundati-Piceetum* Pawl. et Br.-Bl. 1939

### **Habitats**

Taking into account the order for “the actualization of the annexes no. 2, 3, 4 and 5, in the Emergency Ordinance of the Romanian Government, no. 236/2000, regarding the status of protected areas, their conservation and the preservation of wild flora and fauna, approved with changes and completions, by the Law no. 462/2001, in the Official Gazette, part 1, no.1097/6.12.2005, there can be noticed that the habitat in the Căpățâni Mountains is mentioned : Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*) (CLAS. PAL.: 42.21 from 42.23, 42.25 and NATURE 2000 CODE – 9410).

## **ANTHROPIC IMPACTS ON THE FOREST VEGETATION IN THE CĂPĂȚÂNII MOUNTAINS**

The decline in the diversity of forests and the restriction of afforestation have become reality in the last years, yet the world’s need for wooden resources is expected to double. Man brought about changes in the structure of the wooden phytocoenoses through his direct or indirect actions: unreasonable clearings, the opening of dense networks of forestry roads, the usage of certain hard equipments for collecting the wood, the intensive grazing.

**Ass. *Hieracio rotundati-Piceetum* Pawl. et Br.-Bl. 1939**  
subass. ***calamagrostetosum*** (Br.-Bl. et Sisig 1939) Coldea 1990 (r. 1-4)

Table 1

No. of relevée	1	2	3	4	5	6	7	8	9	10	11	12	K	Adm
Altitude m.o.s. (x 10 m)	130	135	140	140	130	135	180	180	180	180	175	175		
Exposure	S	S	V	NV	S	SE	-	E	E	V	SV	SE		
Inclination (in grades)	20	15	20	30	15	20	-	10	15	40	35	20		
Coverage (%)	0,8	0,7	0,8	0,7	0,7	0,7	0,8	0,8	0,8	0,6	0,7	0,7		
Area (m <sup>2</sup> )	60	70	50	65	70	70	50	65	60	40	60	70		
No. of relevée	400	400	400	400	400	400	400	400	400	400	400	400		
<b>Char. ass.</b>														
<i>Picea abies</i>	5	4	4-5	4	4	4	4-5	4-5	4-5	4	4-5	4-5	V	70,83
<i>Hieracium rotundatum</i>	+	+	+1	1	+	+1	+	+	+	+	1	+	V	1,62
<b>Vaccinio-Piceion</b>														
<i>Homogyne alpina</i>	+	+	+	+	+	+	+1	+1	1	+	+	+	V	1,25
<i>Soldanella hungarica</i> ssp. major	+	-	+	+	-	-	2	2	1-2	+	+	+	IV	4,35
<i>Blechnum spicant</i>	+	-	+	-	-	-	-	-	-	+	+	+	III	0,20
<i>Dryopteris dilatata</i>	+	+	+	+	+	+	+	+	+	+	+	+	V	0,50
<i>Gymnocarpium dryopteris</i>	+	+	+	-	+	+	+	+	-	-	+	-	IV	0,33
<i>Thelypteris phegopteris</i>	-	+	+	+	+	-	-	-	+	+	+	+	III	0,33
<b>Vaccinio-Piceetalia</b>														
<i>Vaccinium myrtillus</i>	3-4	3	2	2-3	3-4	3	2	3	3	1-2	3	3-4	V	32,39
<i>Vaccinium vitis-idaea</i>	+	-	-	-	-	-	+	+	+	-	+	-	III	0,20
<i>Huperzia selago</i>	+	+	+	+	+	-	+	-	-	+	-	+	IV	0,33
<i>Lycopodium anotinum</i>	-	-	-	-	-	+	-	+	-	-	+	+	II	0,16
<i>Lycopodium clavatum</i>	-	-	-	-	-	-	-	+	+	-	+	+	II	0,16
<i>Deschampsia flexuosa</i>	+	+	+	+	+	+	+	+	+	1	+	+	V	0,79
<i>Sorbus aucuparia</i>	-	-	-	+	+	+	+	+	+	+	-	-	III	0,29
<b>D. subas.</b>														
<b>calamagrostetosum</b>														
<i>Calamagrostis arundinacea</i>	2	2	2	2	+1	+1	+	+	+	1	1	1	V	9,72
<i>Dryopteris filix-mas</i>	+	+	-	+	-	+	+	-	+	+	+	+	V	0,37
<i>Spiraea chamaedrifolia</i>	+	-	-	+	-	-	-	-	-	-	-	-	I	0,08
<i>Senecio ovatus</i>	+	-	+	-	+	-	-	-	-	+	+	+	III	0,25
<b>Symphyto – Fagion</b>														
<i>Symphytum cordatum</i>	+	-	-	+	-	-	-	-	-	-	-	-	I	0,08
<i>Pulmonaria ruhra</i>	-	-	+	-	-	-	+	-	+	+	+	+	III	0,25
<i>Dentaria glandulosa</i>	+	-	+	-	+	-	+	+	-	-	-	-	III	0,20
<b>Fagetalia</b>														
<i>Fagus sylvatica</i>	-	-	-	+	-	-	-	-	-	+	-	-	I	0,08
<i>Daphne mezereum</i>	+	-	-	-	+	-	-	-	-	-	-	-	I	0,08
<i>Epilobium montanum</i>	-	+	+	+	+	+	+	+	+	+	+	+	IV	0,33
<i>Euphorbia amygdaloides</i>	-	+	+	-	+	+	-	-	-	+	-	-	III	0,20
<i>Actaea spicata</i>	+	+	-	+	+	-	-	+	-	-	+	-	III	0,25
<i>Galium odoratum</i>	+	-	-	-	+	+	+	-	-	-	-	+	III	0,20
<i>Luzula luzuloides</i>	+	+	+	+	+	+	+	+	+	+	+	+	V	0,50
<i>Mercurialis perennis</i>	-	-	-	+	-	-	-	-	-	+	-	-	I	0,08
<i>Polystichum setiferum</i>	-	-	-	-	+	+	+	-	-	-	-	-	II	0,12
<i>Rubus hirtus</i>	-	-	+	-	+	-	-	-	+	-	-	+	II	0,16
<i>Veronica urticifolia</i>	-	+	+	+	-	+	-	+	+	-	+	-	III	0,29
<i>Campanula rapunculoides</i>	+	-	+	-	+	-	+	-	-	-	+	-	III	0,20
<b>Quercu - Fagetea</b>														
<i>Athyrium filix-femina</i>	-	-	-	-	+	+	+	-	+	+	+	+	III	0,29
<i>Galium schultesii</i>	-	-	+	-	-	+	-	+	+	-	-	-	II	0,16
<i>Poa nemoralis</i>	-	-	-	+	+	-	+	+	+	-	+	-	III	0,25
<i>Viola reichenbachiana</i>	+	-	-	+	+	+	+	-	-	-	-	+	III	0,25
<b>Adenostyletalia</b>														
<i>Doronicum austriacum</i>	-	-	-	-	+	-	-	-	-	-	+	+	II	0,12
<i>Polygonatum verticillatum</i>	-	-	+	+	-	-	-	+	-	+	-	+	II	0,20
<i>Veratrum album</i>	-	-	-	-	-	-	+	+	-	-	-	-	I	0,08
<i>Cystopteris fragilis</i>	-	+	-	+	-	+	-	+	+	-	-	-	III	0,20
<i>Polystichum lonchitis</i>	-	-	-	-	+	+	-	-	-	-	-	-	I	0,08
<b>Variæ Syntaxa</b>														
<i>Polypodium vulgare</i>	+	-	-	+	+	-	-	-	-	-	-	-	II	0,12
<i>Geranium robertianum</i>	-	-	+	-	+	-	-	-	+	-	+	-	II	0,16
<i>Mycelis muralis</i>	+	-	+	+	+	+	-	-	+	+	-	-	IV	0,33
<i>Oxalis acetosella</i>	+	-	+1	+1	+	+	+	+	-	1	+	+	V	1,16
<i>Campanula patula</i> ssp. abietina	+	+	+	-	+	+	+	-	+	+	+	-	V	0,37
<i>Sambucus nigra</i>	+	-	+	-	+	-	-	-	-	-	-	-	II	0,12
<i>Gentiana asclepiadea</i>	-	-	+	-	-	-	-	-	-	-	+	-	I	0,08
<i>Solidago virgaurea</i>	-	+	+	-	-	-	-	-	-	-	-	-	I	0,08
<i>Lathraea squamaria</i>	+	-	-	+	-	-	-	-	-	-	-	-	I	0,08
<i>Rubus idaeus</i>	-	+	-	-	+	-	+	+	-	-	+	+	III	0,25
<i>Saxifraga cuneifolia</i>	+	+	+	+	+	+	+	-	+	-	-	-	IV	0,33

**Place and data of the relevés** : 1, 2 - Curpenilor Valley, 25.VII.2001; 3 - Culmea Balotei, 26.VII.2001; 4 – Căpățâna Valley, 9.IX.2000; 4, 5 - Curpenilor Valley, 25.VII.2001; 7, 8, 9 – Ursuleț Mountain, 30.VII.2001; 10 – Balota Mountain, 7.VIII.2000; 11, 12 – Balota Valley, 20.VIII.2002.

The over winning of timber for industrial purposes has a negative impact, leading to the degradation of the forests and the forestry soil, allowing the initiation of some erosion

processes. The exploitation of forests tends almost all the time to exhaust, break up and homogenize the forests. In order to withstand the impact of such a challenge it is necessary to increase the productivity of the already existing forests as well as the afforestation in the areas where high quantities of wood had been cut. The artificial afforestation, under the form of one-crop system must be avoided because it leads to the increase diminishing in the diversity of flora and fauna.

The exploitation of forests led to the achievement of a dense network of forestry roads which imply important clearings. These access ways, in the areas with high downgrades, lead to a great soil erosion and the collection of sediments in the riverbeds.

The hard equipments used to drag the timbers have also a negative impact as a consequence of the settlement of the soil.

Important hydro-technical works were performed in the upper basin of the Luncavăț River during the 80s. Important areas covered with forests were cleared, especially around Ursu Lake.

The ecological catastrophes have also a great impact on forests. The winds, which are mainly influenced by the relief, can lead to destructions on large areas in this region. Such destructions were made in the Balota Mountains in 2001. Due to the difficult access in the area, these damages could not be totally cleared, and the collecting of the fallen trees was made through non-ecological procedures, thus considering them the consequence of anthropic impacts.

The over grazing has also a negative impact on the forestry phytocoenoses from the Căpățâni Mountains, through the decrease of the vegetal biomass and of the number of species with fodder value. The forests around the sheepfolds: Balota, Ursulețul, Căpățâna, Dârjala and Ursu, which are cattlefolds, are characterized by a grassy layer poorly developed, because of the over grazing and the actual number of animals in these sheepfolds, as well as the great number of sheepfolds in this area.

## CONCLUSION

The examined area, process which started in 1995, is situated in the Căpățâni Mountains (Romanian Carpathians). In this paper, we present one plant associations, within **VACCINIO PICEETEA** Br.-Bl. 1939 Class because the human impact in this type of habitat are very increased and their generally conservation value is important: **Hieracio rotundati-Piceetum** Pawł. et Br.-Bl. 1939 (syn.: *Luzulo sylvaticae-Piceetum* Wraber 1953). Ecology, chorology, floristic composition (species richness, life forms, phyto-geographical elements), the dissimilarity (using Bray-Curtis index), as well as its economic importance for all these associations (characterised by 12 original phytosociological relevés) are analysed. A great importance was attached to the anthropic impacts on the vegetation of this area, as well as to the legal frame of protecting and developing the forests.

The spruce fir forests have a great value from the economic point of view, because they represent an important source of high quality wood. The spruce fir wood has various usages in the furniture industry, cellulose and paper, manufacture of musical instruments, constructions. From the food industry point of view, the *Vaccinium myrtillus* fruits and the eatable mushrooms which grow in these forests, are of a great importance.

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**THE COROLOGY, ECOLOGY AND PHYTOSOCIOLOGY OF THE  
TELEKIO SPECIOSAE-PETASITETUM HYBRIDI (MORARIU 1967 N.N)  
RESMERIȚĂ ET RAȚIU PLANT COMMUNITIES IN THE UPPER BASIN OF  
THE LUNCAVĂȚ RIVER**

**COROLOGIA, ECOLOGIA ȘI FITOSOCIOLOGIA ASOCIAȚIEI  
VEGETALE TELEKIO SPECIOSAE-PETASITETUM HYBRIDI (MORARIU  
1967 N.N) RESMERIȚĂ ÎN BAZINUL SUPERIOR AL LUNCAVĂȚULUI**

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**Keywords: vegetation, plant communities, upper basin, floristic composition, chorology,  
ecology, syndinamic, phytocenosis**

**Cuvinte cheie: vegetație, asociație vegetală, bazin superior, compoziție floristică, corologie,  
ecologie, sindinamic, fitocenoză**

**ABSTRACT**

*The general aspect of vegetation in the upper basin of the Luncavat River represents an image of the very different stationary conditions, to which one can add the influence of the anthropo-zoogenous factors. Herbous vegetation is represented by the meadow vegetation, aquatic and paludous vegetation, ruderal vegetation and saxicole vegetation.*

*In this paper, we present one plant community, within *Adenostylion alliariae* Br.-Bl. 1925 alliancet: *Telekio speciosae- Petasitetum hybridi* (Morariu 1967 n.n.) *Resmeriță et Rațiu*.*

*This plant communities grows mostly along the brooks and the springs in the mountainous regions. The phytocoenosis association grows on flat lands or slight slopes, on high-humidity lands, more or less shady. The plant community have been analyzed and characterized from the chorological, ecological point of views. They were also examined according to their floristic composition and physiognomy, syndynamics and economics. We paid much attention to the determination of the Bray-Curtis qualitative index and the achievement of dendrograms, using the Group-Average method (UPGMA) from the program SYN-TAX 2000 (for the associations with minimum 10 relevées).*

**REZUMAT**

*Aspectul general al vegetației din bazinul superior al Luncavățului, constituie o reflectare a condițiilor staționare foarte variate, la care se adaugă influența factorilor antropo-zoogeni. Vegetația ierboasă este reprezentată de vegetația pajiștilor, vegetația acvatică și palustră, vegetația ruderală și vegetația saxicolă.*

*In această lucrare este descrisă și analizată din punct de vedere corologic, ecologic, fitosociologic și sindinamic asociația vegetală ierboasă: *Telekio speciosae-**

*Petasitetum hybridi* (Morariu 1967 n.n.) Resmeriță et Rațiu ce aparține alianței *Adenostylion alliariae* Br.-Bl. 1925

Această asociație se întâlnește frecvent de-a lungul pâraielor și izvoarelor din etajul montan. Fitocenozele asociației se dezvoltă pe terenuri plane sau ușor înclinate, cu umiditate mare, mai mult sau mai puțin umbrite. O atenție deosebită am acordat calculării indicelui cantitativ Bray-Curtis și realizării dendrogramelor, folosind metoda Group-Average (UPGMA) din programul SYN-TAX 2000 (pentru asociațiile cu minim 10 relevee).

## INTRODUCTION

The examined area, process which started in 1997, is situated along the superior course of Luncavăț and covers a surface of about 450 km<sup>2</sup>. From a geo-morphological point of view, the upper basin of the Luncavăț River presents several relief levels, clearly separated: the mountainous area with Căpățâni Mountains from the Meridional Carpathians and the sub-Carpathian depression Horezu, belonging to the sub-Carpathian area of Oltenia.

In this paper, we present one plant community, within *Adenostylion alliariae* Br.-Bl. 1925 alliance, because the human impact in this type of habitat are very increased and their generally conservation value is important: *Telekio speciosae- Petasitetum hybridi* (Morariu 1967 n.n.) Resmeriță et Rațiu.

## MATERIALS AND METHODS

For the study of the vegetal carpet in the upper basin of the Luncavăț River, we have used methods of phyto-sociologic research characteristic to the Central European phyto-sociologic School, which was based on the principles and methods elaborated by J. Braun-Blanquet (1926) and adapted by A. Borza (1934) to the particularities of our country's vegetation.

The name of the vegetal association was given taking into account the regulations stated by the Phytosociologic Nomenclature Code (2000).

We gave a special attention to the calculation of the quantitative index *Bray-Curtis* and to performing the dendograms, by using the Group-Average method (UPGMA) in the program SYN-TAX 2000 (for the associations with minimum 10 surveys).

The vegetal associations were analyzed and characterized from the chorologic, ecologic point of view and according to the aspect of the floristic composition and physiognomy, syndinamically and economically.

## RESULTS AND DISCUSSIONS

**Ass. *Telekio speciosae- Petasitetum hybridi*** (Morariu 1967 n.n.) Resmeriță et Rațiu

**Corology.** This association grows mostly along the brooks and the springs in the mountainous regions. The phytocoenosis association grows on flat lands or slight slopes, on high-humidity lands, more or less shady. Such species of phytocoenosis grow in the upper Luncavăț basin at Polovragenilor Valley., Râmești Valley., Luncavăț Valley and Urșani Valley., at heights ranging between 700 m and 900 m, especially on aluvial soil.

**Ecology.** Phytocoenoses are fall into the following categories: mesophyle (51,47%), micro-mesotherme (51,47%) and euriionic (36,76) and acido-neutrophyles (30,88%) (fig. 1).

**Physiognomy and floristic composition.** Research shows a rich phytocoenotic composition, the 10 relevées comprise 68 species of vascular plants. They are well-

structured phytocoenosis, covered by vegetation in a proportion of 90% to 100%. Apart from these “protypical” species, some species with a high stem, such as *Cirsium oleraceum*, *Urtica dioica*, *Carduus personata*, *Festuca gigantea*, *Mentha longifolia*, *Cirsium waldsteinii*, *Myosotis sylvatica*, *Impatiens noli-tangere*, *Tussilago farfara*, *Festuca gigantea*, are present and fully shape the association aspect.

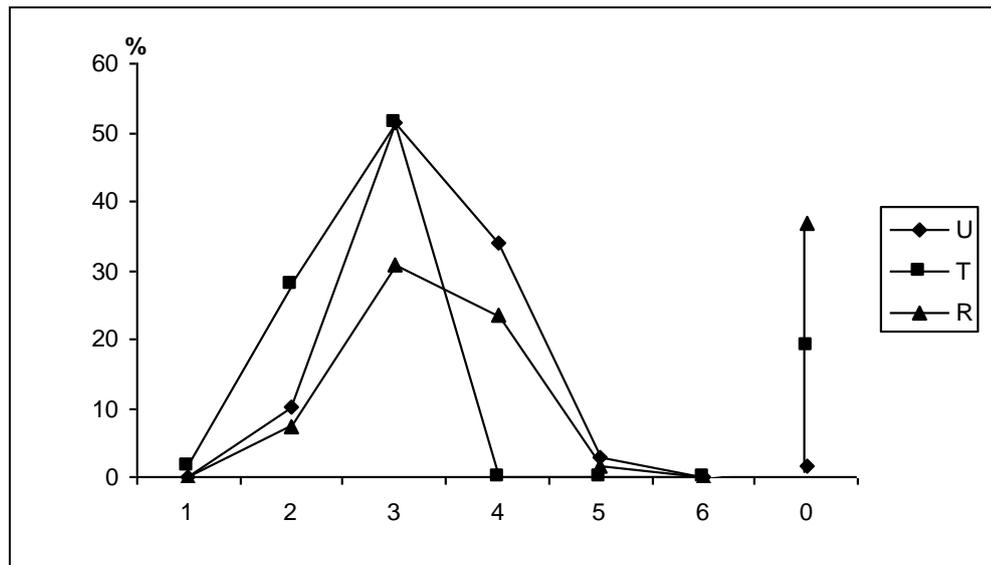


Fig. 1. Ecologic indexes for the ass. *Telekia speciosae- Petasitetum hybridi* (Morariu 1967 n.n.)  
Resmeriță et Rațiu

Geophytes are the dominant biform (69, 39%). The floral elements which prevail are the eurasiatic ones (51, 47%). The caryologic spectrum is dominated by polyploid species (50, 00%). The diploidy index has the value of 0.91.

The dendrogram of this association (fig. 2) shows the division of two clusters, the first one which groups the relevées- 1,2,3,4,7,10 and 6, and the second one the relevées - 5,8 and 9. In the first cluster there are two distinct sub-clusters. Relevées 3 and 4 can be grouped together on the basis of the value of the abundance-dominance of the species *Telekia speciosa* (AD=2). The relevées 7, 10 and 6 couple thanks to the value abundance-dominance of the species *Cirsium oleraceum* (AD=1), compared to the other relevées. In the second cluster, in comparison to the rest of the association relevées, the union of the relevées 8 and 9 can be explained due to the value abundance -dominance of the species *Telekia speciosa* (AD=+) and *Petasites hybridus* (AD=5). Relevée 5 is different from all the others through the higher value abundance -dominance of the species *Salvia glutinosa*, indicating the degradation of this phytocoenosis. The dendrogramme branches are well individualized, having the value of the quantitative index *Bray-Curtis* between 0.39 and 0.19, indicating the high degree of homogeneity of the phytocoenosis association. We mention that the dendrogram was drawn according to the first 10 relevées made in the upper Luncavat basin.

**Ass. *Telekio speciosae- Petasitetum hybridi* (Morariu 1967 n.n.) Resmerița et Rațiu**

Table 1

No. of relevée	1	2	3	4	5	6	7	8	9	10	K	Adm
Altitude m.o.s. (x 10 m)	70	75	80	90	75	75	80	70	75	80		
Exposure	V	-	N	SV	-	SV	E	-	V	SE		
Inclination (in grades)	15	-	10	10	-	5	10	-	10	5		
Coverage (%)	90	90	100	100	90	100	90	100	100	90		
Area (m <sup>2</sup> )	100	30	50	100	25	100	100	50	25	100		
<b>Char. Ass.</b>												
<i>Telekia speciosa</i>	1	1	2	2	1	1	1	+	+	2	V	7,85
<i>Petasites hybridus</i>	4	4	4	4	4	4	4	5	5	4	V	67,5
<b>Petasion officinalis</b>												
<i>Filipendula ulmaria</i>	+	+	+	-	-	-	-	+	-	-	II	0,20
<i>Carduus personata</i>	-	-	+	+	+	+	-	+	+	-	III	0,30
<i>Cruciata laevipes</i>	-	+	+	+	-	-	-	-	+	-	II	0,20
<i>Chaerophyllum hirsutum</i>	-	-	+	+	-	-	+	-	-	+	II	0,20
<i>Lamium maculatum</i>	+	+	+	+	-	-	+	+	-	-	III	0,30
<i>Cirsium oleraceum</i>	+	-	+	+	+	1	1	+	+	1	V	1,80
<i>Heracleum sphondilium</i>	+	+	-	+	-	+	-	-	-	-	II	0,20
<b>Adenostyletalia</b>												
<i>Senecio germanicus</i>	-	-	+	+	-	+	+	-	+	+	III	0,30
<i>Stellaria nemorum</i>	1	+	1	+	+	+	+	+	+	+	V	1,40
<i>Achillea distans</i>	-	+	-	+	-	+	-	-	-	-	II	0,15
<i>Leucanthemum waldsteinii</i>	+	+	+	+	-	-	-	+	+	-	III	0,30
<i>Cirsium waldsteinii</i>	-	+	+	1	1	-	+	+	-	+	IV	1,25
<b>Molinio-Arrenatheretea et Molinietales</b>												
<i>Ranunculus acris</i>	+	+	-	-	-	+	-	-	-	-	II	0,15
<i>Agrostis stolonifera</i>	+	-	-	+	-	+	+	-	+	-	III	0,25
<i>Stellaria graminea</i>	+	+	-	-	-	-	-	-	-	-	I	0,10
<i>Trifolium pratense</i>	+	+	+	+	-	+	-	+	-	-	III	0,30
<i>Holcus lanatus</i>	+	+	+	+	-	+	-	+	-	+	IV	0,35
<i>Ranunculus repens</i>	1	1	+	+	+	+	1	+	+	+	V	1,85
<i>Rumex acetosa</i>	-	-	+	-	-	-	-	+	-	-	I	0,10
<i>Mentha longifolia</i>	+	1	+	1	+	1	1	+	+	+	V	2,30
<i>Poa pratensis</i>	+	+	+	+	+	-	-	+	+	-	IV	0,35
<i>Centaurea Phrygia</i>	+	+	+	+	-	+	+	-	-	-	III	0,30
<i>Lotus corniculatus</i>	-	+	-	+	-	-	-	+	-	-	II	0,15
<i>Prunella vulgaris</i>	+	+	+	+	-	-	+	-	-	+	III	0,30
<i>Dactylis glomerata</i>	+	+	+	+	-	-	+	-	+	-	III	0,30
<i>Lysimachia nummularia</i>	-	+	-	+	-	-	-	+	-	-	II	0,15
<b>Artemisietea</b>												
<i>Rumex obtusifolius</i>	-	+	+	+	-	-	+	-	+	+	III	0,30
<i>Urtica dioica</i>	+	+	+	+	+	+	-	+	-	+	IV	0,40
<i>Arctium lappa</i>	+	+	-	-	+	+	-	-	-	-	II	0,20
<b>Quercu-Fagetea</b>												
<i>Festuca gigantea</i>	+	-	+	+	+	+	-	+	+	+	IV	0,40
<i>Myosotis sylvatica</i>	+	+	+	+	+	+	+	+	+	+	V	0,50
<i>Salvia glutinosa</i>	1	+	+	+	2	+	+	+	+	+	V	2,65
<i>Dentaria glandulosa</i>	+	+	+	-	-	+	+	-	+	+	IV	0,35
<i>Circea lutetiana</i>	+	+	+	-	-	+	-	-	+	+	III	0,30
<i>Impatiens noli-tangere</i>	+	1	+	+	+	1	1	+	+	+	V	1,85
<i>Brachypodium sylvaticum</i>	+	+	+	+	-	+	+	-	-	+	IV	0,35
<i>Rubus hirtus</i>	+	-	+	-	+	+	-	-	-	+	III	0,25
<i>Poa nemoralis</i>	+	+	+	+	+	+	+	+	+	+	V	0,50
<b>Epilobietalia</b>												
<i>Chamerion angustifolium</i>	+	+	+	+	-	-	+	-	-	+	III	0,30
<i>Rubus idaeus</i>	-	+	+	+	-	-	+	-	+	+	III	0,30
<b>Variae Syntaxa</b>												
<i>Solidago virgaurea</i>	-	+	+	+	-	-	+	-	+	+	III	0,30
<i>Cardamine amara</i>	+	+	+	+	-	-	+	+	-	+	IV	0,35
<i>Luzula luzuloides</i>	+	+	+	+	+	+	+	+	+	+	V	0,50
<i>Carex remota</i>	-	+	+	+	+	-	-	-	+	-	III	0,25
<i>Equisetum telmateia</i>	-	-	+	+	+	-	+	-	-	-	II	0,20
<i>Tussilago farfara</i>	+	+	+	+	+	+	+	-	+	+	V	0,45
<i>Hypericum maculatum</i>	-	+	-	+	-	-	-	+	-	-	II	0,15

Place and data of the relevés: 1, 2, 3, 4 – Luncavățului Valley., 20.VI.2001; 5, 6, 7 – Râmești Valley, 17.VI.2002; 8, 9, 10 – Urșani Valley, 20.VI. 2004

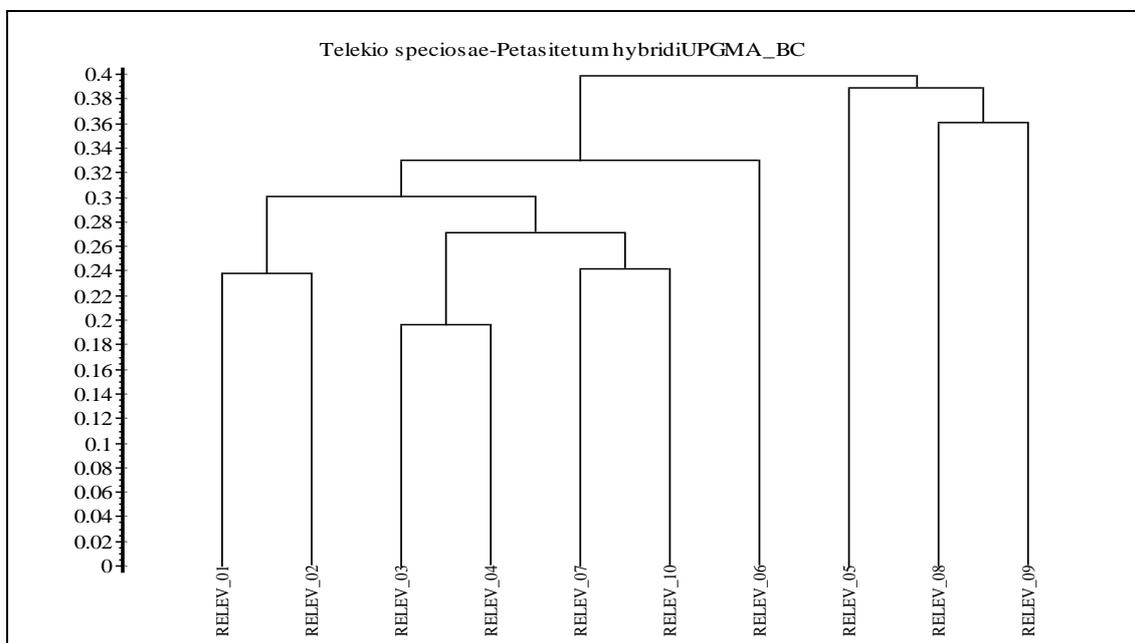


Fig. 2. Dendrogram of the ass. *Telekio speciosae- Petasitetum hybridum*

**Importance.** It is very important for the formation of the soil in the everglade valleys. Many species which are a part of the floral composition of this association have a phytopharmaceutic, melliferous and decorative importance.

## CONCLUSIONS

The territory under research is located along the upper basin of the Luncavăț River, as part of Capățanii Mountains.

According to the research carried out between 1997-2006, in the upper basin of the Luncavăț river, there were identified one plant community belonging to *Adenostylin alliariae* Br.-Bl. 1925 alliance: *Telekio speciosae- Petasitetum hybridum* (Morariu 1967 n.n.) Resmeriță et Rațiu.

Ecology, chorology, floristic composition (species richness, life forms, phytogeographical elements), the dissimilarity (using Bray-Curtis index), as well as its economic importance for all these associations (characterised by 10 original phytosociological relevés) are analysed.

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**INIȚIEREA DE CULTURI IN VITRO LA CĂȚINĂ (HIPPOPHAE  
RHAMNOIDES SSP. CARPATHICA )  
THE INITIATION OF IN VITRO CULTURES OF SEA BUCKTHORN  
(HIPPOPHAE RHAMNOIDES SSP. CARPATHICA)**

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**keywords:** sea buckthorn, in vitro, micropropagation

**ABSTRACT**

*Cățina albă este una dintre cele mai valoroase specii de arbuști fructiferi din flora spontană și cultivată, datorită conținutului unor substanțe biologice active evidențiate în frunze, fructe și lăstari. Fructele de cățină sunt apreciate ca polivitamine naturale întrucât sunt bogate în principalele vitamine (A, B<sub>1</sub>, B<sub>6</sub>, C, E, F, K, P). Planta este utilizată pentru tratarea unor afecțiuni de piele, ochi, hepatită cronică, urticarie, nevroze, alcoolism, gută, reumatism, ciroză hepatică, ateroscleroză, anemie, etc.*

*Prin cultivarea in vitro a acestei specii s-a urmărit multiplicarea și conservarea pe timp nelimitat a unor eventuale genotipuri valoroase, precum și izolarea unor noi genotipuri.*

*Pentru inițierea culturilor in vitro s-au folosit muguri dorminzi și activi prelevați de pe arbuști de cățină de la S.C. FRUCTEX S.A. Bacău. Sterilizarea materialului biologic s-a realizat în mai multe etape, în care am folosit soluție de acid citric și acid ascorbic, soluție tetraciclină, soluție de clorură mercurică 1‰, urmată de spălări repetate cu apă distilată sterilă. Ca medii nutritive de bază am utilizat mai multe variante ale soluției MS (Murashige-Skoog, 1962) și WPM (Woody Plant Medium, 1981), suplimentate cu diferite concentrații de auxine și citochinine.*

*Reacția materialului inoculat a variat în funcție de tipul și concentrația fitohormonilor din mediile nutritive, dar și de explant. Principala reacție morfogenetică evidențiată a fost caulogeneza axilară, fenomen ce a variat în funcție de varianta nutritivă. Cele mai favorabile formule hormonale pentru inducerea lăstaririi multiple s-au dovedit variantele WPM suplimentate cu BAP și IBA în diferite concentrații, precum și o variantă a mediului de bază MS suplimentat cu BAP și NAA.*

*S-a evidențiat și apariția calusului la baza lăstarilor, pe mediul de bază WPM, suplimentat cu mici concentrații de NAA.*

*Sea buckthorn is one of the most valuable species of fruit bearing shrubs of the spontaneous and also of the cultivated flora, due to its content of biologically active substances from leaves, fruit and shoots. Sea buckthorn fruit are most appreciated as natural polyvitamins as they comprise high amounts of the most important vitamins (A, B<sub>1</sub>, B<sub>6</sub>, C, E, F, K, P). The plant is used in the treatment of skin and eye diseases, chronic hepatitis, rashes, neuralgia, alcoholism, gout, rheumatism, cirrhosis, atherosclerosis, anaemia etc.*

*The in vitro cultivation of this species aims either the long-lasting multiplication and preservation of possible valuable genotypes, or the isolation of some new genotypes.*

*Active or dormant buds were harvested from sea buckthorn shrubs from S.C. FRUCTEX S.A. Bacău, and then used to initiate the in vitro cultures. The biological material was disinfested in several stages, using citric and ascorbic acid, tetracycline solution, mercury chloride solution 1‰, and subsequently rinsed with sterile distilled water. The nutritive medium formulii were variants of MS medium (Murashige-Skoog, 1962) and WPM (Woody Plant Medium, 1981), supplemented with varied amounts of auxins and cytokinins.*

*The reaction of the inoculated explants varied with the type and concentration of growth regulators within the nutritive variants, and within the explants. The main*

*morphogenetic reaction was axillary caulogenesis, that varied with the nutritive medium. The most favourable variants to induce multiple shooting were WPM supplemented with varied amounts of BAP and IBA, and a variant of basic MS medium comprising BAP and NAA.*

*Callus formation at the the shoot base was evinced on a variant of supplemented with small amounts of NAA.*

## INTRODUCTION

Sea buckthorn is one of the most valuable species of fruit bearing shrubs of the spontaneous and also of the cultivated flora, due to its content of biologically active substances from leaves, fruit and shoots. Sea buckthorn fruit are most appreciated as natural polyvitamins as they comprise high amounts of the most important vitamins (A, B<sub>1</sub>, B<sub>6</sub>, C, E, F, K, P). The plant is used in the treatment of skin and eye diseases, chronic hepatitis, rashes, neuralgia, alcoholism, gout, rheumatism, cirrhosis, atherosclerosis, anaemia etc, (BRAD I., BRAD IOANA-LUMINIȚA, RADU FLORICA, 2002, HALIS S. et al., 2002).

Micropropagation raised the number of species that can be multiplied within this system, shortened the period of time until complete plants are provided and improved the multiplication output. The cost price for seedlings decreased considerably for some important crops. Micropropagation technique is very frequently used for these species, (GHIORGIȚĂ G, NICUȚĂ PETRESCU D, 2005).

The economical importance of *Hyppophaë rhamnoides* draw the attention of specialists all over the world. The *in vitro* cultivation of this species aims either the long-lasting multiplication and preservation of possible valuable genotypes, or the isolation of some new genotypes.

## MATERIAL AND METHODS

Several types of explants were used to initiate the *in vitro* cultures, such as: shoot apices provided by *in vitro* seed germination, active or dormant buds, harvested from sea buckthorn shrubs from S.C. FRUCTEX S.A. Bacău, and also from shrubs maintained in lab conditions, into soil pots.

The biological material (sea buckthorn seeds) was disinfested by immersion into mercury chloride solution 1‰, then into chloramine-T solution 5%, each of them for 10 minutes. The seeds were rinsed with sterile distilled water several times.

The disinfestation of buds was a very important stage of the *in vitro* cultivation technology of sea buckthorn, as the buds are hairy and retain micro-organisms.

During a series of tests, we obtained pathogen-free cultures: the active buds were thoroughly washed in tap water comprising a few drops of TWEEN. The explants were rinsed to remove any trace of TWEEN, then they were immersed in a citric and ascorbic acid solution (0.0015 g citric acid + 50 drops of ascorbic acid + 100 ml distilled water) for two hours. The explants were subsequently kept in a tetracycline solution (250 mg tetracycline in 100 ml distilled water) for two hours in the refrigerator, and then rinsed again in distilled water and submitted to low temperatures for 12-14 hours.

The biological material was disinfested with a mercury chloride solution 1‰ for 6 minutes at the laminar flow hood, then repeatedly rinsed with sterile distilled water. There was a different disinfestation method when dormant buds were used as explants: immersion into Tween solution 0.1 % for 5 hours, tetracycline solution– 12 hours, ethylic alcohol 70% - 15 minutes. The explants were then immersed into a mercury chloride solution 1‰ for 20 minutes at the laminar flow hood. The disinfesting agent was removed by rinses into sterile distilled water.

Sterile Erlenmeyer vials (100 ml, B type) were used as culture flasks. Three or four explants were inoculated into each vial. The inoculated flasks were maintained in a culture

chamber with controlled parameters: light intensity of about 2500 lux, 16 hour photoperiod, temperature of 20°C. Some vials were submitted to a higher temperature (23 - 24°C).

The explants were inoculated on several variants of MURASHIGE–SKOOG, (1962) (MS) and WOODY PLANT medium, (WPM, 1981, altered by YAO, 1994). Two medium variants of four-times diluted MS were also used ( $\frac{1}{4}$ ). Basic media (MS and WPM) were enriched with various amounts of growth regulators.

Some nutritive variants - V<sub>2</sub> (WPM + 0.2 mg/l IBA + 0.2 mg/l BAP), and V<sub>6</sub> (WPM + 0.1 mg/l IBA + 1 mg/l BAP) - were supplemented with vegetal charcoal to neutralize the phenols eliminated by the explants into the nutritive medium. Our tests regarding the *in vitro* sea buckthorn inoculation were effected on 25 medium variants of basal MS și WPM.

Some of the shoots provided *in vitro* were transferred on four nutritive medium variants to induce root formation. The basal media were hormone-free MS and WPM, supplemented with NAA – V7 (WPM + 2 mg/l NAA), V8 (WPM + 1 mg/l NAA), and VR (WPM + 0.0015 mg/l BAP) variants.

## RESULTS AND DISCUSSIONS

Our research aimed the *in vitro* reaction of the three types of explants: apices, active and dormant buds. The biological material from the vials maintained at higher temperatures (23 - 24°C) degenerated.

Various percentages of germination for the *in vitro* cultivated seeds were observed on most of the nutritive media (MS, BG, B<sub>02</sub>, BD). The fastest germination was registered on BG variant six days from the inoculation moment.

Rootless cotyledonary-stage plantlets (aged 9 days) were inoculated on hormone-free MS and on BG medium, (table 1). Unlike the hormone-free MS, the presence of BAP and gibberellin induced a more active cotyledonary shoots' growth on this medium variant. The new leaves were more vigorous and of a darker green compared to those provided on basal MS. Apical shoot elongation and the formation of axillary shoots at nodal level were noticed on this nutritive media.

The apices of the shoots provided by seed germination were separated by means of a scalpel, and transferred on several nutritive variants of basal MS, (table 1), in order to study the morphogenetic reaction induced by the interaction of genotype and hormonal balance within the nutritive media.

The explants placed on MS, BK, BB, BA, BN, and B<sub>2</sub> variants generated new axillary shoots, and the best caulogenetic reaction was induced by the hormonal combination of BAP and NAA, and on the variant enriched with BAP (2 mg/l) as well, with the formation of 4 to 6 axillary shoots/explant.

Shoot aspect differed with the nutritive formula. On BA variant their length was of about 2-3 cm, and they bore 2-3 pairs of narrow leaves. Shoots were vigorous, of about 1-1.5 cm in length, with 2 pairs of leaves on BN variant; the shoots provided on B medium were well-developed, of about 3-4 cm in length, each of them bearing 3-4 pairs of long, wider leaves.

The explants were transferred on fresh medium formula on fresh nutritive media each 3 weeks (sometimes sooner, depending on the evolution of the inoculated explants).

The shoots had a positive development, they grew and provided new axillary shoots on the previously-mentioned medium variants. Two months afterwards they tended to degenerate. When shoots were transferred on the same medium variants, and also on some new ones (MS<sub>1/4I</sub> – MS  $\frac{1}{4}$  enriched with 0.02 mg/l NAA and 0.3 mg/l BAP, MS<sub>1/4II</sub> – MS $\frac{1}{4}$  supplemented with 0.04 NAA and 0.1 BAP), there was no positive morphogenetic reaction, they were not able to be maintained *in vitro*.

Callus formation was noticed on BN and BA media at the shoot base. Callus was small-sized, hard and brown on BN (0.5 mg/l NAA + 1 mg/l BAP) medium. A small number

of shoots provided friable, cream callus on BA variant (0.1 mg/l IAA + 1 mg/l BAP). The callus generated at the basal shoot region either on BN, or on BA was not organogenetic after its subcultivation on BD (MS + 0.5 mg/l 2.4 – D + 1 mg/l BAP), V1 (WPM + 0.04 mg/l NAA + 0.1 mg/l BAP) și V6 (WPM + 0.1 mg/l IBA + 1 mg/l BAP) medium formulii.

Dormant buds were inoculated on several variants of basal MS și WPM (enriched with growth regulators). They started to grow, but did not provide shoots or roots, they finally faded. The morphogenetic reaction of active buds varied with the type and the amount of growth regulators, and also with the explant type. The explants' development was sometimes different in the same culture vial (some explants displayed a faster growth than others).

On V1 medium variant (WPM + 0.1 mg/l IBA + 0.2 mg/l BAP), axillary buds grew at each nodal level. The shoots grew (about 6 cm in length), apical shoots were provided as well. The shoot development was positive after the second transfer on the same medium variant, (fig.2, 7).

The explants inoculated on V2 medium (WPM + 0.2 mg/l IBA + 2 mg/l BAP) provided axillary shoots after 2 weeks. The morphogenetic reaction was similar to the one on V1 variant, the differences were obvious after the second transfer on the same medium variant, in this case there was a tendency of degeneration for several shoots.

Though basal WPM was enriched with 0.5 mg/l IBA and 2 mg/l BAP, the explants inoculated on this medium variant did not display a positive reaction. The morphogenetic reaction was represented by a limited explant growth. Axillary caulogenesis was not evinced. The explants' degeneration started two weeks after the inoculation.

Some explants (green and with no tendency to necrosis) were transferred on V5 medium, in view of their *in vitro* maintenance. The presence of BAP (2 mg/l) and IBA (1 mg/l) in the nutritive medium sustained the survival of the transferred propagules and their slow growth. Neither axillary shoots, nor apical shoots were evinced, and the biological material started to degenerate two weeks after. Half of the inoculated explants grew and provided shoots (of about 6 cm) on nutritive variants supplemented with 1mg/l BAP + 0.05 mg/l IBA (V4), (fig. 3, 4, 6). One or two axillary buds were generated from each node. Subsequently they provided shoots. The axillary shoots were placed on the same nutritive medium variant three weeks afterwards. Their development stopped and their degeneration began. The variant V5 (WPM + 1 mg/l IBA + 2 mg/l BAP) stimulated the explant growth, shoot formation, and the generation of axillary shoots. The initial shoots were vigorous and green. They were transferred on the same medium variant three weeks afterwards. They displayed a good development, though only a part of them provided axillary buds, that generated shoots with a slow growth, (fig.5).

The explants inoculated on V6 variant displayed a similar reaction to that on V5 medium. After the first transfer, some shoots turned degenerative, and other had a very good development, providing many axillary shoots (1-2/node), (fig. 1, 8).

Other authors reported that rhizogenesis appeared spontaneously on nutritive media comprising varied amounts of NAA, (YAO, 1995), or on ¼ MS (hormone-free)(MONTPETIT, LALONDE, 1988). In our researches, this growth regulator did not induce root formation. In the basal region of the shoots transferred on V7 (WPM + 2 mg/l NAA), (fig. 9) and V8 (WPM + 1 mg/l NAA) variants, (fig.10), a compact, low-proliferative, cream callus was generated. The nutritive variants used to induce rhizogenesis also stimulated the shoot maintenance *in vitro* and the appearance of new shoots.

Shoot development on V7 variant was not a positive one, as they began to degenerate soon after callus formation. V8 variant stimulated shoot survival for a longer period of time. The offshoots were vigorous and green, with a favourable development. One month after callus formation, the shoots began to degenerate.

Table 1.

## The morphogenetic reaction of some sea buckthorn explants on several variants of Murashige – Skoog (MS) și Woody Plant (WPM) media

Var.	Explant	Basal medium	Medium variant	Growth regulators (mg/l)						The morphogenetic reaction and proliferation speed
				BAP	IAA	IBA	NAA	2,4-D	GA3	
1.	Vf. lăstar	MS	MS							Seed germination (+++); formation of apical shoots with 1 – 2 bunches of intense green leaves; rhizogenesis is absent on this nutritive medium
2.	“	MS	BB	1		0.1				Poor morphogenetic reaction of the initial explants; about 30% of the explants provided apical shoots with 1-2 pairs of small short leaves; axillary shoots sporadically (+), 1 axillary shoot / explant
3.	“	MS	BA	1	0.1					About 60% of the inoculated apices grew (shoots of 2-3 cm); the formation of new apical (+) and axillary (++) shoots with a good development; callogenesis sporadically (+), friable, non-organogenetic, cream callus
4.	“	MS	BG	1					0.1	Seed germination (+++); formation of apical shoots with 1 – 2 bunches of intense green leaves
5.	“	MS	B <sub>2</sub>	2						Most explants elongated (shoots of about 3-4 cm), with 3-4 pairs of wide, long leaves; vigorous axillary shoots (+++), 4 - 6 axillary shoots/explant
6.	“	MS	BN	1			0.5			Most explants elongated (shoots of about 3-4 cm), with 3-4 pairs of wide, long leaves; axillary shoots (+++), 4-6 axillary shoots/explant; strong axillary shoots; hard, non-organogenetic, brown callus (+)
7.	Active buds	WPM	V1	0.2		0.1				All the inoculated explants displayed organogenetic phenomena; apical shoots' elongation (about 6 cm); axillary shootys appeared at nodal level (+++); strong axillary shoots with a good development
8.	“	WPM	V2	2		0.2				Most explants grew and provided apical shoots, that elongated (3-4 cm); axillary shoots with a good development (++)
9.	“	WPM	V3	2		0.5				Slow explant growth; axillary caulogenesis was not stimulated
10.	“	WPM	V4	1		0.05				About 50% of the inoculated explants provided shoots (cca. 6 cm)( +++). 1 - 2 axillary buds at each node, that provided shoots; shoots started to degenerate after their transfer on the same medium variant
11.	“	WPM	V5	2		1				The explants grew and provided shoots, then axillary shoots (++) . Positive development, only a few generated axillary buds, that provided shoots with a slow growth
12.	“	WPM	V6	1		0.1				Callogenesis (++) in the basal region of the explants; friable light-green
13.	“	WPM	V7				2			Callogenesis (+), compact, small, cream callus (+), in the basal region of the explants
14.	“	WPM	V8				1			Callogenesis (++) , compact, small, cream callus (+), in the basal region of the explants

B=BAP; BA=BAP+IAA; BB=BAP+IBA; BD=BAP+2.4-D; BN=BAP+NAA; BD= BAP + 2.4-D; BG= BAP + GA3

+ =poor reaction; ++ = good reaction; +++ = very good reaction

Although there were some very stimulative medium variants for the biological material, with a good morphogenetic reaction (caulogenesis being a very frequent phenomenon), the evolution of shoots stopped, and they turned degenerative.

This process of degeneration affects either the initial explants, or it appears later in the newly formed shoots (though they were vigorous). Leaves and basal stem are the first to degenerate, then the process continues, affecting the apex. In most cases, apical regions were cut to be protected from this phenomenon. Still, the explants continued to turn brown.

*In vitro* cultivation of *Hippophaë rhamnoides* L. was and still remains a challenge for the specialists of this research area. The data published by numerous scientists, and our own observations as well, make us state that this species is somehow reluctant to the *in vitro* cultivation system, as there are some unsolved issues in this technology for sea buckthorn. There is no „special” medium recipe to induce a good vegetative multiplication, and a very good multiplication output was not achieved so far (on the organogenetic medium variants); shoot maintenance *in vitro* for long periods of time and the induction of rhizogenesis are still obstacles to surpass in view of perfecting a profitable technology of non-conventional multiplication of this species.

The survival, growth and the positive reaction of the inoculated explants on some nutritive variants, enhance the influence of basal medium and of the growth regulators balance used in the technology of *in vitro* multiplication of sea buckthorn. The later explant degeneration proves the fact that these processes are caused by a cell „biological clock”.

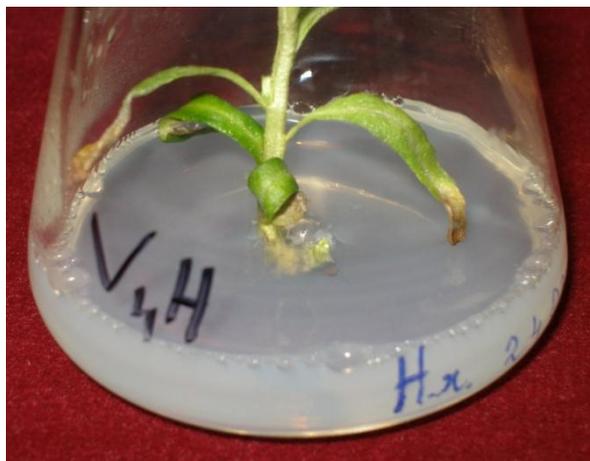
Further research will establish what stops the processes of caulogenesis, growth and limited survival of sea buckthorn shoots provided *in vitro*.



Fig. 1 Shoot growth and axillary bud formation (V6)



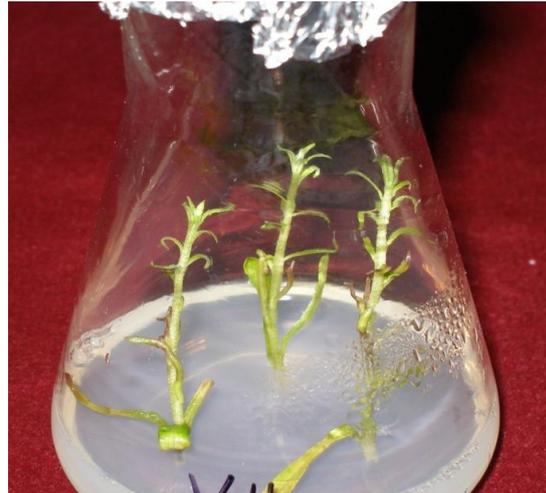
Fig. 2 Shoot growth and axillary bud formation (V1)



**Fig. 3 Formation of one axillary bud in the nutritive medium (V4)**



**Fig. 4 Development of axillary buds on V4 medium**



**Fig. 5 Axillary shoots at basal node level (V5)**



**Fig. 6 Slow shoot growth on V4 variant**



**Fig. 7 Vigorous shoots on V1 medium**



**Fig. 8 Apex elongation and formation of axillary shoots, on V6 variant**



**Fig. 9 Development of the shoots transferred on V7 to induce rhizogenesis**



**Fig. 10 Compact cream callus at the explant base, on V8**



## CONCLUSIONS

- *In vitro* cultures of sea buckthorn were initiated using shoot apices and active buds.
- The disinfection of biological material was a really important stage in the process of culture initiation for this species, because the buds are hairy and retain micro-organisms.
- Woody Plant Medium (WPM) enriched with growth regulators was the most efficient variant for the survival and development of the inoculated explants.
- The main morphogenetic reaction was caulogenesis; the most efficient hormonal variants to induce multiple shoots were: V1 (WPM + 0.2 mg/l BAP + 0.1 mg/l IBA), V5 (WPM + 2 mg/l BAP + 1 mg/l IBA) and V6 (WPM + 1 mg/l BAP + 0.1 mg/l IBA); MS ¼ II (¼ MS + 0.1 mg/l BAP + 0.04 mg/l NAA).
- The best morphogenetic reaction was evinced on the V1 (WPM + 0.1 mg/l IBA + 0.2 mg/l BAP), and V6 (WPM + 0.1 mg/l IBA + 1 mg/l BAP) medium variants; numerous shoots were provided (3-4 shoots/initial explant), still they did not survive in this *in vitro* culture system.
- Repeated transfers on the same medium variants or on different variants, did not allow shoot maintenance *in vitro*, and led to their degeneration.
- Medium variants used to induce rhizogenesis - V7 (WPM + 2 mg/l NAA), V8 (WPM + 1 mg/l NAA), VR (WPM + 0.0015 BAP) – were not appropriate to fulfill this aim.
- The perfecting of a clonal multiplication technology of *Hippophaë rhamnoides* was and still remains a challenge for the specialists of this research area, due to the fact that this species appears to be reluctant to this culture system.

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# EFECTE PRODUSE ÎN PLANTE PRIN SIMULAREA STRESULUI HIDRIC

## EFFECTS PRODUCED BY SIMULATED SOIL WATER STRESS IN PLANTS

*Olimid V, Luminita Buse-Dragomir*

**Key words:** *Water stress, stomates, mesophyll, photosynthesis, transpiration*  
**Cuvinte cheie:** *Stres hidric, stomate, mezofil, fotosinteza, transpiratie*

### ABSTRACT

*Stresul hidric produce efecte dintre cele mai variate asupra plantelor, majoritatea acestor efecte având ca rezultată finală scăderea productivității. Ca urmare, este importantă cunoașterea modului de reacție al fiecărei specii de plantă la acest tip de stres, în vederea asigurării condițiilor optime de creștere și dezvoltare.*

*Lucrarea de față prezintă rezultatele experiențelor efectuate în condiții de laborator la trei specii horticole (*Calendula officinalis*, *Chrysanthemum leucanthemum* și *Echinacea purpurea*), crescute în condițiile simulării stresului hidric. Pentru cunoașterea răspunsului plantelor s-au determinat conductanța dioxidului de carbon la nivel mezofilic și stomatal și potențialul hidric al apei.*

*Un factor critic l-a constituit creșterea rezistenței mezofilice aproape în paralel cu cea stomatică pe măsura creșterii stresului hidric, această creștere determinând reducerea proceselor de fotosinteză și transpirație.*

*Soil water stress has adverse effects on the water relations and productivity of plants, there are few quantitative descriptions of these important effects, permitting comparisons between species, or an understading of which physiological attributes are particularly sensitive to stress, this is particularly true for many species.*

*The present paper describes experiments in which the short-term responses of three species (*Calendula officinalis*, *Chrysanthemum leucanthemum* and *Echinacea purpurea*) to different known levels of simulated soil water stress are contrasted and compared in a controlled environment. Plant responses are evaluated in terms of changes in leaf water potential, transpiration and photosynthesis. From these primary data important attributes including, stomatal and mesophyll resistances to CO<sub>2</sub> fixation, and plant hydraulic resistance to water flow have been computed. One critical factor is the increase in mesophyll resistance approximately parallels that in stomatal resistance, as stress increases and plays an important role in reducing photosynthesis and transpiration.*

### INTRODUCTION

Although it has been known in a general way for many years that soil water stress has adverse effects on the water relations and productivity of plants, there are few quantitative descriptions of these important effects permitting comparisons between species, or an understading of wich physiological attributes are particularly sensitive to stress, this is particularly true for horticultural species.

## MATERIAL AND METHODS

*Callendula officinalis*, *Chrysanthemum leucanthemum* and *Echinacea purpurea* are growing in nutrient solution in laboratory. Experiments were conducted in growth chamber at  $25\pm 0,5^{\circ}\text{C}$ , atmospheric humidity  $58\pm 2\%$  and 12 h photoperiod.

Initial, unstressed rates of  $\text{CO}_2$  uptake and water vapour loss were measured using a water-jacketed assimilation chamber an individual, almost fully expanded, attached leaf whose temperature was controlled at  $25\pm 0,5^{\circ}\text{C}$  by water circulated through the water jackets from a temperature- controlled bath.

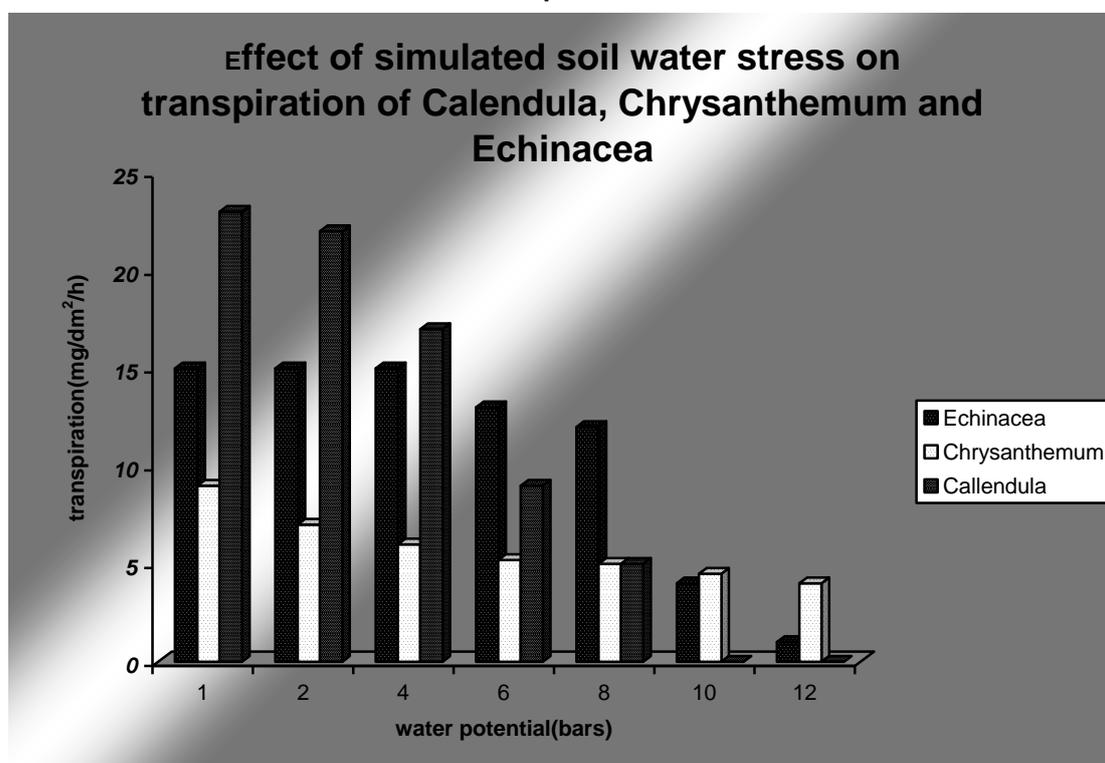
After gas exchange rates had remained steady for at least 30 minutes, the water potential of leaves adjacent to the assimilation chamber was measured using the psychrometer Assman.

## RESULTS AND DISCUSSION

### 1. Gas exchange

Examples of the effects of decreasing solution water potential on the gas exchange rates of the three species are given in gr. 1,2, together on the following day.

Graph.1



Analysis of variance for replicates confirmed such differences were statistically significant for both transpiration and photosynthesis and were still significant after stress.

The transpiration curves for Echinacea and Chrysanthemum show that water was fully available to them down to solution water potential of -3 to -3,5 bars since transpiration was constant over this range, but that water was not freely available at still lower solution water potential since transpiration declined curvilinearly thereafter.

On *Calendula* species is no suggestion of an initial plateau, transpiration declining as soon as solution water potential started to fall.

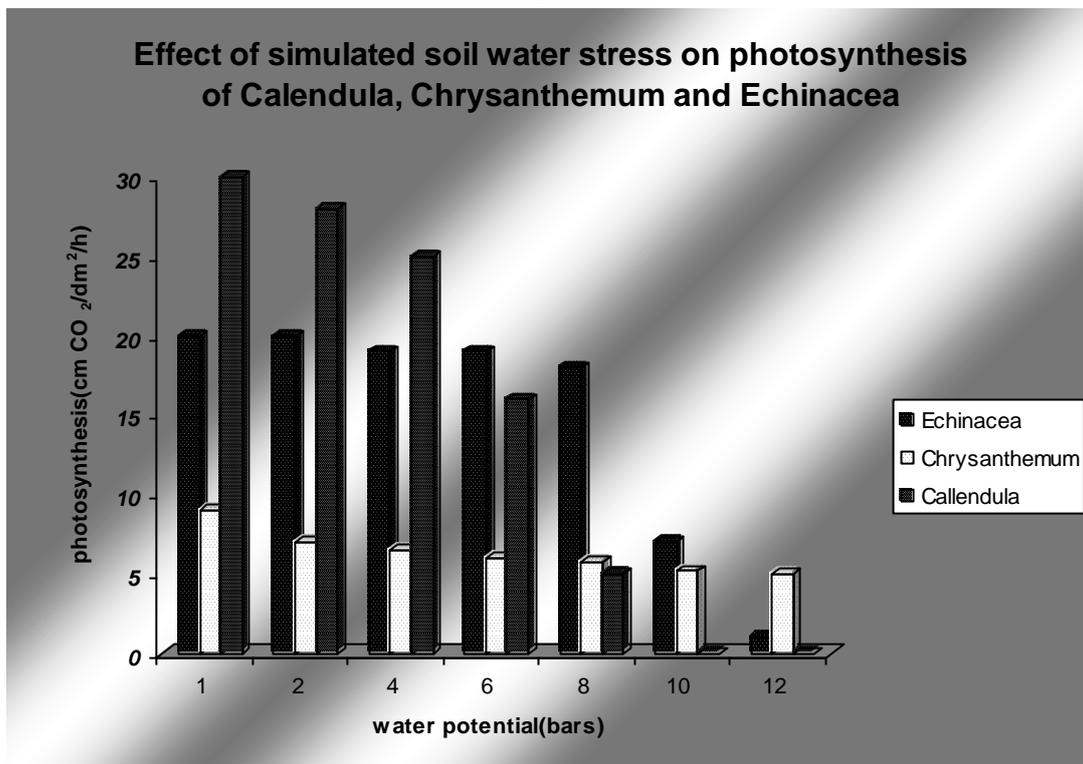
The relatively great sensitivity of *Calendula* to water stress is shown by the fact that by the time the solution water potential had fallen to -5 bars *Calendula*'s transpiration was less than that of Echinacea, which it had initially exceeded by more than 50%.

This was mainly due to the lack of an initial plateau in Calendula; on an absolute basis it would appear that transpiration was least affected by stress in Chrysanthemum.

However, this may be because transpiration was initially unusually low in this species. When the rates are expressed percentages of their initial values, the order of sensitivity of the species is Calendula, Chrysanthemum, and Echinacea.

Recovery from stress also differed between the species. Calendula despite being the most stress-sensitive species, showed the greatest recovery from stress in both photosynthesis and transpiration. Photosynthesis recovered completely in this species and recovery in transpiration was very good. This behaviour persisted in experiments in Calendula plants were more strongly stressed and seems to Chrysanthemum were not nearly so good. In Echinacea, as in Calendula, photosynthesis on average recovered more than transpiration but in Chrysanthemum there was little difference between the two.

Graph. 2



Gr. 1 and 2 also shows a clear parallelism between the reduction in transpiration and photosynthesis is solely due to reduced stomatal opening, or that photosynthesis must be reduced by increases in both in mesophyll resistance and stomatal resistance, otherwise photosynthesis would have been reduced less than transpiration.

## 2. Diffusive resistances

Fig. 3 and 4 shows that the initially lower (unstressed) photosynthesis of Chrysanthemum and Echinacea than of Calendula were due not only to increased stomatal resistances (s.r.), but also to increased mesophyll resistances (m.r.).

Graph.3

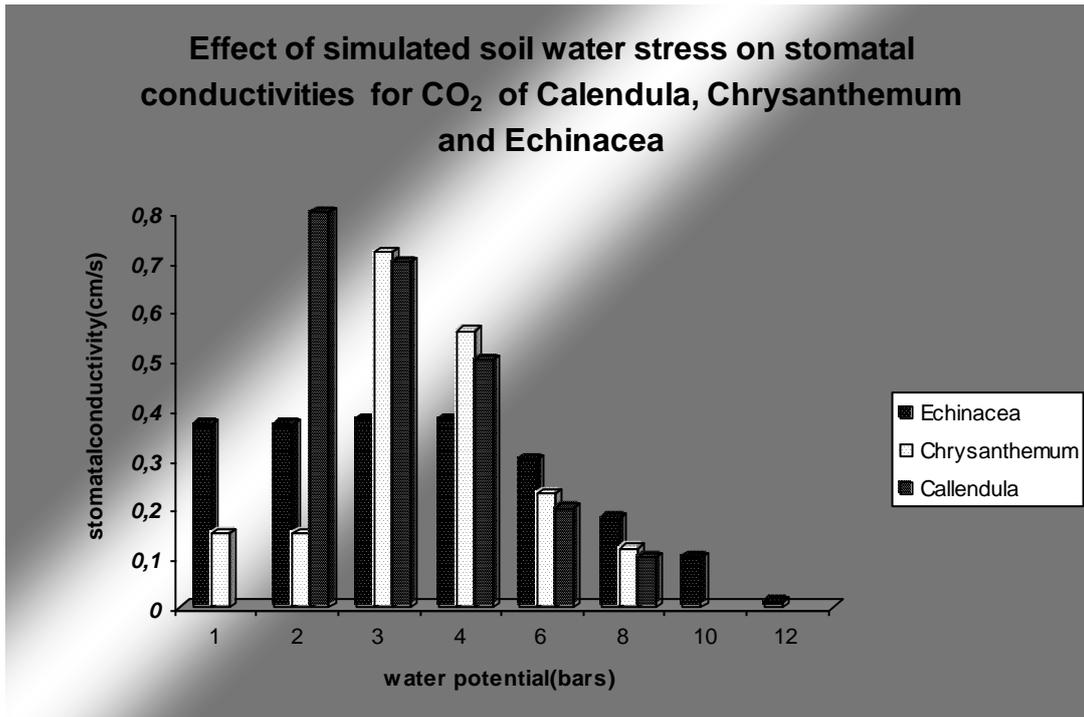
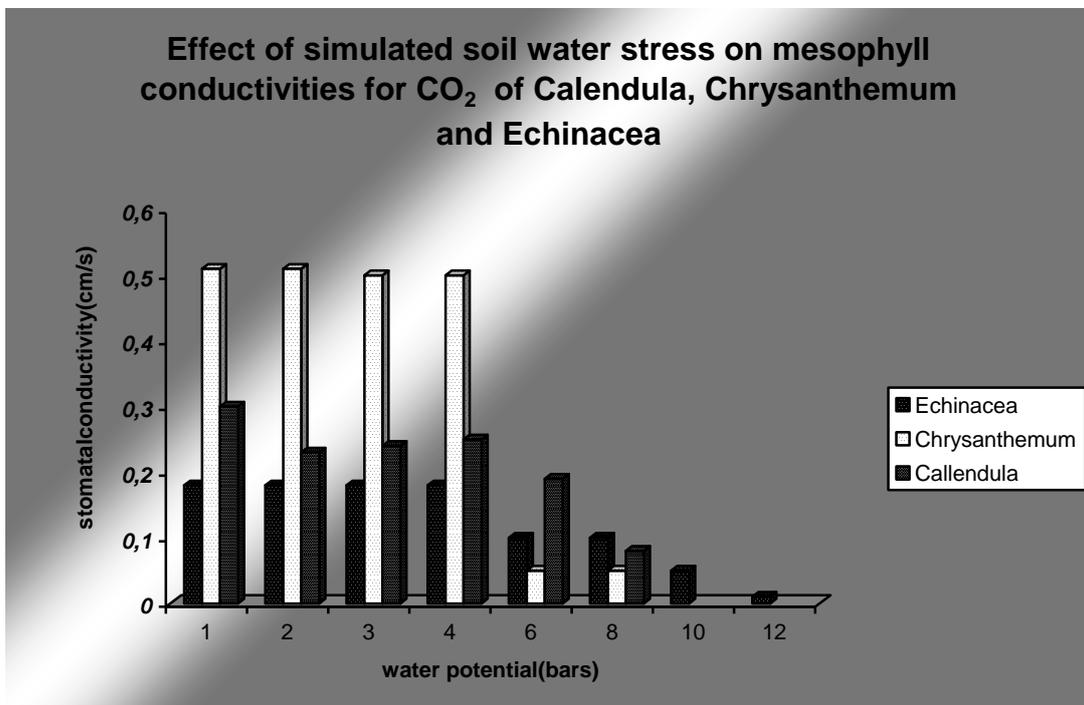


Fig. 3 and 4 also brings out clearly the role of appreciable decrease in  $1/r.m.$  as well as in  $1/r.s.$  in reducing photosynthesis as solution water potential fell.

Graph.4

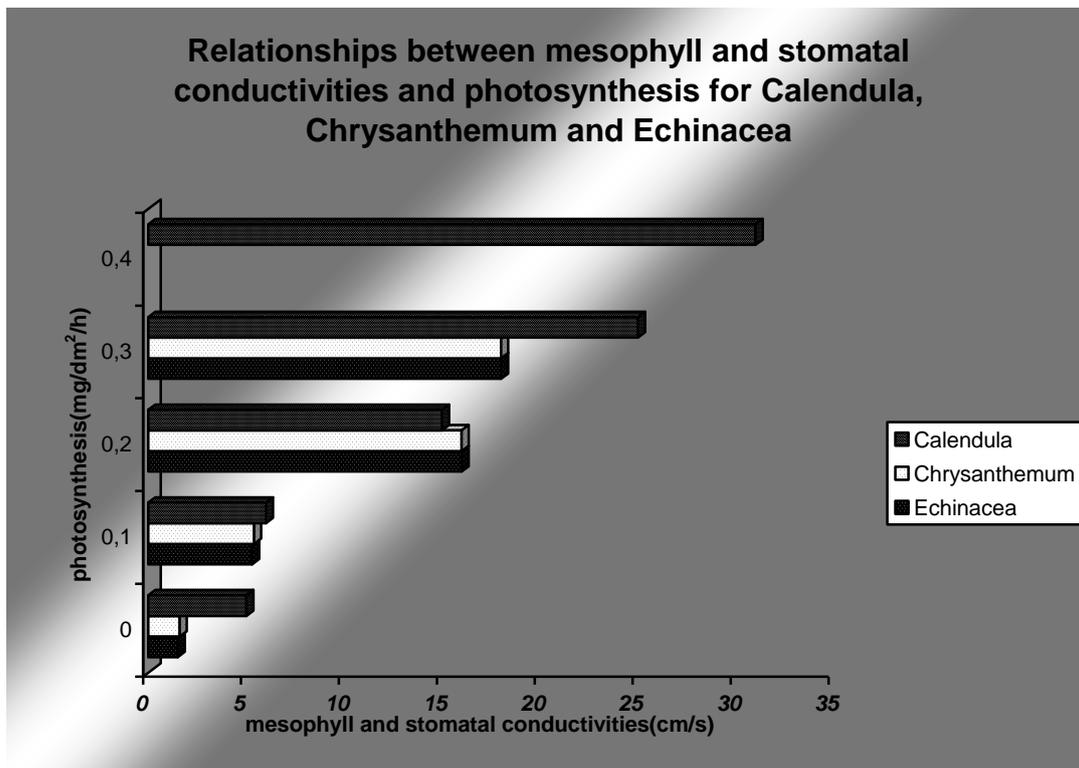


The decline in  $1/r.s.$  was initially faster than that in  $1/r.m.$ , showing up finally as  $1/r.s.$  approached  $1/r.m.$  in all three species, although the relative responses of  $1/r.s.$  and  $1/r.m.$  to increasing stress varied widely between the species. Thus in Calendula  $1/r.s.$  fell much more than  $1/r.m.$ , Echinacea was intermediate, and in Chrysanthemum the decline in the two conductances was more nearly equal. Presumably these differences are related to the differences in the initial ratio  $r.s./r.m.$  discussed above, greater stomatal closure occurring in those species with initially higher values of this ratio and higher absolute values of  $1/r.s.$

Echinacea 1/r.s. appears more sensitive to stress than does Chrysanthemum on an absolute though not on a percentage basis, whereas 1/r.m. of Chrysanthemum appears more sensitive than that of Echinacea, even on an absolute basis. Echinacea and Calendula showed on average a clear trend for recovery of 1/r.m. to exceed that of 1/r.s., but in Chrysanthemum average of 1/r.s. and 1/r.m. were approximately equal.

These results lend support that in some species at least; nonstomatal effects on photosynthesis can be brought about by mild or moderate water stress, rather than to the earlier view that only stomatal closure is involved.

Graph. 5



The fig.5 shows that 1/r.m. declined almost linearly as photosynthesis fell but that the decline of 1/r.s. was markedly curvilinear.

Furthermore, the data for the two species appear to fall on the same curves. Both species therefore seem to show the same absolute relationships between all three variables, Chrysanthemum simply operating over about half the range that Echinacea does. One possible explanation for this could be that r.m. is a function of CO<sub>2</sub> concentration in the intercellular spaces of the leaf, increasing as concentration falls in response to stomatal closure.

## CONCLUSIONS

It is interesting to consider the contrasting responses of Calendula and Echinacea to soil water stress.

Calendula is characterized by early and rapid stomatal closure, Echinacea by later and slower closure. Its early stomatal closure is considered an important drought adaptation minimizing the accompanying reduction in water potential of leaves, Calendula would be more drought resistant than Echinacea. But if drought resistant species are considered to exhibit delayed stomatal closure, allowing gas exchange to continue such plants being adapted to the consequent low water potential of leaves, Echinacea would be more drought resistant than Calendula.

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# INFLUENȚA SĂRURILOR MINERALE CU N,P,K ASUPRA PROCESELOR FIZIOLOGICE LA PLANTELE DE CORYLUS AVELLANA L.

## THE INFLUENCE OF THE SALINOUS MINERALS WITH N, P, K CONCERNING THE PHYSIOLOGICAL PROCESSES IN CORYLUS AVELLANA L. PLANTS

*Olimid V., Luminița Bușe-Dragomir*

**Cuvinte cheie:** săruri minerale, fotosinteză, respirație ,proteine,lipide  
**Key words:** minerals salinous, photosynthesis, respiration, protides, lipides

### ABSTRACT

*Lucrarea de față se referă la influența sărurilor minerale cu N,P,K administrate separat și în amestec –asupra fotosintezei, respirației, transpirației frunzelor, precum și asupra creșterii suprafeței foliare și a conținutului în lipide și proteine al semințelor plantelor de Corylus avellana, crescute în Parcul dendrologic „Lunca Jiului; .*

*În urma determinărilor efectuate s-a constatat că spre sfârșitul perioadei de vegetație suprafața foliară la variantele cu azot și cu amestec era mult mai mare în comparație cu variantele fără azot, care se apropiau ca valoare de martor*

*În comparație cu martorul, conținutul în proteine a fost mai mare la variantele cu azot, iar conținutul în lipide , la variantele ce conțin fosfor. Fotosinteza a crescut cel mai intens la varianta cu NPK iar respirația nu a prezentat diferențe mari la nici una din variante în comparație cu plantele de control.*

*The work refers to the influence of the salinous minerals with N, P, K administrated sepparrately and in mixture concerning the growth in height of the stem, concerning the content in protides and lipides of the seeds and also about the photosynthesis and the respiration of the leaves by the Corylus avellana plants cultivated in „Lunca Jiului,, dendrologycal Park .*

*One has established that towards the end of the period of vegetation the plants of all variants are nearing the control height (without salinous minerals) while the foliar surface is much bigger that to the control.*

*In comparison with the control, content in protides it is bigger to the variantsthat contain N and the content in lipides is bigger to the variants that contain P.*

*The photosynthesis has grown intensively by the variants with NPK, and the respiration does not represent to great differences in comparison to the control plants.*

### INTRODUCTION

The plants problem of mineral nutrition, frequently tackled in the physiology works, it was generally applied, to the cultured plants, to know the nourishing demands of those.

This working had the goal to distinguish the importance of macroelements and for the spontaneous plants, known as less pretentious from nutritionally point of view. The obtaining data to the wild nut tree (Corylus avellana) point out that a balanced nutrition has a healthy effect on it, leading to the increasing to quantity of biomas and to the quality of seeds.

## MATERIAL AND METHODS

There were supplementary administered mineral elements to the growth field plants, and the experiments was effectuated on the next variants:

V<sub>1</sub> – control variant; V<sub>2</sub> – plants fertilized with ammonium nitrate; V<sub>3</sub> – plants fertilized with superphosphate; V<sub>4</sub> – plants fertilized with potassium salt; V<sub>5</sub> – plants fertilized with ammonium nitrate, superphosphate, potassium salt.

On the examined material it was determined: the intensity of photosynthesis, the intensity of perspiration, the intensity of respiration, the accumulation of dry substance, the foliar surface, the content in protein and lipid of fruits.

The intensity of photosynthesis it was determined by the Ivanov method, which consist in the volume measurement of CO<sub>2</sub> consumed by the plant in one hour. The intensity of perspiration it was determined by leaves weighing at every 10 minutes using the torsion balance. The intensity of respiration it was determined by the Boyson – Jensen method based on the dosing of CO<sub>2</sub> resulted before the process. The content in protein it was determined by the Kjeldahl method, and the content in lipid by the Soxhlet method.

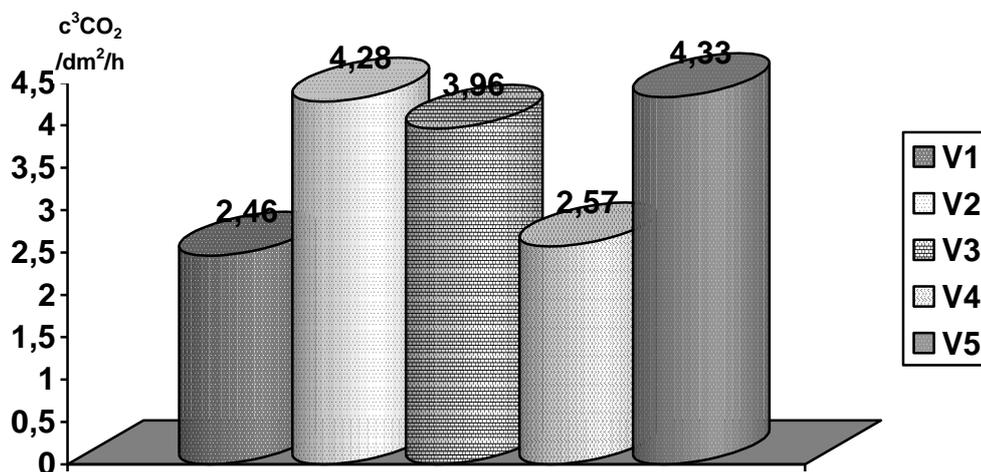
### 1. The intensity of photosynthesis

The effectuated **analyses** distinguished an intensification of photosynthesis process on the plants leaves treated with N, P și NPK.

The influence of mineral elements on the intensity of photosynthesis process is due to the fact that the elements go in the composition of some organic substances involved in this process. In this way, the nitrogen go in the chlorophyll composition and it's component part of the aminoacids and proteins, while the phosphorus is part of the transporter substances with energy: ADP și ATP.

The V<sub>1</sub> control variant had the most reduced photosynthetical rate and the V<sub>4</sub> varaint – with K it had also low values of photosynthesis, proving that the ion of K is not dirrectly implicated in the photosynthesis process.

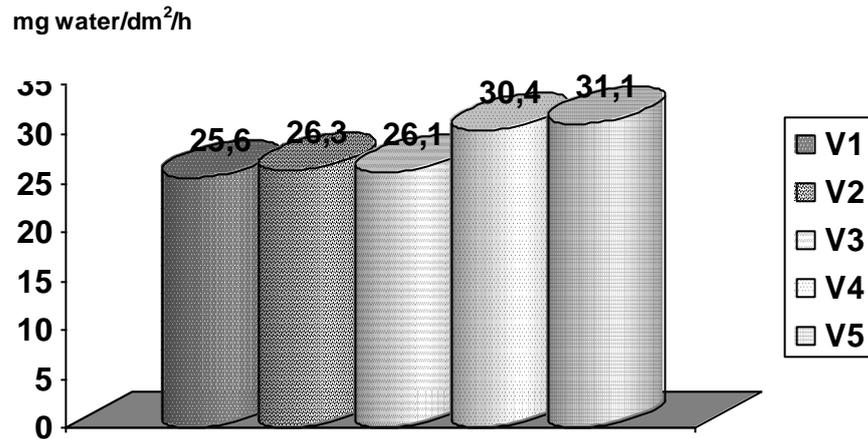
**Graph.1. The influence of macroelements N, P, K on the photosynthesis process at *Corylus avellana*(cm<sup>3</sup>CO<sub>2</sub>/dm<sup>2</sup>/h)**



### 2. The intensity of transpiration

From the data written into the graph 2 we can see that the transpiration process is influenced by the simultaneous administration of the mineral elements, registering the highest value of the perspiration intensity at the N P K variant, followed by the variant with K. The hydro – electrolysable role of K ion and its involvement in the mechanism of closing and opening of the stomata it explains the intensification of process at this variant too.

**Graph.2. The intensity of transpiration at *Corylus avellana* plants under the influence of macroelements N, P, K.**

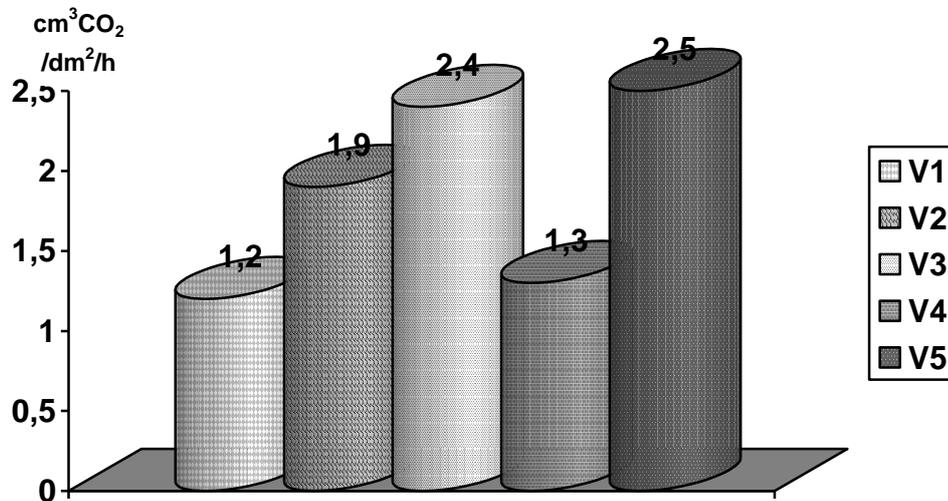


### 3. The intensity of respiration

The determination of respiration in darkness points out increase considerably the process by applying supplements of macroelements, the obtaining value at the variants V<sub>3</sub> and V<sub>5</sub> being almost double than the recording values at the control variant.

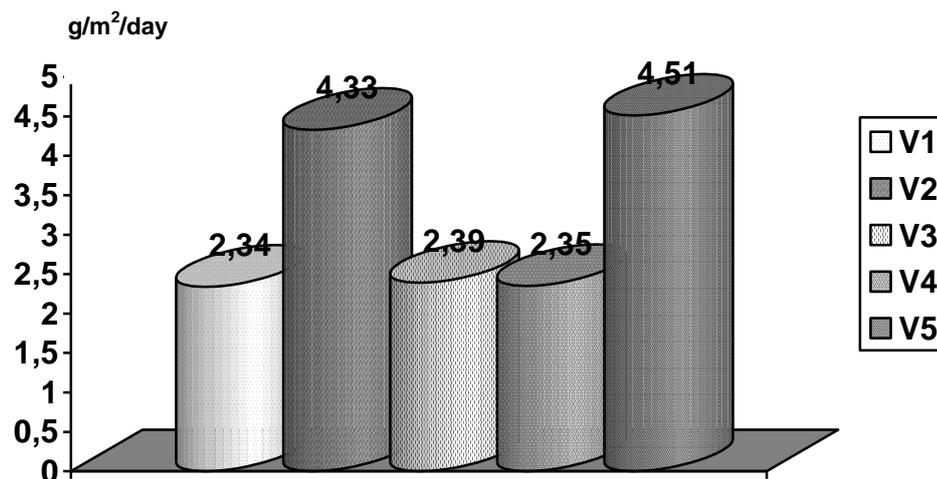
The variant with K did not significantly modified the respiration process, and the obtaining values at this variant were near by the control (V<sub>1</sub>)

Graph.3. The intensity of respiration at *Corylus avellana* leaves under the influence of macroelements N, P, K.



### 4. The intensity of net assimilation

Graph.4. The intensity of net assimilation (g/m<sup>2</sup>/day)



It represents a very important parameter, because it offers data regarding the accumulation of biomass (the photosynthesis productivity).

The determinations effected in this respect, they point out raised values at the variants (V<sub>2</sub>) with N and (V<sub>5</sub>) with N, P, K.

All this demonstrates that the applying of nitrogen goes to a significant vegetative development, and the applying of N, P, K determines the vegetative increasing also the development more easily of the plants.

#### 5. The foliar surface

The growth rhythm of foliar surface at the studied variants it was determined by a 30 days period.

In accordance with the table 1, the applying of macroelements did not modify the growth rhythm in the first 5 days, but after this period, at the treated plants with N and also with complex fertilisers, it was recorded an increasing rhythm of the leaves development.

**Table 1. – The growth rhythm of the leaves at *Corylus avellana* plants under the influence of macroelements N, P, K.**

Variants	Foliar surface (cm <sup>2</sup> ) Number of days since the beginnings of experiments				
	0	5	10	20	30
V <sub>1</sub>	27,5	28,9	31,2	33,6	34,5
V <sub>2</sub> (N)	28,1	28,6	33,6	35,8	36,7
V <sub>3</sub> (P)	27,2	27,5	28,1	29,6	32,3
V <sub>4</sub> (K)	25,1	25,5	26,3	28,9	31,6
V <sub>5</sub> (N P K)	26,9	27,2	31,7	36,3	38,4

#### 5. The content in proteins and lipids

As compared to the control, the content in proteins is bigger than the variant with nitrogen and the content in lipids is higher than the variant with phosphorus.

**Table 2. The content in proteins and lipids of *Corylus avellana* nuts**

Variants	Total proteins(%in d.s.)	Lipids (% in d.s.)
V <sub>1</sub>	18.43	44.26
V <sub>2</sub> (N)	21.20	45.6
V <sub>3</sub> (P)	18.64	44.37
V <sub>4</sub> (K)	19.21	48.23
V <sub>5</sub> (N P K)	20.62	46.92

## CONCLUSIONS

The nitrogen administration in optimal concentrations it determines the intensification of photosynthesis process and the increase of accumulated biomass quantity

The additional administration of phosphorus it stimulates the photosynthesis proceses, blossoming, fruition, it increases the resistance to abiotical factors of stress

The potassium intensify the water absortion and reduce the perspiration, increasing the osmotical pressure of vacuolar juice, hydration grade and protoplasm permeability. It takes part at the closing and opening mechanism of stomates and it stimulates the crude and elaborated sap transport

The simultaneous administration of the three macroelements in the likeness of salts it has an favorable effect on the plants, determining the photosynthesis intensification and the qualitative appreciation of fruits

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# RATIONAL USE OF AGRI-ENVIRONMENT ASSESSED BY NUCLEAR AND ATOMIC METHODS

## FOLOSIREA RATIONALA A MEDIULUI AGRICOL ESTIMATA CU AJUTORUL METODELOR NUCLEARE SI ATOMICICE

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**Keywords:** agriculture, environmental impact, nuclear and atomic methods

### ABSTRACT

It is wellknown that the development of agriculture introduces environmental pressures and impacts on the ecosystems. In terms of soil degradation, the main pressures caused by agriculture are compaction, diffuse contamination with pesticides and herbicides, acidification and erosion. The problems of water pollution by agriculture, both of ground – and surface water are amplified by water availability. Atmospheric emissions of  $\text{NH}_3$  and greenhouse gases (as  $\text{N}_2\text{O}$  and  $\text{CH}_4$ ) causing eutrophication and acidification have decreased in the last decade due to decreased use of fertilizers.

The environmental monitoring implies a lot of tools and methods, which identified and investigate the existing problems, particularly those of local and regional concern, and their relation with common environmental standards.

The employment of nuclear and atomic methods in the agri-environment factors assessment is treated in this study.

### INTRODUCTION

The remarkable achievements in physics have opened up wide opportunities for the use of nuclear applications in agricultural research.

In the spite of working towards a cleaner and more efficient agricultural production, the use of nuclear and atomic techniques in agricultural research implies important comparative benefits. This technology provides enormous utility in because it permits a direct quantitative measurement of the influence of varied factors on the environment. Nuclear and atomic techniques have been developed and refined, permitting the research and development of solutions in areas such as soil fertility, compaction, diffuse contamination with pesticides and herbicides, acidification and erosion, water use, through application of techniques in agricultural lands.

Indeed, if the recommendations obtained in the studies performed by nuclear and atomic techniques are followed, the application rate of fertilizers can be reduced, degraded soils can be restored, soil erosion can be quantified, optimal fertilizer and water use can be applied (fertigation) in fruit tree plantations, pesticides can be adequately used, among other remarkable advances for the area.

The nuclear and atomic methods are being well accepted among analysts as modern tools for stable element analysis. The potential for the application of the analytical methods such as activation analysis, ion beam techniques and X-ray fluorescence analysis has been focused on their high sensitivity with nondestructive, simultaneous multi-element analysis. Such functions may offer marked progress in environmental,

biological and medical sciences. Furthermore, the potential adaptability for samples in all physical states and all chemical species for quantitative analysis is included in these subjects.

In an agricultural environment, such capabilities are eagerly anticipated, for agricultural samples are not uniform in their physical and chemical properties and are normally rich in some elements, which critically interfere in performing analyses of trace elements.

The above mentioned nuclear and atomic methods are well employed for analyzing trace elements in crops and in soil for a detailed quality examination and in irrigation water for environmental monitoring.

## MATERIALS AND METHODS

A 24 MeV microtron installed at the Flerov Laboratory for Nuclear Reactions in JINR was used. The material under study was irradiated with high-energy bremsstrahlung, with energy range 15 MeV to 30 MeV at 15 mA. Thereafter, the induced radioactivity ( $\gamma$  rays) is measured by photon spectrometry with a Ge(Li) detector whose resolution expressed as FWHM is 2.5 keV at 1.33 MeV. The quantitative determination of components was performed by signal comparison with a calibration material irradiated simultaneously.

For ion beam analysis a 3 MV Van der Graaff of EG-5 experimental facility of the Frank Laboratory for Neutron Physics was used. Bombardment was carried out with a 2.1 MeV proton beam at  $45^\circ$  with respect to beam direction in vacuum at a few nA for 1.5 hours and are detected by a Si(Li) detector with a Be window and the energy resolution of the system was 260 eV FWHM at 5.89 KeV Mn  $K_\alpha$  line. The total distance of the detector from the sample target was 10 mm.

In the present investigation, the K-shell fluorescence yields for minor and major elements in the samples have been measured using a fluorescence excitation method to excite target atoms for annular shaped  $^{109}\text{Cd}$  ( $E_g=22.16$  keV) and  $^{241}\text{Am}$  ( $E_g=59.57$  keV) radioisotop irradiation sources. Two methods of using coherent and incoherent scattered peak intensities in quantitative XRF analysis for minimizing matrix effects were used, namely relative and absolute method. The ratios coherent/incoherent of the peaks in the source spectrum in determination of the etalons analyzed together with the samples are used.

A large variety of agricultural samples and soil as well as environmental objects and human samples were used and correlated during the present investigation with the means to have a much more complex estimation of the environmental situation in the investigated region. All the important agricultural plants have been subjected to such studies: barley, berries, cabbage, carrot, celeriac, corn, fruits, peas, pimpernel, potatoes, radishes, rye, soybeans, sunflower, tomatoes, and wheat. Different parts of each crop were separated and properly prepared prior to analysis. Many samples were obtained with various improved characteristics of selection value.

The validation of the obtained results was accomplished by quality assurance and control methods by using primary calibration materials as well as well-determined etalons samples. Further enhancement of the quality of results is achieved by application of inherent or additive internal monitors. These studies showed good accuracies of the methods involved and significant lower detection limits for the elements in the sample matrix.

Mass concentrations of the elements such as C, N, O, Na, Mg, Si, Cl, Sc, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Sr, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, Cs, Ba, Ce, Nd, Sm, Eu, Gd, Dy, Tm, Yb, Lu, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl,

Pb, Bi and U are determined in agricultural and biological samples and nearly any matrix could be analyzed.

### ***Uncertainty of the results***

- from 10 - 3% for concentrations of about 0.1  $\mu\text{g/g}$  – 1g/g: C, N, O, F, Cl, Sc, Ni, Ge, As, Rb, Sr, Zr, Ru, Pd, Ag, Sn, Sb, I, Ce, Sm, Eu, Gd, Tm, Yb, Ta, Re, Os, Ir, Pt, Au, Hg, Tl, U;

- from 10 - 2% for concentrations of about 0.1  $\mu\text{g/g}$  – 1g/g: Na, Mg, Si, K, Ca, Ti, Cr, Mn, Co, Zn, Ga, Se, Br, Y, Nb, Mo, Rh, Cd, In, Te, Cs, Ba, Nd, Dy, Lu, Hf, W, Pb, Bi;

- from 4 - 2% for concentrations  $> 1000 \mu\text{g/g}$  – 1g/g: Fe, Cu.

As an example, the  $\gamma$ -ray spectra obtained from the soil sample 4 hours irradiation, 1 day after the end of irradiation and 20 min measurement are shown in Fig. 1. The  $\gamma$ -ray spectra observed in the other samples also showed similar patterns. The concentrations of the radioactive nuclides shown in the figure were calculated.

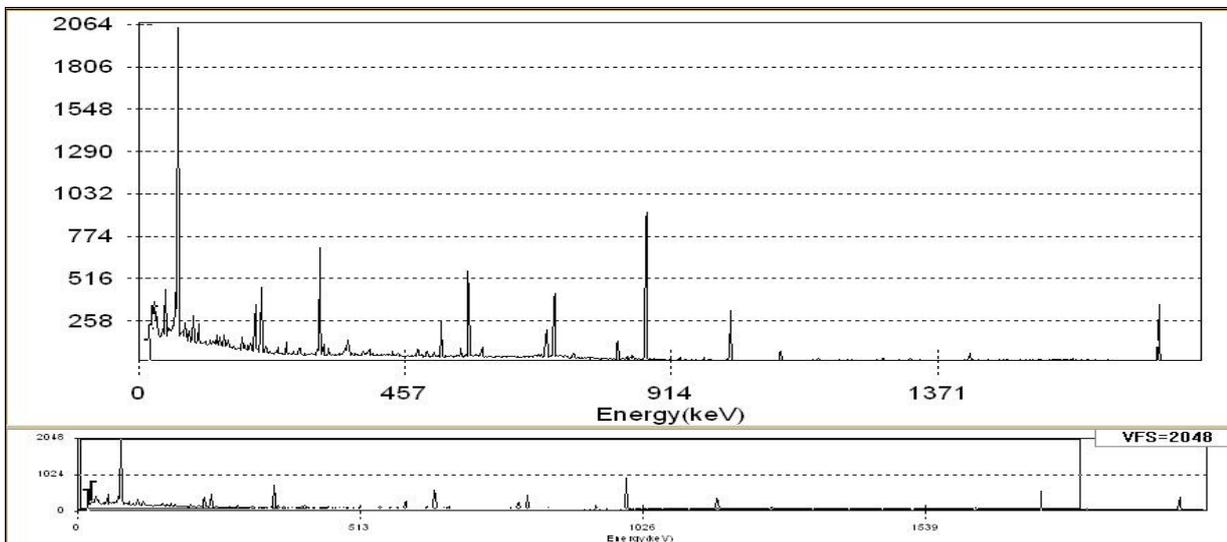
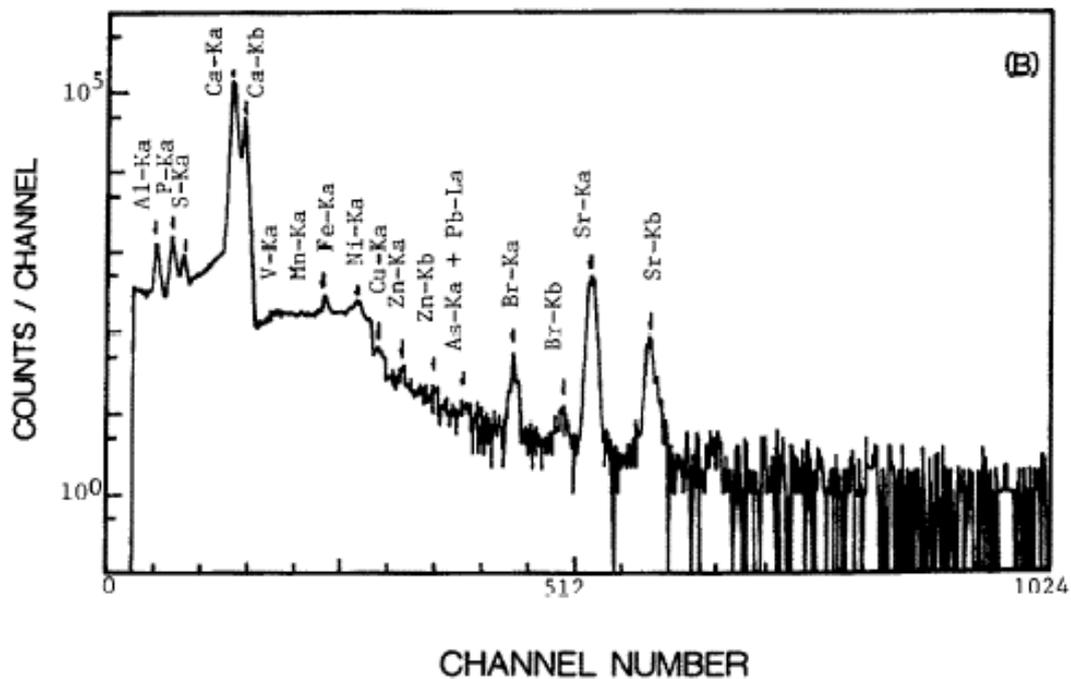
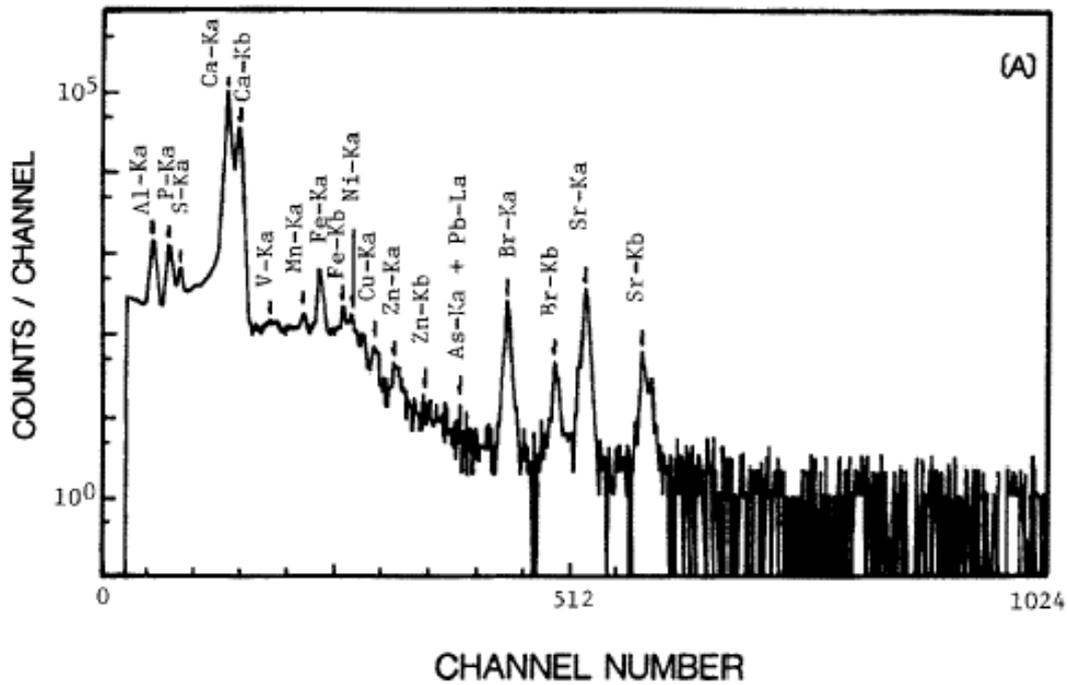


Fig.

1.  $\gamma$  activation spectrum of a soil sample: time of irradiation 4 h,  
time of desintegration - 1day, measurement time - 20 min.

Figs. 2 (A) and (B) show the X-ray spectra of stable isotopes from the outside in inside of the external shell of 2 cm thickness of a potatoes sample. In the agricultural research, potatoes are typical in their accumulation behavior of radionuclides. More than 30 radioisotopes of the stable elements were identified in the sample matrix. Fe and Sc, which were found in significant levels in the surface peel, for them it is possible they are derived in the ambient soil.

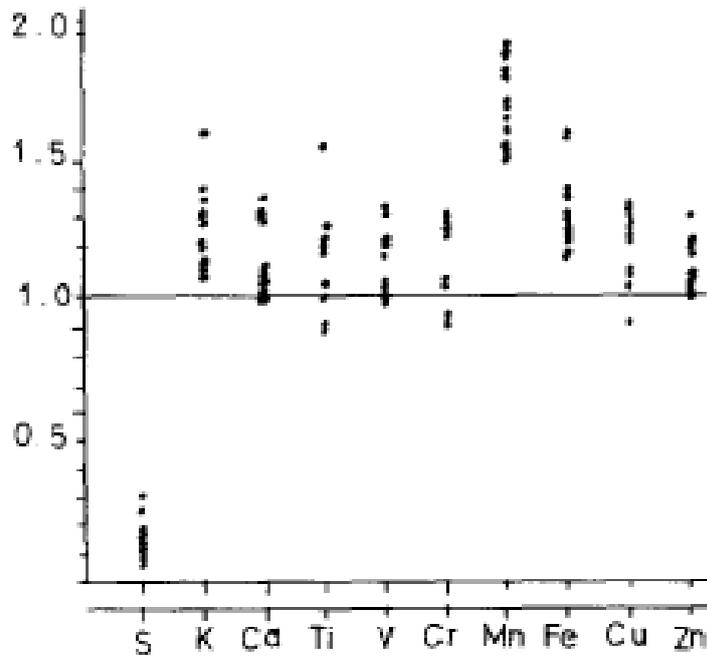
We should also mention the critical interfering elements as Ca and Zn in the spectrum, which can be eliminated by introducing absorbers. The trace elements such as Fe, Ni, Cu, Zn, As, Br and Sr were successfully determined in both sides, outer and inner, respectively.



**Fig. 2. (A): X-ray spectrum from the outside of external shell (peel), potatoes sample**

**(B): X-ray spectrum from the inside of external shell (of about 2 cm thickness)**

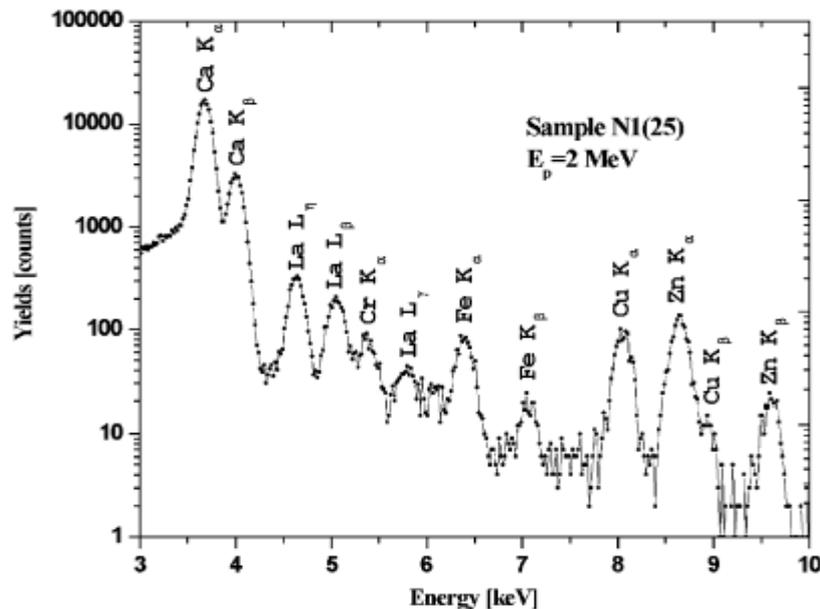
Some samples of tree fruits were analyzed both by XRF and PIXE. The results of some elements, namely S, K, Ca, Ti, V, Cr, Mn, Fe, Cu and Zn in a collective sample of n apple tree garden are shown in Fig. 3 as PIXE/XRF ratios. It can be deduced that the element concentrations as determined by PIXE method are slightly higher than those obtained by XRF method. This recommend PIXE as more sensitive analysis tool than XRF for this kind of objects.



**Fig. 3. PIXE/XRF concentration ratios in the analysis of tree fruits**

Fig. 4 shows the elemental content of dental enamel from a segment of exposed population in a medium industrialized urban environment in Romania compared with that of an unexposed/rural one, as determined by PIXE analysis with protons of 2 MeV. All trace heavy metals showed clear risings in concentrations of 1.5 - 3 times for exposed compared with unexposed population, which reflects the quality of air/environment in the two living situations.

In order to give a correct interpretation of environmental trace element levels, the results obtained for agricultural plants were correlated with those of corresponding soil samples and human samples analyzed in the same region. This has been studied in detail in the paper "Food security and environmental changes: a photon neutron activation analysis study of agricultural crops", presented by the author at the XXXVIII congress of ESNA in Krakow in 2008.



**Fig. 4. X-ray spectrum of the human tooth enamel**

## CONCLUSION

Major and trace elements, in terms of their quantities and trophic balance are essential in sustaining life on the Earth. The anthropogenic activities mobilize large quantities of some elements in the ecosystems. As a result, the uptake of environmental trace elements by living organisms is being modified, and because of a narrow range of adequacy this can result in different abnormalities. Since the trace concentration levels and the variability of species and subjects, a large number of measurements has to be performed to investigate this processes. These requirements ask for use of nuclear and atomic methods of detection in problems associated with air, water, soil or food pollution.

We presented some examples on the measurements by the most applied methods in agricultural and biological researches.

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# INSTRUMENTAL PHOTON NEUTRON ACTIVATION ANALYSIS FOR DETERMINATION OF TRACE HEAVY METALS

## APLICAREA ANALIZEI PRIN ACTIVARE CU FOTONI CU PRODUCERE DE NEUTRONI IN SCOPUL DETERMINARII METALELOR GRELE URMA

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**Keywords:** trace heavy metals, photon neutron activation analysis, environmental studies

### **ABSTRACT**

*The major part of trace elements enters living organism via the food chain. Then the accurate determination of trace heavy metal concentrations is an important task in applicative sciences and their use in the benefit of human life. For example, Photon Neutron Activation Analysis (PNAA) offers a reliable possibility of providing a rapid multielemental analysis of various samples in ppm range, supposing as well the preservation of the samples. The accuracy of the analytical method was proved by analysis of a number of environmental materials.*

### **INTRODUCTION**

Multielemental activation analysis is one of the most usefully analytical techniques in trace element radiochemical analysis. Compared with another laboratory analytical techniques, activation analysis is non-destructive, and requires not any complicated and time-consuming chemical separation procedures. PNAA is a highly sensitive method based on the ( $\gamma$ , n) photonuclear reactions and following gamma-ray spectrometry for determining the elemental composition of the samples. The analytical procedure, requiring high energy photons from a microtron, has been used successfully for a wide range of applications ranging in industry, geology, environment, medicine, defense and research. Trace heavy metals such as As, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb and Zn by the PNAA method can be analyzed efficiently. The photon neutron activation method was applied to a large variety of environmental objects and some results in this paper are presented.

### **MATERIALS AND METHODS**

The principle of the PNAA method is based on the fact that high energy electrons from a microtron hit a target which transfers electrons to bremsstrahlung (photons) [1]. The produced photons activate stable isotopes in the sample by removing a neutron from nucleus. The activated isotopes often emit  $\gamma$  rays, which are then detected by  $\gamma$  spectroscopy (Table 1). By detecting the radioactivity of the irradiated sample one can determine the elemental concentrations in the sample.

Table 1

Photonuclear reactions and  $\gamma$  lines of some radionuclides

Element	Reaction	$E_{\gamma}$ , keV	$T_{1/2}$ , d
<b>Cr</b>	$^{52}\text{Cr}(\gamma, n)^{51}\text{Cr}$	320.1	17.7
<b>Ni</b>	$^{58}\text{Ni}(\gamma, n)^{57}\text{Ni}$	1377.6	1.5
<b>Co</b>	$^{59}\text{Co}(\gamma, n)^{58}\text{Co}$	810.6	70.78
<b>Zn</b>	$^{68}\text{Zn}(\gamma, p)^{67}\text{Cu}$	184.6	243.8
<b>As</b>	$^{75}\text{As}(\gamma, n)^{74}\text{As}$	595.9 634.8	17.8
<b>Se</b>	$^{76}\text{Se}(\gamma, n)^{75}\text{Se}$	264.7	120
<b>Sb</b>	$^{123}\text{Sb}(\gamma, n)^{122}\text{Sb}$	564	2.68
<b>Pb</b>	$^{204}\text{Pb}(\gamma, n)^{203}\text{Pb}$	279.1	2.171

The samples are irradiated for 4 hours with maximum photon energy of 24 MeV at the compact electron accelerator MT-25 of FLNR, JINR (Fig. 1). The average electron current is about 15 mA. Then the irradiated targets are “cooled” for about 2 hours and later measured using a  $\gamma$ -ray spectrometer equipped with a Ge(Li) detector under an energy resolution of 2.5 keV FWHM for the 1.33 MeV line of  $^{60}\text{Co}$ .

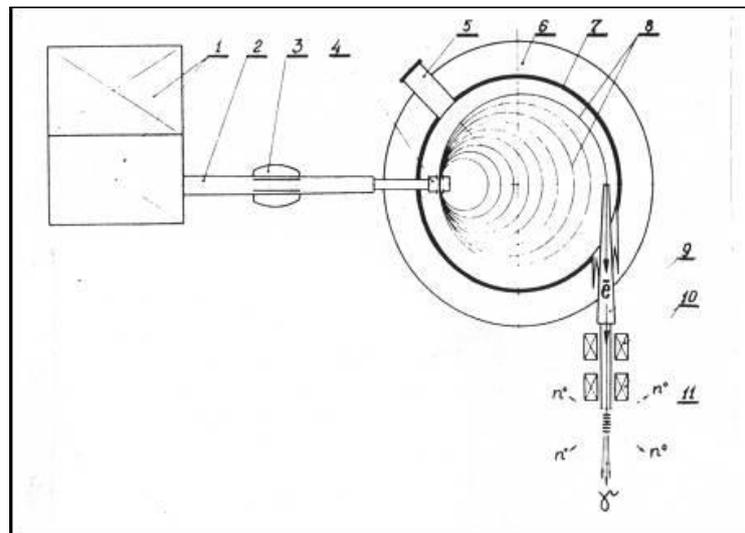


Fig. 1. The scheme of the microtron MT-25

- 1 - system of high frequency; 2 - wave channel; 3 - ferrite isolator; 4 - resonator;
- 5 - vacuum system; 6 - magnet; 7 - vacuum camera;
- 8 - orbits of accelerated electrons; 9 - exit of electron beam;
- 10 - magnet, focusing electron beam; 11 - brake target

The main features of the machine are:

Beam energy	8/12 MeV
Energy spread	4-25 MeV
Pulsed beam current	20 $\mu\text{A}$
Pulsed current duration	$2.2 \cdot 10^{-6}$ s
Beam spot diameter	5 mm
Monochromatization	50 keV
Power consumption	20 kW
Gamma-quanta flux	$10^{14}$ s $^{-1}$
Bremsstrahlung dose (1m)	$1.5 \text{ Gy m}^2 \text{ s}^{-1}$
Density of thermal neutron flux	$5 \cdot 10^7$ pps cm $^{-2}$
Density of ephi-thermal neutron flux	$5 \cdot 10^7$ pps cm $^{-2}$
Density of fast neutron flux	$10^{12}$ s $^{-1}$

## **APPLICATION OF THE METHOD IN ENVIRONMENTAL STUDIES**

There have been increasing interests in studying the effects of environmental pollution on natural vegetation and crops. Only in the Europe, the environmental degradation is under observation of scientists from 32 countries reunited in different national and international organizations and laboratories.

The aim of a series of environmental studies was to investigate the trace-element polluting effect of two different industrial areas on the agricultural crops, in particular on potato, carrot and celeriac. Determination of heavy metals in agricultural crops is frequently required in health-related environmental studies, because of high toxicity of trace amounts of such elements for human organism. For their assay, the photon neutron activation analysis at the Microtron MT-25 was used.

### *Sampling*

The environmental samples were collected from the agricultural area surrounding two towns in Romania, namely Turnu and Oradea, of different industrial profiles. The same types of samples were recorded from a rural remote area chose as a clean spot. A representative amount of 1 kg from each crop was collected in a polyethylene bag. The material was mixed and dried for some few days at room temperature. Then about 100 g was further dried at room temperature one month and later 48 hours at 40<sup>0</sup>C and then homogenely melted into fine powder in an agate mortar. The fresh/dry mass ratios calculated for crop material were about 9.5 – 8.6.

### Analytical procedure

The IPAA procedure was based on irradiation with bremsstrahlung produced in microtron operated at 24 MeV energy. The method provides detection limits of about 10% for the elemental concentrations in investigated crops. On the crop samples were done four types of measurements, in order to account the elemental concentrations based on the activity of very short-, short-, medium- and long lived isotopes which exhibit times of desintegration of about few minutes, few hours, 1-3 days and, respectively, more than 4 days.

Element ratios for crop and corresponding soil samples collected in the same sampling spots were calculated relative to those for control samples. Further the concentration factors (CF) were assessed for crop relative to host soil.

### **Quality control of the results**

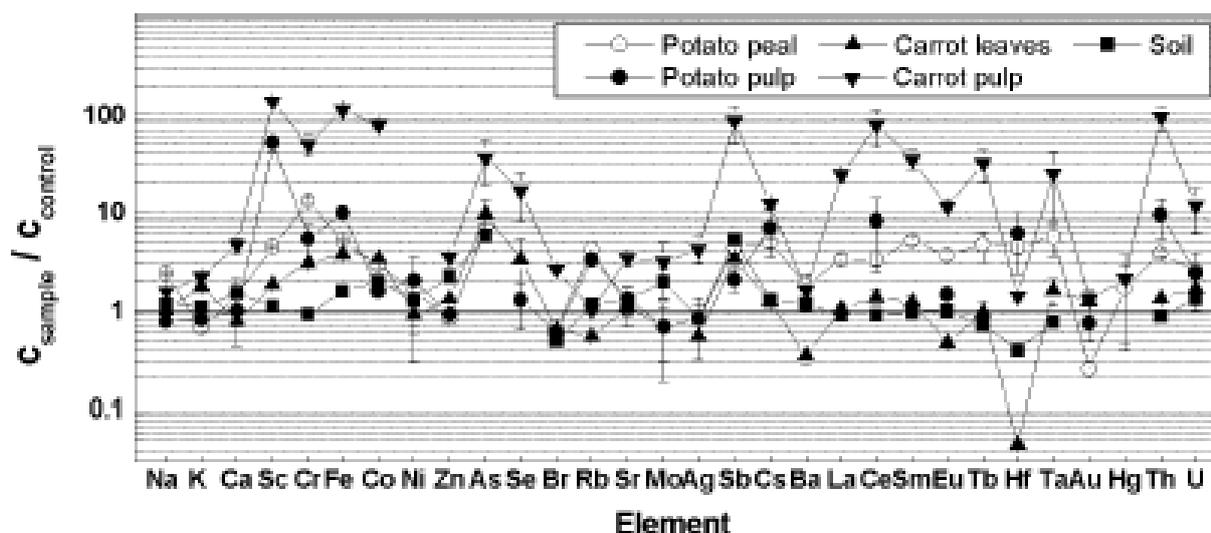
Suggested analytical techniques are appropriate to measure concentrations of heavy metals in vegetation samples.

Suggested methodology mostly gives lower concentrations than in standard samples, high concentrations can be received in 1-2 cases from 5 for Cr, Cu, Ni.

Only 49,4% and 70% of standard concentrations are determined for Cd and Pb using the above methodology. Maximum determined concentrations of Cd and Pb were 62% and 78% from standards.

Relative to the control zone, significantly higher concentrations were found for various elements in carrot and potato, and to a lower degree in celeriac grown on the polluted areas. Fe, Mg, Mn, Ca, Cl, and K concentrations in carrot pulp, as well as Fe and Cl in potato pulp were found to exceed the normal levels (Fig. 2). As, Zn, and Hg

concentrations in potato and carrot pulp were found to be lower than the maximum allowable levels in Romania (except for As in carrot pulp which was 1.5 times higher).



Relative to the control zone, significantly higher concentrations were found for various elements in carrot and potato, and to a lower degree in celeriac grown on the polluted areas. Fe, Mg, Mn, Ca, Cl, and K concentrations in carrot pulp, as well as Fe and Cl in potato pulp were found to exceed the normal levels. As, Zn, and Hg concentrations in potato and carrot pulp were found to be lower than the maximum allowable levels in Romania (except for As in carrot pulp which was 1.5 times higher).

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# COMPORTAREA UNUI SORTIMENT DE CULTIVARE DE GRÂU DE TOAMNĂ FAȚĂ DE ATACUL PATOGENULUI PYRENOPHORA TRITICI REPENTIS f. c. DRECHSLERA TRITICI REPENTIS ÎN CONDIȚII DIFERITE DE FERTILIZARE LA SCDA ȘIMNIC

## THE BEHAVIOUR OF A WINTER WHEAT SET TO PYRENOPHORA TRITICI REPENTIS f. c. DRECHSLERA TRITICI REPENTIS ATTACK IN DIFFERENT FERTILIZING TREATMENTS TO ARDS SIMNIC AREA

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**Key words:** winter wheat set, yield, Pyrenophora tritici repentis, attack degree

### ABSTRACT

Patogenul care produce Arsura frunzelor de grâu este **Pyrenophora tritici repentis(Died.) (anamorph) Drechslera (Helminthosporium) tritici repentis(Died.) Shoemaker**. În ultimii ani aceasta a devenit o boală cu un potențial distructiv ridicat în România, precum și în țările învecinate. Prezenta lucrare cuprinde date referitoare la nivelele de producție realizate de un sortiment de cultivare de grâu de toamnă cât și gradele de atac înregistrate în urma atacului patogenului *Pyrenophora tritici repentis f.c. Drechslera (Helminthosporium) tritici repentis* la aceleași cultivare în condiții diferite de fertilizare în zona S.C.D.A. Șimnic.

Atacul patogenului *Pyrenophora tritici repentis f.c. Drechslera (Helminthosporium) tritici repentis (PTR)* s-a manifestat doar la cinci cultivare, atât la fertilizat, cât și la nefertilizat.

La nefertilizat, la momentul T1, adică 28.04.2008, GA% avea valori de la 1,31% la cultivarul IAȘI, până la 6,92% la cultivarul MANDOLIN. Cultivarul EXOTIC a realizat un GA% de 4,32%. La momentul T2 adică 10.05.2008 GA% avea valori de la 4,91% la cultivarul IAȘI până la 20,00% la cultivarul EXOTIC. La Cultivarul MANDOLIN s-a înregistrat un GA% de 17,66%. La momentul T3 adică 20.05.2008 GA% avea valori de la 10% la cultivarul IAȘI până la 25,00% la cultivarul EXOTIC. La Cultivarul MANDOLIN s-a înregistrat un GA% de 22,33%.

Pe varianta fertilizată cu 40 kg/ha N și 40 kg/ha P<sub>2</sub>O<sub>5</sub> în toamnă și 60 kg/ha N în primăvară GA% ale patogenului au fost aproximativ la același nivel sau chiar mai scăzute deoarece plantele au reușit să lupte mai bine cu patogenul.

La momentul T1 adică 28.04.2008, GA% avea valori de la 1,64% la cultivarul ORQUAL până la 6,16% la cultivarul MANDOLIN. Cultivarul EXOTIC a realizat un GA de 4,06%. La momentul T2 adică 10.05.2008, GA% avea valori de la 4,56% la cultivarul ESENȚIAL până la 14,69% la cultivarul EXOTIC. La Cultivarul MANDOLIN s-a înregistrat un GA% de 13,%. La momentul T3 adică 20.05.2008, GA% avea valori de la 9,57% la cultivarul ESENȚIAL până la 20,% la cultivarul EXOTIC. La Cultivarul MANDOLIN s-a înregistrat un GA% de 15,%.

La nefertilizat se constată că valorile GA% sunt mai ridicate, dar pierderea de producție este mai scăzută din cauza absenței îngrășămintelor cu azot în primăvară care favorizează efectul pierderilor de producție.

The pathogen that causes tan spot on wheat is **Pyrenophora tritici repentis(Died.) (anamorph) Drechslera (Helminthosporium) tritici repentis(Died.) Shoemaker**. In

recent years tan spot has become a potentially destructive disease of wheat in Romania and neighboring countries. The present paper contains winter wheat yields and attack degrees data in order to *Pyrenophora tritici repentis* f.c. *Drechslera* (*Helminthosporium*) *tritici repentis* (PTR) attack in different fertilizing treatments in ARDS Simnic area. The PTR attack was observed only to five cultivars for both fertilizing treatments. Thus, in fertilizing deficiency conditions at T1 on the 28<sup>th</sup> of April 2008 the attack degree recorded values among 1,31% by Iasi to 6,92% by Mandolin. Exotic cultivar had 4,32% attack degree value. At T2 on the 10<sup>th</sup> of May, the attack degree recorded values among 4,91% by Iasi to 20% by Exotic. Mandolin cultivar had 17,66% attack degree value. At T3 on the 20<sup>th</sup> of May 2008 the attack degree recorded values among 10% by Iasi to 25% by Exotic. Mandolin cultivar had 22,33% attack degree value. At 40 kg/ha N and 40 kg/ha P<sub>2</sub>O<sub>5</sub> rates applied in autumn and 60 kg/ha N rate applied in spring, the pathogen attack degrees were almost at the same level or less due to the plants capacity to combat better the pathogen. At T1 on the 28<sup>th</sup> of April 2008 the attack degrees values were among 1,64% by Orqual to 6,16% by Mandolin. Exotic cultivar recorded 4,04 % attack degree value. At T2 on the 10<sup>th</sup> of May, the attack degree recorded values among 4,56% by Essential to 14,69% by Exotic. Mandolin cultivar recorded 13% attack degree value. At T3 on the 20<sup>th</sup> of May 2008 the attack degree recorded values among 9,57% by Essential to 20% by Exotic. Mandolin cultivar had 15% attack degree value. It was observed that in fertilizing deficiency treatment the attack degree had higher values, but the yield loss had a lower value due to the lack of nitrogen fertilizer applied in spring, which favors the yield losses effect.

## INTRODUCTION

Tan spot caused by *Pyrenophora tritici repentis* (Died.) anamorph *Drechslera tritici repentis* is a major disease of wheat (*Triticum aestivum*) worldwide (Wiese, 1987). Yield losses have ranged from 3% to 53%, depending on cultivar susceptibility, environmental conditions and virulence of the pathogen population (Hosford 1971, Rees and Pratz 1983). The disease is very destructive on durum, winter and spring wheat (Lamari and Bernier 1989 a, b, Misra and Singh 1972). Tan spot reduces total yield, kernel weight (Schilder and Bergstrom 1990), number of grains per head (Schilder and Bergstrom, 1990), total biomass and/or grain quality because of red smudge symptoms.

This pathogen has received considerable attention in the past three decades, following the description of etiology of tan spot of wheat by Hasford, 1971.

Tan spot has gained predominance among foliar wheat diseases in the most of the wheat growing areas in the world.

Increase in the severity of this disease has been linked with the expansion of the area under conservation tillage practices, especially zero tillage, which allow the build up of inoculum on the wheat stubble over time.

Knowledge of pathogen variation in virulence and/or aggressiveness is one important component of developing durable resistant cultivars to combat plant disease.

The tan spot syndrome consists of two independent symptoms: tan necrosis and extensive chlorosis.

Lamari and Bernier 1989 b, Lamari et al. 1995 proposed a race-based system to describe isolates of PTR and currently 11 races of PTR have been identified (Ali and Franch 2002, 2003, Ali et al. 2002, Lamari et al. 2003, Manning et al 2002).

PTR is also one of wheat pathogens which often come out in ARDS Simnic area. Worldwide the pathologists were focus on this pathogen especially of yield losses and pathotoxins producing capacity. Thus, important researches were realized to CIMMYT in Mexico, USA, Canada, Europe, etc. There were organized workshops focuses on this pathogen.

In order to phytosanitary state, we consider important to study the pathogen evolution in ARDS Simnic area field conditions, how the attack is occurred and which are the attack results to wheat yield capacity.

## MATERIAL AND METHODS

Twenty-five winter wheat cultivars were evaluated for their response to *Pyrenophora tritici repentis* natural infection under field conditions. The experiment was conducted in the Breeding Laboratory field from ARDS Simnic. The field experiment was laid out in a strip-plot system in a randomized complete block design with three replications. Each experimental plot was 7 m<sup>2</sup> and sown using seed rate of 550 grains/ m<sup>2</sup> following classical technology. The seeding was realized on the 10.10.2007. The seedling stage was noticed on 18.10.2007. There were seeded in two different treatments (unfertilized and fertilized). In fertilized plots was applied split fertilizing rates as follows: 40 kg/ha of N and 40 kg/ha of P<sub>2</sub>O<sub>5</sub> in autumn as a basal dose and the remaining 60 kg/ha of N was top-dressed in early spring. Weeds control was realized using 1 l/ha recommended dose Dicopur Top herbicide. Disease assessment was started when initial necrotic symptoms were noticed in the canopy of the wheat cultivars. Visual scoring of percent diseased area was done in three different moments: 28.04.2008, 10.05.2008 and 20.05 2008 using a quantitative rating scale based on lesion size and necrotic leaf area. For each score, percent disease severity (S) and incidence (I) was estimated based on the following formulas:  $I\% = \frac{nx100}{N}$  ,

where  $n$  is the number of diseased plants,  $N$  is plants total number/ m<sup>2</sup>,  $S\% = \frac{ixf}{N}$  , where  $i$  refers to severity measured as diseased leaf area and  $f$  refers to number of affected leaves recording the same percent.

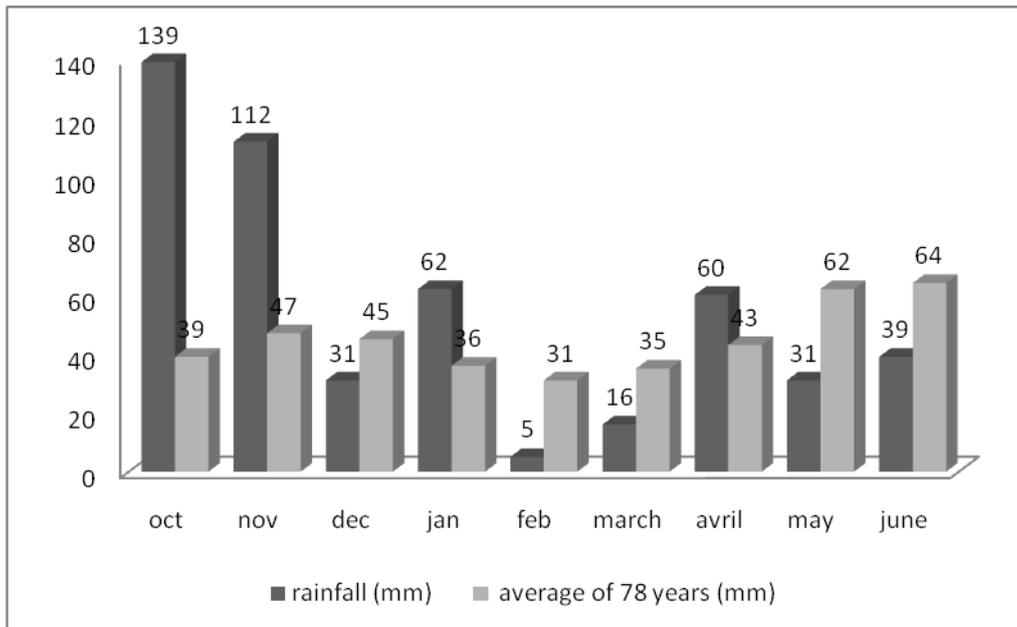
Then, the resulted values were used to calculate the attack degree following formula:  $AD\% = (S\% \times I\%) / 100$ , where AD represents attack degree.

## RESULTS AND DISCUSSION

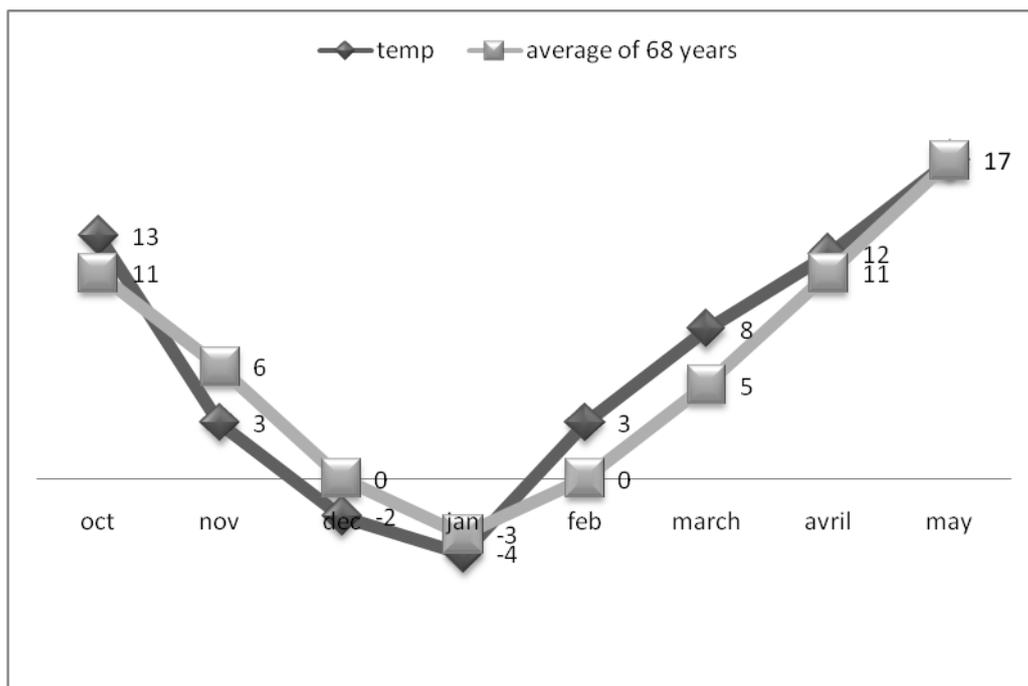
The climatic conditions for the experimental period are presented in fig. no.1 and fig.no.2.

In 2008 year conditions, under unfertilized treatment the tested wheat cultivars recorded yields which ranged among 2280 kg/ha (by Giava) and 3492 kg/ha (by Karlygash) (table no.1). The highest yield (4392 kg/ha) was statistical assured recording very significant difference comparatively with the control cultivar (Dropia – 2614 kg/ha). Thus, Karlygash yield value over crossed the control value with 878 kg/ha. A similar situation was recorded also by Ciprian cultivar (3488 kg/ha) which exceeded the control value with 874 kg/ha. This difference was statistical assured as very significant.

The cultivars Bancal(3211 kg/ha) and Exotic (3160 kg/ha) exceeded also the control value with following differences: 597 kg/ha and 546 kg/ha. The lowest yields were recorded by Giava (2387 kg/ha) and Boema (2387 kg/ha) cultivars. The differences comparatively with the control value were as follows: 334 kg/ha, respectively 227 kg/ha.



**Fig.1. The climatic conditions for 2007-2008 year (rainfall)**



**Fig.2. The climatic conditions for 2007-2008 year (temperature)**

**Table no.1**

**The winter wheat set yields recorded in 2008 year  
under unfertilized treatment**

No.	Cultivar no.	The cultivar	Yield Kg/ha	Difference Kg/ha	Significance
1	12	KARLYGASH	3492	878	**
2	17	CIPRIAN	3488	874	**
3	24	BANCAL	3211	597	*
4	4	EXOTIC	3160	546	*
5	13	MANDOLIN	3071	457	
6	16	GALIL	3029	415	
7	3	FL 85	2973	359	
8	6	ESENTIAL	2921	307	
9	7	IAȘI	2915	301	
10	8	MAGISTRAL	2881	267	
11	9	MOLDOVA	2881	267	
12	5	ANIVERSAR	2850	236	
13	11	DANA	2799	185	
14	15	ROMANSA	2759	145	
15	19	POBEDA	2759	145	
16	21	PAULUS	2757	143	
17	10	ORQUAL	2755	141	
18	14	GK DAVID	2701	87	
19	18	GIOVANI	2682	68	
20	20	NOVISAD	2626	12	
21	1	DROPIA	2614	0	
22	22	IBIS	2583	-31	
23	23	MINA	2451	-163	
24	2	BOEMA	2387	-227	
25	25	GIAVA	2280	-334	

DL 5%= 540, 4761

DL 1%= 732, 4185

DL 0,1%= 980,6604

Under fertilized treatment (N100P40), the yield values increased significantly and the classification was completely changed. Thus, the yield values ranged among 4839 kg/ha (by GK David), which recorded the highest value and 3673 kg/ha (by Dana) (Table no.2). The cultivar Giava realized 3725 kg/ha and was placed on the second place. The control cultivar Dropia recorded good yield 4684 kg/ha exceeded only by GK David with 155 kg/ha. The cultivars: Iasi, Magistral, Paulus, Romansa, Orqual and Giovanni recorded insignificant yields comparatively with the control value, while the cultivars: Mino, Boema, Moldova, Pobeda recorded significant distinct negative differences comparatively with the control value. The cultivars: Novisad, Exotic, Ibis, Esential, Giava and Dana recorded very significant distinct negative.

Table no.2

**The winter wheat set yields recorded in 2008 year  
under unfertilized treatment**

No.	Cultivar no.	The cultivar	Yield Kg/ha	Difference Kg/ha	Significance
1	14	GK DAVID	4839	155	
2	1	DROPIA	4684	0	
3	5	ANIVERSAR	4677	-7	
4	16	GALIL	4576	-108	
5	3	FL 85	4474	-210	
6	12	KARLYGASH	4393	-291	
7	24	BANCAL	4365	-319	
8	17	CIPRIAN	4357	-327	
9	13	MANDOLIN	4351	-333	
10	7	IAȘI	4338	-346	o
11	8	MAGISTRAL	4308	-376	o
12	21	PAULUS	4302	-382	o
13	15	ROMANSA	4299	-385	o
14	10	ORQUAL	4298	-386	o
15	18	GIOVANI	4235	-449	o
16	23	MINA	4224	-460	oo
17	2	BOEMA	4218	-466	oo
18	9	MOLDOVA	4214	-470	oo
19	19	POBEDA	4194	-490	oo
20	20	NOVISAD	3951	-733	ooo
21	4	EXOTIC	3915	-769	ooo
22	22	IBIS	3905	-779	ooo
23	6	ESENTIAL	3881	-803	ooo
24	25	GIAVA	3725	-959	ooo
25	11	DANA	3673	-1011	ooo

DL 5% = 336

DL1% = 455

DL0,1%= 609

The *Pyrenophora tritici repentis*(Died.) anamorph *Drechslera tritici repentis* attack was identified only to the cultivars presented in the tables no.3 and 4 for both fertilizing treatments. Analyzing these data result that plant density under fertilized treatment was higher and specific for each cultivar comparatively with the unfertilized treatment. The attack degrees evolution was different depending on the cultivar and gradual, according with the pathogen infection spreading. Thus, under unfertilized treatment at T1 moment (28.04.2008) the attack degree values ranged among 1,31% (by Iasi) and 6,92% (by Mandolin) ( Table no.3).

**Table no.3**

**The *Pyrenophora tritici repentis* evolution in 2008 year under unfertilized treatment**

Var.	Cultivar	T1 28.04.2008					T2 10.05.2008					T3 20.05.2008				
		total pl	affect. pl	I%	F%	GA%	total pl	affect. pl	I%	F%	GA%	total pl	affect. pl	I%	F%	GA%
1	EXOTIC	83,16	47,16	7	56,84	<b>4,32</b>	69,83	69,83	20	100	<b>20,00</b>	77,83	77,83	25,00	100	<b>25,00</b>
6	ESEŢIAL	88,5	32,83	5	36,88	<b>1,84</b>	78,50	78,50	10	100	<b>10,00</b>	79,83	79,83	13,00	100	<b>13,00</b>
7	IAŞI	98,66	43,16	3	43,9	<b>1,31</b>	89,66	88,16	5	98,23	<b>4,91</b>	91,33	91,33	10,00	100	<b>10,00</b>
10	ORQUAL	96,5	47,16	5	48,65	<b>2,43</b>	79,83	78,50	10	98,39	<b>9,83</b>	77,33	77,33	13,33	100	<b>13,33</b>
13	MANDOLIN	86,5	60,83	10	69,24	<b>6,92</b>	90,00	90,00	17,6 6	100	<b>17,66</b>	90	90,00	22,33	100	<b>22,33</b>

The cultivar Exotic recorded 4,32% attack degree value. At T2 moment (10.05.2008) the attack degree values ranged among 4,91% (by Iasi) and 20% (by Exotic). The cultivar Mandolin recorded 17,66% attack degree value. At T3 moment (20.05.2008) the attack degree recorded the highest values, which ranged among 10% (by Iasi) and 25% (by Exotic). The cultivar Mandolin recorded 22,33% attack degree value.

Under fertilized treatment the attack degree values were almost to the same level or even lower due to the plants ability to fight better with the pathogen. The attack degree values at T1 moment (28.04.2008) ranged among 1,64% (by Orqual) and 6,16% (by Mandolin). The cultivar Exotic recorded 4,06% attack degree value. At T2 moment (10.05.2008) the attack degree values ranged among 4,56% (by Essential) and 14,69% (by Exotic). The cultivar mandolin realized 13%. At T3 moment (20.05.2008) the attack degree values ranged also among 9,57% (by Essential) and 20% (by Exotic) (Table no.4).

Analyzing these results can be observed the infection dynamic and evolution. The yields emphasized that the attack degree high values were reflected in significant yield losses comparatively with the control variant. Under unfertilized treatment the attack degree values were higher, but the yield losses were lower due to the fertilizer lack especially in spring.

### CONCLUSIONS

Under unfertilized treatment the highest yield value was recorded by Karlygash cultivar (3492 kg/ha), which exceeded the control value with 878 kg/ha, a very significant difference. The lowest yield was recorded by Giava (2280 kg/ha) which decreased with 334 kg/ha, comparatively with the control value.

Under fertilized treatment the highest yield value was recorded by GK David (4834 kg/ha), exceeding the control value with 155 kg/ha, while Dana cultivar recorded the lowest yield value (3673 kg/ha) with 1011 kg/ha lower than the control value.

The *Pyrenophora tritici repentis* (Died.) anamorph *Drechslera tritici repentis* attack was identified only to five cultivars for both fertilizing treatments. The highest attack degree values were recorded at T3 moment under unfertilized treatment (9,57-20%). The yields emphasized that the attack degree high values were reflected in significant yield losses comparatively with the control variant.

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**Table no.4**

**The *Pyrenophora tritici repentis* evolution in 2008 year under unfertilized treatment**

Var.	Cultivar	T1 28.04.2008					T2 10.05.2008					T3 20.05.2008				
		total pl	affect. pl	I%	F%	GA%	total pl	affect. pl	I%	F%	GA%	total pl	affect. pl	I%	F%	GA%
1	EXOTIC	106,16	83,33	5	81,21	<b>4,06</b>	104,66	102,16	15	97,63	<b>14,69</b>	103,33	103,33	20	100	<b>20,00</b>
6	ESEŢIAL	120,16	74,16	3	61,81	<b>1,85</b>	120,66	110,16	5	91,26	<b>4,56</b>	113,33	109,33	10	95,78	<b>9,57</b>
7	IAŞI	105,16	67,00	3	63,99	<b>1,91</b>	106,66	105,83	5	99,19	<b>4,95</b>	102,83	102	10	99,21	<b>9,92</b>
10	ORQUAL	112,16	46,00	4	41,10	<b>1,64</b>	109,66	104,00	7	94,75	<b>6,63</b>	109,33	107,16	10	97,97	<b>9,79</b>
13	MANDOLIN	95,66	59,16	10	61,64	<b>6,16</b>	106,83	106,83	13	100,0	<b>13,00</b>	100,33	100,33	15	100	<b>15,00</b>

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# INFLUENȚA UNOR FACTORI ECOLOGICI SPECIFICI ZONEI OLTENIEI ASUPRA GENOTIPULUI UNOR LINII IZOGENE DE GRÂU

## THE SPECIFICALLY ECOLOGICAL FACTOR'S INFLUENCE OF THE OLTENIA AREA ON SOME WHEAT ISOGENE LINES GENOTYPES

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Cuvinte cheie: gene *Rht*, condiții climatice, talie, elemente de producție.

Keywords: *Rht* genes, climatic conditions, plant waist, yield elements.

### ABSTRACT

*Grâul reprezintă una dintre culturile de bază ale acestui areal geografic al României. Din păcate, această zonă nu oferă întotdeauna cele mai prielnice condiții pentru această cultură, cauza majora fiind deficitul de apă.*

*Tocmai de aceea, atunci când se are în vedere introducerea în cultura a unui noi cultivar, trebuie efectuată o testare minuțioasă a acestuia în aceste condiții de cultură în vederea stabilirii potențialului sau biologic, dar și a stabilității caracterelor. De la această regulă nu fac excepție nici o serie de linii de grâu, în care au fost infuzate gene de tip *Rht*, gene a căror acțiune trebuie studiată în vederea stabilirii influenței în condiții acestei zone.*

*The wheat represents one of the base crops of this geographical area of Romania. Unfortunately, this area doesn't always offer the most favorable conditions for this crop, the major cause being the water deficit.*

*That is why, when it is considered to introduce for cropping new cultivars, it must be effectuated a careful testing of those ones, in order to establish the biologic potential but also the character's stability. There are no exception from this rule for a series of wheat lines, where was infused *Rht* type genes, genes whose action must be studied in order to establish their influence in those climatic conditions.*

### INTRODUCTION

Wheat represents one of the most important cultivated species from the south area of Oltenia because of the spreading and of the yield level and its quality. Those advantages of the wheat cultivation are due because of its extraordinary genetics, genetics that gives the wheat other good characteristics for this part of the country.

Unfortunately, the Oltenia area it is remarked by a series of ecological factors less favourable for the cultivation of this specie, limitative factors that diminish every year the yield level and the quality of this yield. In this way, the most harmful from those factors is the drought because of the high frequency of appearance and of the extensive geographic area where of presence.

Also, this part of Oltenia is recognized as being the most arid area of this country, with an annual fall average of 500 mm, fall level which is totally irregular and from this reasons, the annual fall are most of the time insufficient for the wheat crops.

The genetics characteristics of the wheat allow a flexible approach regarding the ecological adaptability of this specie, especially if we have refered on the drought resistance.

In this way, studying very detailed the wheat genom and its reaction on the specifically climate conditions of this area, it is hope to identify a biologic material that is suited to a better adaptation on the ecological stress factors, in particular the drought, and by this once, to obtain higher quality and yield levels.

The „*Rht*” type genes on the 4B and 4D chromosomes have been identified and infused for the first time by the American breeding scientist N.E. Borlaug, which succeeded to reduce in a very meaningful manner the wheat plants waist and by this one, has increased the fall resistance, advantage that leads to superior yield level obtained by supplementation of the fertilizers doses.

In the context of a more and more intense energetic crisis, it is hoped to identify some measures that have as purpose the inputs reduction of culture.

In this way, it is proposed as main objective the breeding, the testing and then the identification of some isogene wheat lines with *Rht* type genes infusion, wheat lines that should be suited to a better adaptation on the ecological conditions of this area.

## **MATERIAL AND METHOD**

Because of the food lack increasing, but also because of needing to reduce the inputs level caused mainly by financial reasons and by increasing the ecologisation level of the agriculture, the wheat breeding process objectives must fallow the new realities. Also, it have to remained that, the agricultural technologies must consider the ecological diversity, that has a higher and higher destructive character for agriculture.

In this way, the studies referring on the plant waist have become a very important objective for the breeding research in Romania. That is way, by the plant waist variation it can be identified a series of solution such as the ones concerning the fertilizers consumption or the one referring on getting new energetic reliable sources.

The researches effectuated until now in our country had studied the *Rht* type genes cultivars behaviour on the specifically ecological factors influence of this area, in order to obtain higher agricultural performances.

Considering the ecological features of this area, characterized by less favourable climate for this plant cultivation, it is in debate the study of the *Rht* type genes influences in this climate on the mainly yield elements of the plant.

At the Şimnic A.R.D.S., in the Oltenia area specifically conditionsns of the 2006-2007 and 2007-2008, have been tested in comparative crops a series of wheat isogene lines, infused with *Rht* type genes, respectively *Rht*<sub>1</sub> and *Rht*<sub>8</sub> genes. Inside off this lines, together with others observation regarding the plants evolution during the vegetation period, were determined the plant waist and the variation of some yield elements such as the no. of ears/ m<sup>2</sup>, the no. of seeds/ear and the weight of 1000 seeds (WTS).

The applied technology in the two years of experimentation was the conventional one for the wheat cultivation, the fertilizers doses and the seedling period fallowing the technological features.

In this way, the seedling period was effectuated during the optimum period and the fertilisation was made in steps, fallowing the plant needs. In autumn, were administered 200 kg/ha complex fertilizers, commercial products. In spring, there were administrated a new fertilizer dose, this one based on nitrogen, in a quantity of 150 kg/ha commercial product.

## RESULTS AND DISCUSSIONS

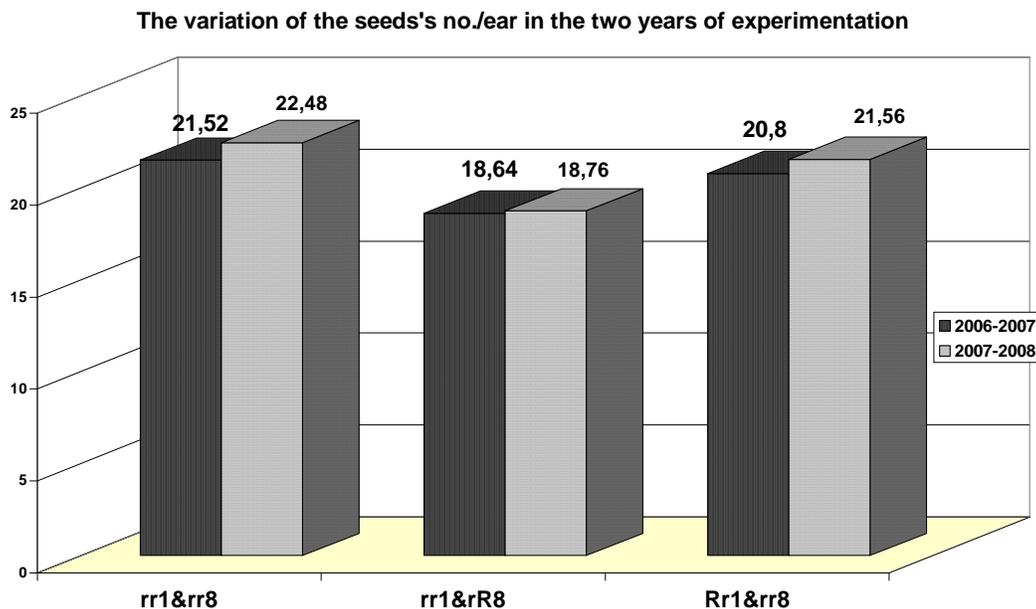
In the first year of experimentation, because of the severe drought, respectively because of the high deficit of humidity, the obtained results were considerate as being modest instead then convincing. In this way, it can be appreciated that, 2006-2007 is the most droughty year from the last half of century, at least in this geographic area.

Starting from this unprecedented situation, we can consider that the recorded results don't show in objective manner the biological potential of the plants.

In the first year of research, regarding the no. of seeds/ear, the *rht1&rht8* type lines obtained the best results with an average of 21,52 seeds/ear, while the *rht1&Rht8* type cultivars, with an average of 18,64 seeds/ear recorded the most modest value (graphic 1).

In the second year, although the annual fall level was much higher, the recorded values of the three types of lines weren't much better then the ones from the previous year, first of all because of the low level of character descent, much more influenced by the climatically factors.

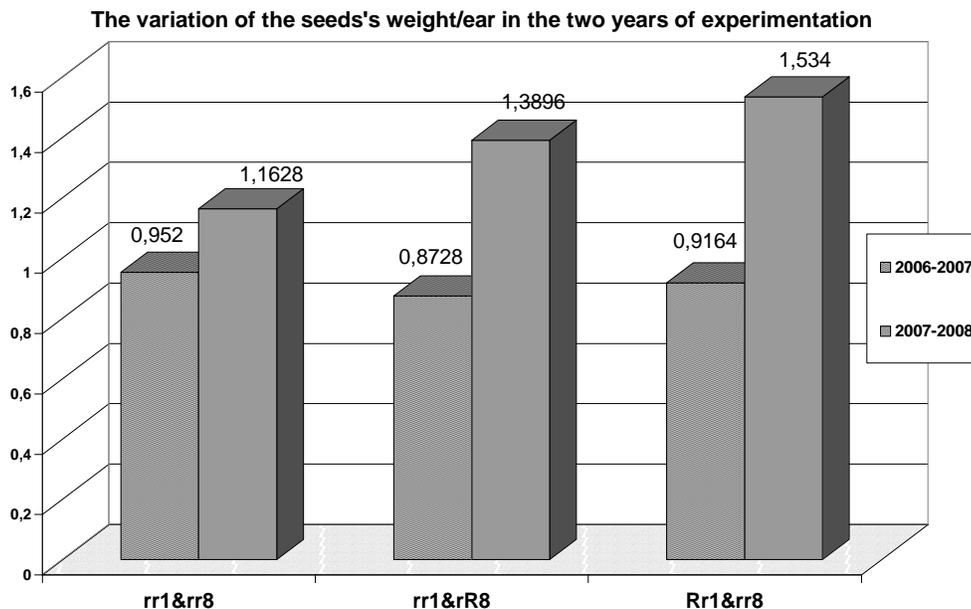
Graphic 1



Regarding the weight of the seeds/ear, it can be appreciate that, this character shows a low level of descent, the recorded values being influenced mainly by the applied technology and by the climatically factors also. Concerning the first year of experimentation, the recorded date doesn't conclude to a major difference between the lines, but this conclusion can't be expressed in the second year.

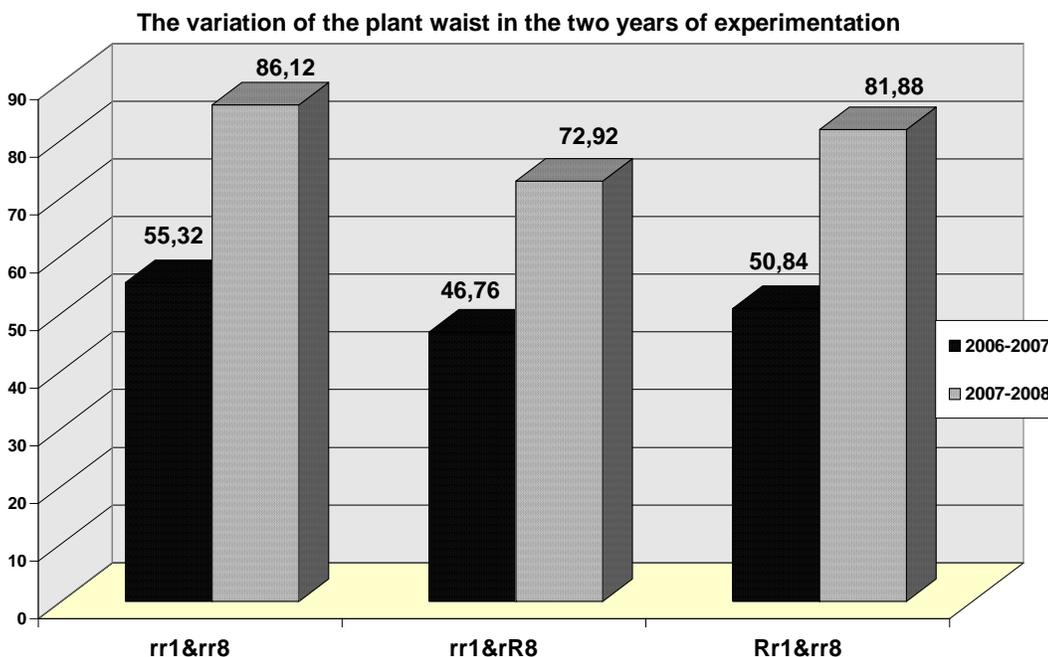
In this way, in the second year, all three types of lines have improved its recorded values, obtaining better results. Thus, *Rr1&rr8* type lines with an average of 1,53 g seeds/ear obtained the best result. Besides, this type of lines achieved the highest difference of the research year, with a value of 0,6176 g. It can be concluded that this type of wheat lines is more sensitive on the fall deficit that can happen during the vegetation period (graphic 2).

Graphic 2



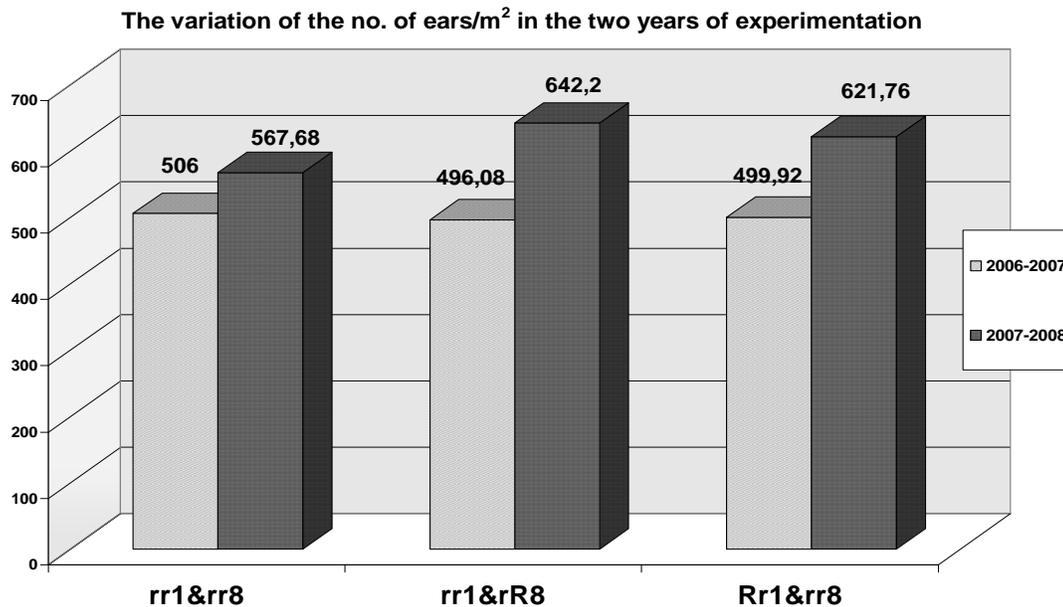
Concerning the plant waist, this character is directly influenced by the *Rht* genes, those one recording modest value in the first year of research, but in the second year there recorded much higher values for all the lines. The highest difference of 31,04 cm it is observed on the *Rr1&rr8* lines, the value average for the first year being of 50,84 cm and of 81,88 cm in the second year. The highest average waist was recorded on the *Rr1&rr8* lines with a value of 86,12cm (graphic 3). This fact proves that, in extreme vegetation conditions, the *Rht* type genes diminish its influence over the plant, its major effect being established.

Graphic 3



Regarding the no. of ears/m<sup>2</sup>, in the first year of experimentation, the recorded results show value much lower under the ones recorded in the second year. Thus, in the first period the differences are not representative, but in the second period the value of this index is much higher on all studied lines. The highest differences was found on rr1&rR8 lines with 144 cm between the two years of experimentation and the highest was obtained on rr1&rr8 lines with an average of 567ears/m<sup>2</sup> (Graphic 4).

**Graphic 4**



Concerning the possible correlation in the first year of experimentation, it is noticed that between the main yield elements taken for study and the plant waist, there are some correlations.

Thus, the no. of ear/ m<sup>2</sup> is in a positive correlation with the plant waist. That means that the higher is growing the plant waist, the higher is the no. of ear/m<sup>2</sup>, the calculated correlation coefficient being of 0,9895.

Concerning the correlation between the plant waist and the no. of seeds/ear, booth in the first and in the second year of experimentation, it is noticed a positive correlation of those two character, that is way it can be said that there is no influence of the ecological factors over the genetics factors that determine the manifestation of this character.

Between the yields elements taken for study, in the first year of experimentation it is identified a positive correlation between all studied yield elements, respectively the no. of ear/ m<sup>2</sup>, no. of seeds/ear and the seeds weight/ear, all this elements being in directly correlation with the plant waist. Thus, between the no. of seeds/ear and plant waist was calculated a correlation coefficient of 0,9582 and between the seeds weight/ear and plant waist was calculated a correlation coefficient of 0,9963.

In the second year of experimentation, it is kept the same value classification regarding the plant waist, but also the no. of seeds/ear, calculating a correlation coefficient of 0,9888, while the no. of ears/m<sup>2</sup> grows proportional opposite with the plant waist, that is way the smallest lines accommodate better on the favourable conditions.

Concerning the seeds weight/ear, this character shows a value order that can be considered as being randomized in the second year of experience, the higher value being recorded inside off the Rr1&rr8 lines. Because of the fact that this character shows a low level

of descent, it can be appreciated that, the *Rr1&rr8* lines respond the best on the favourable environment factors.

## CONCLUSIONS

The biologic material taken for study shows a high genetic variability, its biologic potential being mostly unknown. That is way, the testing conditions totally different in the two years of experimentation, helped in a very significant manner to the knowledge of the wheat lines adaptation level.

From the isogene wheat lines study it can be shown a series of conclusions regarding the yields elements, which defined the yield size. Thus:

- The seeds weight/ear is an index which is influenced in a very significant manner by the climatic conditions, especially by the ones during the seeds formation process, the descent level of this one having a very low value.
- The plant waist is a character that can influence some agricultural features, between those are also included the yields elements, that is way was identified a positive correlation between the plant waist and those yield elements.
- The *Rht* type genes that are responsible with the plant dwarfing waist show its influence especially in the favourable crop conditions, but during unfavourable conditions its action is very limited.
- The stability of the studied yield elements is more influenced in a very significant manner by the vegetation conditions and less by the *Rht* type genes.

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# OBSERVATIONS CONCERNING THE HARMFUL SPECIES FROM THE CEREAL CROPS FROM THE HUȘI - VASLUI ZONE, THE VASLUI COUNTY, IN THE PERIOD 2005-2007

## OBSERVAȚII PRIVIND SPECIILE DĂUNĂTOARE DIN CULTURILE DE CEREALE DIN ZONA HUȘI-VASLUI, JUDEȚUL VASLUI ÎN PERIOADA 2005-2007

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**Cuvinte cheie :** cereal crops, the frequency of the damaged, pest  
**Keywords:** culture de cereale, frecvența atacului, dăunători

### ABSTRACT

Cerealele constituie grupa de plante cu cea mai mare importanță pentru omenire. Aceasta asigură hrana de bază a oamenilor și animalelor, cât și principala materie primă pentru producerea cărnii, laptei și ouălor, alimente care furnizează produsele necesare vieții. Creșterea producției de cereale este posibilă prin aplicarea unor tehnologii care presupune folosirea soiurilor cu mare capacitate de producție, fertilizarea corespunzătoare a solurilor în funcție de cerințele acestora, mecanizarea completă a lucrărilor și prin măsuri de prevenire și combatere a buruienilor și dăunătorilor specifici.

În ceea ce privește dăunătorii din culturile de cereale, aceștia pot produce pagube anuale de 13,8% față de 11,6% produse de către agenții patogeni și față de 9,5% datorită buruienilor (Cramer, 1967 cit. Rădulescu 1974).

În lucrarea de față sunt prezentate speciile din culturile de cereale în perioada 2005-2007, din zona Huși-Vaslui, județul Vaslui.

Speciile cel mai frecvent întâlnite în această perioadă au fost: cărăbușii cerealelor (*Anisoplia* spp.); ploșnițele cerealelor (*Eurygaster* spp.); viespea paiului (*Cephus pygmaeus*); viermele roșu al paiului (*Haplodiplosis marginata*); tripsul cerealelor (*Haplothrips tritici*); gândacul ovăzului (*Lema melanopa*); păduchele verde al cerealelor (*Schizaphis graminum*); gândacul ghebos (*Zabrus tenebrionides* Goeze); dipterele cerealelor (*Oscinella frit*, *Mayethiola destructor*, *Phorbia* spp.)

The cereals represent the group of plants with greatest importance for humankind. This assures the basic food for people and animals, as well as the main raw materials for flesh, milk and eggs production, foods that provides the necessary products for life. The increase of cereals production is possible through the technologies that presupposes the use of the varieties with big capacity of production, the fertilization of the soils, according to their necessities, complete mechanization of the works and through measures of prevention and struggle the weeds and specific pests.

Regarding the pests from the cereal crops, these can produce annual damage of 13.8 against 11.6% produced by the pathogenic agents and against 9.5% due to the weeds (Cramer, 1967 cit. Rădulescu 1974).

In this work are presented the cereal crops pests from the Huși-Vaslui zone, Vaslui County, during 2005-2007.

The species most frequently encountered in this period were: the cereals beetles (*Anisoplia* spp.); the cereals bugs (*Eurygaster* spp.); wheat stem sawfly (*Cephus pygmaeus*);

*the red worm of the straw (Haplodiplosis marginata); wheat thrips (Haplothrips tritici); the oat beetle (Lema melanopa); the green louse of cereals (Schizaphis graminum); the ground beetle (Zabrus tenebrionides Goeze); Diptera pests (Oscinella frit, Mayethiola destructor, Phorbia spp.)*

## MATERIAL AND METHOD

The researches were carried out during 2005 and 2007, in the cereal crops (wheat, barley, oats and maize), located in 3 areas: Huși, Bârlad and Vaslui. We performed many investigations on the cereal fields, 10 to 20 days in between. We collected the pests and we establish their density reported to the surface unit, on the spike or on the plant. We identified the number of attacked plants reported to a 100 analyzed plants. Afterwards, we divided the attack into 4 classes accordingly to the attacked plants' percentage: no attack; low attack; medium attack; high attack.

For wheat, barley and oats, the observations started in autumn and ended in June – July each year. For maize, the observations started in May and continued until August – September.

## RESULTS AND DISCUSSIONS

In 2005, in the wheat, barley and oats crops, 8 pests were identified: *Anisoplia spp.* (cereal beetles); *Cephus pygmaeus* (wheat stem sawfly); *Eurygaster spp.* and *Aelia spp.* (cereal bugs); *Haplothrips tritici* (wheat thrips); *Lema melanopa* (cereal leaf beetle); *Schizaphis graminum* (spring grain aphid, greenbug, greenbug aphid); *Zabrus tenebrionides* (corn ground beetle, cereal ground beetle); *Mayetiola destructor*, *Phorbia spp.* and *Oscinella frit* (cereal flies). The frequency of the attacked plants was between 2 and 25 %, depending on the pest, and the attack level was low to medium, sometimes even missing completely.

We identified 4 pests on the corn crops in 2005 which caused some damages: *Heliothis armigera* (gram pod borer, american bollworm), *Opatrum sabulosum* (darkling beetle), *Ostrinia nubilalis* (european corn borer) and *Tanymecus dilaticollis* (maize leaf weevil, gray corn weevil). The attack level was from low to high or it was even missing.

In 2006, in the wheat, barley and oats crops, 8 pests were identified: *Anisoplia spp.* (cereal beetles); *Cephus pygmaeus* (wheat stem sawfly); *Eurygaster spp.* and *Aelia spp.* (cereal bugs); *Haplothrips tritici* (wheat thrips); *Lema melanopa* (cereal leaf beetle); *Schizaphis graminum* (spring grain aphid, greenbug, greenbug aphid); *Zabrus tenebrionides* (corn ground beetle, cereal ground beetle); *Mayethiola destructor*, *Phorbia spp.* and *Oscinella frit* (cereal flies). The frequency of the damaged plants was between 5 and 25%, depending on the pest, and the attack level was from low to medium, sometimes it didn't occur.

On corn, in 2006, we identified 5 pests causing some damages: *Heliothis armigera* (gram pod borer, american bollworm), *Opatrum sabulosum* (darkling beetle), *Ostrinia nubilalis* (european corn borer), *Tanymecus dilaticollis* (maize leaf weevil, gray corn weevil) and *Rhopalosiphum maydis* (corn leaf aphid).

Table 1

## Pests identified in 2005

No.	Species	Crop	Site	Attack level
1	<i>Anisoplia</i> spp. (cereal beetles)	Wheat and barley	Huși	Under 5 %
			Bârlad	
			Vaslui	
2	<i>Cephus pygmaeus</i> (wheat stem sawfly)	Wheat and barley	Huși	2-5 %
			Bârlad	
			Vaslui	
3	<i>Eurygaster</i> spp., <i>Aelia</i> spp. (cereal bugs)	Wheat and barley	Huși	low - medium
			Bârlad	low
			Vaslui	
4	<i>Haplothrips tritici</i> (wheat thrips)	Wheat and barley	Huși	low (5-30 individuals/spike)
			Bârlad	
			Vaslui	
5	<i>Lema melanopa</i> (cereal leaf beetle)	Wheat and oats	Huși	low
			Bârlad	
			Vaslui	
6	<i>Schizaphis graminum</i> (spring grain aphid, greenbug, greenbug aphid)	Wheat and barley	Huși	low (under 25 % damaged plants)
			Bârlad	
			Vaslui	
7	<i>Zabrus tenebrioides</i> (corn ground beetle, cereal ground beetle)	Wheat and barley	Huși	low
			Bârlad	low-medium
			Vaslui	low-medium
8	<i>Mayethiola destructor</i> , <i>Phorbia</i> spp., <i>Oscinella frit</i> (cereal flies)	Wheat and barley	Huși	low-medium (2- 24 % damaged plants)
			Bârlad	
			Vaslui	
9	<i>Heliothis armigera</i> (gram pod borer, american bollworm)	Maize	Huși	low
			Bârlad	-
			Vaslui	low
10	<i>Opatrum sabulosum</i> (darkling beetle)	Maize	Huși	medium
			Bârlad	-
			Vaslui	-
11	<i>Ostrinia nubilalis</i> (european corn borer)	Maize	Huși	low
			Bârlad	
			Vaslui	
12	<i>Tanymecus dilaticollis</i> (maize leaf weevil, gray corn weevil)	Maize	Huși	low-high
			Bârlad	low-medium
			Vaslui	low

The attack level was from low to medium or it didn't occur.

**Table 2**

**Pests identified in 2006**

No.	Species	Crop	Site	Attack level
1	<i>Anisoplia</i> spp. (cereal beetles)	Wheat and barley	Huși	low (under 5 % damaged plants)
			Bârlad	
			Vaslui	
2	<i>Cephus pygmaeus</i> (wheat stem sawfly)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
3	<i>Eurygaster</i> spp., <i>Aelia</i> spp. (cereal bugs)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
4	<i>Haplothrips tritici</i> (wheat thrips)	Wheat and barley	Huși	low (5-30 individuals/spike)
			Bârlad	
			Vaslui	
5	<i>Lema melanopa</i> (cereal leaf beetle)	Wheat and oats	Huși	low
			Bârlad	
			Vaslui	
6	<i>Schizaphis graminum</i> (spring grain aphid, greenbug, greenbug aphid)	Wheat and barley	Huși	low (under 25 % damaged plants)
			Bârlad	
			Vaslui	
7	<i>Zabrus tenebrioides</i> (corn ground beetle, cereal ground beetle)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
8	<i>Mayethiola destructor</i> , <i>Phorbia</i> spp., <i>Oscinella frit</i> (cereal flies)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
9	<i>Heliothis armigera</i> (gram pod borer, american bollworm)	Maize	Huși	-
			Bârlad	-
			Vaslui	low (under 4 % damaged plants)
10	<i>Opatrum sabulosum</i> (darkling beetle)	Maize	Huși	low-medium
			Bârlad	
			Vaslui	
11	<i>Ostrinia nubilalis</i> (european corn borer)	Maize	Huși	low-medium
			Bârlad	
			Vaslui	
12	<i>Tanymecus dilaticollis</i> (maize leaf weevil, gray corn weevil)	Maize	Huși	low-medium
			Bârlad	low-medium
			Vaslui	low
13	<i>Rhopalosiphum maydis</i> (corn leaf aphid)	Maize	Huși	low
			Bârlad	
			Vaslui	

In 2007, in the wheat, barley and oats crops, 8 pests were identified: *Anisoplia* spp.(cereal beetles); *Cephus pygmaeus* (wheat stem sawfly); *Eurygaster* spp. and *Aelia* spp. cereal bugs); *Haplothrips tritici* (wheat thrips); *Lema melanopa* (cereal leaf beetle); *Schizaphis graminum* (spring grain aphid, greenbug, greenbug aphid); *Zabrus tenebrioides* (corn ground

beetle, cereal ground beetle); *Mayethiola destructor*, *Phorbia* spp. and *Oscinella frit* (cereal flies). The frequency of the damaged plants was between 0,1 and 25%, depending on the pest, and the attack level was from low to medium, sometimes it didn't occur.

On corn, in 2007, we identified 5 pests causing some damages: *Heliothis armigera* (gram pod borer, american bollworm), *Opatrum sabulosum* (darkling beetle), *Ostrinia nubilalis* (european corn borer), *Tanymecus dilaticollis* (maize leaf weevil, gray corn weevil) and *Rhopalosiphum maydis* (corn leaf aphid). The attack level was from low to medium or it didn't occur. Depending on the pest, the damaged plants' percentage was between 1,0 and 30%.

**Table 3**

**Pests identified in 2007**

No.	Species	Crop	Site	Attack level
1	<i>Anisoplia</i> spp. (cereal beetles)	Wheat and barley	Huși	low (3 % damaged plants)
			Bârlad	
			Vaslui	
2	<i>Cephus pygmaeus</i> (wheat stem sawfly)	Wheat and barley	Huși	low (0,1 % damaged plants)
			Bârlad	
			Vaslui	
3	<i>Eurygaster</i> spp., <i>Aelia</i> spp. (cereal bugs)	Wheat and barley	Huși	low-medium
			Bârlad	
			Vaslui	
4	<i>Haplothrips tritici</i> (wheat thrips)	Wheat and barley	Huși	medium
			Bârlad	low (under 5 %)
			Vaslui	medium
5	<i>Lema melanopa</i> (cereal leaf beetle)	Wheat and oats	Huși	low (1% damaged plants)
			Bârlad	
			Vaslui	
6	<i>Schizaphis graminum</i> (spring grain aphid, greenbug, greenbug aphid)	Wheat and barley	Huși	-
			Bârlad	low (under 25 % damaged plants)
			Vaslui	
7	<i>Zabrus tenebrioides</i> (corn ground beetle, cereal ground beetle)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
8	<i>Mayethiola destructor</i> , <i>Phorbia</i> spp., <i>Oscinella frit</i> (cereal flies)	Wheat and barley	Huși	low
			Bârlad	
			Vaslui	
9	<i>Heliothis armigera</i> (gram pod borer, american bollworm)	Maize	Huși	low (under 4 % damaged plants)
			Bârlad	
			Vaslui	
10	<i>Opatrum sabulosum</i> (darkling beetle)	Maize	Huși	low (1% damaged plants)
			Bârlad	
			Vaslui	
11	<i>Ostrinia nubilalis</i> (european corn borer)	Maize	Huși	medium (17% damaged plants)
			Bârlad	low
			Vaslui	
12	<i>Tanymecus dilaticollis</i> (maize leaf weevil, gray corn weevil)	Maize	Huși	low-medium
			Bârlad	low
			Vaslui	
13	<i>Rhopalosiphum maydis</i> (corn leaf aphid)	Maize	Huși	medium (26-30% damaged plants)
			Bârlad	
			Vaslui	

## CONCLUSIONS

1. During the observations' period (2005 – 2007), on wheat, barley and oats crops from Huși, Bârlad and Vaslui occurred the next pests: *Anisoplia* spp. (cereal beetles); *Cephus pygmaeus* (wheat stem sawfly); *Eurygaster* spp. and *Aelia* spp. (cereal bugs); *Haplothrips tritici* (wheat thrips); *Lema melanopa* (cereal leaf beetle); *Schizaphis graminum* (spring grain aphid, greenbug, greenbug aphid); *Zabrus tenebrioides* (corn ground beetle, cereal ground beetle); *Mayethiola destructor*, *Phorbia* spp. and *Oscinella frit* (cereal flies).

2. During the same observations' period, on maize crops occurred mainly the species: *Heliothis armigera* (gram pod borer, american bollworm), *Opatrum sabulosum* (darkling beetle), *Ostrinia nubilalis* (european corn borer) and *Tanymecus dilaticollis* (maize leaf weevil, gray corn weevil).

3. By following all the technological components, during the researches' period, on the wheat, barley, oats as well as on the corn crops, the attack level could be maintained between acceptable limits, from low to medium and the damages didn't register economical impact.

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# INFLUENCE OF GENOTYPE ON MICROPROPAGATION OF TWO INTERGENERIC HYBRIDS *FRAGARIA X POTENTILLA*

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**Keywords:** Pink Panda, Serenata, performance, proliferation, culture media, growth regulators

## ABSTRACT

In this work we present the results of studies carried out on the influence of genotype on micropropagation of two varieties of ornamental strawberry. In order to develop a protocol for high efficiency *in vitro* propagation of Serenata and Pink Panda varieties was investigated on MS and LF medium, with different combinations of growth regulators. *In vitro* performance of explants indicated a positive correlation between shoot proliferation and genotype in Serenata variety. The mean number of shoots formed per explant was higher when Serenata hybrids were subcultured on MS or LF medium, irrespective of the combination of growth regulators, compared with Pink Panda, characterized by a very low response to *in vitro* culture. In Serenata genotype, the highest rate of proliferation was achieved on medium supplemented with 1.0 mg/l BAP, 2.0 mg/l GA<sub>3</sub> and 0.5 mg/l Kin.

## INTRODUCTION

The intergeneric crossings within the *Rosaceae*, reported since the beginning of the last century, have opened the way toward extensive programs for breeding of cultivated strawberry by the introgression of genes from species of *Potentilla* (Wolf, 1908; Mangelsdorf and East, 1927; Jones, 1955; Ellis, 1962; Asker, 1970; Bringhurst and Barrientos, 1973; Macfarlane Smith and Jones, 1985; Niemirowicz-Szczytt, 1984, 1987; Abdullah and Hennerty, 1993, Silva and Jones, 1996).

More than a hundred years have passed since the visionary research of Haberlandt (1902) who attempt plant tissue culture for the first time. After the discovery of the plant hormones (auxins in the 1930s and cytokinins in the 1950s) and synthetic plant growth regulators and after the development of widely applicable nutrient media formulation in the 1960s, *in vitro* culture techniques have monopolized mass propagation and are of beneficial use in various fields in plant breeding. The *in vitro* culture techniques were proven to be extremely valuable both for overcoming the difficulties faced sometime in obtaining viable hybrids from the intergeneric crosses, and for their mass propagation.

As the *Fragaria x Potentilla* hybrids, such as "Serenata", "Pink Panda", "Lipstick", "Red Ruby", "Wildfire" and "Vivarosa", meet the trend in ornamental horticulture, large quantities of planting material are needed to be available at any time of the year. The conventional propagation of these varieties does not allow the obtention of high number of stolons of guaranteed authenticity and biological value in a very short time. Therefore, taking into consideration that they resemble octoploid cultivated strawberries, the *in vitro* micropropagation is the first choice.

The comparison of responses of two different genotypes on different culture media and choosing the most appropriate for obtention of a high efficiency of shoot multiplication in *Fragaria x Potentilla* hybrids is not a simple task, primarily due to their different genetic origin.

Knowing the fact that genotype is the most important from the multitude of factors influencing the regenerative process, we initiated a study on the *in vitro* micropropagation performance of two varieties of ornamental strawberry with different genetic origin.

### MATERIAL AND METHODS

Two varieties of ornamental strawberry (*Fragaria x Potentilla*), named “Pink Panda” and “Serenata”, respectively, were established *in vitro* culture starting from meristems and then subcultured successively on Murashige and Skoog (MS) and respectively Lee and Fossard (LF) media supplemented with various combinations of growth regulators (Table 1).

For the initiation of shoot cultures, meristems with 2-3 leaf primordia, of 0.1- 0.3 mm in size, excised from runners formed by field plants of varieties “Pink Panda” (with pink flowers), and “Serenata” (with red flowers), were used.

Six treatments with different combinations and concentration of benzyl-aminopurine (BAP), kinetin (Kin), indolylacetic acid (IAA), 3-indolylbutiric acid (IBA), and giberellic acid (GA<sub>3</sub>), added to both MS and LF basic culture media, were used in order to find an adequate medium for obtaining a high rate of micropropagation while maintaining a good vigor of micropropagated shoots (Table 1). The concentration of cytokinins in the experimental treatments covered the range currently used with commercial strawberry, thus allowing the establishment of that inducing the best morphogenetic response. To avoid major statistical errors, at least 6 culture flasks with 5 shoots per flask were used as repetitions in each of the experimental treatment investigated.

The cultures have been incubated in a growth chamber at the temperature of 22-24°C, with a photoperiod of 16 hours light/8 hours darkness, and a light intensity of about 3000 lux.

The observations were carried out at every 4 weeks, respectively at the moment of subculturing the micropropagated shoots. The micropropagation rate was calculated as the average number of shoots regenerated on each primary explant cultured *in vitro* on each of the media tested.

Statistical analysis of the data obtained with “Pink Panda” and “Serenata” varieties respectively on the MS and LF media supplemented with various combinations of growth regulators were performed using Windows SPSS 16.0 program (SPSS, 2007) at  $p < 0.05$ .

### RESULTS AND DISCUSSION

The influence of genotype on micropropagation of “Pink Panda” and “Serenata” intergeneric hybrids was still conspicuous in the first subculture, although the *in vitro* performance of explants in “Serenata” variety indicated a positive correlation between shoot proliferation and genotype.

Higher values of proliferation rate were found in the Serenata intergeneric hybrid, compared with “Pink Panda” variety, irrespective of basic medium culture or combination of growth regulators. In “Pink Panda” variety, the highest number of shoots per primary explant (10.15) was obtained when cultured on LF medium supplemented with 2 mg/l BAP and 1 mg/l IAA (V5), value closed to that for the lowest proliferation rate (10.1) obtained in Serenata variety on LF medium supplemented with 0.5 mg/l BAP, 0.1 IBA and 0.1 GA<sub>3</sub> (V1).

As compared to the “Pink Panda”, the “Serenata” variety of *Fragaria x Potentilla* responded by a better rate of micropropagation during the first subculture on all the six variants of MS culture medium. The highest proliferation rate calculated for “Serenata” variety (20.6), was obtained with explants cultured on MS medium supplemented with 0.5 mg/l BAP, 0.1 IBA and 0.1 GA<sub>3</sub> (V1), while the highest rate of micropropagation for “Pink Panda” variety was calculated for the treatment with 1.0 mg/l BAP, 0.2 mg/l IBA and 0.1 mg/l GA<sub>3</sub> (V2) added to the MS (Fig. 2).

A similar performance of “Serenata” variety was found during the second subculture, when cultured on LF medium (Fig. 3). The statistical analysis revealed that the highest micropropagation rate (24.3) for “Serenata” variety was obtained in treatment with 1.0 mg/l BAP, 0.2 mg/l IBA and 0.1 mg/l GA<sub>3</sub> (V2) added to the LF medium. On the same medium, significantly lower values of the proliferation rate was calculated for intergeneric hybrid “Pink Panda” irrespective of the combination of growth regulators added to the basic culture medium.

In the second subculture, intergeneric hybrid “Serenata” responded by good rates of micropropagation on MS medium, higher values being obtained in treatments with 0.5 mg/l BAP, 0.5 mg/l IAA and 0.1 mg/l GA<sub>3</sub> (V3) or 1.0 mg/l BAP, 1.0 mg/l IAA and 0.1 mg/l GA<sub>3</sub> (V4) or 1.0 mg/l BAP, 2.0 mg/l GA<sub>3</sub> and 0.5 mg/l Kin. In “Pink Panda” variety, the micropropagation rate maintained lower on any of the combination of growth regulators added to the basic culture medium (Fig. 4).

In “Serenata” variety, the micropropagation rate maintained higher over the subsequent subcultures as compared to “Pink Panda”, on any of the culture media tested. The statistical analysis have revealed that during the third subculture, the “Serenata” variety responded by a decreased ability of shoot proliferation. Thus, irrespective of the basic culture medium or combination of growth regulators, the best rates of micropropagation did not exceed 8 shoots formed per primary explant.

As shown by the Duncan’s multiple range test, micropropagation rate of intergeneric hybrid “Pink Panda” performed in the same manner over the third subculture, with very low values (maximum 2 shoots formed per primary explant).

## CONCLUSIONS

- (1) Irrespective of the basic culture medium or combination of growth regulators the micropropagation rate of intergeneric hybrid “Serenata” was significantly higher, compared to “Pink Panda”, reflecting its superior genetic potential of multiplication *in vitro*.
- (2) Choosing the most appropriate culture medium for obtention of a high efficiency of shoot multiplication in *Fragaria x Potentilla* hybrids is not a simple task, primarily due to their different genetic origin. Because of the lower multiplication rate of intergeneric hybrid “Pink Panda”, further researches must be carried out to find out the most favourable culture medium and combination of growth regulators.

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**Tables**

Table 1. The combinations and concentration of growth regulators added to MS and LF media respectively, tested in order to establish an efficient protocol for the micropropagation of *Fragaria x Potentilla* varieties.

Culture medium code	Basic medium	Growth regulators used and their concentration in the culture medium (mg/l)				
		BAP	IBA	IAA	GA <sub>3</sub>	Kin
V1	MS, or LF	0.5	0.1	-	0.1	-
V2	MS, or LF	1.0	0.2	-	0.1	-
V3	MS, or LF	0.5	-	0.5	0.1	-
V4	MS, or LF	1.0	-	1.0	0.1	-
V5	MS, or LF	2.0	-	1.0	-	-
V6	MS, or LF	1.0	-	-	2.0	0.5

**Figures**

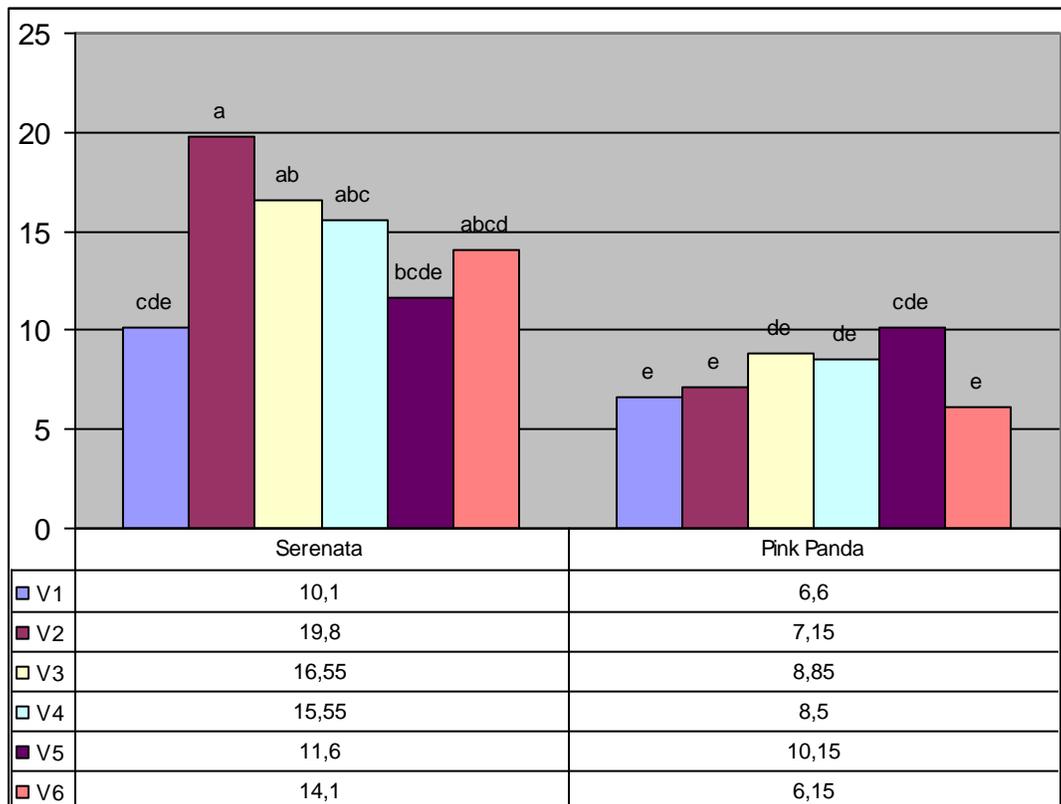


Fig. 1. The micropropagation rate of “Pink Panda” and “Serenata” varieties during the first subculture on LF medium.

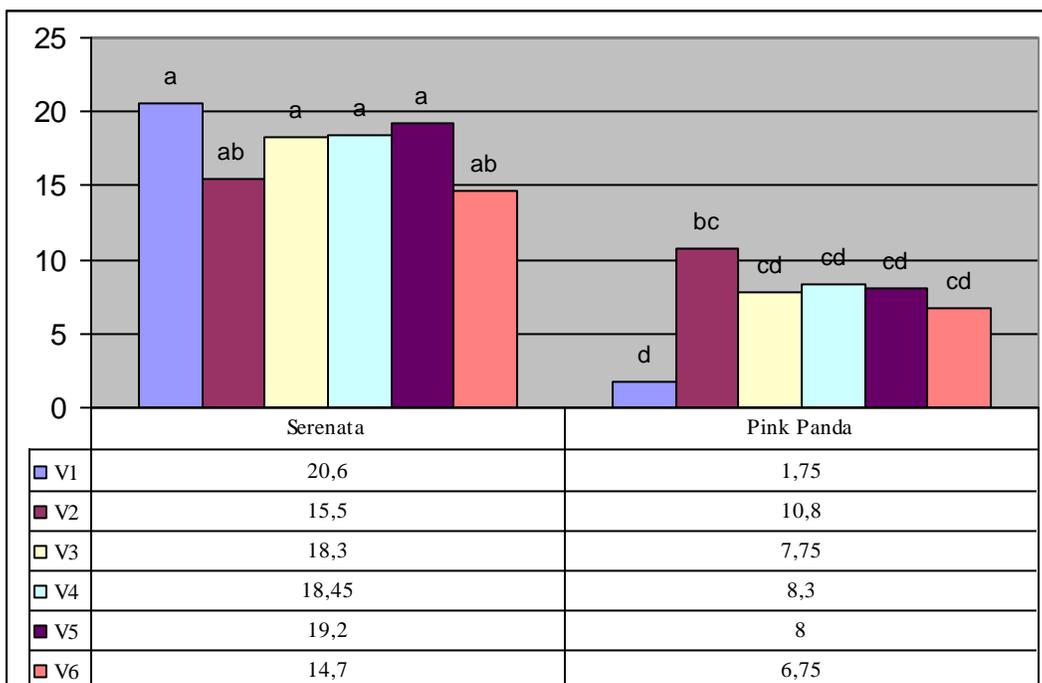


Fig.2. The micropropagation rate of “Pink Panda” and “Serenata” varieties during the first subculture on MS medium.

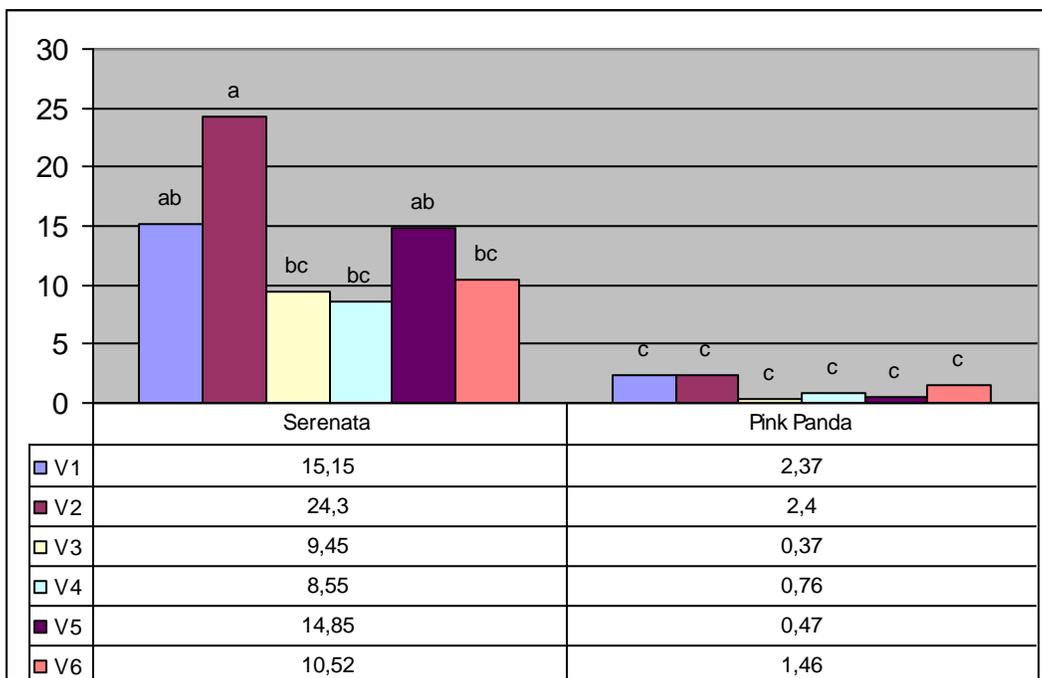


Fig. 3. The micropropagation rate of “Pink Panda” and “Serenata” varieties during the second subculture on LF medium.

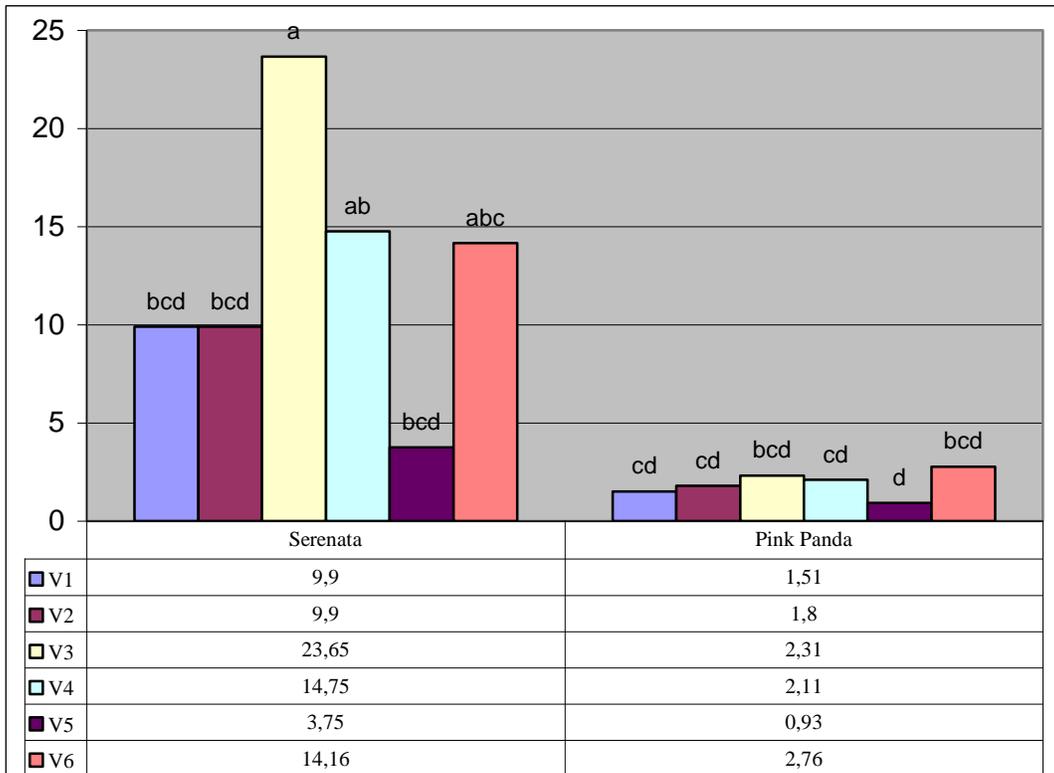


Fig.4. The micropropagation rate of “Pink Panda” and “Serenata” varieties during the second subculture on MS medium.

# DATE COROLOGICE LA CÂȚIVA TAXONI DIN SUBFAMILIA SCILLOIDEAE (I)

## CHOROLOGICAL DATA FOR SEVERAL TAXONS IN THE SCILLOIDEAE SUBFAMILY (I)

*Maria Ionela Răduț oiu*

**Keyword:** chorology, *Scilla*, *Scilloideae*.

### ABSTRACT

În această lucrare se prezintă rezultatele obținute până în prezent cu privire la corologia la câțiva taxoni din Subfamilia *Scilloideae*.

Scopul lucrării constă în cunoașterea cât mai bine a corologiei și ecologiei speciilor din subfamilia *Scilloideae* în vederea unei mai bune raționalizări a folosirii speciilor, îmbinând astfel cercetarea științifică cu cerințele practicii.

Pentru realizarea corologiei speciilor analizate au fost consultate toate herbarele din țară și literatura de specialitate, pentru a avea o imagine cât mai clară asupra răspândirii acestor specii în România. Datele culese au fost inserate în această lucrare.

Lucrarea face parte dintr-un studiu mai amplu cu privire la morfologia, anatomia, taxonomia și corologia speciilor din această subfamilie.

This paper presents the results obtained until now regarding the chorology of several taxons of the *Scilloideae* Subfamily.

The purpose of this paper is to present as accurate an image as possible on the chorology and ecology of the *Scilloideae* Subfamily species, for better rationalizing the species' use, thus combining scientific research with practical requirements.

For the realization of the analyzed species' chorology, all herbariums in the country and the specialized literature were consulted, in order to obtain a very accurate view of these species' spreading in Romania. The respective data have been inserted in the present paper. The paper is part of an extensive study on the morphology, anatomy, taxonomy and chorology of the species belonging to this subfamily.

### INTRODUCTION

The species of the *Scilla* genus are perennial plants, herbaceous, with bulbs presenting fleshy scales, the superior ones with floral axes at the armpits. The leaves are basic lineal or wide-lineal.

The flowers are blue, rarely reddish, purple or white, grouped in simple raceme type of inflorescences, with inarticulate pedicles.

The perigon is star-shaped, caducous or semi persistent, with unnerved leaflets, free or slightly grown together (fo. *holzmannia* (Heldr.) Hay.), almost equal, glabrous, as the entire plant is.

The stamens are fixed to the basis of the tepals and present dorsally fixed anthers. The ovary is globulous or in the shape of an ellipsis, obtuse, triangular, trilocular, with between 2 to 8 ovules per level, in each loculus. The style is triangular, filiform, with small stigmas.

The fruit is a spherical or flattened capsule, which contains small black or dark brown seeds that present a pointed basis.

Of Romania's flora, only 2 spontaneous species are known until now: *Scilla autumnalis* L. and *Scilla bifolia* L. (D. Grecescu 1898, Zahariadi C. in T. Săvulescu & al. 1952-1976, Al. Beldie 1979 and V. Ciocârlan 2000).

### MATERIAL AND METHOD

The first step in researching the taxons of the Scilloideae subfamily has been constituted by the consultation of the bibliographical material.

Starting from these bibliographical information, I have repeatedly conducted personal research in the research area using the itinerary method, taking into consideration the width of the targeted surface, but where a more detailed study was imposed, the stationary method was used, which implied collection and conservation of the floristic material.

The synonymies for each species have been noted with their present scientific denomination of each and every one of them.

For the realization of the analyzed species' chorology all the country's herbariums and specific literature, in order to have as clear as possible an image on the spreading of these species in Romania. The collected data have been inserted in the present paper.

### RESULT AND DISCUSSION

***Scilla bifolia*** L. (Syn.: *Scilla amoena* Schur, *S. cernua* Janka, *S. carnea* Sweet, *S. decidua* Speta, *S. dubia* C. Koch, *S. minor* C. Koch, *S. longistylosa* Speta, *S. nivalis* Boiss, *S. pleiophylla* Speta, *S. ressliei* Speta, *S. secunda* Janka, *S. silvatica* Cretzschott, *S. uluensis* Speta, *S. voethorum* Speta, *S. xanthandra* C. Koch.) (Fig. 2).

**Chorology** It is frequent in all forests, starting from the field area up to the subalpine.

**Cited localities in Romania:** In his paper „Conspectus of Romania's Flora”, (D. Grecescu 1898 – page 561) cites under *Scilla bifolia* L. in Romania the following localities: Turnu Severin, Calafat, Craiova, Caracal, Alexandria, Comana, București, Băneasa, Pantelimon, Brănești, Pasărea, Câmpulung, Sinaia, Văleni, Buzău, Șerbăneasa în Putna, Bârlad, Vaslui, Iași and Mănăstirea Neamțu;

Under *Scilla bifolia* the *gracillima* form is also mentioned – on alpine lawns in the Bucegi Mountains, on the Furnica and Vâful cu Doru peaks.

In his “Supplement to the Conspectus of Romania's Flora” (D. Grecescu 1898 - page 163), the author cites for *Scilla bifolia* other localities as well (Curtea de Argeș, Romula Forest– Olt county and Crângu Forest - Bârlad) and mentions for variability: the *nivalis* Baker form in Journ. Linn. Soc. Vol. 13 p. 239 (1873); Boiss. Fl. Orient. Vol. 5 p. 227. *Scilla nivalis* Boiss. Diagn. Ser. 1, fasc. 5, pag. 63 (1844) pro specie *S. praecox* Schott. Bot. zeit. Vol. 9 p. 283 (1851) – non Willd. spe. Pl. vol. 2 p. 128 (1799). *Scilla alpina* Schur in verh. Siebenb. Ver. Vol. 3 p. 90 (1852). *S. bifolia* f. *gracillima* Grec. Consp. P. 565 (1898). Identified in the Bucegi Mountains on the Caraimanu peak, at 1600 meters of altitude, close to snowy areas (pl. indig. 1901 p. 25).

Al. Beldie (1977, 1979) in his paper „Romania's Flora- illustrated determinator of vascular plants” (page 264) affirms that this species is commonly found from the field area to the subalpine.

V. Ciocârlan (2000) in “Romanias' Illustrated Flora *Pteridophyta* & *Spermatophyta*” signals the presence of 3 subspecies: *subtriphylloides* (Schur) subsp. Domin, *drunensis* Speta subsp. and *bifolia* subsp.

The author also makes several observations to several taxons of this species, as follows: *Scilla nivalis* Boiss. Also mentioned in Romania, after F. Speta, it only grows in

Greece, from the rest of European countries. Small mountainous plants belong to the *Scilla bifolia* subsp. *bifolia*, being only phenotypical modifications.

Other synthesis studies relating to the *Scilla* genus are not known until now.

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Moldavia, county Galați, locality Suceveni, forest Suceveni. 17.IV.1969. Leg. et det. I. Sârbu [I 41252]. /bifolia f. uniflora.

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Moldavia, county Neamț, locality Țolici, Drăganului Valey, scarce forest. 29.IV.1969. Leg. et det. C. Burduja & I. Sârbu. [I 41747]. /bifolia f. trifolia.

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Moldavia, county Botoșani, locality Borolea, forest. 11.IV.1962. Leg. et det. Gh. Mihai. [I 55013].

Oltenia, county Mehedinți, locality Lunca Banului, forest. 25.IV.1956. Leg. et det. N. Roman. [I 57251].

Moldavia, county Buzău, locality Nișcov. 19.IV.1949. Leg. et det. C. Burduja. [I 58579].

Moldavia, county Vrancea, locality Vidra, in the oak wood. 22.03.1980. The collector is not mentioned. [I 62467].

Moldavia, county Vaslui, locality Lipovăț, forest Lipovăț. 04.IV.1953. Leg. et det. C. Burduja. [I 67376].

Moldavia, Iași county, locality Bârnova, forest. 12.IV.1971. Leg. et det. C. Dobrescu. [I 69045].

Moldavia, county Vaslui, locality Bârlad, forest Crângu. 24.III.1908. Leg. et det. P. Enculescu. [I 75742].

Dobruja, county Tulcea, locality Țiganca, forest. 12.VII.1911. Leg. et det. I. Prodan. [I 75743].

Muntenia, county Ialomița, locality Maltezi, close to *Quercus pedunculiflora* roots, with *Ranunculus ficaria*. 15.IV.1953. Leg. et det. N. Roman [I 75744].

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Moldavia, county Vaslui, locality Bârlad, forest Crângu. 24.III.1908. Leg. et det. P. Enculescu. [I 75746].

Muntenia, county Ilfov, locality Pantelimon. 25.III.1905. Leg. et det. P. Enculescu. [I 75748].

Moldavia, county Vaslui, locality Bălteni, forest Bălteni. 18.V.1950. Leg. et det. C. Dobrescu. [I 76112].

Moldavia, county Vaslui, locality Brăhășoia, forest Hârboanca. 31.III.1968. Leg. et det. C. Dobrescu. [I 76113]. /bifolia f. albiflora.

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## CONCLUSIONS

The *Scilloideae* subfamily includes both rare taxons included in the various red national lists, as well as frequent species or with an uncertain taxonomic position. Some have numerous chorology data, whereas for others these data are very scarce. From the analysis of the studied taxons, I have reached the following conclusions:

*Scilla bifolia* L. is frequent in all forests, starting from the field area up to the sub alpine area. The herbarium and specific literature data are numerous.

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25. **BUC** – Herbarul Universității din București.
26. **BUCA** – Herbarul Institutului de Biologie al Academiei Române.
27. **CLA** – Herbarul U.S.A.M.V. Cluj Napoca.
28. **IAAG** – Herbarul U.S.A.M.V. Iași.

# DATE COROLOGICE LA CÂȚIVA TAXONI DIN SUBFAMILIA SCILLOIDEAE (II)

## CHOROLOGICAL DATA FOR SEVERAL TAXONS IN THE SCILLOIDEAE SUBFAMILY (II)

*Maria Ionela Răduț oiu*

Keyword: chorology, Scilla, Scilloideae.

### **ABSTRACT**

**Rezultatele cercetărilor recente asupra plantelor, în special cercetări anatomice, citotaxonomice, ecologice, arealogice, biochimice, alături de cele morfologice au influențat mult taxonomia plantelor. Pentru clarificarea poziției taxonomice la taxoni, implicit cei din subfamilia Scilloideae, este necesară și cunoașterea corologiei acestora.**

Completarea corologiei la taxonii cu o poziție taxonomică neclară este mai mult decât necesară în cunoașterea și denumirea corectă a acestora.

În ultimii 10-15 ani se vorbește tot mai des de divizarea familiei *Liliaceae* în 9-15 familii.

Subfamilia *Scilloideae* cuprinde genurile: *Scilla*, *Hyacinthus*, *Hyacinthella*, *Muscari* și *Ornithogalum*. Caracteres esențiale prin care se diferențiază speciile din această subfamilie de celelalte subfamilii din *Liliaceae* sunt: prezintă bulb în sol, au nectarii septate, fructul este o capsulă loculică iar rafidele sunt prezente și au un sac embrionar de tip *Allium*.

### **ABSTRACT**

*Recent results regarding the research conducted on these plants, especially anatomical, cytotoxic, ecological, area-related and biochemical research, together with the morphological ones, have influenced in great part the plants' taxonomy. In order to classify the taxonomic position in taxons, implicitly taxons in the Scilloidae subfamily, it's also necessary to know their chorology. Completing the chorology for taxons with an unclear taxonomic position is more than necessary in order to correctly know and name them.*

*During the past 10-15 years the division of the Liliaceae family into 9-15 is more and more frequently mentioned*

The *Scilloideae* subfamily comprises the following genera: *Scilla*, *Hyacinthus*, *Hyacinthella*, *Muscari* and *Ornithogalum*. The essential characteristics that set apart the species of this subfamily from the rest of *Liliaceae* subfamilies are: they present a bulb in the soil, septate nectaries, the fruit is a loculicid capsule and the raffidas are also present, and have an *Allium*-type embryary sac.

### **MATERIAL AND METHOD**

For each consulted species the locality was mentioned, as well as county, research station, altitude, date, collector and the person who made the determination, the herbarium's acronym, and inventory number (where applicable).

The acronyms of the country's herbariums are the following: **CRA** – University of Craiova Herbarium; **I** – „A.I.Cuza” Iași University Herbarium; **CL** - “Babeș Bolyai” University Herbarium, Cluj Napoca; **BUC** – Bucharest University Herbarium; **BUCA** – Herbarium of the Biology Institute of the Romanian Academy; **CLA** –U.S.A.M.V. Herbarium Cluj Napoca and **IAAG** –U.S.A.M.V. Iași Herbarium.

If the material is part of the Flora Olteniae Exiccata or Flora Romaniae Exiccata, the attributed number has been mentioned.

## RESULT AND DISCUSSION

Continuation for *Scilla bifolia* from the first part of the paper:

### **Herbarium material from Craiova (CRA):**

Oltenia, Craiova region, in the river Jiu meadow, close to Popoveni. Alt. cca. 80 m.s.m. 20.III.1972. Leg. M. Păun et M. Trică.

Oltenia Region, Craiova district, Podari forest. Alt. cca. 90 m.s.m. 20.III.1961. Leg. M. Păun. 6 files.

Oltenia Region, Craiova district, Bratovoiești forest. Alt. cca. 65. m.s.m. 25.III. 1960. Leg. M. Păun. 6 files.

Craiova area, Gura Jiului district – Tâmburești, Glavacioc forest. Alt. cca. 65 m.s.m. 20.III.1959. Leg. M. Păun et C. Maloș. 2 files.

Banat, Timiș-Torontal district, by the „Casa Verde”. 22.III.1941. Leg. E. Ghișă et E. Pop. Flora Romaniae Exiccata no. 2181a. 2 files.

Muntenia, Ilfov county, Snagov locality, Ciolpani forest. 31.III.1941. Leg. et det. C. C. Georgescu. Flora Romaniae Exiccata, no. 2181b. 2 files.

Oltenia, Craiova area, close to Podari. Alt. cca. 80 m.s.m. 20.III. 1952. Leg. M. Păun et M. Trică.

Crișana, Satu Mare district, on the outskirts of „Ilona Forest”, near Satulung. Alt. cca. 100 m.s.m. 26.III.1929. Leg. S. Forstner.

Oltenia, Dolj district, în pădurea Podari. Alt. cca. 85 m.s.m. 18.III.1951. Leg. N. Găgiu. 4 files.

Oltenia, Dolj district, Ursoaia Valey, near Livezi. 16.III.1950. Leg. Al. Buia, A. Popescu et M. Trică. 3 files.

Oltenia, Dolj district, near Popoveni. Alt. cca. 80 m.s.m. 06.III. 1950. Leg. Al. Buia et M. Trică.

Oltenia, Dolj district, in the Bucovăț forest. Alt. cca. 100 m.s.m. 30.IV.1949. Leg. Al. Buia, M. Patega et A. Popescu. 3 files.

Oltenia, Dolj district, in the Radovan forest. Alt. cca. 60 m.s.m. 16.III.1950. Leg. Al. Buia, A. Popescu et M. Trică.

Oltenia, Craiova area, in the forest between the localities Coșoveni and Ghindeni. Alt. cca. 80 m.s.m. 29.III.1952. Leg. M. Păun.

Oltenia, Craiova area, Leamna forest. Alt. cca. 90 m.s.m. 24.II.1952. Leg. M. Păun.

Oltenia, Craiova area, the locust tree edge between Lascăr Catargiu and Popoveni. Alt. cca. 80 m.s.m. 20.III.1952. Leg. M. Păun et M. Trică.

Oltenia, Craiova area, in the Cârlikei forest. Alt. cca. 100 m.s.m. 03.IV.1952. Leg. M. Păun.

### **Cluj Herbarium material (CL):**

Transylvania, county Bistrița Năsăud, locality Giurgești. 03.II.1973. Leg. I. Gergely. [CL 10622].

Transylvania, county Covasna. Leg. Wolff. The date is not mentioned. [CL 10620].

Transylvania, county Cluj, near Cluj Napoca. Alt. cca. 400-600 m.s.m. 28.IV.1925. Leg. E.I. Nyárády [CL 494537].

Transylvania, Sibiu district, locality Tâlmăciu, hazel-bush under the „Șuvară”. 11.IV.1980. Leg. C. Drăgulescu. [CL 629420].

Transylvania, county Cluj, near Cluj Napoca. 16.IV.1995. Leg. et det. M. Pușcaș. [CL 657436].

Transylvania, county Cluj, Cluj Napoca, Central cemetery. 22.III.2004. Leg. et det. Filipaș Liviu. [CL 657053].

Transylvania, county Sălaj, Motiș, the Șuștoacă forest. 28.III.1998. Leg. et det. Sorana Hentea. [CL 655761].

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Transylvania, Cluj district, in the Cheile Baciului forest. 17.III.1951. A. Cs. Halmágyi et M. Csürös. [593796].

Transylvania, Cluj district, in the Feiurdeni forest. 10.IV.1942. Leg. Șt. Csürös. [CL 593794].

Transylvania, Petroșani district, on the Albele mountain. Alt. cca. 1700 m.s.m. 26.VII.1956. Leg. Șt. Csürös. [CL 560343].

Moldavia, Suceava district, Sucevița at the „Cantonul silvic Poiana Mărului”. Alt. cca. 600 m.s.m. 10.IV.1985. Leg. et det. T. Lucescu. [CL 654456]. Flora Moldaviae et Dobrogeae Exiccatam no. 589b.

Muntenia, Ilfov district, in the Ciolpani forest, near Snagov. 31.III.1941. Leg. et det. C. C. Georgescu. [CL 624051].

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Cluj region, Cioara forest. 05.IV.1961. Leg. et det. E. Vicol. [CL 624217].

Moldavia, Iași district, Mârzești forest. Alt. cca. 200 m.s.m. 12.IV.1972. Leg. et det. I. Sârbu, V. Slonovschi et A. Coman. [CL 645143]. Flora Moldaviae et Dobrogeae Exiccatam no. 589.

Transylvania, Satu Mare district, Turț forest. IV.1976. Leg. I. Pop. [CL 612472].

Transylvania, Cluj district, in the Placica valley, near Cluj Napoca. 20.IV.1985. Leg. Gh. Groza. [CL 642666].

Moldavia, county Suceava, locality Bosanci, in various gardens. 24.IV.1922. Leg. G. Bujorean. [CL 128184].

Transylvania, Cluj district. 03.V.1956. Leg. E. I. Nyárády. [CL 14684].

#### **Bucharest herbarium material (BUCA):**

Oltenia, county Dolj, locality Breasta, through the bushes. Alt. cca. 150 m.s.m. 14.III.1915. Leg. G. Grințescu. [BUCA 66294, 66295].

Muntenia, county Prahova, locality Seci-Boldești, Gâlmeia Hill. 23.IV.1940.

Meridional Carpathians, Bucegi mountains, Vârful cu Dor peak, on the terrain in front of the chalet. 02.VI.1954. Leg. Țucra Iancu. [BUCA 120530].

Muntenia, county Ialomița, Borănești-Ialomița. Alt. cca. 50 m.s.m. 22.III.1910. Leg. G. Grințescu. [BUCA 66302].

Meridional Carpathians, Bucegi mountains, the lawns close to the naturalists' house – Jepii Mici – Prahova. 19.VI.1929. Leg. G. Grințescu. [BUCA 66303]. /var. gracillima.

Muntenia, county Prahova, locality Plopeni. 28.III.1916. Leg. G. Grințescu. [BUCA 66305].

Muntenia, county Ilfov, locality Andronache. 17.IV.1906. Herb. D. Brândză. [BUCA 86568].

Banat, Timiș-Torontal district, near „Casa Verde”. Alt. cca. 92 m.s.m. 22.III.1941. Leg. E. Ghișa et E. Pop. [BUCA 41992].

Muntenia, Ilfov district, Ciolpani forest, near Snagov. 31.III.1941. Leg. et det. C. C. Georgescu. [BUCA 41993].

Muntenia, county Argeş, locality Petreşti. 10.III.1910. Leg. G. Grinţescu. [BUCA 66287].

Muntenia, county Teleorman, locality Prunaru. 13.III.1909. Leg. G. Grinţescu. [BUCA 66286].

Muntenia, county Ilfov, locality Chitila, in the forest. 08.IV.1909. Leg. G. Grinţescu. [BUCA 66285].

Timișoara region, Reșița district, locality Călnic. 06.IV.1955. The collector is not mentioned. [BUCA 56383, 122528].

Muntenia, county Ilfov, Băneasa forest. 24.III.1955. Leg. Ms. Pop. [BUCA 56378]. /var. albiflora

Transylvania, county Maramureş, locality Vișeu de Sus, Eastern exposure zone. Alt. cca. 1151 m.s.m. Leg. A. Coman. [BUCA 56380].

Timișoara region, 6 km from the locality of Zebel, on the roadside, in the bushes. 31.III.1956. The collector is not mentioned. [BUCA 56382].

Timișoara region, Bozovici district, Bozovici village, Poiana Opreștilor Clearing – in the forest. 29.III.1959. Leg. I. Goga. [BUCA 56381].

Timișoara region, Bozovici district, Vârful Gropnei peak. 29.III.1959. Leg. I. Goga. [BUCA 122527, 122528].

Dobruja, Constanța area, locality Târgușor, Litorman forest. 21.III.1957. Leg. Danda, det. C. Zahariadi. [BUCA 56379].

Oltenia, Dolj district, in the Bucovăț forest, near Craiova. Alt. cca. 100 m.s.m. 30.VIII.1949. Leg. Al. Buia. [BUCA 7766].

Transylvania, county Mureş, locality Gurghiu, on the forest outskirts. Alt. cca. 470 m.s.m. 29.IV.1949. Leg. G. Grinţescu.

Banat, county Timiș, „Casa Verde” Forest Alt. cca. 90 m.s.m. 15.IV.1948. The collector's name is not mentioned. [BUCA 7768].

Mogoșoaia Forest. IV.1953. Leg. Dinu Alexandrescu. [BUCA 36090, 36091].

Among the rocks and bushes at the Căile Hadjulei – Liman. 10.III.1918. Leg. G. Grinţescu. [BUCA 63070].

București district, Brănești forest. 10.III.1961. Leg. V. Sanda.

Muntenia, county Ialomița, locality Broșteni, Coasta Ialomiței. Alt. cca. 60 m.s.m. 27.III.1909. Leg. G. Grinţescu. [BUCA 66209].

Moldavia, county Botoșani, locality Săuceni, in the forest. 19.IV.1953. Leg. G. Grinţescu et A. Dinu, det. G. Grinţescu. [BUCA 72423].

**Ecology and geo element.** Eutrophic species, mezoxerofite- mezohigrofite, found in forests, clearings, bushes and meadows from the forest steppe to the sub alpine level.

***Scilla autumnalis* L.**

### **Chorology**

**Cited localities in Romania:** In the paper „Conspectus of Romania's Flora “ (D. Grecescu 1898 – page 561) cites under Romanian localities, for *Scilla autumnalis* the following places: Comana, near the railways from Grădiștea halt.

In the “ Supplement to the Conspectus of Romania's Flora” (D. Grecescu 1898 - page 163), the author cites for *Scilla autumnalis* also the locality of Alexandria, in low places throughout the town's forest.

In Romania's Flora, volume XI, page 310 the following research stations are mentioned: Comana towards Grădiștea in the bushes by the railway; in the clearings in the

Neajlovului meadow forest; Alexandria – in the town's forest– county Teleorman; locality Fulga – county Prahova.

**Herbarium material from Craiova (CRA):**

Muntenia, county Giurgiu, locality Călugăreni, in salty meadows. Alt. cca. 100-200 m.s.m. 28.IX.2007. Leg. et det. D. Răduțoiu.

**Herbarium material from Iași (I):**

Moldavia, county Buzău, locality Fulga. 15.IX.1959. Leg. et det. N. & Șt. Roman. [I 75739, 75740, 75741, 75747, 75749, 75750].

Locality Bodrog. The date of the collection and the county are not mentioned. Leg. et det. I. Prodan. [I 75757].

Caliacra, 02.IX.1934. Leg. et det. P. Enculescu. [I 75758].

Muntenia, county Ialomița, locality Grădiștea, in the Argeș meadow (former Vlașca county). 10.IX.1938. Leg. et det. P. Enculescu. [I 75759].

**Herbarium material from Cluj (CL):**

There is no herbarium material with this species.

**Herbarium material from București (BUCA):**

Oltenia, county Olt, locality Slatina. 08.IX.1948. Leg. S. Rădulescu. [BUCA 8120].

Muntenia, county Giurgiu, locality Călugăreni. 17.IX.1954. Leg. I. Șerbănescu. [BUCA 56376, 56377].

Muntenia, county Giurgiu, locality Călugăreni. 17.IX.1954. Leg. I. Șerbănescu. [BUCA 122531, 122532].

**Ecology and geoelement.** Lawns, bushes, forest clearings, riverside coppices; on often salty soils, mezofile. Mediterranean.

## CONCLUSIONS

*Scilla autumnalis* L. is a rare species in Romania's flora, being encountered in a few localities of the country, on lawns, bushes, forest clearings, and riverside coppices; on often salty soils, mezofil. It vegetates alongside *Limonium gmelinii*, *Bupleurum tenuissimum*, *Aster tripolium* subsp. *pannonicus*, *Lotus glaber*, *Scorzonera laciniata*, *Crypsis alopecuroides*, *Odontites serotina*, *Rorippa sylvestris*, *Gypsophila muralis*, *Elymus repens* etc..

Herbarium chorology data, and from the specific literature, are scarce. In the Iași University's herbarium there is no material from this species.

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25. **BUC** – Herbarul Universității din București.
26. **BUCA** – Herbarul Institutului de Biologie al Academiei Române.
27. **CLA** – Herbarul U.S.A.M.V. Cluj Napoca.
28. **IAAG** – Herbarul U.S.A.M.V. Iași.

# CONSIDERATII PRIVIND FOLOSIREA GERMOPLASMEI LOCALE DIN OLTENIA LA OBTINEREA HIBRIZILOR DE PORUMB

## FEW ASPECTS ON THE USING OF THE LOCO CORN GERMPLASM IN BREEDING CORN HYBRIDS

*Salceanu C., Voica N., Olaru L., Niculescu Mariana*

**Keywords:** corn, inbred lines, Oltenia, hybrids

### **ABSTRACT**

*Variabilitatea fenotipică a unor linii consangvinizate de porumb poate fi interpretată ca factor de bază în realizarea unui heterozis performant la hibridii în care sunt incluse liniile respective.*

*Liniile consangvinizate se caracterizează prin existența plantelor mai puțin viguroase, mai scunde cu o capacitate de producție mai redusă, ritm de creștere și dezvoltare încetinite, o capacitate de adaptare mai scăzute, ca urmare a consangvinizării.*

*Prin consangvinizare nu se produce întotdeauna o degenerare ci favorizând segregarea și exprimarea genelor cu efecte negative și favorabile, selecția devine mai eficientă.*

*The phenotypical variability of inbred lines can be interpreted as basis factor in the achieving of a high heterosis with the hybrids that are those inbred lines included in. The inbred lines are characterized by the presence of less developed plants, shorter, with a lower yielding capacity, reduced growing rhythm, lower adapting capacity as a result of inbreeding process. By inbreeding is not always produced the degeneration yet the segregation and expression of the negative or unfavorable genes. In such conditions the selection becomes more difficult. Our research has identified the way these characters can be avoided.*

### **INTRODUCTION**

The researches have been carried out at the Research Station of Simnic, on a brown-reddish luvic soil within the Plant Breeding Laboratory, Seed Production and Plant Protection. The material was represented by 13 inbred lines (7 romanian and 6 foreign). The methodology for the evaluation of the studied material represented by inbred lines has consisted of experiment these lines in comparative trials of two rows in three replications. The planting was performed by the planter, 2-3 seeds in a place. The eliminating of the exceeding plants was made at 4-6 leaves phase ensuring a density of 50,000 plants/hectare. The experiment was set up using the randomized block method.

### **MATERIAL AND METHOD**

There have been made measurements of the plants during the milk – wax phase of the corn for each variant measuring 30 plants in order to get an average value. For every line of the two there was used as control the values of the normal inbred line. The variability degree of the two studied factors was established by analysis of the variation chain taking account of  $x \pm s_x$  and  $s\%$ . As we can see, in the case of the plant height the crossing of Ic 349 with the androsterile source has conducted to a more pronounced heterosis in comparison with the one achieved with Ic 85206, the plant height being at Ic 349 T with 10.8% and with Ic 349 ES

with 8.6% more than Ic normal. As regard the height of the main cob insertion, the values of the androsterile lines are similar with the ones of the androfertile analogues.

## RESULTS

The results are about the following aspects:

- plant features: the total height (including the panicle), the insertion height of the main cob, the number of cobs per plant, nr. of leaves per plant, foliar surface, nr. of branches per panicle.

- cobs features: the length, the number of rows, number of grains in a row, the cob diameter, the rahis diameter, the grain depth.

- performance features: the grain yield, the dry matter, the grain randament, the mass of a thousand grains and the mark of cob tilth.

The amplitude of the variation of the values that represent the height of the plants as s% show a higher uniformity of the normal lines in comparison with the androsterile ones and of the two, more uniform is Ic 85206. Regarding the insertion height there are not significant differences in all 6 cases that are the variants of the two analysed inbred lines. Overall, it can be appreciated that the uniformity of the insertion height show that the selection works applied during the crossings with the androsterile source have been properly conducted and the androfertile analogues obtained both with the T type ms and ES ms have phenotypical uniformity that is indispensable for the obtaining of performant hybrids.

In comparison with the average value taken as control, two lines of A type give significantly inferior yields while the inbred line nr 8 gives significant outputs in comparison with the control and of the C type lines the R inbred line gives significant results. As a result, the yielding capacity of the inbred lines is an element that must be taken in account when we need to breed corn hybrids.

These results emphasize the drought resistance of the loco germplasm that is transmitted to the inbred lines and then to the hybrids.

The results obtained in the favorable year show the limits of the loco germplasm in obtaining suitable hybrids.

The inbred lines of C type are the most suitable for the breeding process because they are the results of a laborious selection process. At the beginning there were applied to two sintetic hybrids from the loco population to three mass selection cycles and then to two recurrent reciprocal selection cycles (SRR)2 during 8 years.

The yield data in 2004 (dry) show that the A type hybrids were at the control level and the btype hybrids were 6% up. The average of C type hybrids show an 10.2 % output to the control.

The 2005 year (very rainy), the A type hybrids give lower yields in comparison with the average, by 12% while the b type hybrids are at the control level. The C type hybrids overpass the control by 9%.

Table 1

## The yields of the inbred lines of corn in 2004, 2005 and 2006 in the soil and climate conditions of ARDS Şimnic

Type of the line	Inbred line	Yield in 2004			Yield in 2005			Yield in 2006		
		Q/ha	%	S	Q/ha	%	S	Q/ha	%	S
Type A	l.c.1	22,7	80,2	00	42,0	98,6		31,7	92,7	
	l.c.2	26,0	91,9	0	39,6	92,9		29,4	86,2	00
	l.c.3	24,9	88,0	00	37,4	87,8	00	29,0	85,0	00
Type B	l.c.4	26,1	92,2	0	42,6	100,0		29,9	87,7	0
	l.c.5	27,6	97,5		39,4	92,5		35,8	104,9	
	l.c.6	29,5	104,2		43,0	100,9		35,0	102,6	
Type C	l.c.7	27,7	97,9		41,7	97,9		32,6	95,6	
	l.c.8	29,3	103,5		45,9	107,7		37,7	110,5	X
	l.c.9	32,0	113,0	XXX	45,7	107,2		38,0	111,4	X
Inbred lines	l.c.P	30,6	108,1	X	46,7	109,6	X	35,2	103,2	
	l.c.K	29,2	103,2		42,2	99,9		36,9	108,2	
	l.c.R	34,0	120,1	XXX	44,9	105,4		38,6	113,2	X
X Mt.		28,3	100,0		42,6	100,0		34,1	100,0	
	DL 5%		7,7		DL 5%	8,0		DL 5 %	9,5	
	1 %		9,8		1 %	10,7		1 %	12,9	
	0,1 %		12,5		0,1 %	13,0		0,1 %	16,4	

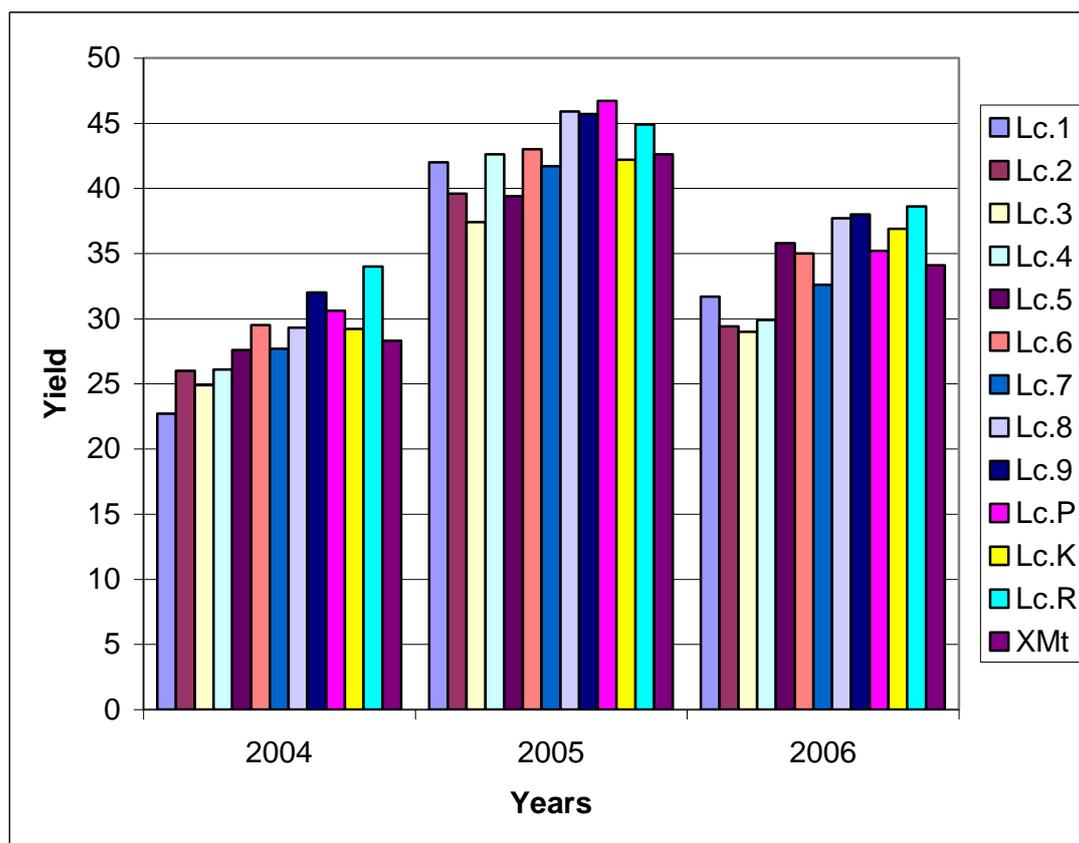


fig.1 The yields gained by the inbred lines in 2004, 2005 and 2006 in the soil and climate conditions of ARDS Simnic

### CONCLUSIONS

The upward facts show the possibilities and the limits of the local germplasm in obtaining proper corn hybrids. There can be observed that in order to extract valuable inbred lines from the local germplasm the initial material must undergo efficient breeding programs. In our case there is evident the superiority of three mass selection cycles followed by a selection cycle after the C1 inbred lines appreciated *per se*.

With the C type hybrids a better performance is given by the recurrent, reciprocal selection performed to the initial material.

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# CERCETARI PRIVIND METODELE DE AMELIORARE FOLOSITE LA OBTINEREA LINIILOR CONSANGVINIZATE LA PORUMB

## RESEARCHES ON THE BREEDING METHODS USED IN ORDER TO OBTAIN CORN INBRED LINES

*Sălceanu C., Voica N., Niculescu Mariana, Bădescu H.*

**Keywords:** corn, inbred lines, breeding lines

### **ABSTRACT**

*Lucrarea de față prezintă metodele de selecție folosite la obținerea liniilor consangvinizate ce, ulterior, vor forma hibrizi de porumb. Dintre cele trei metode utilizate, cea mai bună s-a dovedit a fi cea prin care liniile sunt extrase din două populații sintetice divergente, supuse la două cicluri de selecție recurentă reciprocă (SRR)<sub>2</sub>, care necesită o perioadă de 8 ani. The present paper explains the selection methods used for obtaining the inbred lines that will, further give the corn hybrids. Of the three used methods, the most suitable is the one that extracts the lines from two synthetic, divergent populations that undergo two recurrent, reciprocal selection cycles (SRR)<sub>2</sub> during 8 years.*

### **INTRODUCTION**

The corn breeding process is very time consuming and requires skilled specialists and lot of work. The loco corn populations can not be taken the way they are taken from growers. The raw genetic material in this case has a not desirable loading of genes that must be eliminated. They show up in the inbred lines and through this process can be removed and kept the proper ones.

In this manner there appeared the need of undergo the loco populations to special breeding methods of selection. After laborious scientific documentation, the Plant Breeding Laboratory team from ARDS Simnic has developed three selection methods for breeding the inbred lines that further will form the corn hybrids.

### **MATERIAL AND METHOD**

There have been created at ARDS Simnic three types of inbred lines. The type A inbred lines were extracted from the initial material that undergo repeated mass selection, the type B were extracted from the initial material that underwent the mass selection after the behavior of C type lines appreciated *per se* and type C lines extracted from the initial material that underwent two reciprocal and recurrent selection cycles.

### **RESULTS**

By inbreeding the number of heterozigotes and the harmful recessive genes percent are reduced along with the lines that express their characters. This fact pledges for the using of inbreeding followed by the selection of the lines.

No matter the selection method, there can not be lost the way the biotypes selection is made, high attention being paid to the influence of the soil and climate conditions.

Synthesizing the data on models used with the corn populations there is appreciated that in order to get a valuable genetic progress the selection method must be suitable with the predominant type of gene action in population.

**Table 1**

**The genetic progress with a local population after the selection method(after Ilicevici, 1972)**

The selection method	Duration years	Yielding capacity		Prolificity		The length of the cobs		MMB (g)	
		PGA %	PGR %	PGA %	PGR %	PGA %	PGR %	PGA %	PGR %
P <sub>0</sub>	-	-	100	-	100	-	100	-	100
Pm <sub>3</sub>	3	-	116	-	115	-	107	-	102
Pc <sub>1</sub>	3	-	111	-	110	-	105	-	103
Pm <sub>6</sub>	6	132	119	130	117	114	111	104	106
Pm <sub>3</sub> C <sub>1</sub>	6	127	135	125	118	112	118	105	112
(Pc <sub>1</sub> ) <sub>2</sub>	6	122	124	120	117	110	115	106	110

PGA – genetic expected progress

PGR – achieved genetic progress

Continuing the selection within the corn population there was obtained from the same initial material (P<sub>0</sub>), after 6 mass selection cycles (Pm<sub>6</sub>), after two selection cycles of C<sub>1</sub> appreciated *per se* (PC<sub>1</sub>)<sub>2</sub> and a population with three selection cycles followed by a cycle of selection after C<sub>1</sub> lines behavior (Pm<sub>3</sub>C<sub>1</sub>).

The relative values of the yielding capacity that express the genetic progress after three years were used in order to calculate the expected genetic progress after 6 years of selection at PM<sub>6</sub>, the achieved genetic progress being lower at (PC<sub>1</sub>)<sub>2</sub> and with Pm<sub>3</sub>C<sub>1</sub> the achieved genetic progress was superior to the expected genetic progress.

As a result, in order to increase the yielding capacity there were applied three selection cycles followed by a selection cycle after the behavior of the C<sub>1</sub> lines appreciated *per se*. In this case, the association of mass selection with the recurrent selection has permitted the improving of the initial genetic material by using the additive effects of the productivity genes that have responded to the mass selection and of the dominant effects, interaction and epistasy that have responded to the recurrent selection.

**Table 2**

**The evolution of the number of the inbred lines kept after the successive selfpollinated cycles**

The type of the initial material	Inbred generation					
	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>
Pm <sub>3</sub> C <sub>1</sub> N <sub>2</sub> %	2397	934	415	163	68	18
	100.0	32,2	14,3	5,6	2,3	0,6
Material N <sub>2</sub> From the II nd cycle %	210	1752	1200	680	297	134
	100,0	83,0	56,9	32,2	14,1	6,4

This situation shows that the selection performed to the initial material of the second cycle (verified hybrids) is ten times higher in comparison with the selection performed to the material of the local population.

The major defects of the corn plants that came from the self pollination of the local populations are:

- low bending resistance and plants falling to the soil that determines yield loses;
- high shouting capacity of the stem;
- uneven height of the plant;

### CONCLUSIONS

The performed researches have shown that type A inbred lines that have undergo the initial material to 6 years of mass selection is inferior to the B type that have three

cycles of mass selection followed by one selection cycle after the behavior of C1 lines appreciated *per se* and of the type C lines that have an initial material which undergo a cycle of recurrent reciprocal selection (SRR)<sup>2</sup> repeated during 8 years.

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# CERCETĂRI PRIVIND STABILITATEA PĂDURII NATURALE DIN CARPAȚII ȘI SUBCARPAȚII VÂLCII ȘI DIN ZONA NORD-ESTICĂ A PIEMONTULUI OLTEȚULUI

## RESEARCHES REGARDING THE NATURAL FOREST STABILITY FROM THE CARPATHIANS AND SUBCARPATHIANS OF VALCEA AND FROM THE NORTHEASTERN AREA OF THE OLTET PIEDMONT

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*Rm. Vâlcea Forest District*

**Cuvinte cheie:** ecosisteme forestiere, faze de dezvoltare, stabilitate, pădure naturală, molidișuri pure.  
**Keywords:** forest ecosystems, development phases, stability, natural forest, pure spruce stands.

### **ABSTRACT**

*Cercetarile sunt localizate în ecosisteme forestiere naturale situate pe versanții estici ai Munților Căpățâanii, în partea sud-vestică a Subcarpaților Vâlcii și în nord-estul Piemontului Oltețului.*

*În urma cercetărilor întreprinse s-au indentificat trei faze de dezvoltare de bază (faza terminală, faza de degradare și faza de regenerare) și o fază intermediară (faza terminală cu regenerare).*

*Potrivit cheilor de determinare adoptate, stabilitatea pădurii naturale studiate pe faze de dezvoltare este următoarea:*

*- stabilitate ridicată: faza de regenerare (domeniul stabil-labil);*

*- stabilitate intermediară: faza terminală și faza terminală cu regenerare (domeniul labil-stabil);*

*- stabilitate scăzută: faza de degradare (domeniul labil).*

*Stabilitatea medie a ecosistemelor de pădure din teritoriul studiat se situează în domeniul labil-stabil.*

*Researches are located in natural forest ecosystems situated on the eastern slopes of the Capatana mountains and in the southwestern part of Valcea Subcarpathians and in the north east of the Oltet Piedmont.*

*After our undertaken researches, there have been identified 3 basic development phases (terminal phase, degrading phase and regeneration phase) and an intermediate phase (regeneration terminal phase).*

*According to the adopted determination solutions natural forest stability studied in the development phase is the following:*

*- high stability: regeneration phase (stable-labile domain);*

*- intermediate stability: terminal phase and regeneration terminal phase (labile-stable domain);*

*- low stability: degradation phase (labile domain).*

*The average stability of forest ecosystems from the studied territory is situated in the labile-stable domain.*

### **INTRODUCTION**

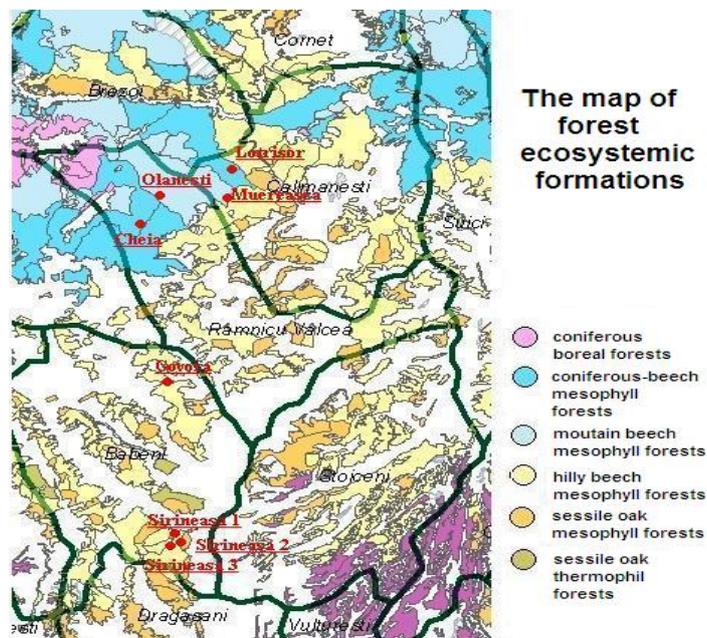
The forest stability, regarded as an open ecological system represents its characteristic to return to the initial state after a perturbing exterior action.

Under the circumstances, in the last centuries, the forest has been under a continuous and unworthy aggression, even the continuity of its economical, social and aesthetical functions was endangered, it has been required a last and new principle in forest management, the principle of stability.

The gradual decrease of forest areas, the reduction of biodiversity, the damage of stability and the artificiality of natural forests from the Romanian Carpathians involves decisive measures in order to save this priceless national asset.

### THE PLACE OF RESEARCHES

Researches are located in natural forest ecosystems situated on the eastern slopes of Capatana mountains, in the south-western part of Valcea Subcarpathians and in the north-east of Oltet Piedmont, pertaining to a number of four forest ecosystemic formations like these, identified in the area (figure 1).



On this territory, there are still many areas of natural forests characterized by a high stability, grouped together in nine natural formations: pure spruce stands (*Piceeta*), mixtures of spruce-silver fir-beech (*Piceeto-Abieto-Fageta*), spruce-beech stands (*Piceeto-Fageta*), silver fir-beech stands (*Abieto-Fageta*), pure pine-wood stands from Scots pine (*Pineta sylvestris*), pure mountain beech stands (*Fageta montana*), pure hill beech stands (*Fageta Submontana*), pure sessile oak stands (*Querceta sessiflorae*) and sessile oak-beech stands (*Querceto-Fageta*), from which two are very rare: spruce-beech stands and pure pine-wood Scots pine.

Figure 1 Main ecosystemic forest formations on the east of Căpățâni mountains and Oltet piedmont

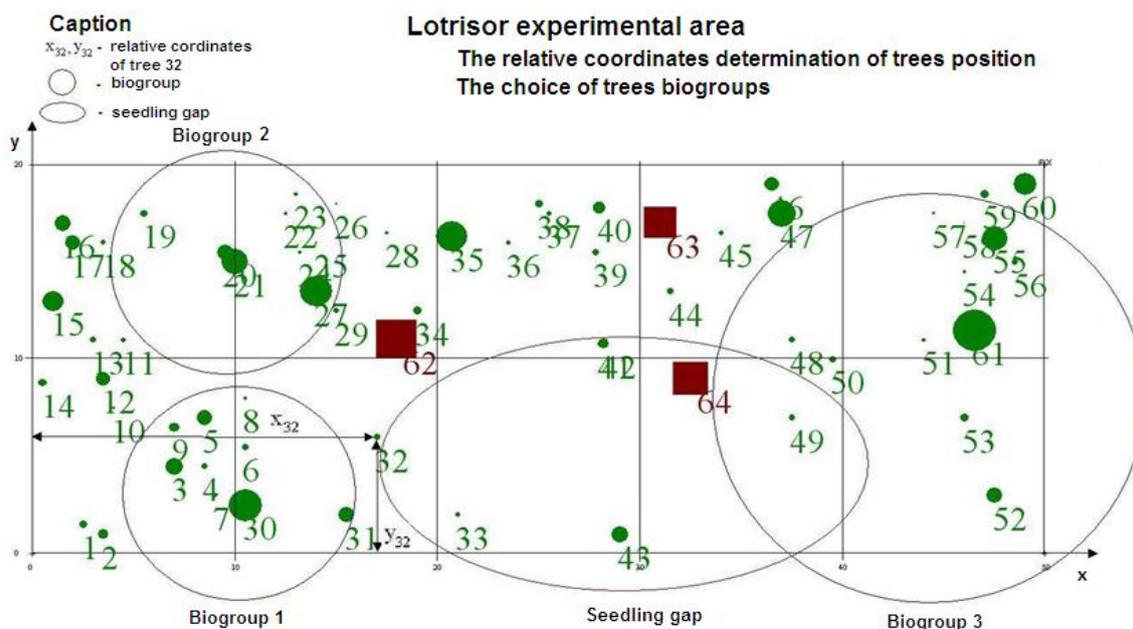
### MATERIALS AND METHODS OF RESEARCH

The research material was made of a network of eight experimental areas, with a rectangular form, having its areas between 1000 and 5700 square meters (figure 2).

The graphical representation and determination of the development phases, and the determination of the studied natural forest stability was necessary for the following tasks:

- the marking of the experimental areas limits;
- the marking of the elementary areas of 100 square meters in order to find out the Cartesian coordinates of trees;
- the tree numbering, with the measurement of basic diameters, the measurement of total and pruning height, as the measurement of their crowns diameter;
- the estimation of defoliation/discoloration degree of the crowns;
- the quantification of the perturbing factors 'action over the forest ecosystems;
- the quantification of the reaction capacity of the last ones to the destabilizing agents.

The gathered data were processed through statistic calculation "Proarb 2" and through the usual calculation programs, facilitated by Microsoft Excel.



**Figure 2 Calculating the trees coordinates in the experimental area Lotrișor. Defining the trees biogroups and the seedling gap**

### ACQUIRED RESULTS

With a view to the inclusion on development phases of studied forest ecosystems, it has been adopted the determination key proposed by Bary-Lenger et al., (1993) and applied in our country by Iacob (1998) for uneven-aged stands of beech and resinous trees from Bucegi and Piatra Craiului mountains, a determination key based on tree distribution on thickness classes.

The proportion of trees number on thickness classes according to different development phases identified in the forest ecosystems on the east of Capatana mountains and Oltet Piedmont is represented in chart 1. The differences between the development phases in the natural beech or beech and sessile oak forests could be emphasized through, an analytical presentation, of the distribution curves of the trees number proportion on thickness classes.

**Chart 1**

**Trees proportion on thickness classes. Development phase**

Experimental area	Trees proportion on thickness classes (%)				Development phase...
	Thin (6 - 28cm)	Average (28.1 - 48 cm)	Thick (> 48.1 cm)	Sum	
Muereasca	63	20	17	100	of regeneration
Lotrișor	64	19	17	100	of regeneration
Cheia	21	25	54	100	terminal
Olănești	46	25	29	100	of degradation
Șirineasa 1	31	24	45	100	terminal with regeneration
Șirineasa 2	48	13	39	100	of degradation
Șirineasa 3	31	24	45	100	terminal with regeneration
Govora	55	9	36	100	of degradation
Govora bis	56	6	38	100	of degradation

Thus, in the terminal phase, the distribution of the number of trees on thickness classes is presented as an increasing distribution curve adjusted through a polynomial equation of the second degree (figure 3 A) like:

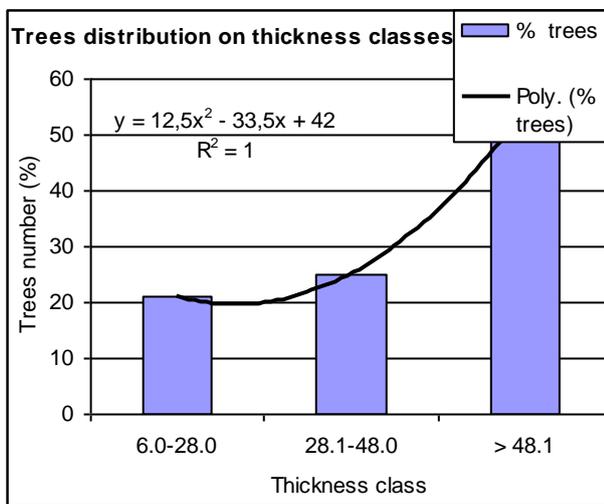
$$y = ax^2 + bx + c$$

where  $y$  = proportion of trees number;

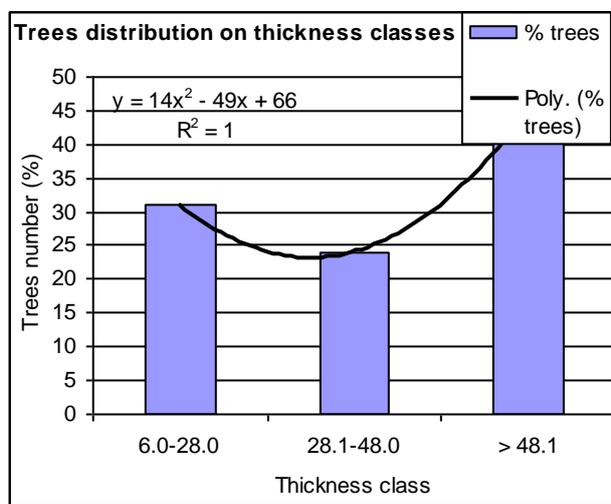
$x$  = thickness class;

$a, b, c$  = equation parameters.

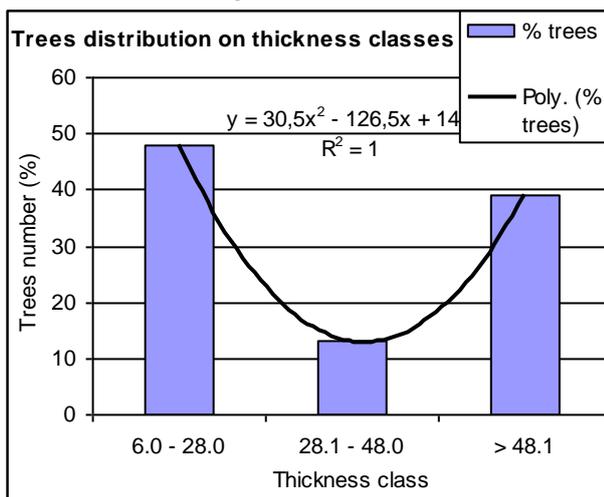
In the terminal phase of regeneration and degradation, the relative frequencies of the trees number on thickness classes turn into some concave distribution curves, also adjusted through a second degree polynomial equation (figure 3 B,C) except that, in the degradation phase, the arrow of the curve is much more emphasized than the proper curve of the regeneration terminal phase. The explanation is given by the low number of the mean trees in comparison with the thin and thick trees, but on the contrary of the previous phase, where the number of mean trees is close to the one of the thin trees.



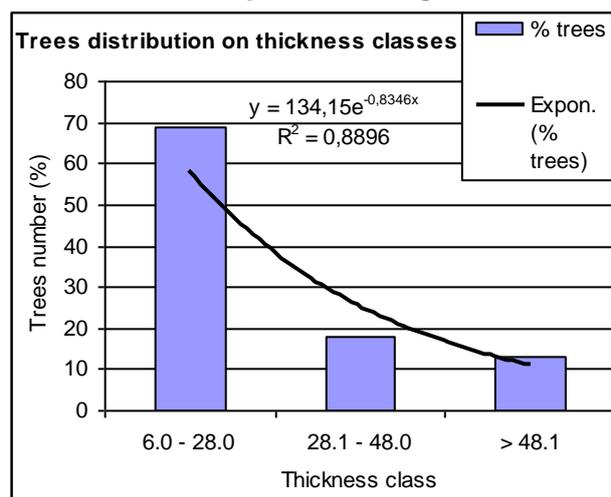
**A. Terminal phase**



**B. Terminal phase with regeneration**



**C Degradation phase**



**D. Regeneration phase**

**Figure 3 Trees allotment on thickness classes for the development phases identified in the experimental areas from eastern Capatana mountaines and from Oltet piedmont**

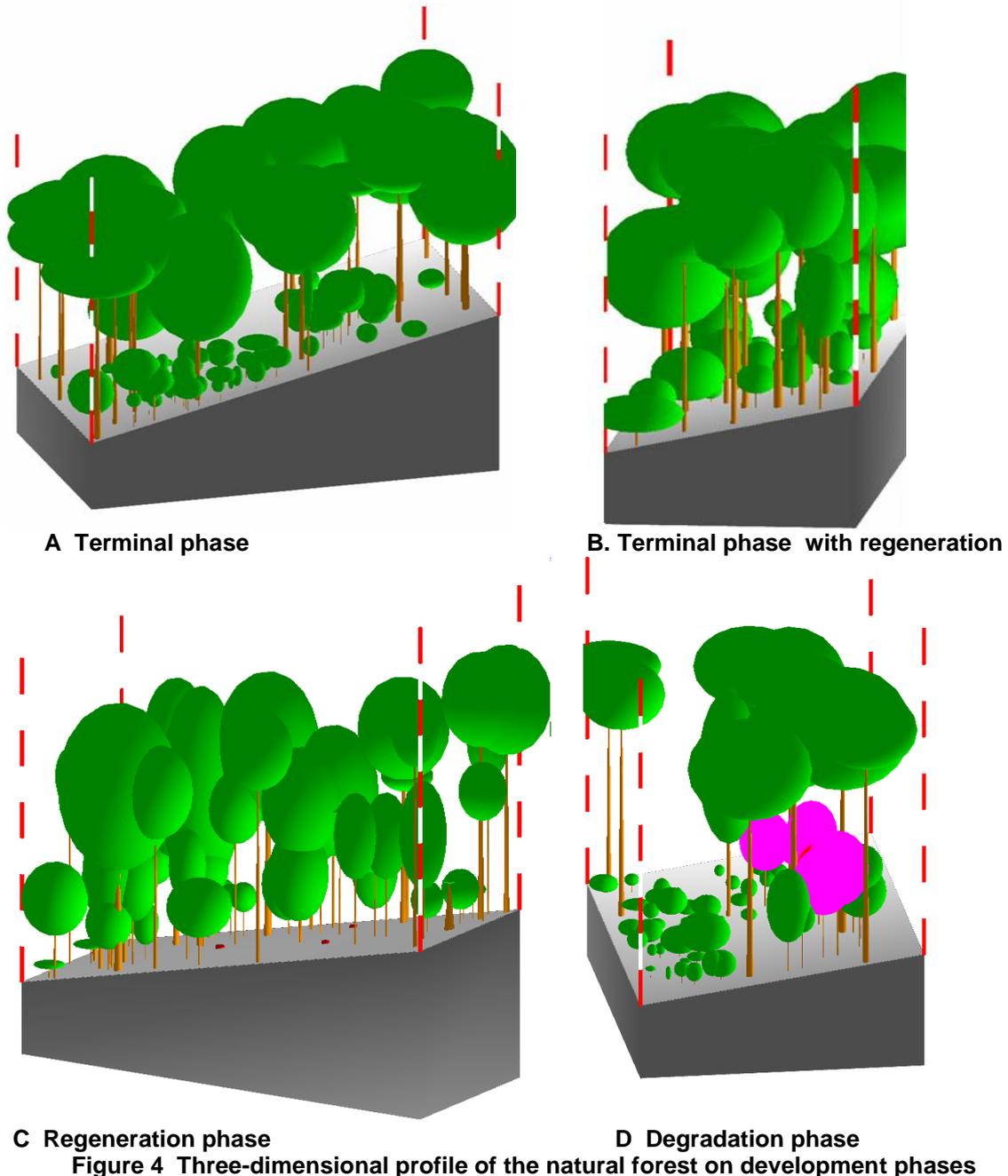
In the regeneration phase the repartition of trees number on thickness classes takes the form of a decreasing distribution curve, adjusted through an exponential function (figure 3 D) as:

$$y = ax^{-b}$$

where  $y$  = proportion of trees number  
 $x$  = thickness class ( $x = 1, 2, 3$ );  
 $a, b$  = equation parameters.

According to the classification adopted by IUFRO (**Cenușă, 1996**), the eight studied experimental areas are included in four development phases, three basic ones (the terminal phase, the degradation phase and the regeneration phase) and an intermediate one (the terminal regeneration phase).

The three-dimensional profile of the studied natural forest on development phases is presented in *figure 4*.



According to the specific literature, there have been applied two keys to determine the natural forest stability in our country, by now.

The first determination key of the natural forest stability on development phases was proposed by **Iacob (1998)** and is based on the tight link between the complexity and stability and on the idea that the complexity and diversity of ecosystems (calculated with Shannon-Wiener formula) determines their stability. The results of its application to the

natural forests on the east of Capatana mountains and Oltet Piedmont is presented in *chart 2*.

According to this key, the bigger the value of the stability index is, the bigger the stability of the natural forest is.

**Chart 2**

**Determination of the natural forest stability through Shannon – Wiener method**

Development phase	Forest ecosystems	Stability index ( $I_s$ )
Terminal	Cheia	3.617
Terminal with regeneration	Șirineasa 1, Șirineasa 3	3.608
Of degradation	Olănești, Șirineasa 2, Govora, Govora bis	3.523
Of regeneration	Lotrișor, Muereasca	3.624

Right now, the use of the stability index for the natural stands on the east of Capatana mountains and Oltet Piedmont, being in various development phases, proved the following:

- the development phase with the highest stability is the regeneration phase ( $I_s = 3.624$ );
- the development phase with the lowest stability is the degradation phase ( $I_s = 3.523$ );
- the other two identified development phases present intermediate stabilities, their order being: the terminal phase ( $I_s = 3.617$ ) and the regeneration terminal phase ( $I_s = 3.608$ ).

The high stability of forest ecosystems in the regeneration phase is due to the structural diversity of these in comparison with the ones identified in other development phase, gives them flexibility to the action of the perturbing factors.

The forests from the terminal and regeneration terminal phases are characterized by a lower stability, due to the high degree of defoliation/discoloration of these, to the reduction of the wood mass accumulations and to the voids in the upper content which increase their vulnerability to the windfall .

Finally, the low stability of the stands in the degradation phase is due to the old age of the trees, to the high degree of defoliation/discoloration of these, but mostly to the intensification process of void formation in the canopy of the forest.

**Chart 3**

**Determination of the natural forest stability through Mayer method**

Perturbing factor	Action/reaction on development phases:				Mean
	Terminal phase	Terminal phase with regeneration	Degradation phase	Regeneration phase	
Grazing	1/2	1/2	1/2	1/2	2.00
Hunting	2/2	1/2	2/2	1/2	3.43
Snow	2/3	2/3	2/3	1/2	5.43
Wind	2/3	2/3	2/3	2/2	5.71
Stress	1/1	1/1	1/1	1/1	1.0
Xylophagous fungi	2/2	1/2	2/3	1/2	4.67
Xylophagous insects	1/2	2/2	2/3	2/2	5.07
Mean	3.57	3.29	4.43	2.43	3.90

Another stability determination key was proposed and used by **Cenușă (1996)** to determine the stability on development phases of the spruce natural forest from Calimani and Giumalau. In comparison with the previous method, it has the advantage that, by the action-analysis perturbing factor/forest ecosystem reaction, it's taken into consideration both the side of stational stability and that of the structure stability. The results of method

application in natural forest ecosystems from the studied territory is presented in *chart 3*. The system destabilizing factor action/forest ecosystem reaction is rendered as a fraction.

Making a correlation between the results and the limits between the stability categories (the limit between stable and stable-labile is 1.5; the limit between stable-labile and labile-stable is 3.0; the limit between labile-stable and labile is 4.0; the limit between labile and labile-unstable is 6.0; and the limit between labile-unstable and unstable is 7.5), we can do the following classification of development phases according to the stability ratio:

-stable-labile phases: the regeneration phase (Lotrisor and Muereasca experimental areas);

-labile-stable phases: the terminal phase and the regeneration terminal phase (Olanesti, Sirineasa 2, Govora, Govora bis experimental areas);

-the labile phases: the degradation phase (Cheia, Sirineasa 1, Sirineasa 3 experimental areas).

Starting from the weight of each development phase in the studied total area, we can say that the global stability of forest ecosystems in the studied territory is 3.90, situating these ecosystems in the labile-stable domain.

## CONCLUSIONS

The natural forest ecosystems still have an important area, of approximately 10400 ha in Olt gorge; these forests characterized by a relatively great stability due to their big structural diversity, can be real models of management for the cultivated forest.

- The space configuration of the studied uneven –aged natural forest is the result of the distribution method of this on development phases.

- Sometimes, a forest ecosystem has a certain distribution of trees on diameter classes which is specific to every development phase and it can be, at the same time, the determination key of the development phase.

- By applying this determination key, it has been established that the studied forest ecosystems belong to four development phases: the regeneration phase (Lotrisor and Muereasca), the terminal phase (Cheia), the regeneration terminal phase (Sirineasa 1 and Sirineasa 3) and the degradation phase (Olanesti, Sirineasa 2, Govora).

- The stability of the natural forest has been studied and determined through two ways: the Iacob application, based on the use of the determination formula of the structural entropy (Shannon-Wiener formula) and Cenusă application, founded on the system of perturbing factor action/forest ecosystem reaction (Mayer method). Even they are mainly different, the results of the two applications in the natural forests from the studied territory are close as possible, what proves their validity.

- According to Shannon-Wiener method, the most stable development phase proved to be the regeneration phase, and the most unstable is the degradation phase, the other two identified development phases (terminal and regeneration terminal) can be characterized by intermediate stabilities.

- The higher stability of forest ecosystems from the regeneration phase is due to their structural diversity in comparison with those from other development phases, giving them a bigger flexibility to the action of the perturbing factors.

- The forests from the terminal and regeneration terminal phases are characterized by a lower stability due to the high degree of their defoliation, to the reduction of the wood mass accumulation and the occurrence of voids in the upper content, which increase their vulnerability to the windfall.

- The low stability of the stands in the degradation stage is explained by the old age of the trees, by the high degree of their defoliation/discoloration and due to the development of voids in the upper content of the forest ecosystems.

- According to Mayer method and correlating the application results with the limits between the stability categories, it can be done the following classification of the development phases identified in the studied ecosystems according to stability:
  - stable-labile phases: the regeneration phase;
  - labile-stable phases: the terminal and regeneration terminal phase;
  - labile phases: the degradation phase.
- Taking into consideration the weight of each forest ecosystem a phase of development or another from the total studied area, the global stability of forest ecosystems on Capatana mountains and Oltet Piedmont proved to be in the labile-stable domain.

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# CERCETĂRI PRIVIND CREȘTEREA RADIALĂ A ARBORILOR ÎN PĂDUREA NATURALĂ ÎN RAPORT CU VÂRSTA ȘI CLASA POZIȚIONALĂ A ARBORILOR

## RESEARCHES REGARDING THE RADIAL GROWTH OF THE TREES IN THE NATURAL FOREST IN COMPARISON WITH THE AGE AND THE POSITIONAL CLASS OF THE TREES

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Cuvinte cheie: ecosisteme forestiere, biogrupă, competiție, stabilitate, pădure naturală.

Keywords: forest ecosystems, biogroup, competition, stability, natural forest.

### ABSTRACT

*Cercetările sunt localizate în ecosisteme forestiere naturale situate pe versanții estici ai Munților Căpățanii și în nord-estul Piemontului Oltețului, pe teritoriul județului Vâlcea .*

*În acest teritoriu, în cadrul unor păduri naturale de fag și amestecuri ale acestuia cu gorunul, s-au delimitat biogrupe alcătuite din 5-7 arbori care se intercondiționează reciproc între ei în procesele de creștere și dezvoltare .*

*Între indivizii ce alcătuiesc o astfel de biogrupă se dezvoltă relații de natură diversă, de dominare, competiție, favorizare etc.*

*Creșterea radială a arborilor este influențată de vârsta și poziția acestora în cadrul biogrupelor astfel delimitate.*

*Researches are located in natural forest ecosystems situated on the eastern slopes of Capatana mountains and in the north east of the Oltet Piedmont on the territory of Valcea district.*

*In this territory as part of some natural beech forests and some mixtures of this with the sessile oak there have been delimited biogroups made of 5-7 trees which interconnect each other in processes of growth and development.*

*There are various relations between the individuals that make up such a biogroup, of domination, competition, favour etc.*

*The radial growth of the trees is influenced by the age and position of these as part of the biogroups thus delimited.*

### INTRODUCTION

The process of plants growth is influenced by a series of internal factors, which are related to their age, to the quantity of available and synthesized substances at some time, the hydrological regime of the tissues, and the existence and activity of the regulator substances of growth.

There are many diverse relations between the individuals of a community, sometimes contradictory, of domination, competition, favour etc., which are related to the social position (Kraft class), owned by every tree in this community.

### THE PLACE OF RESEARCHES

The researches are located in natural forests situated on the eastern slopes of Capatana mountains ,on the south-western part of Valcea Subcarpathians and on the north-east of Oltet Piedmont, on the territorial administrative area of Valcea district (*figure 1*).

The vegetation of the studied territory is included in the great unit of the „Falling mesophyll forests of resinous and resinous-broad-leaved trees” (**Doniță et al., 1992**).



Figure 1 Map of Vâlcea district with the location of the studied territory

### MARERIALS AND METHODS OF RESEARCH

The material of research was made of a network of eight experimental areas, with a rectangular form, having the size between 1000 and 5700 square meters.

In these research areas there have been delimited biogroups of 5-7 trees, formed around a predominant tree which interconnect each other in the processes of growth and development (figure 2).

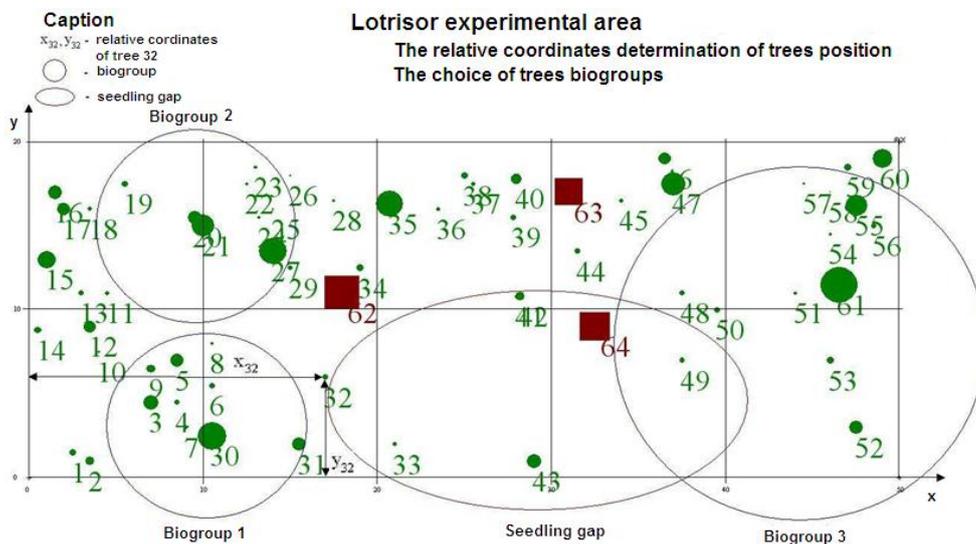


Figure 2 Defining the trees biogroups in the experimental areas

To determine the size of trees radial growth and to obtain the growth series, and to establish the relations between the growth and the age or social position of the individuals inside the biogroups there have been done the following operations:

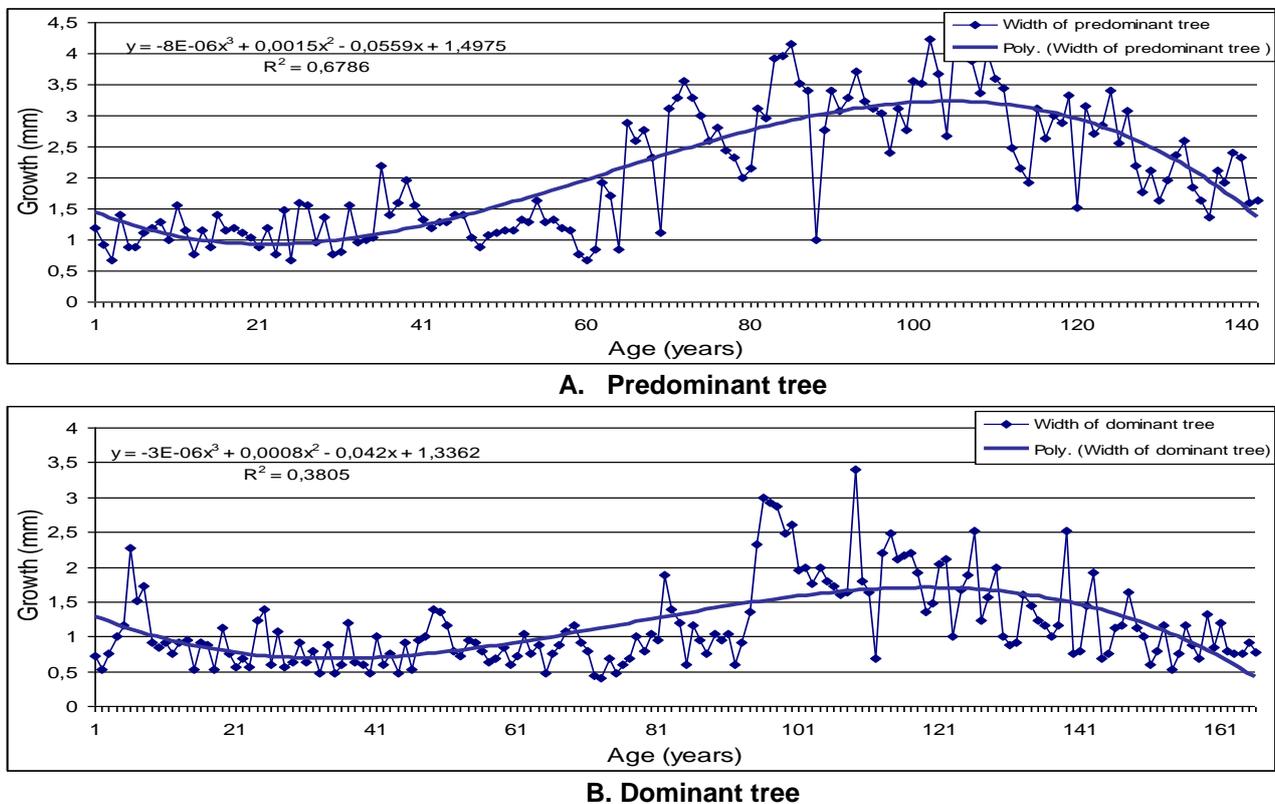
- growth samples extraction with Pressler's borer;
- samples conversion through drying and sanding in order to determine the annual layers width (by applying the "Carota" program);
- graphic representation of the converted data in Microsoft Excel program;

- data processing of the growth series obtained by the method of graphic comparison on a logarithmic scale and the check-up of these with “Confexha” program;
- standardisation of individual growth series in order to eliminate the non-climatic signals and maximize the climatic information by turning the individual growth series into growth indices series, using the polynomial regression curves of the third degree, facilitated by Microsoft Excel calculation program.

### ACQUIRED RESULTS

In trees competition for light, after a beginning characterized by thickness growth in the first years of life, these are decreasing but the height increment intensifies. As a general rule, thickness growth is activated only after height increment reaches a maximum, that is in the second part of trees’ life. Only when the trees interfere and settle for all in the upper content, the thickness growth achieves the maximum and, at the same time, the volume increment.

In *figure 3* the thickness growth dynamics is rendered at some trees in the studied experimental areas.



**Figure 3 Radial Growth dynamics for the beech species in relation with age**

If we study the annual growth of the dominant tree, for instance, we find that, in the first years of life, the intensity of radial growth is a little higher, after which it decreases and it maintains at a minimum level for a long time (until the age of 50-60 years). It's the time of achieving some intense height increment, of finalizing the future social position of the individual. In time thickness growth is reactivated and reaches a maximum, sometimes around the age of 120 years. Near the maximum thickness growth, a platform is made, where the radial growth remains constantly high, a period which lies on many tenths of years (approximately between the age of 100 and 140 years). Then, the growth course becomes much more decreasing, as the tree grows old, as a result of the natural ageing processes.

The moment of reaching the maximum thickness growth depends on the individual's position inside the biogroup. The more favourable its position is the less the

ages when the maximum growth is reached. In the situation set forth above, the order of radial growth maximum achievement is predominant tree, dominant tree.

In the process of thickness growth achievement, the trees interconnect each other in space and they have a similar social position. Thus, following the compensation curves of radial growth of the trees with predominant and dominant positions, great similarities can be noticed between their thickness growth course (figure 4).

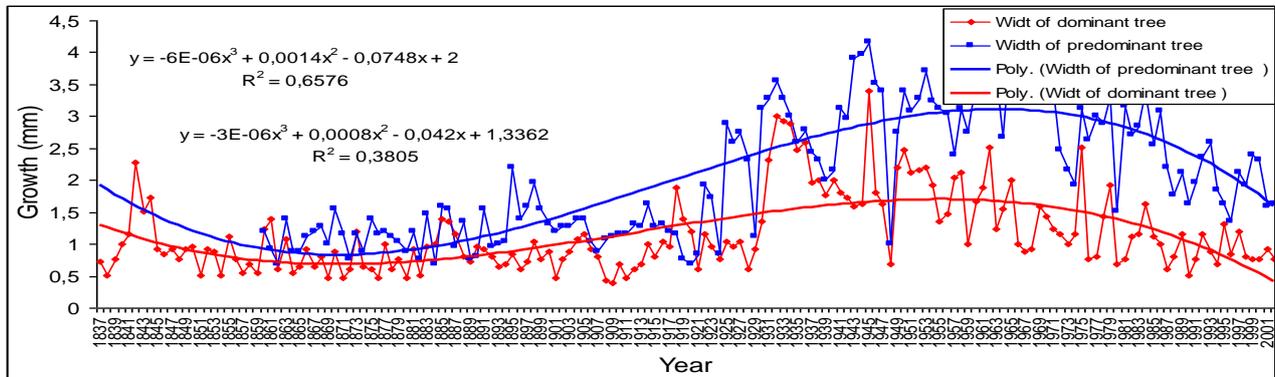


Figure 4 Radial growth dynamics of two trees which have similar social ranks

To test the supposition that, in time, on the background of some similar micro-stationary conditions, a certain interrelation is created between the growth of the community's individuals, there have been determined the simple parametrical correlations with the statistic program added to Microsoft Excel calculation program (chart 1).

Chart 1

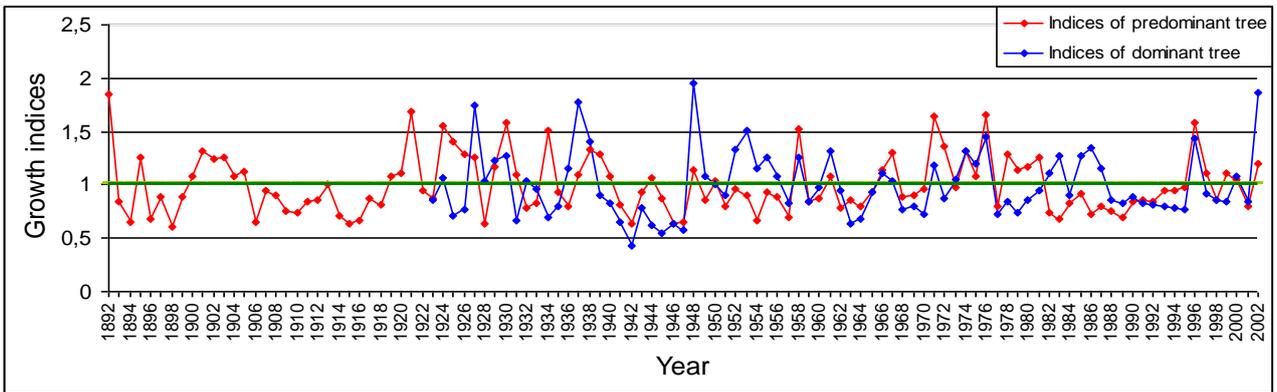
Correlations between radial growth of the trees

Social position	Simple correlation coefficient (r)				
	Predomi nant	Dominant	Codomi nant	Dominated	Dominated
Tree number	3	2	16	14	25
Predominant 3	x	0.657	0.612	0.719	0.248
Dominant 2	0.657	x	0.69	0.443	-0.058
Codominant 16	0.612	0.69	x	0.505	-0.54
Dominated 14	0.719	0.443	0.505	x	-0.047
Dominated 25	0.248	-0.058	-0.54	-0.047	x

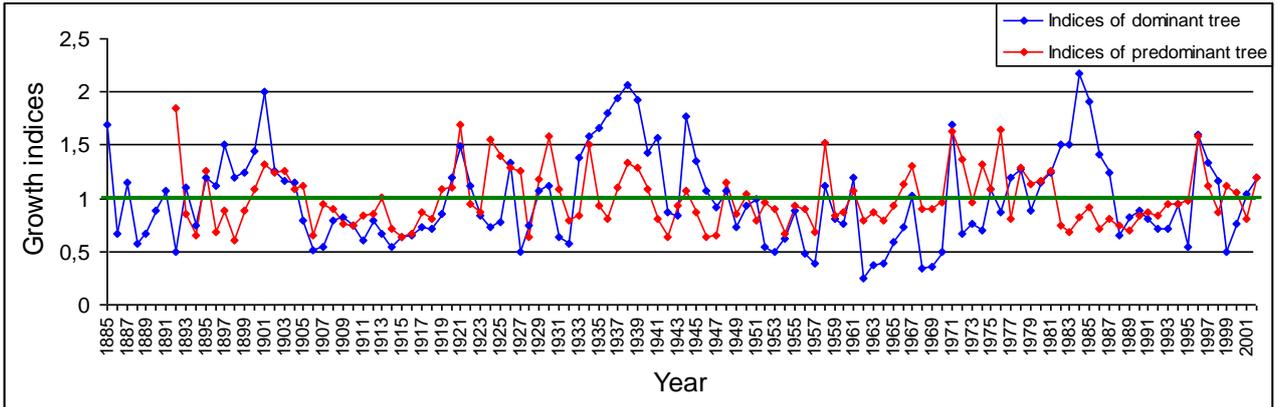
The high values of the simple correlation coefficients (r), prove the positive significant correlations which are made between the increment of the trees pertaining to a group. It seems like there are more significant correlations between trees in direct competition, which have almost the same social position (predominant-dominant, dominant-codominant). The less significant correlation between the growth of tree 25, dominated, and those of the trees from the upper content (2 dominant, 16 codominant) is the result of the big distance, on vertical and horizontal between trees, which causes the lack of direct interaction between them.

In order to eliminate the influence of age over growth dynamics, the growth series have been standardized by their transformation in growth indices series. This way, it has been found that:

a) The trees that have close social positions make similar growth indices, what proves the analogous response of the trees to the action of the perturbing factor, even more, it demonstrates the achievement of some "local solidarity" in comparison with the possible effects of the perturbing factor (figure 5).



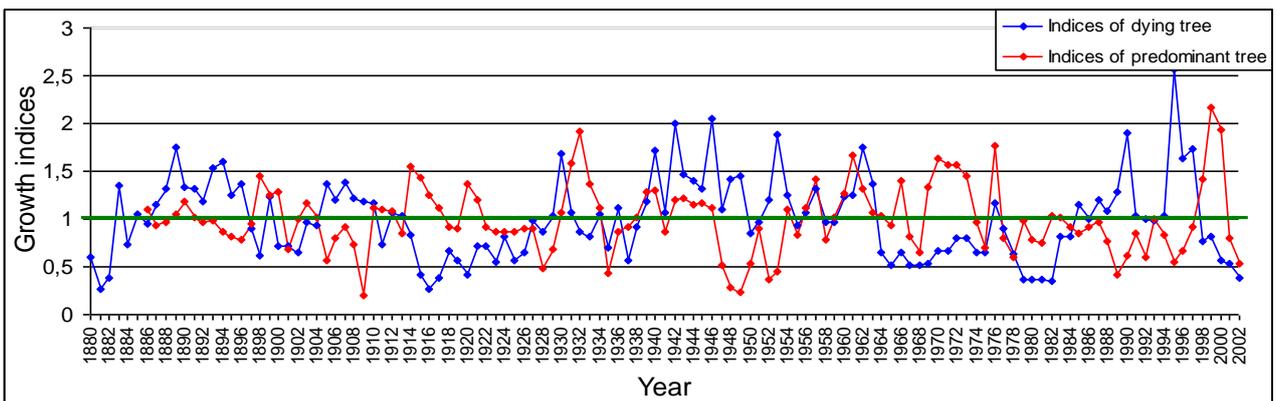
**A Predominant tree (21), dominant (11)**



**B Predominant tree (21), dominant (14)**

**Figure 5 Growth indices series for the trees which are close on the social scale**

b) As the trees are more distant on the social scale the responses of these to the action of the perturbing factors delay in time, what means that the dominated trees from the lower contents of the stand have a certain protection from the community to the action of these factors (*figure 6*).



**Figure 6 Growth indices series for the trees which are distant on the social scale**

### CONCLUSIONS

- The intensity of trees radial growth is tightly correlated to their age. Thus, thickness growth is increased in the first years of life, it decreases and it maintains minimum for a long time, then it intensifies after the height increment reaches the maximum, that is somewhere around the age of 120 years. The thickness growth is high (approximately between the ages of 100 and 120 years) for a long time, then the growth course becomes decreasing, thanks to the natural processes of ageing.
- The moment of achieving the maximum thickness growth depends on the position of every individual from the biogroup. The better its position is, the less the ages when

maximum growth is achieved. In this respect, the order of achieving the maximum radial growth is predominant tree, dominant tree, codominant tree.

○ In the process of achieving the thickness growth, the trees interconnect each other even more when they are closer in space and they have a similar social position. The phenomenon is even more obvious when the trees have closer ages, so a similar growing potential. Calculating the correlation coefficients between the radial growth of the trees from a biogroup, there have been acquired significant correlations between the trees in direct competition which have almost the same social position.

○ In these researches, in order to simplify the way of working and to increase the accuracy of interpretation regarding the influence of the general climate as well as of the endogenous and exogenous local factors on growth, it has been eliminated the influence of age over the radial growth through the standardisation of the growth series, and through their transformation into series of growth indices. This way, it could be noticed that the trees which have close social positions make series of similar growth indices, proving the analogous response of the trees to the action of the local perturbing factor, and even more, it demonstrates the creation of a certain "local solidarity" to the possible effects of the perturbing factor.

○ At the same time, as trees are more distant on the social scale, their responses to the action of the local perturbing factors are altered in time, what means that the dominated trees from the lower contents of the stand have a certain protection from the community to the action of the perturbing factors.

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## STUDII PRIVIND STABILITATEA UNOR ELEMENTE DE PRODUCȚIE ȘI IDENTIFICAREA UNOR POSIBILE CORELAȚII ÎNTRE ACESTEA LA UNII

# HIBRIZI DE PORUMB ROMÂNEȘTI ȘI STRĂINI ÎN CONDIȚII DE ECOLOGIE SPECIFICE ZONEI DE SUD A OLTENIEI

## STUDIES CONCERNING THE STABILITY OF SOME YIELD ELEMENTS AND THE IDENTIFICATION OF SOME POSSIBLE CORRELATIONS BETWEEN THOSE ON SOME ROMANIAN AND FOREIGN CORN HYBRIDS IN THE SPECIFICALLY ECOLOGICAL CONDITIONS OF THE OLTEINA'S SOUTH AREA

*Soare M., Păniță O., Zaharie Oana, Bică M.*

**Cuvinte cheie:** condiții climatice, hibrizi de porumb, coeficient de prolificitate, elemente de producție  
**Keywords:** climatic conditions, corn hybrids, prolificacy coefficient, yield elements.

### **ABSTRACT**

*Zona Olteniei se remarcă printr-un climat de cele mai multe ori arid, acest factor de mediu fiind foarte limitativ pentru cultura porumbului. Dat fiind faptul că, anual sunt omologați un număr apreciabil de hibrizi de porumb de origine străină, se impune testarea riguroasă a acestora în prealabil, astfel încât să se realizeze o apreciere cât mai obiectivă a potențialului biologic al acestora. De asemenea, prin testarea în condiții de secetă se pot identifica acele caractere și însușiri condiționate genetic care conduc spre o cât mai mare stabilitate a producției, chiar și în climat de secetă.*

*The Oltenia geographical area is remarked as having a climate mostly droughty, this environment factor being limitative for the corn crops. Because of the fact that, every year is certified a high number of foreign corn hybrids, preliminary it is necessary a rigorous testing, in order to appreciate objectively as possible the biologic potential. Also, by testing in droughty conditions, it can be identified those characters and features genetically conditioned that led to a higher yield stability, even in drought climate.*

### **INTRODUCTION**

In the last years, in the south area of Oltenia, the main yield limitative factor for the corn crops is the water deficit from the soil associated with the one from the atmosphere, phenomenon that are showing in different phases of corn vegetation.

Once with the accentuation of this kind of severe climate phenomenon, combined in the same time with the bad effects of the warming climate, it has to review the conventional agricultural technology concept, regarding that the expert's forecast for our country for the next decades aren't very optimistic.

Starting from this premise, the aim of this research is to analyse in compare with the 2007-2008 agricultural year, the effects of the severe drought from this area from the 2006-2007 agricultural year on the behaviour of some new corn hybrids.

So, in order to establish the resistance in severe drought of some Romanian and foreign corn hybrids, on Banu-Maracine D.S. have taken place a research which have studied the possible correlation between some yield elements.

### **MATERIAL AND METHOD**

In comparative crops, in the years 2007 and 2008 there were sowed on Banu-Maracine D.S. a corn hybrids assortment of Romanian and foreign origin respectively Kitty, KWS 1394, Garbure, KWS 3381, Laureat, KWS 2376, KWS 1394, Kapsus and Stanza.

The sowing was made on optimum period, the applied technology being the conventional one for the corn cultivation.

During the vegetation, there have been effectuated observations regarding the main phenologic phases, but also concerning the behavior of main agricultural characteristics on drought conditions.

Concerning the drought conditions, 2007 year was a very draughty year, the falls quantity being very low both in summer and in winter. Also, the medium temperatures were very high for the vegetation period, which created perfect conditions for the drought resistance study. Regarding the drought resistance, there were considered that, the main element of this research was the correlation study between the prolificacy and sterility percent.

## RESULTS AND DISCUSSIONS

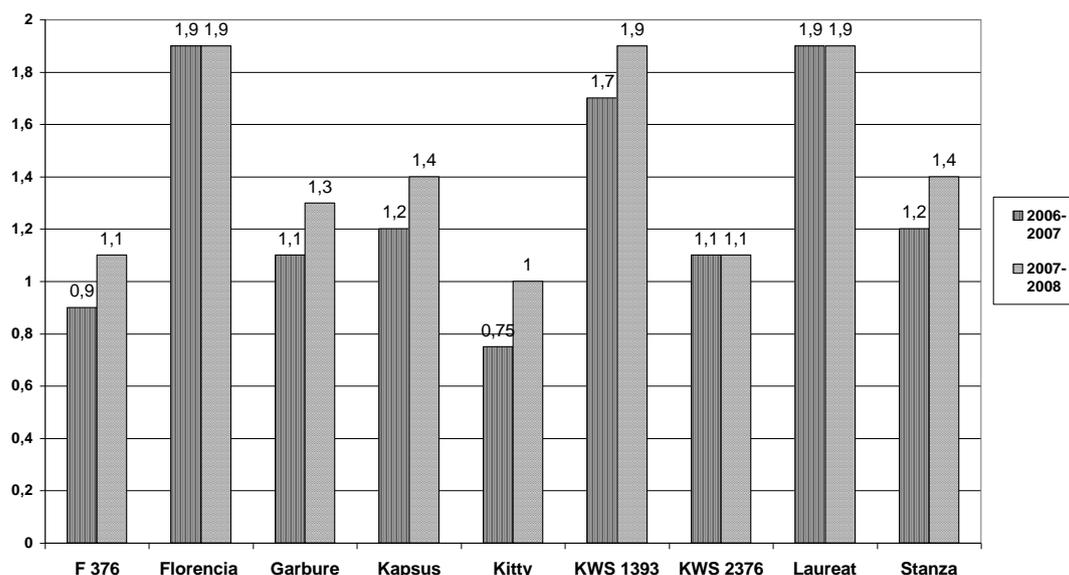
Concerning the recorded number of corn-cob/plant in the first year of research, this one varied between 0,75 corn-cob/plant on Kitty hybrid and 1,9 corn-cob/plant on Laureat and Florencia hybrids. Important results also obtained KWS 3381 hybrid with 1,7 corn-cob/plant. Modest results were recorded on Garbure and KWS 2376 with 1,1 corn-cob/plant and Kapsus with 1,2 corn-cob/plant.

In the second year of experimentation, because of a considerable improvement of the climatic conditions, all the recorded values were considerable higher then in the first year.

Thus, the no. of the corn-cob/plant was situated between 0,8 corn-cob/plant on Kitty hybrid and respectively 1,9 corn-cob/plant on KWS 1393, Florencia and Laureat hybrids. Compared to last year, both KWS 1393 and Florencia held their prolificacy level, level that was improved on all studied hybrids. It must be reminded that Kitty corn hybrid held the last position in the second year with only 1,0 corn-cob/plant. Medium results recorded Garbure with 1,3 corn-cob/plant, Kapsus and Stanza with 1,4 corn-cob/plant (graphic 1).

**Graphic 1**

The variation of the no. of the corn-cob/plant in the two years of experimentation

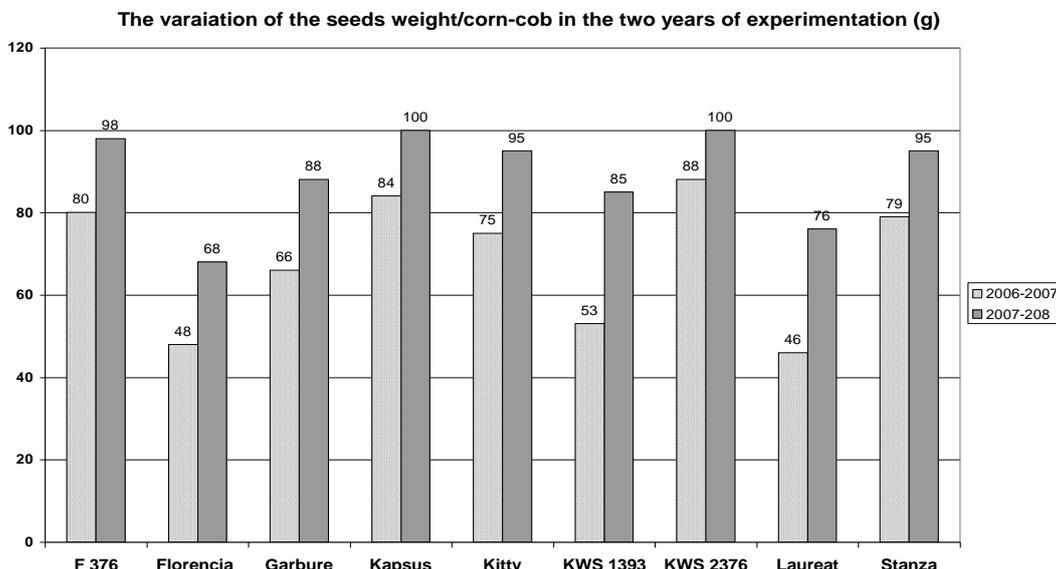


Another yield element taken for study was the seeds weight/corn-cob. In the first year of experimentation, this index was situated between 88g on KWS 2376 and 48g on

Florenzia hybrid. Mentioning KWS 2376, considerable values have been obtained also with the Kapsus hybrid of 84g and F 376 hybrid of 80g.

The values of this index have been considerably improved in the second year of research. Thus, with Kapsus and KWS 2376 hybrids, one has obtained an average of 100 g seeds/corn-cob, being the cultivars with the best values. With Florenzia hybrid, with 68g, one has situated on the last rank (graphic 2).

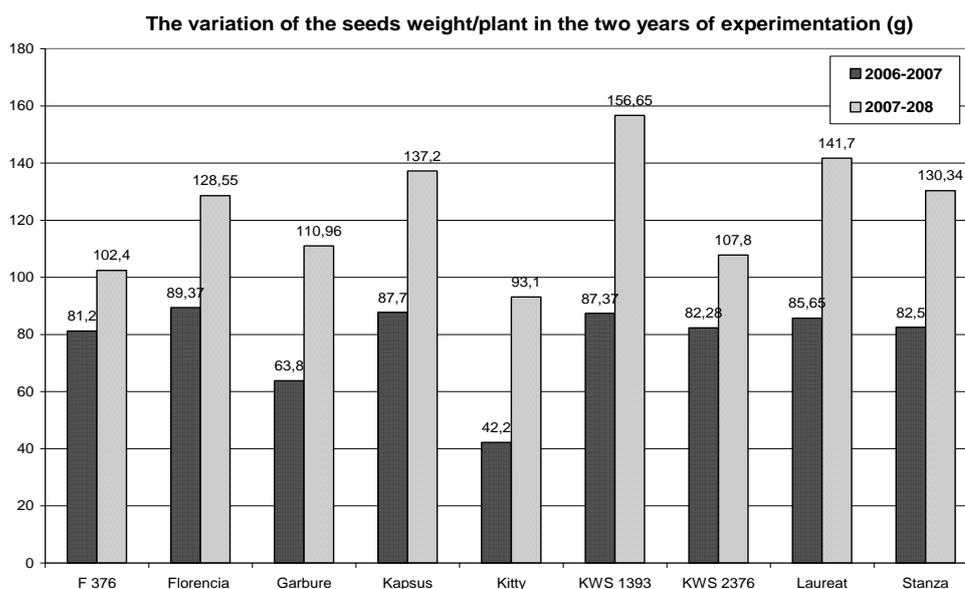
**Graphic 2**



Another important index taken for study is the seeds weight/plant. In the first year of experimentation, this one was situated between 42,2 g seeds/plant on Kitty hybrid and respectively 89,37 g/plant on Florenzia hybrid. Considerable results have been obtained with the Stanza (82,5 g/plant) and Laureat (87,7 g/plant) hybrids.

The seeds weight/plant on the second year of experimentation was an index of which values have been situated between 93,10 g/plant on Kitty hybrid and respectively 156,65 g/plant on KWS 1393. Valuable results have been recorded also on Laureat (141,7g/plant) and respectively Kapsus (137,2g) hybrids (Graphic 3).

**Graphic 3**



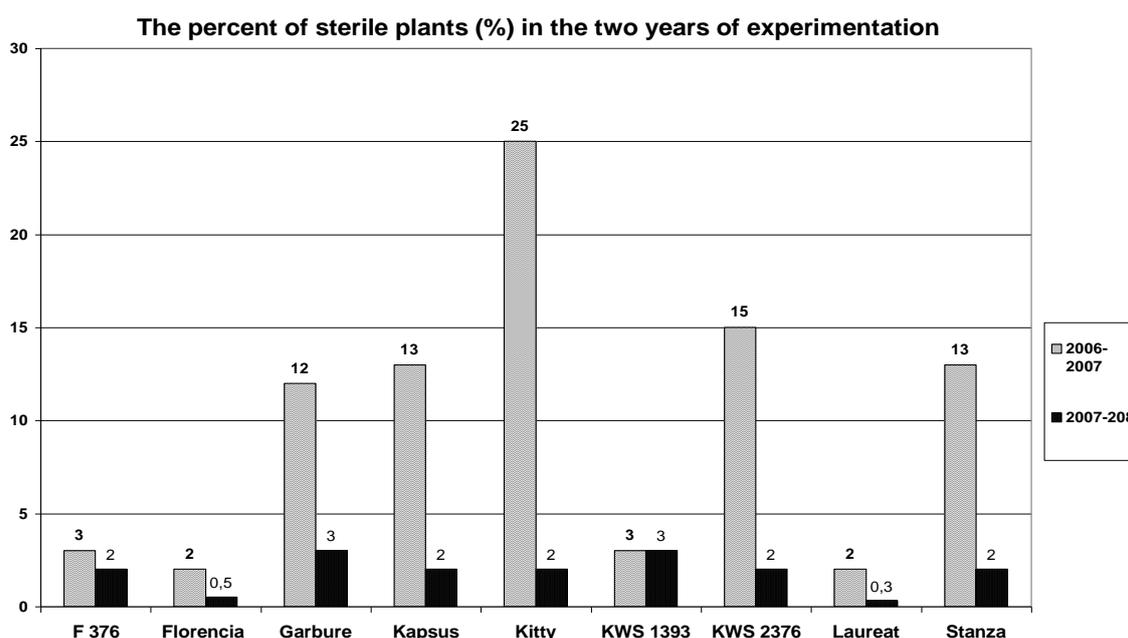
The sterile plants percent is a character that shows a high level of instability mainly caused by the climatic factors. Thus, in severe cropping conditions, the value of this index exponentially increases, negatively influencing the yield.

In the first period of experimentation, because of the severe cropping conditions, the sterile plants percent have reached a maximum with the Kitty hybrids with no less than 25%, lower values being recorded with Florencia and Laureat with 2% sterile plants and with KWS 1393 and F 376 hybrids, with 3% sterile plants.

Medium values have been recorded with Garbure with 12 % sterile plants, Kapsus and Stanza with 13 % sterile plants and with KWS 2376 with 15 % sterile plants.

In 2008, the sterile plants percent have showed a significant decreasing for all the hybrids. Thus, the best results for this period have been obtained with Laureat (0,3 sterile plants) and Florencia (0,5 sterile plants) hybrids. In this period, five of the hybrids recorded the same percent of 2% sterile plants, those one being F 376, Kapsus, Kitty, KWS 2376 and respectively, Stanza. On the last rank was situated Garbur hybrid with 3% sterile plants (graphic 4).

**Gráfico 4**



Regarding the main correlation elements taken for study, those ones refer to:

- the correlation between number of corn-cob/plant and respectively the seeds weight/plant;
- the correlation between seeds weight/corn-cob and respectively no. of corn-cob/plant;
- the correlation between the percent of sterile plants and the no. of corn-cob/plant.

Concerning the correlation between the number of corn-cob/plant and respectively the seeds weight/plant, in the first year of experimentation there has been calculated a correlation coefficient of 0,6517, while for the second year the calculated correlation coefficient was equal with 0,8622. Thus, in the two years of experimentation because of the positive value of this coefficient relatively close to 1, was determined a positive correlation between those two yield elements, no matter the climatic cropping conditions (table 1).

The second type of correlation was referred to the one between the seeds weight/corn-cob and the number of corn-cob/plant. Thus, both in the first and the second year of experimentation have been obtained relatively closely values of -0,8438 and respectively of -0,8269, that proving a negative correlation between those two yield elements (table 1).

Concerning the percent of sterile plants and the number of corn-cob/plant, the calculated correlation coefficient in the both year of experimentation are negative with a decreasing in absolutely value in the second year. In other words, the percent of sterile

plants increases in severe cropping conditions but can be diminished because of the prolificacy of the hybrids.

**Table 1**

**The calculation of the correlation coefficient between the studied yield elements in the two years of experimentation**

The yield elements	The experimentation year	
	2006-2007	2007-2008
The no. of corn-cob/plant and the seeds weight/plant	0,6517	0,8622
The seeds weight/corn-cob and the no. of corn-cob/plant	-0,8438	-0,8269
Percent of sterile plants and the the no. of corn-cob/plant	-0,7897	-0,4172

### CONCLUSIONS

Because of the severe experimenting conditions of the first year, it can be affirmed that, the recorded data doesn't shows in objective manner the biologic potential of the studied hybrids. Though, in the two years of researches, respectively 2006-2007 and 2007-2008, there have been emphasized a series of conclusions that characterized the adaptability level of the studied corn hybrid on the specifically climatic conditions of this area. Thus:

- by increasing the prolificacy level it is reduced in a significant manner the percent of sterile plants, between those two index being a negative correlation;
- the seeds weight/plant is highly influenced by the number of corn-cob/cob and it is less influenced by the size of the corn-cobs;
- on the hybrids with a reduced number of corn-cobs/plant the sterility percent is an index highly influenced by the climatic cropping conditions;
- generally, superior results have been obtained with the hybrids with a high prolificacy, hybrids which show a higher level of adaptability in this type of conditions;
- in severe cropping conditions, the biologic potential of the studied hybrids is very diminished, thus it can be affirmed that for the success of this specie cultivation it is need it a minimum of climatic conditions.

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## AGRICULTURA ORGANICĂ, PARTE INTEGRANTĂ A AGRICULTURII ECOLOGICE

# THE ORGANIC AGRICULTURE, INTEGRATED PART OF THE SUSTAINABLE AGRICULTURE

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**Cuvinte cheie:** agricultură organică, conversie, Uniunea Europeană, legislation.

**Keywords:** organic agriculture, conversion, European Union, legislation.

## ABSTRACT

*În contextul transformărilor profunde în perioada de după Revoluția din 1989, dar și după aderarea la Uniunea Europeană, agricultura românească necesită investiții majore. O șansă în plus pentru redresarea acestei ramuri vitale este agricultura organică, ramură care valorifică tocmai acele caracteristici majore și care în fond reprezintă marile dezavantaje ale agriculturii românești, referindu-ne aici la lipsa de capital sau capital insuficient, nivel de mecanizare scăzut sau în contrapondere, forță de muncă umană valoric sporită din punct de vedere numeric. Nu se poate considera că, prin agricultura biologică se rezolvă marile probleme ale agriculturii românești, dar acest domeniu prezintă un potențial uriaș, care poate valorifica la maxim tocmai componenta tradițională a agriculturii și care în mod normal ar trebui restructurată.*

*In the profound transformation context of the post Revolution period, but after the EU acceding, the Romanian agriculture needs major investments. An extra opportunity for this economic branch recovery is the organic agriculture, branch that show off exactly that major characteristics which represent the biggest disadvantage of the Romanian agriculture, referring here on the lack of capital or insufficient capital, low mechanical equipments level or in counterpoint numerous human resources. It can not be considered that, with organic agriculture can be solved the biggest problems of the Romanian agriculture, but this domain has a huge potential that can capitalize exactly that traditional part of the agriculture, which normally should be reformed.*

The increased interest of the consumers regarding the food security and the more and more intensive concerning for the environment's protection have contributed to the organic agriculture development in the last years. If, at the beginning of the 2000's this sector had represented about 3% from total agricultural area of EU, today the organic agriculture is one of the most dynamic sector, the annual increasing of the cultivated area being in average of 25-30%.

The organic agriculture must be understand as an viable alternative of the traditional methods of plant cropping and as a way to preserve the environment balance, approaching in that this manner from the durable and natural cropping technology.

### The origin and the development of the organic agriculture notion

The organic agriculture is the result of developing several alternative cropping methods, initiated from the beginning of the last century in Northern Europe.

In this way, can be mentioned three way of approach:

- the biodynamic agriculture, initiated in Germany by Rudolf Steiner;
- the organic farming initiated in England by Sir Howard in the thesis from the Agricultural Testament (1940);
- the organic agriculture developed in Swisserland by Hans Peter Ruscha and H. Muller.

This three different approaches are base of some specific terms, protected by the EU rules, terms that essentially make the connection between the nature and agriculture and make the difference from the controlled agriculture term, where is followed the efficiency maximization by multiple interventions with different synthesis products categories.

In spite of an early appearing of this three approaches, the organic agriculture have shown a very slow development because of the requirements to satisfy by any means the food needs and the lack of care for the environment protection.

Only in the 80's we have assisted to an important increasing of the organic farmer's number and to an intensive development regarding the transformation and the market of the organic products.

This thing led the authorities to the necessity of the recognition this agricultural type and the elaboration of some specifically rules, first in the western countries like UK, France, Austria, Denmark but also in the US, Canada, Australia, Japan, etc.

#### The institutionalize and legislative rules regarding the organic agriculture standards

In order to eliminate the confusion between the organic and the conventional products and to avoid the impermissible using of this precept and to put the organic agriculture inside off a market niche formed by quality products, there have been adopted in 1991 "**The 2092 Regulations of the CCE**", regarding the legislative norms for the vegetal sector and by the Regulations 2078/1992 there have been opened many possibilities for financial support for this type of agriculture.

From the effectual starting of the European legislation for the organic agriculture in 1992, numerous agricultural exploitations have been passed on this system of agriculture aware of the growing interest of the consumers for the organic products.

International Federation for the Organic Agriculture Movements (IFOAM) has adopted in November 1998 the Obligations Registers for the organic agriculture and the transformation that synthesizes for the actual step the methods for obtaining organic products.

Also, in June 1999, the Committee for the "Codex alimentarius" has adopted the rules regarding the yield, the transformation, the labeling and the commercialization of the food obtained from the organic cropping and FAO has adopted an activity schedule that regards the development of this sector in the country during the development stage.

In August 1999, there has been adopted the regulations regarding the yield, the labeling and the inspection on the main animal species (bovines, ships, goats, and domestic birds), that there have been approved by the Regulations no. 1804/1999. The content regards among others, the food for the animals, the prophylaxis and the treatment for the diseases, the comfort of the animals and the growing methods.

The genetic modified organisms (GMO) and the products obtained from those are absolutely excluded from this way of farming.

The regulations cover also the imports of products obtained from the organic agriculture, provided from countries that have criteria and control systems regarding the organic agriculture, recognized as being equal with the ones effectual in EU.

In Romania, the legislative system is regulated by the Government Decision no. 34/2000, which included the methodological rules regarding the organic crops, harmonized by the low no. 28/2001.

On the institutionalized level, in our country, are the next specialized institutions:

- The National Authority for the Organic Products – (ANPE) inside of the Agriculture Ministry;
- The Organic Agriculture National Federation – (FNAE), which includes the national farmers;
- RENAR – institution for the authorization of the certified structures.

### What is the organic agriculture?

The organic agriculture differs from others way of farming by a multitude of characteristics. The organic agriculture is based on reliable resources and on the recycling of those ones, returning to the soil the nutritive elements from the vegetal waist.

Regarding the animal growing, the regulations follow the insurance of a goodness situation for the animals and of an organic feeding of those ones.

The organic agriculture follows the self regulation systems from nature in order to control the bugs and disease of the crops and to avoid applying the pesticides and industrial fertilizers or the growing hormones, antibiotics or genetic manipulation.

The farmers which accept this system utilize a series of techniques that conducive the durable ecosystems and decrease the pollution level.

The reform proceedings from AGENDA 2000 emphasizes the rural development, as being a major component of PAC, having as main mission the environment protection. Those reform proceedings have needed the adaptation of some measures of environment protection similar for all types of agriculture.

The farmers are incumbent to fallow some elementary environment protection rules, without financial compensations and they are forced to respect the principle "you pollute, you pay".

Often, the agriculture-environment measures taken inside of the rural development programs propose the retribution for the farmers that oblige them self to apply measures of good agricultural practices. The ones that practice organic farming are legitimated to receive financial incomes, because it is considered that this agricultural system is good for the environment.

On the other way, the organic agriculture can be stimulated by encouraging the investments on the primary crop, the transformation and the commercialization.

Thank to those measures taken inside of the rural development policy, it has been noticed a notable increasing of the organic agriculture.

In order to understand the role and the functioning of the organic agriculture inside of the EU agricultural policy, that is what should be examined:

- the consumers concerning;
- the quality and responsibility insuring;
- the organic agricultural extension in the EU;
- the role of the integrated agriculture;
- the organic agriculture and the rural development;

### The conversion stages to the organic agriculture

In order to pass on this type of cropping, the farmers must participate on some stages such as:

- the informing and the consulting on ANPE, FNAE, ANCA;
- the professional formation by participation on some school stages organized for every cropping sector;
- the acceding on a professional group;
- the conversion on the organic agriculture which is achieved by the certification of the farmer with help from one of the specialized and control structure that notify the activity in Romania;
- the obligation of applying specified cropping means;
- the conversion period for vegetal farms is about 2 years.

### The advantages of the organic agriculture for the rural development

The organic agriculture and the intensive agriculture constitute a reliable source for the rural economy, contributing on the revitalization of those ones thank to the sustainable development.

The increasing of the agricultural sector has offered already new perspectives for the agricultural sector workers. Beside of the environment benefits, this agricultural systems can produced major benefits for the economy but also for the social unity from the rural area.

Putting on disposable of financial supports and of others measures for supporting the conversion on the organic cropping has the meaning to stimulate the increasing of this sector and to sustain the agricultural and food economic area.

Also, the organic agriculture contributes to achieve many objectives such as:

- the increasing of the biologic diversity in the all ecosystem;
- the increasing of the biological activity of the soil;
- the soil fertility maintaining on long term;
- the animal and vegetal waist recycling, returning to the soil a large part from the extracted nutritive elements;
- the promotion of an rational using of the soil, water and air and the reducing as much as possible of all form of pollution and of the conventional way of farming that might polluted the environment;

Regarding this increasing demands on the western European market for the organic products, this system may become a sustainable alternative for the Romanian farmers, which might solve in this way the problem of the prices instability and the selling problems.

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# RESEARCHES CONCERNING THE WATER CONTENT IN NITRATES AND NITRITES IN SOME VEGETABLE ECOSYSTEMS FROM OLTENIA

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Cuvinte cheie: apă, NO<sub>3</sub>, NO<sub>2</sub>, CMA  
Key words: water, NO<sub>3</sub>, NO<sub>2</sub>, MAC

## ABSTRACT

*Contaminarea solului și apelor determină poluarea lanțurilor trofice, respectiv o poluare insidioasă a produselor legumicole care, pe măsură ce consumul repetat aduce noi doze de noxe în timp, privește în mod direct sănătatea prezentă și viitoare a oamenilor.*

*Cercetările întreprinse permit estimarea conținutului în nitrați și nitriți din pânza de apă freatică din ecosisteme legumicole situate în zona de S-V a României. Pentru studiu s-au recoltat probe de apă atât din intravilanul, cât și din extravilanul a șase comune cu tradiție în cultura legumelor: Izbiceni, Moțăței, Teasc, Tâmburești, Ișalnița și Banu Mărăcine, acestea fiind amplasate pe diferite tipuri de soluri (molisol, luvisol și psamosol). În localitățile monitorizate se aplică tehnologiile legumicole convenționale.*

*La Ișalnița, Moțăței, Izbiceni și Teasc s-a constatat o încărcare suplimentară a apei freactice cu nitrați. Astfel, conținutul de NO<sub>3</sub>, exprimat în mg/l apă, a fost de 213, 202, 209 și respectiv 161 mg/l NO<sub>3</sub>, depășindu-se cu mult limita maximă admisă (50 mg NO<sub>3</sub>/l). În ce privește nitriții, în toate localitățile monitorizate nu s-au înregistrat valori ce depășesc LMA.*

*Soil and water contamination determines the trophic pollution respectively an insidious pollution of the vegetable products which consumed repeatedly brings new doses of noxa in time and determines directly actual and future people health.*

*The researches made until now allow to estimate the content in nitrates and nitrites of the water which ensure the irrigation source of some vegetable ecosystems from the south-west of Romania. Samples of water both from intra- and extra-territory of six counties with tradition in vegetables crop: Izbiceni, Motatei, Teasc, Tamburesti, Isalnita and Banu Maracine were taken for the study. The monitories counties are placed on different types of soil (mol sol, luvisol and psamosol) where the conventional vegetable technologies predominate.*

*In Isalnita, Motatei, Izbiceni and Teasc it was established a supplementary charge of water with nitrates. So, NO<sub>3</sub> content, expressed in mg/l water, was of 237.5, 235.0, 217.5 and respectively 135.0 outrunning the maximum admitted limit (50 mg NO<sub>3</sub>/l). As concerning the nitrites content, in all monitories counties values which outrun the maximum admitted limit were not registered.*

## INTRODUCTION

In Romania the intensive practice of the vegetable crop in some areas led to a deterioration of the quality of the water sources, by pollution with noxa resulting from the agriculture. This contamination is due mainly to the application of uncontrolled dozes of chemical fertilizers, especially based on nitrogen, which has a toxic effect on the eutrophization of the waters and the over accumulation in plants which go beyond the safety limits. In rural areas, most of the drinkable water is represented by the fountains.

So, the nitrites and the nitrates present important toxicological implications, which reside in the cumulative effect that they have on the human and the animal body and on the possible formation of the cancerous nitrosamines. Therefore, it is absolutely obligatory the application of some appropriate technologies to an agricultural system which can

optimize the production in order to avoid the contamination of the environment with nitrates and nitrites.

## MATERIAL AND METHODS

The continuous control of the level of nitrates and nitrites from the underground water is a necessity in the rural and agricultural counties where the drinking water and the water which comes from irrigation represents often the water in small depth.

The researches were led between 2007 - 2008 and had as a goal the monitoring of the content in nitrates and nitrites of the water in small depth as part so some legumicol systems in Oltenia. In these areas the conventional technologies are practiced, the fertilizers based on nitrogen, phosphorus and potassium, as well as manure are applied in different doses. On establishing the monitorized localities, it was kept in mind the placing of these ones on different groups of soils, known that the levigation of the nitrates in fertilizers is determined also by the type of soil:

- cernisoils have a well formed argilo-humic complex and a high capacity of retaining nitrates; localities - Izbiceni and Motatei;
- luvisols present a high content of argil, a well formed argilo-humic complex, with the capacity of retaining nitrates into the soil: locality - Islamite;
- psamosols, with light, sandy soils, which have an clay-humus complex very poorly formed and a low capacity of retaining nitrates: localities - Tamburesti and Teasc.

The water samples were taken from the intravilan as well as from the extravilan of the mentioned areas.

Determining the  $\text{NO}_3$  and the  $\text{NO}_2$  from the water were performed with a refract meter, RQ Flex plus model. The direction of nitrates implies a maximal value of 50 ppm of the concentration of the nitrates of small level water and of 0.5 ppm nitrites.

## RESULTS AND DISCUSSION

The accumulation of nitrates and nitrites in the water can be found under the incidence of some factors as the soil conditions, climate, vegetation, applicated agrotechics, the existence of some aotechnical complex, etc.

The results concerning the level of the accumulation of the nitrites in the small level water, emphasizes a wide interval of variation.

In 2007, the situation is presented as following:

the small depth water from the intravilan of the localities Izbiceni, Isalnita, Motatei si Teasc presents a content of 201, 193, 179  $\text{NO}_3$  and respectively 179 mg per liter, values which overpass from three to four times the maximal concentration allowed for the potable water, from 50 mg  $\text{NO}_3$  per liter.

- in the localities of Banu Maracine and Tamburesti, the values of the nitrates from the intravilan are situated under CMA, as being of 29 mg  $\text{NO}_3$  /l and respectively of 48 mg  $\text{NO}_3$  /l of water;

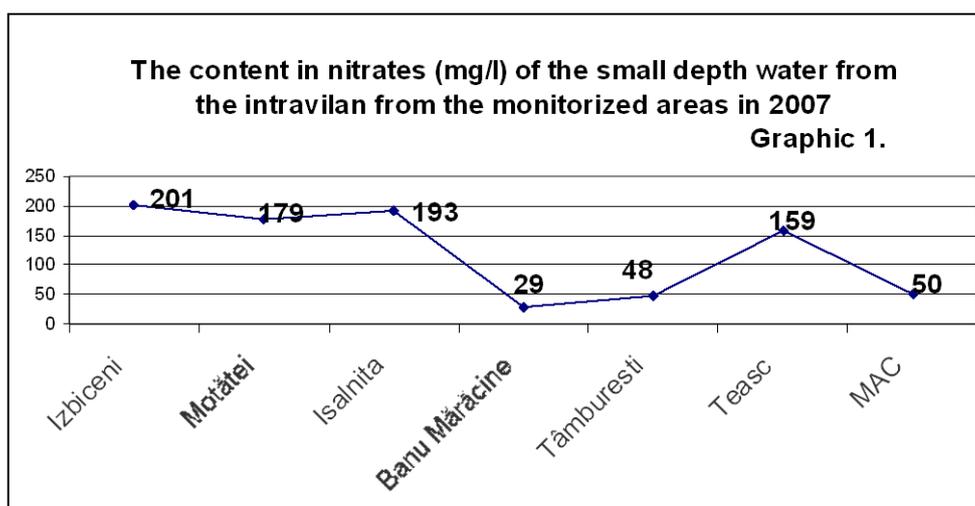
As referred to the nitrites, in all the monitorized localities, the maximal accumulations were of 0.01 – 0.07 mg/l, subscribed under the permitted concentration of 0.5 mg/l.

As for the small depth water from the extravilan, the nitrites are also situated over the permitted concentration, in most of the areas an amplitude of the variation of 91 mg/l – 137 mg/l  $\text{NO}_3$  being registered. The nitrites are to be found in neglectable quantities under MAC (Table 1., Graphic 1.).

**Table 1.**

The content in nitrates and nitrites of the small depth water from the intravilan and the extravilan from the monitorized areas in 2007

Counties	Water from the intravilan		Water from the extravilan	
	NO <sub>3</sub>	NO <sub>2</sub>	NO <sub>3</sub>	NO <sub>2</sub>
	(mg/l)			
Izbiceni	201	0.05	135	0.1
Motăței	179	0.02	129	0.09
Ișalnița	193	0.07	137	0.1
Banu Mărăciine	29	Urme	29	Urme
Tâmburești	48	Urme	91	Urme
Teasc	159	0.01	123	Urme
CMA	50	0.5	50	0.5



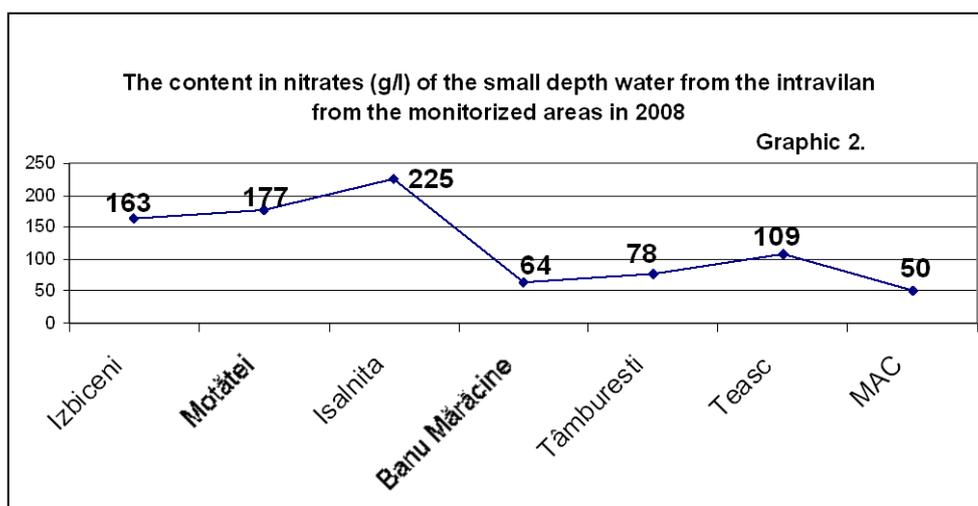
From the collected data in 2008 it can be generally observed that the level of the nitrates from the small depth water overruns the values registered in 2007:

- the water from the intravilan, from the localities Izbiceni, Motatei and Ișalnița contains over 225 mg NO<sub>3</sub>/l;
- also in the other locations the level of the accumulation of nitrates, of 64-164 mg/l is situated over the MAC.
- The content in nitrites of 64 -164 mg/l doesn't overcome the MAC (0.5 mg/l);
- in the extravilan, the differences between the areas are also very high, values of 64 mg NO<sub>3</sub>/l (Banu Mărăciine) from 225 mg NO<sub>3</sub>/l (Ișalnița) being registered. The content of 0.04 – 0.10 mg NO<sub>2</sub>/l of water is inferior to the maximal permitted concentration (Table 2.. Graphic 2.).

**Table 2.**

The content in nitrates and nitrites of the small depth water from the intravilan and the extravilan from the monitorized areas in 2008

Localities	Water from the intravilan		Water from the extravilan	
	NO <sub>3</sub>	NO <sub>2</sub>	NO <sub>3</sub>	NO <sub>2</sub>
	(mg/l)			
Izbiceni	>225	0.04	163	0.07
Moțăței	>225	0.06	177	0.08
Ișalnița	>225	0.07	>225	0.10
Banu Mărăciine	64	0.05	64	0.05
Tâmburești	97	0.04	78	0.06
Teasc	164	0.04	109	0.04
CMA	50	0.5	50	0.5



## CONCLUSIONS

On the base of the results concerning the accumulation of the nitrates and the nitrites in the small depth waters from some legumicol areas in Oltenia, the following conclusions are outlined:

- the content of the small depth water in nitrates from the intravilan of the localities Izbiceni, Motatei and Isalnita overcomes from three to four times the admitted maximal concentration being in 2007 of 201, 179 and respectively of 193 mg/l, and in 2008 of over 225 mg/l;

- in the other monitorized localities, although the level of nitrates is lower, being of 29 – 159 mg/l in 2007 and of 64-164 mg/l in 2008, the maximal limit is overruled.

- the accumulation of the nitrites in the small depth water is of 0.04 – 0.10 mg, values that are situated under the maximal permitted concentration.

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# REASERCHES CONCERNING THE UTILISATION OF GREEN MANURE AND OF HUSKS OF GRAPES COMPOST IN ORGANIC ONION CROP

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**Cuvinte cheie:** compost, îngrășământ verde, ceapă  
**Key words:** onion, compost, green fertilizer

## **ABSTRACT**

*În demersul de ecologizare a fermelor legumicole, o măsură prioritară se referă la conversia sistemului tehnologic convențional la cel de tip organic, având drept bază structuri și modele de cultivare ecologice, formate din secvențe viabile și adecvate pentru diferitele zone geografice, în vederea obținerii de produse legumicole cu valoare adăugată mare. În acest sens, la S.D.Banu Mărăcine a Universității din Craiova, pe un teren după trei ani de conversie, s-a luat în studiu un model experimental, încadrat în procesul de ecologizare, prin fertilizarea culturii de ceapă cu îngrășământ verde (soia+ridichi furajere) ca agrofond (V1-martor) la care s-a adăugat compostul de tescovină, 15 t/ha (V2) și 25 t/ha (V3). Producția de ceapă s-a situat între limitele de 34,7 t/ha (V1-martor) și 37,9 t/ha (V2). Aplicarea dozelor sporite de îngrășămintă organice nu a determinat acumularea de nitrați în bulbii de ceapă.*

*In the demarche of organic vegetables technology, one priority measure referees on conversion of the conventional technologic system on the organic one, having as base structures and models of ecological cultivars, formed from viable adequate sequences for different geographical areas, with the purpose of obtaining vegetable products with high added value. In this way, at S.D. Banu Mărăcine University of Craiova, on a land after 3 years of conversion, it was studied an experimental model for the ecological process, by fertilization the onion crop with green fertilizer (soy bean and fodder radish) as fertilizers bases of the soil and husks of grapes compost, 15 t/ha (V<sub>2</sub>) și 25 t/ha (V<sub>3</sub>). The onion yield has situated between 34,7 t/ha (V<sub>1</sub>-the control) și 37,9 t/ha (V<sub>2</sub>). The increased organic fertilizer dose have not determined the nitrates accumulation in the onion bulbs.*

## **INTRODUCTION**

Generally, in order to protect the environment and especially the ecosystems, it is recommended inside of the vegetable crops, the applying of ecological fertilizers such as green fertilizers and composts.

The green fertilizers represent a source of soil enrichment in humus and fertilizer substances, having a positive effect on the physical and chemical features of the soil, on plugging and cationic interchange capacity of the soil and attenuate the effects of some toxic and pollutions factors (Rusu., M. & colab., 2005).

The composts that come from the controlled decomposition of some vegetal materials can have a superior fertilizer action compare with other organic fertilizers, having also an antibiotic effect on some bacteria, fungi, viruses, etc.

In a study with organic fertilizers (manure and compost resulted from vegetal home waist) applied on a sandy soil in north Germany, there were identified high quantity of mineral salts in the soil, and also an increasing of the C vitamin content from vegetable provides from the compost. Also, there has been recorded an opposite action against the soil insects, especially on the nematode population, the effect being much stronger compare with the one from pesticide. This study shows that during the composting process are destroyed all the infection sources: fungus, bacteria and viruses (Fuchs si colab., 2004).

Excepting the interest regarding the trophic aspect, the compost become more and more important, contributing to the decreasing of the pollution level on the fields polluted with animal, home and industrial waste and also of the soil and underground and surface water with nitrates, nitrites, phosphorus, heavy metals, etc.

## MATERIALS AND METHOD

The researches made at Banu-Maracine D.S. of Craiova University, had as purpose to establish the green fertilizers and compost influences on some agrochemical features of the soil and also on the onion yield organically cropped, concerning the quality and quantity aspects.

The green fertilizers, formed from fodder radish and soybean represented the fertilizers bases of the soil, being sowed with one year before the onion crop cultivation. The fresh vegetal materials (25 t/ha) was incorporated in the autumn, once with the soils mechanical works.

The husks of grapes, a secondary product obtained from the grapes processing, it is mineralized by composting and become a green fertilizer, ensuring the waste recycle. In table 1, are shown, by comparing, the agricultural features of the husks of grapes compost and of the mineralized manure. It is to remember that, excepting the high content in nutrient elements, the husks of grapes compost it's not infested with harmful organism (weed seeds, pathogens, etc.), in this manner being eliminated the disinfection works, absolutely incumbent for the mineralized manure.

Table 1.

The agrochemical features of the husks of grapes compost and of the mineralized manure

The product	pH	CaCO <sub>3</sub> (%)	N total (%)	P total (%)	Pmobil (ppm)	Ktotal (%)	Kmobil (ppm)	M.O. (%)	Humus (%)
Husks of grapes	7.6	0.2	1.90	0.83	3630	0.93	7720	67.75	31.56
Mineralized manure	8.5	0.5	1.48	1.31	5710	0.77	6380	59.04	32.80

The experimental model, replaced on a field after three years of reconversion, was composed by three variants, replaced in randomized blocks, in three repetitions, the area of a variant-repetition being of 10 m<sup>2</sup>, with a number of 500 plants/variant-repetition. There were used the Stuttgart chive onion variety.

- V1 – fertilizers bases of the soil (control);
- V2 – fertilizers bases of the soil + 15 t compost/ha;
- V3 – fertilizers bases of the soil + 25 t compost/ha.

Inside of the experience, there was applied the specifically chive onion crop technology:

- in the spring, on the preparation of the germinate soil bed, was applied husk of grapes compost, according to each experimental variant;
- the onion chive planting was effectuated in the second part of march;
- the planting scheme: 4 rows on a furrow with 104 cm and with 28 cm between the rows and 6 cm between plants on a row;
- the maintenance works:
  - manual weeding for the soil loosen, the soil crust and weeds destruction;
  - peanuts husks mulch applied between rows;
  - furrow irrigation;
  - fertilization on phases with decomposed cow droppings, as solution dissolved in water in 1:5 concentration and with 1% Cropmax foliage fertilizer;
  - the pest and bugs control by specifically treatments of preventing, with organic certificated products for the pathogen control: 0,5-1% copper sulphate, Kocide, Champion and for the bugs control were used 2% aluminum sulphate and wormwood extract.

In order to achieve the proposed aimed, were effectuated recordings, determinations and analysis to establish the main agrochemical features of the soil: humus, total nitrogen, mobile Phosphorus, mobile Potassium, pH, nitrates and nitrites.

- it has been determined the onion yield and also its quality concerning the TDS, SDS, sugar, vitamins, nitrates and nitrites.

The agrochemicals features of the soil were monitorised after the husks of grapes compost applying on the fertilizers bases of the soil composed from soybean and fodder radish and after the onion crop ending.

The date regarding the onion yiled efficacy were statistically processed, after the Fisher test method.

## RESULTS AND DISCUSSION

In order to monitories the main agrochemical features of the soil, in the spring, before the onion crop sowing and also after the harvesting, were taken for analysis sample soil from the experimental fields: V<sub>1</sub>-fertilizer bases of the soil (green fertilizer); V<sub>2</sub>- fertilizer bases of the soil+15t/ha compost and V<sub>3</sub>- fertilizer bases of the soil + 25 t/ha husks of grapes compost (Table 2).

On 25.03.2008, after autumn incorporation of the fertilizer and in the spring after the husks of grapes incorporation, the soil showed the next agrochemical features: humus reserve has been between 3.02 % (V<sub>1</sub>) and 3.60 % (V<sub>3</sub>), of total nitrogen between 0.218 % (V<sub>1</sub>) – 0.230 % (V<sub>3</sub>), of nitrates between 251 ppm (V<sub>1</sub>) - 307 ppm (V<sub>3</sub>), of mobile P between 282 ppm (V<sub>1</sub>) - 355 ppm (V<sub>2</sub>) and of mobile K between 285 ppm (V<sub>3</sub>) - 297 ppm (V<sub>1</sub>).

After ending the onion crop on 24.09.2008, the nutritive supplies reserve from the soil, is situated in close parameters compare with the determinations from 25.03.2008: 3.11-3.56 % humus, 0.168- 0.252 % total nitrogen, 194 -291 ppm nitrates, 293-323 ppm mobile P and 231-416 ppm mobile K.

This date shows the fact that by applying the green fertilizer and the husks of grapes compost, the soil nutritive elements supplies have maintained from the middle level to the high level and after onion cropping.

In the specifically conditions of the 2008, with high temperature and with an ununiform fall level during the vegetation period, the chive onion yield efficacy, cropped in organic conditions, with no treatments based on syntesis chemical products and exclusiv organic fertilization, can be considered positive on all three varaints.

Thus, by fertilising with green fertilizers, the onion yield was by 34.7 t/ha (control) and on the varaints where was applied husks of grapes compost the yield was by 37.9 t/ha on V<sub>2</sub> (15 t/ha) by 37.1 t/ha on V<sub>3</sub> (25 t/ha) (Table 3.).

Table 2.

The agrochemical features monitoring of the soil - 2008

The variant	The period	Humus (%)	pH	Nitrogen		P mobile	K mobile
				Total	NO <sub>3</sub>		
				(%)	ppm		
V <sub>1</sub>	25.03.2008	3.02*	7.43	0.218*	251	282*	297**
	24.09.2008	3.11*	7.36	0.168*	194	307*	318**
V <sub>2</sub>	25.03.2008	3.37*	7.40	0.224*	273	355*	296**
	24.09.2008	3.29*	7.26	0.172*	212	293*	231*
V <sub>3</sub>	25.03.2008	3.60*	7.58	0.230*	307	287*	285**
	24.09.2008	3.56*	7.61	0.252**	291	323*	416***

The soil fertilizer supply for the vegetable crops (ICPA 1981): Humus: \*-middle. N total: \*-middle; \*\*- normal. Phosphorus mobile: \*- very high. Potassium mobile: \*-middle; \*\*-high; \*\*\*-very high.

It can be seen that, the variants fertilized with husks of grapes compost have surpassed the control with 2.4 – 3.2 t/ha, respectively 6.91 – 9.22 %.

The dose of 15 t/ha of husks of grapes compost (V<sub>2</sub>), have determined the highest level of onion yield, of 37.9 t/ha, the control being surpassed positive meaningful with 3.22 t/ha (9.22 %).

Table 3.

**The organic fertilization influence on the onion yield - 2008**

The variant	Total yield (t/ha)	The relative yield (%)	The difference (± t/ha)	The signification
V <sub>1</sub> (agrofond)-Mt.	34.7	100.00	-	-
V <sub>2</sub> (A+15 t/ha)	37.9	109.22	+3.2	*
V <sub>3</sub> (A+25 t/ha)	37.1	106.91	+2.4	-

LD 5% = 2.89 t/ha                      LD 1% = 4.78 t/ha                      LD 0.1% = 8.95 t/ha

Regarding the chemical composition of the onion bulbs, obtained in the organic conditions, the main nutrient components are situated between optimum parameters for this specie: the TDS is situated between 12.78-14.04 %, the SDS content between 11.85-12.92 %, the sugar content between 11.72-12.39 % and in C vitamin between 18.43-21.53 mg/100g f.s.

Concerning the nitrates from bulbs, there were not identified nitrates to none of the variants (the maximum accepted concentration for onion bulbs is by 150 ppm) (Table 4).

Table 4.

**The biochemical composition of the onion bulbs obtained in the organic cropping conditions**

The variant	TDS	SDS	Sugar	C Vitamin (mg/100 g s.p.)	NO <sub>3</sub> <sup>-</sup> (ppm)
	(% s.p.)				
V <sub>1</sub> (fertilizers bases of the soil)-The control	14.04	12.71	12.02	21.53	-
V <sub>2</sub> (fertilizers bases of the soil +15 t/ha)	12.78	11.85	11.72	21.04	-
V <sub>3</sub> (fertilizers bases of the soil +25 t/ha)	13.53	12.92	12.39	18.43	-

\*-CMA NO<sub>3</sub><sup>-</sup> 150 ppm (V. Lăcătuș, 1997).

## CONCLUSIONS

From the results of the researches regarding the influence of the green fertilizer (soybean+fodder radish) and of the husks of grapes compost on the agrochemical features of the soil and on the onion quantity and quality yield, it can be concluded:

1. the green fertilizer applied alone or together with the husks of grapes compost improves the soil fertility, the humus content being of 3,02-3,60%, in total nitrogen of 0.168 – 0.252%, in mobile P of 282 – 355 ppm and in total K of 231 – 416 ppm.
2. the chive onion yield obtained from organic cropping system has been situated between 34.7-37.9 t/ha;
3. the 15 t/ha compost dose determines yield increasing, surpassing meaningful the control with 9.22 %;
4. the biochmic content of the onion bulb are situated in superior qualitative parameters 12.78-14.04 % TDS, 11.85-12.92 % SDS, 11.72-12.39 % sugar și 18.43-21.53 mg/100g f.s. C vitamin;
5. in the onion bulbs obtained in organic cropping conditons, the nitrates have not been identified.

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# THE SPECTRUM OF THE BENEFICIAL ENTOMOFAUNA FROM THE VITICULTURAL ECOSYSTEM S.D. BANU MĂRĂCINE CRAIOVA

## SPECTRUL ENTOMOFAUNEI UTILE DIN ECOSISTEMUL VITICOL S.D. BANU MĂRĂCINE CRAIOVA

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**Key words:** beneficial entomofauna, parasites, predators

### ABSTRACT

*Biocenoza viticolă este mai simplă decât biocenoza naturală (pajiș te, pădure, etc.) și prezintă o stabilitate și o complexitate mai redusă.*

*Intervenția profundă a omului în agroecosistemele viticole a condus la dezechilibre puternice, în special aplicarea pesticidelor este unul dintre cei mai importanți factori care afectează biodiversitatea, pesticidele reprezentând substanțe de sinteză chimică complexă, toxice sau foarte toxice, străine agroecosistemelor.*

*Pentru a contracara aceste efecte negative, trebuie să cunoaștem entomofauna utilă (paraziți și pradatori), trebuie de asemenea să protejăm și eventual să ajutăm prin acțiunile noastre la conservarea și dezvoltarea acesteia.*

*Entomofauna utilă (paraziți și prădători) a fost reprezentată de 14 specii încadrate sistematic în patru ordine.*

*Cel mai numeros ordin a fost ord. **Coleoptera** cu 7 specii, urmat de ord. **Hymenoptera** cu 4 specii și ord. **Neuroptera** cu 2 specii, iar din ord. **Diptera** a fost identificată o singură specie.*

*The viticultural biocoenosis is simpler than the natural biocoenosis (meadow, forest, etc.) and presents a reduced stability and complexity.*

*The profound intervention of the human in the viticultural ecosystems has led to powerful disequilibrium, especially the pesticides applying it is one of the main factors which affect the biodiversity, the pesticides being synthesis chemical substances, toxic or very toxic, from outside of the agricultural ecosystems.*

*In order to counterbalance these negative effects, we have to know the beneficial entomofauna (parasites and predators), we have also to protect and eventually to help through our actions its preservation and development.*

*The beneficial entomofauna (parasites and predators) has been represented by 14 species systematically framed in four orders.*

*The most numerous order has been **Coleoptera** with 7 species, followed by **Hymenoptera** with 4 species and **Neuroptera** with 2 species, and from the **Diptera** order has been identified a single species.*

### INTRODUCTION

The main primary producer existing in the viticultural biocoenosis is the vine, often represented by the bio-system graft/stock. Besides the vine, there are other primary producers represented by different herbal species (weeds), which usually make the object of some controlling measures. The monocotyledonated weeds as well as the dicotyledonated weeds, perennial or annual represent host plants for a series of damaging secondary species (*Anomala* spp., *Melolontha melolontha*, *Polyphylla fullo*), species with damaging potential (*Ephippiger ephippiger*) and migratory species (*Docostaurus maroccanus*, *Gryllus* spp., *Eurydema* spp., *Graphosoma lineatum*, *Opatrum sabulosum*, *Agriotes* spp.).

*Bothynoderes punctiventris*). Also, the weeds from the vineyard ensure shelter and conditions for laying eggs and the development of new generations of predators (beneficial entomofauna: *Calosoma* spp., *Carabus* spp., *Adalia* spp., *Coccinella* spp., *Trichogramma* spp.) of the vine damaging species.

From the consumers presents in the viticultural biocoenosis, the ones from the first order are the best represented. They are represented by the phytopathogen agents and pests. The consumers from the second order within the viticultural biocoenosis has a reduce representation, more numerous being the micro-organisms species (the reducers) which ensure the decomposing of the organical matter from the vegetal and animal organisms.

The profound intervention of the human in the viticultural ecosystems has led to powerful disequilibrium, especially the pesticides applying it is one of the main factors which affect the biodiversity, the pesticides being synthesis chemical substances, toxic or very toxic, from outside of the agricultural ecosystems (Mirică I., Mirică Afrodita 1986).

The targeted organisms (damaging organisms) receive a very small quantity of pesticide, which represent in fact the most important quantity for controlling, the rest go into the soil and on other elements of the agricultural ecosystem (the beneficial entomofauna).

Thus, the pesticides generate important dangers regarding the environment pollution (water, air, soil) and crop, but also the appearance of the resistant phenomem of the pests toward some phytosanitary products (Simeria Gh. 2002).

In order to counterbalance these negative effects, we have to know the beneficial entomofauna (parasites and predators), we have also to protect and eventually to help through our actions it presevation and development (Simeria Gh. 2003).

## MATERIAL AND METHODS

In order to establish the beneficial entomofauna from the vineyard of the S.D. Banu Mărăcine, during the research period (2007-2008), there has been made collecting of the entomological material using different means and methods: collecting with the entomological net, tests in the soil or on the soil surface (on the interval between the rows), lightning traps, coloured traps, visual control, analyzing the sample with magnifying glass, microscope in the field or laboratory (fig.1, fig. 2).

The collecting has been made in different vegetation phase of the vine.

The collected species has been analyzed and identificated according to the determinators published in the Romanian Fauna (Panin L. 1951) and European Fauna (Chinery M.1998).



**Fig.1 Trap at the soil surface**



**Fig. 2 Yellow trap**

## RESULTS AND DISCUSSIONS

The beneficial entomofauna (parasites and predators) has been represented by 14 species systematically framed in 4 orders (table nr. 1).

The most numerous order has been **Coleoptera** with 7 species (*Adalia decimpunctata*, *Adalia bipunctata*, *Coccinella 7 punctata*, *Carabus ulrichi*, *Carabus violaceus*, *Carabus cancelatus*, *Calosoma sycophanta*) (fig.3), followed by **Hymenoptera** with 4 species (*Trichogrammaspp.* (*T. dendrolimi*, *T. evanescens*, *T. minutum*), *Scolia flavifrons*) (fig. 4) and **Neuroptera** with 2 species (*Chrysopa spp.*, *Hemerobius spp.*) (fig 5).

From the **Diptera** order has been identified the species *Syrphus ribesii* (fig. 6).

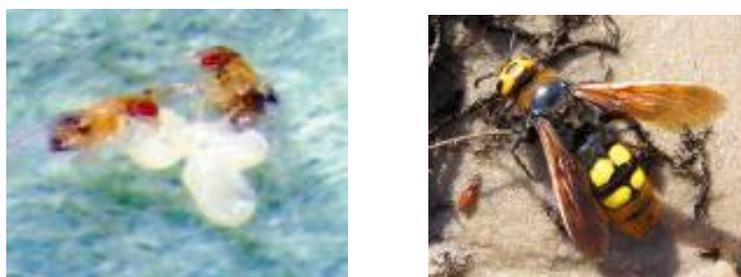
**Table nr. 1**

**The structure of tyhe beneficial entomofauna from the viticultural ecosystem  
S.D. Banu Mărăcine**

Nr.	Order	Nr. of beneficial species
1	<b>Hymenoptera</b>	4
2	<b>Neuroptera</b>	2
3	<b>Coleoptera</b>	7
4	<b>Diptera</b>	1
	<b>TOTAL</b>	14



**Fig. 3** *Adalia bipunctata*, *Coccinella 7 punctata*, *Calpsoma sycophanta*, *Carabus violaceus*



**Fig. 4** *Trichogramma spp.*, *Scolia flavifrons*



**Fig. 5** *Chrysopa spp.* *Hemerobius spp.* **Fig. 6** *Syrphus ribesii*

The role and the evolution of the zoophagus from the vine plantation during the vegetation period are presented in the table 2.

Table nr.2

## The zoophagus from the vine plantation and their evolution during the vegetation period

The group of the pests	Zoophagus (ord.)	Month						
		III	IV	V	VI	VII	VIII	IX
Acarians, wooly scale, cycads	Diptera	■	■	■	■	■	■	■
	Neuroptera	■	■	■	■	■	■	■
	Hymenoptera	■	■	■	■	■	■	■
	Coleoptera	■	■	■	■	■	■	■
Moth eggs, first instar larva, moth	Diptera	■	■	■	■	■	■	■
	Neuroptera	■	■	■	■	■	■	■
	Hymenoptera	■	■	■	■	■	■	■
	Coleoptera	■	■	■	■	■	■	■
Beetle, cockchafer, locusts	Diptera	■	■	■	■	■	■	■
	Neuroptera	■	■	■	■	■	■	■
	Hymenoptera	■	■	■	■	■	■	■
	Coleoptera	■	■	■	■	■	■	■

■ Present low activity (nule)    ■ Present- medium activity    ■ Present- intense activity

### CONCLUSIONS

The beneficial entomofauna (parasites and predators) has been represented by 14 species systematically framed in four orders.

The most numerous order has been **Coleoptera** with 7 species, followed by **Hymenoptera** with 4 species and **Neuroptera** with 2 species, and from the **Diptera** order has been identified a single species.

The fungicides used for control the phytopathogen agents had a different efficient action on the pathogens, but the great majority are not selective for the beneficial entomofauna. The acaricides, insecticides used for controlling the pests are not selective for the beneficial entomofauna (parasites and predators), thus we recomend their using only a advertising.

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# THE PROPAGATION OF 5 GYMNOSPERM SPECIES AT THE BOTANICAL GARDEN „AL. BUIA” CRAIOVA

## ÎNMULȚIREA A 5 SPECII DE GIMNOSPERME LA GRĂDINA BOTANICĂ „AL. BUIA” CRAIOVA

*Stan I., Stan C.*

**Key words:** Gymnosperme, propagation, cuttings

### ABSTRACT

Gimnospermele sunt arbori și arbuști, mai rar plante ierboase, cu frunze aciculare, solzoase sau scvamiforme cu flori masculine și femele (unisexuate) constituite în conuri care formează semințe prin fecundarea ovulului de către polenul anemofil (transportat de vânt), iar semințele sunt libere deoarece coniferele nu formează fructe adevărate. Pentru că formează păduri pe suprafețe întinse, gimnospermele au o mare importanță ecologică (influențează clima, umiditatea, calitatea aerului) sunt folosite atât pentru diferite forme ornamentale dar și pentru calitatea lemnului folosit în industria de construcții, la fabricarea mobilei și a instrumentelor muzicale. De asemenea sunt folosite și în industria farmaceutică și anume din rășină se obțin: tusul, negru de fum, terebentina, sacâzul, vâscoza, spirit, celuloză și altele. Gimnospermele au stat la baza formării rezervelor de cărbuni superiori.

The Gymnosperme are trees or shrubs, rarely herabceous plants, with aciccular leaves, scaled or squamiform, with male and female flowers (unisexuate) constitute in cones which form seeds through the ovul fecondation by the anemophyle pollen, and the seeds are free because the coniferes does not form real fruits. Because the Gymnosperme form forests on large area, they have a great ecological importance (influencing the climate, humidity and air quality) they are used for different ornamental varieties as well for the wood quality used in construction, furniture and musical instruments. Also they are used in the pharmaceutical industry and from the resine can be obtained: turpentine, resin, terebentine, spirits, cellulose and others. The gymnopserme constitute the base for the superior coal reserve.

### INTRODUCTION

During 2007-2008 at the Botanical Garden „Al. Buia” from Craiova, there hasa been studied 5 gymnosperme species, apreciated as jewellery of the landscape architecture. For these species there will be made a series of observation and will be analyzed their aptitude for vegetative.

The Gymnopserme species are used in the pharmaceutical industry and from the resine can be obtained: turpentine, resin, terebentine, spirits, cellulose and others. Also the gymnopserme constitute the base for the superior coal reserve.

### MATERIAL AND METHODS

The research has been made during 2007-2008 at the Botanical Garden „Al. Buia” from Craiova, and focused on the rooting percentage of five gymnosperme species, belonging to 3 families of the Coniferales.

The cuttings has been collectedd from mature plants free of pests and diseases or without any visible carency in nutrients. These cuttings has been removed from the mother

plants with some pruning scissors. There has been made 45 cuttings for each species, 15-20 cm length and has been placed in a heat rooting substrate. During the rooting period the watering of the cuttings has been made very carefully. The recorded temperature in the greenhouse during this period, has been oscilated between 18-22<sup>0</sup>C.

The research has been made from October 2007 following the rooting percentage untill the spring of 2008, when the rooted cuttings has been prepared for their plantation in the nursery.

## RESULTS AND DISCUSSIONS

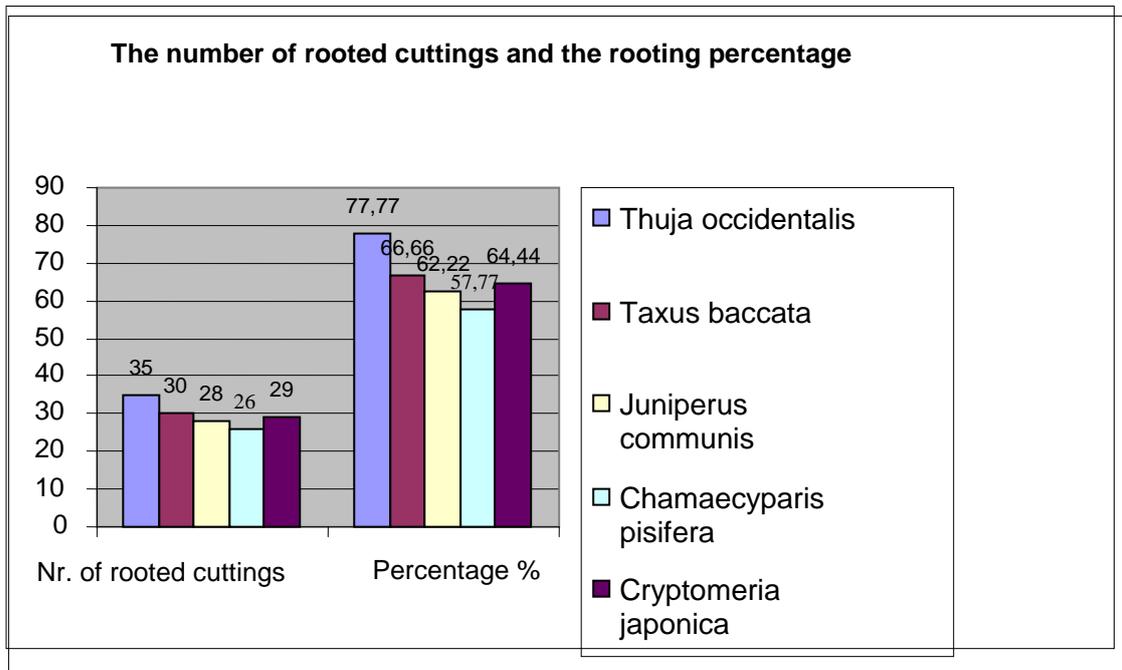
During the research period there has been followed the rooting percentage of the 5 coniferes species take it into study (tab. 1, fig. 1), knowing their important role in the modern landscape architecture, due to apperance and the persistence of the leaves.

Species	Thuja occidentalis	Taxus baccata	Juniperus communis	Chamaecyparis pisifera	Cryptomeria japonica
Nr. cuttings	45	45	45	45	45
Period	October 2007	October 2007	October 2007	October 2007	October 2007
Nr. rooted cuttings	35	30	28	26	29
Percentage %	77,77	66,66	62,22	57,77	64,44



Fig. 1 The cuttings of the 5 species on the heated rooting substrate

From the species take it into study the highest rooting percentage has been recorded for Thuja occidentalis with a 77% (with a number of 35 rooted cuttings from the total of 45), and the lowest rooting percentage has been recorded for Chamaecyparis pisifera with a percentage of 57,77% (with a number of 26 cuttings from the total of 45) (graph. 1).



Graphic 1 The number of rooted cuttings and the rooting percentage

The species *Taxus baccata*, *Juniperus communis* and *Cryptomeria japonica* had a rooting percentage lower than the 2 species mentioned previously: the cuttings of *Taxus baccata* has rooted in a percentage of 66,66%, the cuttings of *Cryptomeria japonica* has rooted in a percentage of 64,44%, and the cuttings of *Juniperus communis* has rooted in a percentage of 62,22%.



Fig. 2 Rooted cutting of *Chamaecyparis pisifera*

## CONCLUSIONS

In this paper we studied the rooting percentage of 5 gymnosperme species, on heated substrate;

There has been recorded a higher rooting percentage due to the heated substrate;

The best result has been recorded for the cuttings of the species of *Thuja occidentalis* with a percentage of 77,77%;

The lowest rooting percentage has been recorded for the cuttings of the *Chamaecyparis pisifera* species with a percentage of 57,77%.

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# STUDIUL CAPACITĂȚII DE NODULARE SI A EFICACITĂȚII UNOR TULPINI SĂLBATICE SI SELECȚIONATE DE *BRADYRHIZOBIUM LUPINII*

## STUDY OF NODULATION CAPACITY AND EFFICACY OF SOME NATIVE AND SELECTED *BRADYRHIZOBIUM LUPINII* STRAINS

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**Keywords:** *total nitrogen content, performing strains, nodulation*

### ABSTRACT

*Indiferent de sistemul cultural adoptat pentru cultura lupinului: cultură principală, succesivă, cultură intercalată, prin utilizarea de tulpini performante simbiote se asigură îmbunătățirea conținutului de azot total din sol preluat fiind din atmosferă și imobilizat în compuși organici. În prezenta lucrare facem cunoscut rezultatele studiului privind eficacitatea și capacitatea de nodulare a patru tulpini selecționate de *Bradyrhizobium lupini* comparativ cu tulpini indigene aparținând microflorei edafice. Eficiența tulpinilor a fost testată prin inocularea semințelor de *Lupinus angustifolius* cu culturi bacteriene. După 6 săptămâni de creștere a plantelor s-a determinat, lungimea tulpinii, acumularea de biomasa uscată, conținutul total de azot, numărul și volumul nodozităților formate. Tulpina Lp 78 s-a dovedit a fi genotipul cel mai eficient în ce privește acumularea de azot pe plantă, numărul și volumul nodozităților.*

*In any cultural systems for *Lupinus* sp. such as principal culture, intercropping, crop rotation, allied crops through utilization of performing symbiotic strains, the improvement of total nitrogen content in soil is assured. The present paper shows results about efficacy and nodulation capacity for four *Bradyrhizobium lupini* selected strains compared with native strains of edaphic microflora. The efficacy of the strains was tested by inoculating *Lupinus angustifolius* L. seeds with the bacterial culture. After a 6 week growing period, dry weight, total nitrogen content, number and volume of the nodules were determined. The strain LP78 is the most efficient genotype, determining the highest total nitrogen content in the plants and the greatest number and also volume of nodules per plant.*

### INTRODUCTION

The use of ecological methods, promoting sustainable technologies with low inputs represents a contemporaneous subject at an international scale (Gregory P.J., 2006, McKenzie M, 2007). Because of this reason, the adoption of alternatives in maintaining and increasing of soil fertility is a constant concern in this domain.

In agriculture, lupin is used as green manure, especially in rotation with wheat, because of the symbiosis with the nitrogen fixing bacteria which permit the accumulation of high nitrogen content in plants. No matter the type of culture system of lupin (principal, successive or intercropped culture), the use of performant rhizobial strains assures the improvement of nitrogen content in soil. Simultaneously, at the edaphic level, there appears a fixation of carbon dioxide in organic matter, reducing the greenhouse effect (Freire, J., Saccol de Sa E. L., 2006.).

## MATERIALS AND METHODS

The objective of our research was to characterize 4 genotypes of *Bradyrhizobium lupinii*, designated LP53, LP73, LP78 and LP83, from *Lupinus albus* L. plants cultivated on cambic chernozem. The efficacy of the strains was tested by inoculating *Lupinus angustifolius* L. seeds with the bacterial culture. After a 6 week growing period in temperature and light controlling condition, dry weight (drying methods), total nitrogen content (Kjeldahl method), number and volume of the nodules were determined.

## RESULTS

The efficacy of the *Bradyrhizobium* strains regarding the stem length and dry weight of the plants. Six weeks after shooting, plants from different experimental variants are in different stages of development. It could be observed that plants without bacterial inoculation are shorter, and are forming floral buds, meanwhile the inoculated plants are flowering and forming pods. Regarding the stem length of the variants, the values are 42% greater when the lupin seeds are inoculated with bacterial suspension of the strain Lp 73. The strain Lp 83 determines a growth of dry weight of 26% higher than the control.

Table 1.

Parameters Var.	Stem dry weight (%)		Stem length (cm)	
	$\bar{x} \pm s_x$	%	$\bar{x} \pm s_x$	%
native strains (control)	23.6±2.50	100	24.50±2.0	100
Lp 78	26.3±1.40	111	31.18±0.20	127
Lp 73	25.5±2.80	108	35.20±1.10	142
Lp 53	28.3±2.40	119	31.03±2.0	127
Lp 83	29.7±1.40	126	30.15±3.20	123

The efficacy of the *Bradyrhizobium* strains regarding the nitrogen content of plants. The total nitrogen content (presented percentually), indicates a higher efficacy of the strain Lp 83 regarding the nitrogen fixing capacity. The strain Lp78 had the lowest nitrogen fixing capacity.

Table 2.

Parameter Var.	Nitrogen total content %	
	$\bar{x} \pm s_x$	%
native strains (control)	4.01±0.28	100
Lp 78	3.40±0.28	84
Lp 73	4.40±0.30	109
Lp 53	5.02±0.30	125
Lp 83	5.92±0.30	148

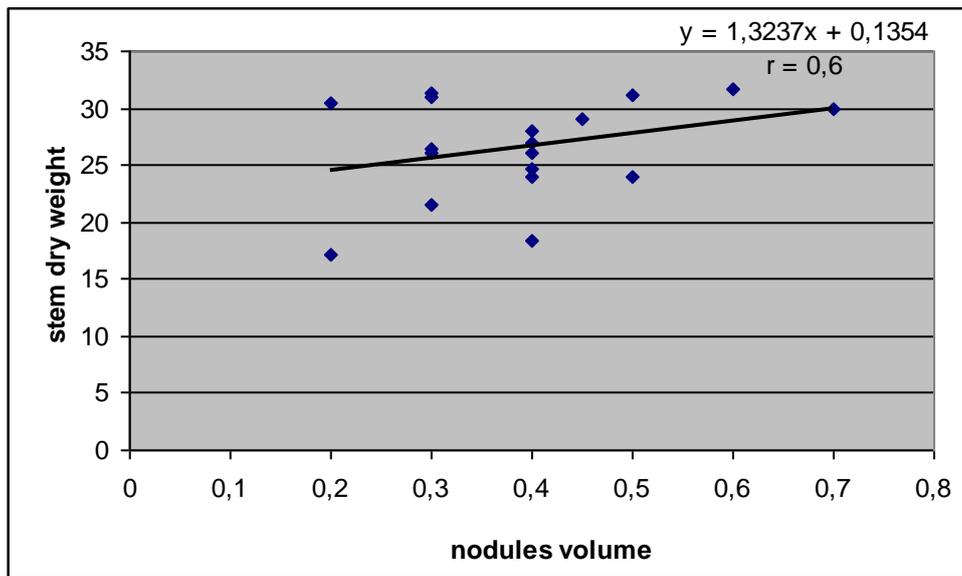
The efficacy of the *Bradyrhizobium* strains regarding the nodulation capacity. From the analysis of the obtained data (table 2.) it can be observed that the strain LP83, with the nodulation mean of 2.75 has the lowest capacity of nodulation. However, the higher volume compensates for the small number of the nodules, making an average growing of the stem length and the dry weight. (table 1)

Table 3.

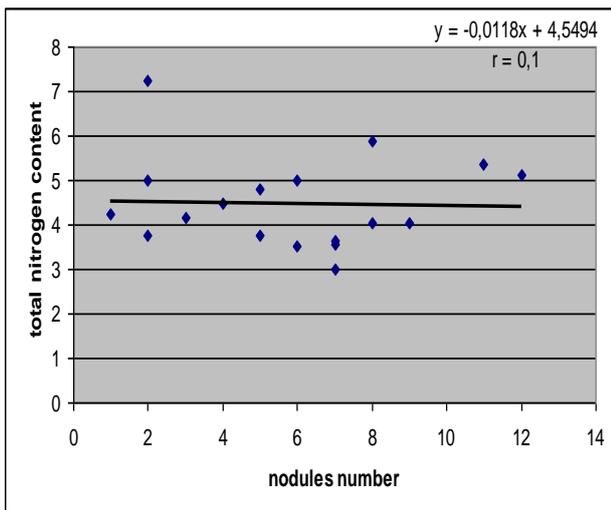
### The variation of nodulation parameters

Param. Var.	Nodules number		Nodules volume(cm <sup>3</sup> )	
	$\bar{x} \pm s_x$	%	$\bar{x} \pm s_x$	%
native strains (control)	5.25±2	100	0.35±0.1	100
Lp 78	8.25±1.1	157	0.4±0	114
Lp 73	5.5±1.2	104	0.39±0.0	111
Lp 53	6.75±0.4	129	0.45±0.1	129
Lp 83	2.75±1.9	52	0.43±0.1	123

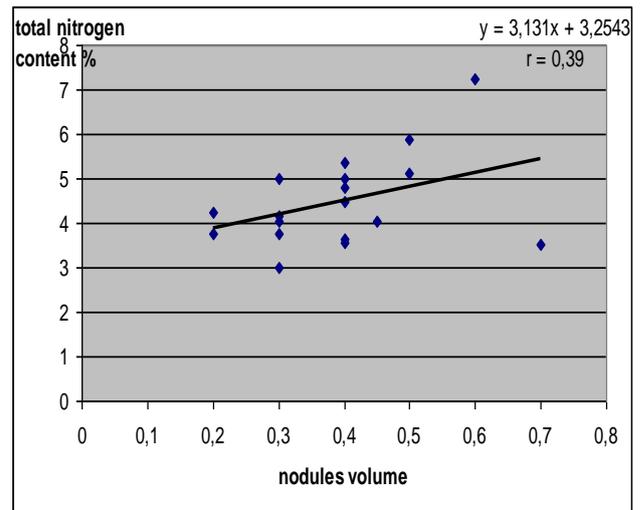
Between the volume of the nodules and the accumulation of dry weight there is a correlation (see Picture 1), meanwhile in the case of the number of the nodules and the total nitrogen content, the coefficient of the correlation had a small value (Picture 2a).



Picture 1. Correlation between volume of nodules and stem dry weigh



a.



b.

Picture 2. Correlation between nodules number (a), nodules volume (b) and total nitrogen content in plants

The negative correlation (Picture 2a.) brings us to the conclusion that the number of nodules does not represent an efficient indicator for the efficacy of bacterial strains in

nitrogen fixation. The strain LP78 leads to the highest number of nodules but lowest of total nitrogen content.

The total volume of nodules per plant is positively correlated with the total nitrogen content (Picture 2b). The high efficacy in nitrogen accumulation in plant is due to the low number of nodules, but with greater volume.

## CONCLUSIONS

- Soil natives' microflora contains populations of rizobia with a remarkable infection capacity but a low efficacy, fact proved by the reduced growing rhythm and accumulation of dry weight per plant.
- The numbers of nodules do not reflect an efficient biological nitrogen fixation.
- Greater nodules assure an efficient nitrogen fixation, determining a more vigorous growth of the plants, also with a higher dry weight and total nitrogen content.
- The strain Lp 83 assures the higher total nitrogen content in plants' tissues.
- Using efficient strains, a stimulation of the plants' development can be observed, much more accentuated than using indigenous edaphic strains.

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## **CARACTERIZAREA UNOR TULPINI PERFORMANTE DE BRADYRHIZOBIUM LUPINII ÎN CE PRIVEȘTE TOLERANȚA LA ERBICIDE ȘI CAPACITATEA COMPETIȚIONALĂ**

# CHARACTERIZATION OF *BRADYRHIZOBIUM LUPINII* GENOTYPES REGARDING TOLERANCE TO HERBICIDES AND COMPETITIVE CAPACITY

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**Keywords:** *Bradyrhizobium lupinii*, acetochlor, trifluralin, Actinomycetes

## ABSTRACT

*Rizosfera este un sistem dinamic în care interacționează simultan un număr mare de fungi, bacterii și actinomicete. Rizobiile sunt bacteriile fixatoare de azot din sol cu importanță în agricultura organică, cu posibilități în înlocuirea îngrășămintelor organice. Cercetările noastre au avut ca obiectiv caracterizarea a patru genotipuri de *Bradyrhizobium lupinii* izolate (notate LP53, LP73, LP78 și LP83 de la plante de *Lupinus albus* L. cultivate în 2007 pe cernoziom cambic. Am testat toleranța in vitro la erbicide (acetochlor și trifluralin) și rezistența la antibioticele sintetizate de actinomicetele edafice. Rezultatele au indicat o bună toleranță a tulpinilor la acetochlor și trifluralin, efectul negativ evidențindu-se numai la concentrație ridicată. Tulpina 78 s-a remarcat ca având capacitate competitivă semnificativă.*

*The rhizosphere is a highly dynamic system with a vast number of fungi, bacteria and actinomycetes interacting simultaneously. The Rhizobia are nitrogen fixing soil bacteria with a great importance in sustainable agriculture, offering the possibility to replace the mineral fertilizers. The objective of our research was to characterize 4 genotypes of *Bradyrhizobium lupinii* (designated LP53, LP73, LP78 and LP83), from *Lupinus albus* L. plants cultivated on cambic chernozem in 2007. We tested the in vitro herbicide (acetochlor and trifluralin) tolerance and the resistance at antibiotics synthesized by edaphic actinomycetes. The results indicate proper tolerance of the bacterial strains at the acetochlor and trifluralin herbicides, a negative effect appearing only at a high concentration. The strain with the most significant competitive capacity was LP83*

## INTRODUCTION

Nutritionists' attention and the consumers' too, regarding the use of a balanced diet, rich in essential nutrients, emphasizes the importance of the species of Leguminosae family. These plants provide a great amount of nutritive vegetal proteins, and also have a significant agricultural and ecological importance. In Europe, sweet lupin is used in alimentation, as a substitute for soybeans in production or vegetal milk, milk powder and tofu. Narrow-leafed lupin seeds are comparatively high in protein (about 40% by weight) and fiber (30%) but they are lower in oil than soybean. (Gladstones et al, 1998)

In agriculture, lupins are used as green manure and in rotation with wheat because of the bacterial symbionts which are capable of fixing nitrogen from the atmosphere and converting it to a usable form. On the other hand, the use of ecological and sustainable agricultural technologies, with low inputs is a contemporaneous subject at an international scale (Gregory P.J., 2006, McKenzie M, 2007).

For guaranteeing the symbiosis with performing strains, it is necessary to isolate and characterize the rhizobacteria strains regarding the survival capacity in the edaphic microflora, tolerance of prescribed pesticides to the Legumes crops, high efficiency on nitrogen fixation, high competitiveness in nodule formation in the presence of other strains, tolerance to high temperature and low soil moisture (Brockwell, J et al, 1982). In any cultural systems for *Lupinus* sp. such as principal culture, intercropping, crop rotation, allied crops through utilization of performant symbiotic strains the improvement of total

nitrogen content in soil is assured and the sequestration of carbon dioxide from atmosphere is increased, together with its incorporation into soil organic matter, which may be a useful way of reducing the greenhouse effect. (Freire, J. and Saccol de Sa E. L., 2006.).

### MATERIALS AND METHODS

The objective of our research was to characterize 4 genotypes of *Bradyrhizobium lupinii*, designated LP53, LP73, LP78 and LP83, from *Lupinus albus* L. plants cultivated on cambic chernozem.

For the determination of the stains' survival capacity in soil we use the in vitro determination of antibiotic sensitivity test for lyncomycin, neomycin, gentamycin, kanamycin, eritromycin, chloramphenicol and tetracyclyn. The antibiograma test was used for ascertaining the sensitivity levels (Zarnea Gh. 1992). This method assumed obtaining the stationary cultures through „in turf” inoculations and distributing the antibiotic ingrained discs on the medium surface after a slight dry. Three repetitions were used for each strain. The results were read after 48 hours of incubation at 27 ° C, measuring the diameter of inhibition area in around of the antibiotic disc.

Because the application of the bacterial suspension is directly on the seed, the rizobia are exposed to the action of pre-emergent herbicides. One of the characteristics of the rizobia we studied was in vitro tolerance to herbicides using YMA medium (Vincent J.M, 1970) and discs imbued with acetochlor and trifluralin. We tested different concentrations of herbicides in our study, using normal, half, double and quadruple concentration used in field. The sensitivity was determined by measuring the zone of bacterial growth inhibition.

### RESULTS AND DISCUSSION

#### Results regarding the determination of the stains' survival capacity in soil

Regarding the comparison of the different bacterial strains, it can be observed that the tested *Bradyrhizobium* genotypes do not show significant differences in resistance to antibiotics. The antibiotics with the most inhibitory effect are chloramphenicol (C) and erythromycin (E). The bacterial strains we tested are very little sensitive to the effect of the antibiotics lyncomycin (MY), gentamycin (CN) and neomycin (N).

Table 1.

The influence of different types of antibiotics on *Bradyrhizobium lupinii* strains, diameter of growth zone inhibition (mm)

Rhizobium	Antibiotics							Strains mean (mm)	Relative diameter (100%)	Difference (mm)	Significances
	CN	C	E	TE	N	MY	K				
LP53	8.5	24.5	25	13.5	9.5	4.5	18	14.78	96.47	-0.54	-
LP73	7.5	34	24.5	13	10.5	1.5	19.5	15.78	103.00	0.46	-
LP78	10.5	30.5	25	14	12	2.5	19.5	16.28	106.27	0.96	-
LP83	7	31,5	24	13.5	9	0	16.2	14.46	94.39	-0.86	-
Antib mean (mm)	8.37	30.12	24.62	13.5	10.25	2.12	18.30				
Relative diameter (%)	54.63	196.60	160.70	88.12	66.91	13.84	119.45				
Difference	-6.95	14.8	9.3	-1.82	-5.07	-13.2	2.98				
Signification	000	***	***	-	00	000	-				

DL<sub>5%</sub>= 3.22, DL<sub>1%</sub>= 4.35, DL<sub>0.1%</sub>= 5.79

DL<sub>5%</sub>=1.95, DL<sub>1%</sub>= 2.63, DL<sub>0.1%</sub>= 3.50

The most resistant strains of *Bradyrhizobium lupinii* seemed to be: LP83 and LP73 to gentamicin, LP53 to chloramphenicol, LP83 to erythromycin, neomycin, lincomycin and kanamycin, LP73 to tetracycline. As a result, the strain with the most significant competitive capacity was LP83.

### Results regarding the strains' resistance to herbicides

We compared every mean of the concentrations with the mean of the values from the normal concentration (1x) of the herbicide of the four strains of *Bradyrhizobium lupinii*. This mean has the value 1.63. In order to compare the different bacterial strains, we used as control the mean of the variants, with the value of 2.19.

Table 2.

#### The influence of acetochlor concentrations on *Bradyrhizobium lupinii* strains

Rhizobium	Concentrations of acetochlor				Strains mean (mm)	Relative diameter (100%)	Dif. (mm)	Signif
	0,5 x	1 x	2 x	4 x				
LP53	0.5	2	3.5	7	3.25	148.40	1.06	-
LP73	0.5	0.5	2	4.5	1.88	85.84	-0.31	-
LP78	0	1.5	1	3	1.37	62.56	-0.82	-
LP83	0	2.5	2.5	4	2.25	102.74	0.06	-
Mean of conc(mm)	0.25	1.63	2.25	4.63				
Relative diameter (%)	15.34	100	138.04	284.05				
Difference	-1.38	-	0.62	3				
Signification	-	Control	-	**				

DL<sub>5%</sub>=1.60, DL<sub>1%</sub>= 2.21, DL<sub>0.1%</sub>= 3.05

Regarding the different bacterial strains, it can be observed that the genotypes don't show any significant difference at the appliance of the acetochlor. Analyzing the influence of the different concentrations of acetochlor, the results for the half and the double of the normal concentration are not significantly different from those of the normal concentration and those for the quadruple concentration are distinct significantly sensitive to the acetochlor. For the analysis of the effect of trifluralin concentrations, we compared each concentration with the mean of all the variants from the normal concentration of herbicide, the control's value being 1.13. For the comparison of the different bacterial strains, as control we used the mean of the variants, with the value 1.41. It can be observed, that the most resistant to the effect of trifluralin is the strain LP78.

Regarding the comparison of the different concentrations of trifluralin, the strains are significantly more resistant to the half of the normal concentration, there isn't any significant difference between the doubled concentration and the normal one, and the strains we tested are very significantly more sensible to the four times higher concentration.

Table 3.

#### The influence of different concentrations of trifluralin on *Bradyrhizobium lupinii* strains

<i>Rhizobium</i>	Concentrations of trifluralin				Strains mean (mm)	Relative diameter (100%)	Dif. (mm)	Signif.
	0.5 x	1 x	2 x	4 x				
LP53	0.5	2	1.5	2.5	1.63	115.60	0.22	-
LP73	0	2	2	4	2	141.84	0.59	-
LP78	0	0,5	0.5	1.5	0.62	43.97	-0.79	0
LP83	0.5	0	2	3	1.38	97.87	-0.03	-
Conc mean (mm)	0.25	1,13	1.5	2.75				
Relative diametre (%)	22.12	100	132.74	243.36				
Difference	-0.88	-	0.37	1.62				
Signif.	0	Control	-	***				

$DL_{5\%}=0.68$ ,  $DL_{1\%}=0.94$ ,  $DL_{0.1\%}=1.30$

In conclusion, the normal, double, and half of the acetochlor and trifluralin dozes do not inhibit considerably the development of the *Bradyrhizobium* strains we tested. An enhanced inhibition appears when a higher doze of herbicide is applied, for example a four times more concentrated doze than the normal one. However, the diameter of the in vitro inhibition zone is a few millimeter large, due to the capacity of the bacteria to metabolize these substances, and the volatilization of the active components of these preemergent herbicides.

### CONCLUSIONS

- The results indicate proper tolerance of the bacterial strains at the acetochlor and trifluralin herbicides, a negative effect appearing only at a high concentration (4 times the normal doze).
- The most resistant bacterial strain to herbicides was LP78.
- Regarding the competitive capacity, the Rhizobia genotypes are negatively influenced by the presence of the edaphic actinomycetes *Streptomyces venezuelae* and *Streptomyces erythrus*.
- The strain with the most significant competitive capacity was LP83.

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### THE INFLUENCE OF FERTILIZATION UPON SPECIFIC LEAF AREA (SLA), LEAF AREA INDEX (LAI), LEAF AREA RATIO (LAR) AND DRY MATTER CONTENT IN SOME MAYZE (*ZEA MAYS* L.) HYBRYDS CULTIVATED IN BANAT AREA

# INFLUENȚA FERTILIZĂRII ASUPRA SUPRAFEȚEI FOLIARE SPECIFICE (SLA), INDEXULUI SUPRAFEȚEI FOLIARE (LAI), RAPORTULUI SUPRAFEȚEI FOLIARE (LAR) ȘI A CONȚINUTULUI DE SUBSTANȚĂ USCATĂ LA UNII HIBRIZI DE PORUMB (*ZEAMAYS L.*) CULTIVAȚI ÎN BANAT

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**Key words:** maize, SLA, LAI, LAR, dry matter

*In this paper we study the influence of different type of culture technology in changes of some physiological index in mayze (*Zea mays L.*) hybrids cultivated in Banat area. We cultivated the principal 6 hybrids used in this region in the following cultivated technology: conventional technology (with application of N,P,K fertilization), organic technology and ecologic technology. Nitrogen is considered as one of the most important inputs needed for increasing productivity of field crops. Balanced amount of N application at proper time according to the need of the maize decreases N losses, increases yield and quality.*

*We determinate followed parameters: specific leaf Area (SLA), leaf area index (LAI), leaf area ratio (LAR) and dry matter content. The experience showed that the application classic fertilization increase all physiological index. The best results regarding SLA and LAR was obtained in PR36D79 with 67,01 cm<sup>2</sup>/g, regarding LAI the best results was obtained in LG-3330 with 10072,887 (leaf area per plant x No. of plants m<sup>2</sup>). The dry matter content showed different value between 6% and 22,50% function with the organ which was analyzed.*

*În această lucrare s-a studiat influența diferitelor tehnologii de cultură asupra schimbărilor unor indici fiziologici la hibridi de porumb (*Zea mays L.*) cultivați în zona Banatului. În acest scop am cultivat 6 dintre principalii hibridi utilizați în această regiune în următoarele variante de cultură: tehnologie convențională (cu aplicarea fertilizării N,P,K), tehnologie organică și tehnologie ecologică. Azotul este considerat unul dintre cele mai importante inputuri pentru creșterea productivității plantelor de cultură. Schimbările în cantitățile de N aplicate în anumite momente optime produc eficientizarea costurilor și creșterea productivității.*

*Prin acest experiment am determinat următorii parametrii: suprafața foliară specifică (SLA), indicele suprafeței foliare (LAI), raportul suprafeței foliare (LAR) și conținutul de substanță uscată. Experimentele au demonstrat că aplicarea fertilizării convenționale produce o sporire a indicilor fiziologici studiați. Cele mai bune rezultate în cazul SLA și a LAR au fost obținute la hibridul PR36D79 cu 67,01 cm<sup>2</sup>/g, în ceea ce privește LAI cele mai bune rezultate au fost obținute la LG+3330 cu o valoare de 10072,887 (suprafață foliară per plantă x Nr. de plante per m<sup>2</sup>). Conținutul de substanță uscată a manifestat valori diferite între 6% și 22,50% în funcție de organul în care s-a făcut determinarea.*

## INTRODUCTION

Maize (*Zea mays L.*) is an important cereal crop of and more weeds germinate and grow rapidly. This study investigated the response of 6 maize hybrids to three different type of culture technology. Nitrogen plays an very important role in grain production of maize. It is known that for maize the modern hybrids perform better only when growth under high level of fertilizers. Differences in N utilization among genotypes have been demonstrated not only in differential response to N fertilizers but also in differences in absorption and in utilization of absorbed N.

## MATERIAL AND METHOD

The experiment was conducted in three experimental variant: V1 – with conventional technology by application fertilization N<sub>27</sub> P<sub>13,5</sub> K<sub>13,5</sub>; V2 – organic fertilization by application of 30/t ha rather (soil); V3 – ecologic technology (only manual weeding). In our experiment we cultivated the principal 8 maize hybrids from Banat region: PR36R10, PR36D79, LG-2306, LG3330, MONSANTO DKC 3511, MONSANTO DKC 4626. Leaf area was calculated by an undisruptive method using portable *Leaf Area Meter AM-300*.

Data was collected on specific leaf area (SLA), leaf area index (LAI) and leaf area ratio (LAR).

$$\text{Specific Leaf Area} = \frac{\text{Leaf area per plant}}{\text{Leaf weight per plant}} \text{ cm}^2 / \text{g}$$

$$\text{Leaf Area Index} = \text{Leaf area/ plant} \times \text{Nr. of plants m}^2$$

$$\text{Leaf Area Ratio} = \frac{\text{Leaf area per plant}}{\text{Weight per plant}} \text{ cm}^2 / \text{g}$$

The dry matter was obtained by the difference between fresh weight of biological material and his humidity and was determined by thermo balance Kern MLS 50. For this determination we used the following vegetable material: root, stem and leaf.

## RESULTS AND DISCUSSION

From the results obtained regarding the leaf area was observed that the maize hybrids showed differences in function with fertilization variant.

**Table 1**

**Experimental results regarding Specific Leaf Area, Leaf Area Index and Leaf area ratio**

Hybrid	SLA (cm <sup>2</sup> /g)			LAI			LAR (cm <sup>2</sup> /g)		
	v1	v2	v3	v1	v2	v3	v1	v2	v3
PR 36R10	38,91±1,2	33,21±2,1	26,18±1,8	9010,62±0,2	8812±1,16	7752±0,92	13,57±1,2	11,23±0,1	9,43±1,1
PR36D79	67,01±0,4	59,11±1,4	40,18±2,1	8929,21±1,1	8214±0,4	7612±1,21	19,28±0,7	16,43±1,56	12,18±2,4
LG – 2306	36,55±1,1	27,20±0,4	20,13±0,5	9804,92±1,9	9124±1,7	8127±0,5	15,08±1,3	13,21±0,4	9,94±1,03
LG – 3330	25,64±1,0	20,21±1,2	14,76±1,1	10072,88±2,3	9204±2,1	8462±1,4	9,78±1,4	7,88±1,3	6,12±1,7
MON - DKC 3511	33,20±0,5	29,23±0,2	22,42±1,5	8481,36±1,2	7914±1,6	7134±1,2	10,51±2,6	9,11±0,8	8,21±2,8
MON - 4626	22,40±0,7	18,17±1,1	14,04±1,2	4902,46±1,4	4005±1,88	3842±0,4	8,96±2,8	6,97±1,2	5,86±0,5

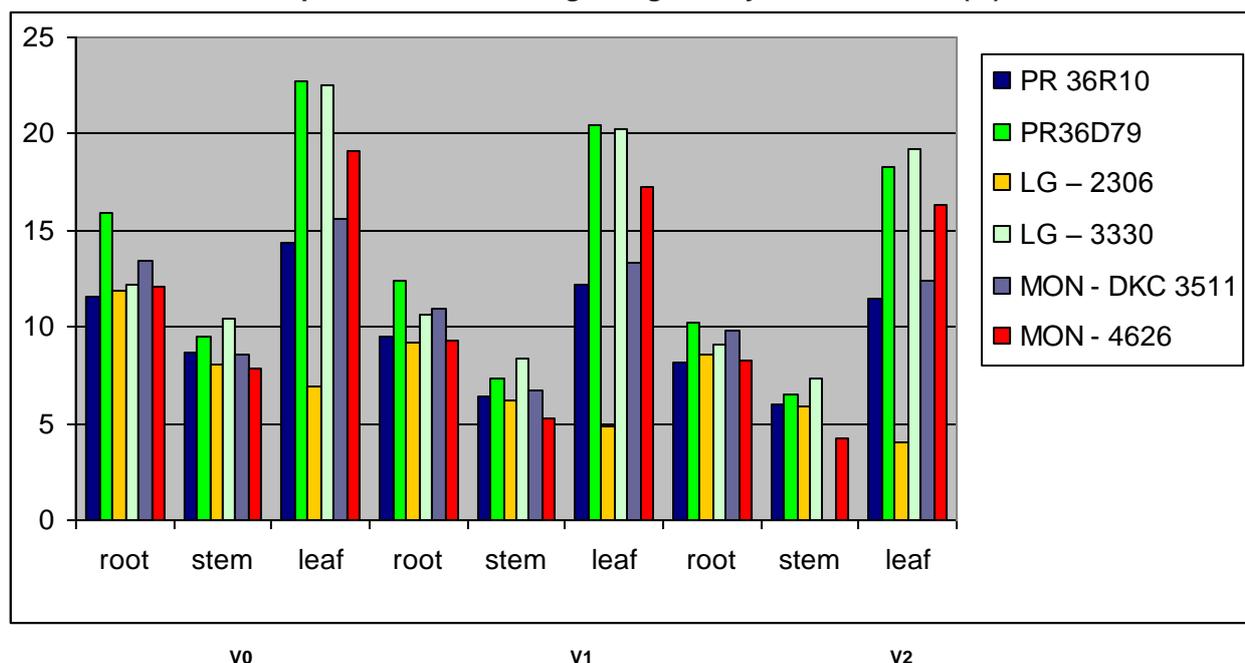
Specific leaf area (SLA) is a measure of leaf thickness. The SLA of maize was slightly greater in conventional technology variant, the best results was showed in PR36D79 hybrid. This observation are in agreement with previous workers who reported increase in leaf size by the application of N and P fertilizers (Shahzad, 1996).

Leaf area index (LAI) is a measure of leafiness per unit ground area and denotes the extent of photosynthetic machinery. Leaf area increasing significantly by application of N fertilizers.

Leaf area ratio (LAR) is the ratio of leaf area to the total weight. It is also a measure of photosynthetic machinery per unit of plant biomass.

**Figure 1**

### Experimental results regarding the dry matter content (%)



The results indicated that the application of fertilizers gave significantly higher dry matter yield comparative with the variant without NPK application. The maximum dry matter yield was obtained in leaf of PR36D79 hybrid.

### CONCLUSIONS

From the data collected it was observed that the application of fertilizers produced an increase of leaf area in all the hybrids studied.

Regarding the specific leaf area (SLA) the best results were manifested by PR36D79 hybrid (67,01 cm<sup>2</sup>/g). For leaf area index (LAI), LG-3330 hybrid showed the best results with 10072,88. The LAI was calculated in the case of 6,5 plants/m<sup>2</sup> densities. The best results regarding leaf area ratio (LAR) were recorded in PR36D79 hybrid (19,28 cm<sup>2</sup>/g) in V1 variant (NPK fertilizers application).

Deficiency of N reduces cell division and protein synthesis. So we observed a decrease of dry matter percent in variant V2 and V3. The dry matter percent was obtained in leaf of PR36D79 hybrid (V1).

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### ACKNOWLEDGEMENT

We would like to thank to Ministry of Development Public Works and Housing and European Union, which finance the PHARE program: "The founding of the Centre for Consultancy and Euro-Regional Rural Co-operation (CC&EU) to improve the ecological and conventional management regarding agricultural yield quality and quantity"

### OBSERVATIONS REGARDING THE COLEOPTERS FAUNA FROM A NATURAL PASTURE BELONGING IN THE EASTERN ROMANIA

### OBSERVAȚII PRIVIND FAUNA DE COLEOPTERE DIN PAJIȘTILE NATURALE SITUATE ÎN PARTEA DE EST A ROMÂNIEI

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**Cuvinte cheie: Coleoptera, structură, pajisti naturale.**  
**Keywords: Coleoptera, structure, natural pastures.**

### **ABSTRACT**

*Observațiile au fost efectuate în pajști invadate de *Lepidium draba* L. rezultat al pășunatului nerațional cu vaci și respectiv oi.*

*În timpul perioadei de cercetare (2007, 2008), s-au făcut observații privind structura, abundența și dinamica speciilor de coleoptere. Au fost colectate în anul 2007 un număr de 307 exemplare de coleoptere ce aparțin la 46 de specii. În anul 2008, au fost colectate 446 exemplare de coleoptere ce aparțin la 38 de specii. De asemeni sunt prezentate valorile parametrilor ecologici (abundența, constanta, dominanța și indicele de semnificație ecologică). Speciile dominante, cu cel mai mare număr de exemplare colectate, au fost: *Baris chlorizans* Germ. (140 samples); *Dermestes lanarius* Illig. (92 exemplare); *Harpalus aeneus* F. (64 exemplare); *Ophonus azureus* F. (48 exemplare); *Pseudophonus rufipes* Mull. (45 exemplare).*

*The researches were done in the pastures invaded by *Lepidium draba* L. – the result of irrational grazing of livestock respectively cows and sheep*

*During the research period (2007, 2008), observations were made upon the structure, abundance and dynamics of the coleopters. Were collected in season 2007 at number of 307 samples of coleopteras belonging to the following 46 species. In 2008, were collected of 446 samples of coleopteras belonging to the following 38 species. We also present the value of ecological parameters (abundance, constance, dominance and ecological importance). The dominant species what in concerns the number of samples collected were: *Baris chlorizans* Germ. (140 samples); *Dermestes lanarius* Illig. (92 samples); *Harpalus aeneus* F. (64 samples); *Ophonus azureus* F. (48 samples); *Pseudophonus rufipes* Mull. (45 samples).*

The study of Coleopterans (the beetles) seems a scientific and practice necessity, taking in consideration their frequency on Terra meridians, the big number of species contained (across 250. 000), the biggest from class Insecta, which group more than one million species, and the numerous species that damage the world agriculture.

The first scientific papers, concerning the study of insects generally and Coleopterans in chief, appeared in XVII th century (Redi); in XVIII th century, were described numerous species of beetles by Fabricius, Latreille and in the XIX century, by Reitter.

In this paper are presented some Coleopterans species that were identified in the pastures invaded by *Lepidium draba* L.

### **MATERIAL AND METHOD**

The studies were conducted in 2007 - 2008 in the pastures invaded by *Lepidium draba* L. – the result of irrational grazing of livestock respectively cows and sheep

The fifth material collectings have been made in monts May-August. We used the soil traps Barber and the interval between the collectings was 10 to 20 days.

The first collecting took place on 31<sup>st</sup> may, the second has been made on 13<sup>rd</sup> June, the third was on 10<sup>th</sup> July, the fourth on 20<sup>th</sup> July and the fifth on 21<sup>st</sup> August. At each collecting we took the biological material from the traps and we replaced or we filled in the formalin solution of 3-4% concentration.

From the biological material we selected the coleopters and identified them.

## RESULTS AND DISCUSSIONS

In 2007-2008 in the pastures, were effectuates a number of 5 collectings. Were collected in season 2007 at number of 307 samples of coleopteras belonging to the following 46 species. In 2008, were collected of 446 samples of coleopteras belonging to the following 38 species (table 1).

In the research period we discovered species belonging to the next families (table 2): *Carabidae* (17 species), *Curculionidae* (7 species), *Scarabaeidae*, *Cerambycidae* and *Chrysomelidae* (3 species), *Elateridae*, *Tenebrionidae*, *Anthycidae*, (2 species), *Coccinellidae*, *Staphylinidae*, *Dermestidae*, *Nitidulidae*, *Lariidae*, *Mordellidae* (1 specie).

We also present the value of ecological parameters (abundance, constance, the domination and the parameter of ecological semnification) in 2008.

Value of ecological parmeters (A, C, D, W) is presented so (table 3):

**The abundance (A)** have the values between 88 samples (*Baris chlorizans* Germ.) and 1 samples (*Staphylinus caesareus*, *Anthicus floralis*, *Metabletus foveatus* Geoffr., *Cassida nobilis* L., *Ophonus sabulicola* Panz., *Anthicus antherinus* L. and *Mordella aculeatu* L.).

The dominant species what in concerns the number of samples collected were: *Baris chlorizans* Germ. (88 samples); *Dermestes lanarius* Illig. (52 samples); *Harpalus aeneus* F. (36 samples); *Harpalus distinguendus* Duft. (34 samples), *Ophonus azureus* F. (27 samples); *Pseudophonus rufipes* Mull. (26 samples).

**The dominance (D)** depending on variable percentage calculated, the species is delivered the in class:

- subordinate species: 15 species have the values < 1,1%;
- recedent species, with the domination indices between 1,1-2,0%, 9 species: *Anisodactylus poeciloides* Steph., *Ophonus puncticollis* Payk., *Amara aenea* Dejean, *Onthofagus vacca* L., *Bothynoderes punctiventris* Germ., *Bembidion lampros* Hrbst., *Pterostichus koyi* ssp. *marginalis* Dejean., *Tanymecus palliatus* F. and *Agriotes lineatus* L.;
- 8 species, subordinate species, have the values between 2,1-5% (*Cleonus piger* Scop., *Crypticus quisquilius* L., *Harpalus tardus* Panz., *Ceuthorrhynchus rapae* Gyll., *Calathus fuscipes* Goeze., *Sitona puncticollis* Steph., *Metabletus truncatellus* L. and *Phyllotreta atra* F.);
- 3 species, dominate species, have the values between 5,1-10,0% (*Harpalus aeneus* F., *Harpalus distinguendus* Duft. and *Ophonus azureus* F.);
- 3 species, eudominate species, with the domination value over 10% (*Pseudophonus rufipes* Mull., *Dermestes lanarius* Illig. and *Baris chlorizans* Germ.).

**The constancy (C)** – depending on this values, the species collected type in thus:

- accidentally species, have the values between 1-25%, 15 species: *Dorcadion fulvum* Scop., *Staphylinus caesareus*, *Agriotes ustulatus* L., *Metabletus foveatus* Geoffr., *Cassida nobilis* L., etc.
- accessory species, have the values between 25,1-50%, 16 species: *Anisodactylus poeciloides* Steph., *Ceuthorrhynchus troglodytes* F., *Harpalus tardus* Panz., *Amara aenea* Dejean, *Ophonus puncticollis* Payk., *Onthofagus vacca* L., *Ceuthorrhynchus rapae* Gyll., *Bothynoderes punctiventris* Germ., *Aphodius varium* Duft., etc.
- constante species, have the values between 50,1-75%, on species: *Crypticus quisquilius* L.
- euconstante species, have the values between 75,1-100%, 6 species: *Pseudophonus rufipes* Mull., *Dermestes lanarius* Illig., *Harpalus aeneus* F., *Harpalus distinguendus* Duft., *Ophonus azureus* F. and *Baris chlorizans* Germ.

**The indices with the ecological importance (W)** have high values:

- 5 species with the domination value over 5%: *Pseudophonus rufipes* Mull. (23,318), *Dermestes lanarius* Illig. (11,659%), *Baris chlorizans* Germ. (15,785%), *Harpalus aeneus* F. (8,072%) and *Harpalus distinguendus* Duft. (6,098), and enghliten species;
- 23 species have the values between 0,1 – 5,0%, accompanying species
- 10 species have the values < 0,1% , accidentally species in the cenosys pasture.

### CONCLUSION

1. During the research period, were collected at number of 753 samples of coleopteras belonging to the following 46 species.

2. The dominant species what in concerns the number of samples collected were: *Baris chlorizans* Germ. (88 samples); *Dermestes lanarius* Illig. (52 samples); *Harpalus aeneus* F. (36 samples); *Harpalus distinguendus* Duft. (34 samples), *Ophonus azureus* F. (27 samples); *Pseudophonus rufipes* Mull. (26 samples).

3. In the research period we discovered species belonging to the next families: *Carabidae*, *Curculionidae*, *Scarabaeidae*, *Cerambycidae*, *Chrysomelidae*, *Elateridae*, *Tenebrionidae*, *Anthycidae*, *Coccinellidae*, *Staphylinidae*, *Dermestidae*, *Nitidulidae*, *Lariidae* and *Mordellidae*.

4. In 2008, we also present the value of ecological parameters (abundance, constance, the domination and the parameter of ecological semnification).

5. the species *Pseudophonus rufipes* Mull., *Dermestes lanarius* Illig. and *Harpalus aeneus* F., were collected in all period of observation.

6. A number of 6 species: euconstante species, have the values between 75,1-100%, were: *Pseudophonus rufipes* Mull., *Dermestes lanarius* Illig., *Harpalus aeneus* F., *Harpalus distinguendus* Duft., *Ophonus azureus* F. and *Baris chlorizans* Germ.

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Table 1

The structure, the dynamics and the abundant species of coleopteras collected from the natural pastures

Crt no	Name of the species	Total samples
--------	---------------------	---------------

		2007	2008	Total
1	Dorcadion fulvum Scop.	1	2	3
2	Anisodactylus poeciloides Steph.	1	5	6
3	Pseudophonus rufipes Mull.	19	26	45
4	Cleonus piger Scop.	10	14	24
5	Ceuthorrhynchus troglodytes F.	4	3	7
6	Dermestes lanarius Illig.	40	52	92
7	Crypticus quisquilius L.	17	11	28
8	Harpalus aeneus F.	28	36	64
9	Ophonus puncticollis Payk.	8	5	13
10	Harpalus distinguendus Duft.	11	34	45
11	Staphylinus caesareus	2	1	3
12	Harpalus tardus Panz.	3	9	12
13	Ophonus azureus F.	21	27	48
14	Amara aenea Dejean	2	5	7
15	Opatrum sabulosum L.	1	0	1
16	Baris chlorizans Germ.	52	88	140
17	Agriotes ustulatus L.	5	2	7
18	Onthofagus vacca L	2	7	9
19	Ceuthorrhynchus rapae Gyll.	3	9	12
20	Bothynoderes punctiventris Germ.	7	5	12
21	Aphodius varium Duft.	5	4	9
22	Bembidion lampros Hrbst.	3	7	10
23	Anthicus floralis	2	1	3
24	Metabletus foveatus Geoffr.	3	1	4
25	Strangalia bifasciata Mull.	1	0	1
26	Cassida nobilis L.	1	1	2
27	Ophonus sabulicola Panz.	2	1	3
28	Cryptocephalus sericeus Lin.	1	0	1
29	Poecilus cupreus L.	1	3	4
30	Pterostichus koyi ssp. Marginalis Dejean.	2	5	7
31	Calathus fuscipes Goeze.	3	9	12
32	Formicomus pedestris Rossi	5	4	9
33	Meligethes brevis Strm.	1	0	1
34	Tanymecus palliatus F.	2	7	9
35	Agriotes lineatus L.	5	7	12
36	Sitona puncticollis Steph.	5	11	16
37	Spermophagus sericeus Geoffr.	2	0	2
38	Clytus figuratus Scop.	1	0	1
39	Metabletus truncatellus L.	12	22	32
40	Anthicus antherinus L.	2	1	3
41	Mordella aculeatu L.	2	1	3
42	Phyllotreta atra F.	5	14	19
43	Pentodon idiota Hrbst.	1	0	1
44	Pterostichus unctulatus L.	1	2	3
45	Coccinella 7 punctata L.	1	0	1
46	Notiophilus rufipes Curt.	2	4	6
	<b>Total</b>	<b>307</b>	<b>446</b>	<b>753</b>

**Table 2**

**The families and the species of coleopteras collected and the number of samples from the natural pastures**

Families	Name of the species	Total samples
Carabidae	Pseudophonus rufipes Mull.	45
	Harpalus distinguendus Duft.	45
	Harpalus tardus Panz.	12

	Harpalus aeneus F.	64
	Amara aenea Dejean	7
	Ophonus puncticollis Payk.	13
	Ophonus azureus F.	48
	Ophonus sabulicola Panz.	3
	Bembidion lampros Hrbst.	10
	Anisodactylus poeciloides Steph.	6
	Calathus fuscipes Goeze.	12
	Poecilus cupreus L.	4
	Pterostichus unctulatus L.	3
	Pterostichus koyi ssp. Marginalis Dejean.	7
	Notiophilus rufipes Curt.	6
	Metabletus foveatus Geoffr.	4
	Metabletus truncatellus L.	32
Anthycidae	Formicomus pedestris Rossi.	9
Chrysomelidae	Phyllotreta atra F.	19
	Cassida nobilis L.	2
	Cryptocephalus sericeus Lin.	1
Dermestidae	Dermestes lanarius Illig.	92
Coccinellidae	Coccinella 7 punctata L.	1
Tenebrionidae	Opatrum sabulosum L.	1
	Crypticus quisquilius L.	28
Nitidulidae	Meligethes brevis Strm.	1
Elateridae	Agriotes lineatus L.	12
	Agriotes ustulatus L.	7
Curculionidae	Tanymecus palliatus F.	9
	Sitona puncticollis Steph.	16
	Cleonus piger Scop.	24
	Baris chlorizans Germ.	140
	Ceuthorrhynchus rapae Gyll.	12
	Ceuthorrhynchus troglodytes F.	7
	Bothynoderes punctiventris Germ.	12
Scarabaeidae	Onthophagus vacca L.	9
	Aphodius varium Duft.	9
	Pentodon idiota Hrbst.	1
Anthicidae	Anthicus floralis	3
	Anthicus antherinus L.	3
Cerambycidae	Dorcadion fulvum Scop.	3
	Strangalia bifasciata Mull.	1
	Clytus figuratus Scop.	1
Lariidae	Spermophagus sericeus Geoffr.	2
Mordellidae	Mordella aculeatu L.	3
Staphylinidae	Staphylinus caesareus	3
	TOTAL	753

Table 3

The major ecological indices of the coleopteras species collected in the natural pasture in 2008

Crt. no.	Name of the species	A	C <sub>A</sub>	D <sub>A</sub>	W <sub>A</sub>
1.	Dorcadion fulvum Scop.	2	20	0,448	0,089
2.	Anisodactylus poeciloides Steph.	5	40	1,121	0,448
3.	Pseudophonus rufipes Mull.	26	100	23,318	23,318

4.	<i>Cleonus piger</i> Scop.	14	40	3,139	1,256
5.	<i>Ceuthorrhynchus troglodytes</i> F.	3	40	0,673	0,269
6.	<i>Dermestes lanarius</i> Illig.	52	100	11,659	11,659
7.	<i>Crypticus quisquilius</i> L.	11	60	2,466	1,479
8.	<i>Harpalus aeneus</i> F.	36	100	8,072	8,072
9.	<i>Ophonus puncticollis</i> Payk.	5	40	1,121	0,448
10.	<i>Harpalus distinguendus</i> Duft.	34	80	7,623	6,098
11.	<i>Staphylinus caesareus</i>	1	20	0,224	0,045
12.	<i>Harpalus tardus</i> Panz.	9	40	2,018	0,807
13.	<i>Ophonus azureus</i> F.	27	80	6,054	4,843
14.	<i>Amara aenea</i> Dejean	5	40	1,121	0,448
15.	<i>Baris chlorizans</i> Germ.	88	80	19,731	15,785
16.	<i>Agriotes ustulatus</i> L.	2	20	0,448	0,089
17.	<i>Onthofagus vacca</i> L.	7	40	1,569	0,628
18.	<i>Ceuthorrhynchus rapae</i> Gyll.	9	40	2,018	0,807
19.	<i>Bothynoderes punctiventris</i> Germ.	5	40	1,121	0,448
20.	<i>Aphodius varium</i> Duft.	4	40	0,897	0,359
21.	<i>Bembidion lampros</i> Hrbst.	7	40	1,569	0,628
22.	<i>Anthicus floralis</i>	1	20	0,224	0,045
23.	<i>Metabletus foveatus</i> Geoffr.	1	20	0,224	0,045
24.	<i>Cassida nobilis</i> L.	1	20	0,224	0,045
25.	<i>Ophonus sabulicola</i> Panz.	1	20	0,224	0,045
26.	<i>Poecilus cupreus</i> L.	3	20	0,673	0,135
27.	<i>Pterostichus koyi</i> ssp. <i>Marginalis</i> Dejean.	5	20	1,121	0,224
28.	<i>Calathus fuscipes</i> Goeze.	9	40	2,018	0,807
29.	<i>Formicomus pedestris</i> Rossi	4	20	0,897	0,179
30.	<i>Tanymecus palliatus</i> F.	7	40	1,569	0,628
31.	<i>Agriotes lineatus</i> L.	7	20	1,569	0,314
32.	<i>Sitona puncticollis</i> Steph.	11	40	2,466	0,986
33.	<i>Metabletus truncatellus</i> L.	22	40	4,933	1,973
34.	<i>Anthicus antherinus</i> L.	1	20	0,224	0,045
35.	<i>Mordella aculeata</i> L.	1	20	0,224	0,045
36.	<i>Phyllotreta atra</i> F.	14	40	3,139	1,256
37.	<i>Pterostichus unctulatus</i> L.	2	20	0,448	0,089
38.	<i>Notiophilus rufipes</i> Curt.	4	20	0,897	0,179

## PEST AND BENEFICIAL INSECTS OF MEDICINAL PLANTS IN BULGARIA AND ROMANIA

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**Key words:** medicinal plants, Bulgaria, Romania, insect pests

### **ABSTRACT**

*Medicinal Plants (MeP) plants play a vital role in the maintenance of human health throughout the world. The sustainable use of MeP in the Balkans is threatened due to over-exploitation, destructive harvesting, habitat loss and alteration and decrease in genetic diversity. In the framework of bilateral project between Bulgaria and Romania we are developing pest management strategy for cultivated and wild life commercially important MeP.*

*The specific objectives of this study are: (1) To develop an inventory list of pest insects on MeP in Bulgaria and Romania; (2) To identify the pest management problems and needs of producers and exporters of medicinal plants as well as needs of pharmacy business of new cultivated plants species; (3) To assess the species composition and economic impact of insect pests on top-ten most produced and used MAP in the targeted countries; (4) To study of species composition of beneficial insects of key pest of targeted plants; (5) To develop a digital database of insect pests on Medicinal plants in Bulgaria and Romania and (6) To analyze the data obtained and produce recommendations to authorities*

*The expected results are: (1) Assessment of available level of knowledge on pest insects on MeP in Bulgaria and Romania; (2) List on pests on MeP on the base of literature data published in English, Bulgarian and Romanian; (3) Identifying plants what need a development a technology for cultivation and pest management; (4) Identifying the key pests what need a development of an environmental friendly pest management strategy; (5) Better understanding of the actual economical importance of pests on the targeted plants; (6) Identifying of the key pests of targeted plants what will allow the development of specific pest control strategies in MeP in future cultivation of these plants and (6) Contacts between business, farmers and academia will be established what would be base for future innovative collaborative projects.*

*In the paper we discuss the present state of art concerning the level of knowledge of pest management of MeP in both countries.*

### **INTRODUCTION**

Medicinal and aromatic plants (MAP) play a vital role in the maintenance of human health throughout the world. An estimated 50,000 – 70,000 plant species are used in traditional and modern medicine. According to the World Health Organization (WHO), approximately 80% of the world's populations still rely mainly on traditional remedies such as herbs for their medicines. (Tripathi and Tripathi, 2003). Several EU projects and programs are tackling the problem of sustainable use of MAP in Europe. The project ISSC-MAP (International Standard for Sustainable Wild Collection of MAP), provide a standard which bridges the gap between existing broad conservation guidelines and management plans developed for specific local conditions. Important activities are conducted in the framework of the wildlife trade monitoring program TRAFIC of WWF – World Wide Fund for Nature working in cooperation with the CITES Secretariat (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Bulgaria and Romania are among the biggest medicinal plants exporters in Europe (Julsing et al. 2006). Their medicinal plants are considered to be among the highest quality plants in the world owing to the specific soil and climatic conditions. The both countries have developed a comprehensive system of laws and other regulations related to MAP.

The utilization of MeP is a priority in the developed agro-environmental and rural development programs in the both countries. These plants have a social effect on

population since their production is regarded as alternative agriculture in mountain regions. Most of the more than 2,000 different plant species that are used for producing medicine or other herbal products in Europe are collected from the wild. Wild collection secures valuable income for rural households, especially in developing countries. Wild plants account for 70% of the total herb production while 30% are cultivated (Varabanova, 2002). The Federal Agency for Nature Conservation commissioned WWF Germany to conduct a study on the situation of MAP utilization in Albania, Bosnia-Herzegovina, Bulgaria, Croatia and Romania. The conducted study shows that stocks of many medicinal plant species in the Balkan countries have declined in the past decades with some species becoming rare or endangered due to over-exploitation, destructive harvesting techniques, habitat loss and alteration and decrease in genetic diversity. It is concluded that the sustainable use of MAP in the Balkans is threatened.

There are several possible measures for avoiding potential danger, or for reversing existing threats, to a species. Among them are - improved management programs, enhancement of cultivation efforts and certification of plant material from sustainable sources.

Several actions could be done in order to develop agricultural estate which would provide alternative income for the people in Bulgaria and Romania: (1) by means of collaboration of researchers from the both countries the gaps in research on MAP to be identified and solutions to fill these gaps to be proposed, developing future joint projects; (2) developing of pest management strategies for cultivated and wild life MAP. This aspect is often neglected. There are little data about impact of pests as potential threat to MAP in Bulgaria and Romania.

Bulgaria and Romania are traditional producers of aromatic plants what explains the interest of scientists in pest management of these plants. But there are not many studies concerning insects of medicinal plants. The insect pest fauna is studied mainly of most common and traditional plant species (Popov 1972a, 1972b, 1972c, 1973a, 1973b, Lecheva and Margina 1995, 1997, Lecheva, 2001, Lecheva 2003). The situation in Romania is similar. Recent research topics are concerning with the ecological management of medicinal and aromatic plants, the cited control programs like *Stenocarus fuliginosus* and *Ceuthorrhynchus macula-alba* control on poppy, *Crysomela* spp. on *Mentha piperita* and so on. (Manole, 2004; 2006; 2007).

## **MATERIALS AND METHODS**

To assess the available level of knowledge on pest insects on medicinal plants in Bulgaria and Romania, survey will be made of publications, textbooks, databases, species lists of pest insects etc. Data will be collected for the plants falling under the Provisions of Medicinal plants acts of Bulgaria and Romania.

To identify the needs of specific medicinal plant species and pest management problems, queries will be created and distributed among the enterprises exporting herbs or preparing pharmacy products on the base of herbs as well as farmers cultivating medicinal plants.

Meetings with representatives of these enterprises will be organized as well.

Field surveys will be made of the identified most valuable and economical important MAP in the targeted countries. A validated method of assessing of the infestation level will be established and used by all partners.

For assessment of species composition of insect pests, the collected insects will be determined mainly by the two teams. An external support from taxonomists could be used for some cases. The pest's location on a specific crop will be digitally mapped with GPS technique.

Beneficial insects on most abundant pest insects will be collected during field surveys as well.

The data base of pest insects will be prepared on the base of list created and field surveys made. When available, basic information on the area of origin and impact of pests will be added to the database.

The list of pests established in Bulgaria and Romania will be used for pest risk assessment. Information will be extracted on the less threatened plants.

### EXPECTED RESULTS

We expect to obtain the following results: (1) Assessment of available level of knowledge on pest insects on MP in Bulgaria and Romania; (2) List on pests on MeP on the base of literature data published in English, Bulgarian and Romanian; (3) Identifying plants what need a development a technology for cultivation and pest management; (4) Identifying the key pests what need a development of an environmental friendly pest management strategy; (5) Better understanding of the actual economical importance of pests on the targeted plants; (6) Identifying of the key pests of targeted plants what will allow the development of specific pest control strategies in MeP in future cultivation of these plants and (6) Contacts between business, farmers and academia will be established what would be base for future innovative collaborative projects

### CONCLUSION

The proposed research will foster collaboration between researchers from Bulgaria and Romania what would help for developing of future joint projects, concerning biocontrol strategies in production of Medicinal plants.

The following information concerning medicinal plants is still absent in Bulgaria and Romania:

- current pest management problems and needs of producers and exporters of medicinal plants as well as needs of pharmacy business of new cultivated plants species
- pest insects on recently cultivated plants
- comparative studies on pest insects on particular plant species in wild and cultivated form what could allow the prediction of future problems in plantations.
- current information of MAP's pest insects, including their distribution maps and biological characteristics.
- data about the possibilities for developing of biocontrol strategies against pests on MAP
- scientific and operational local expertise of pest management of MAP is absent in the both countries too.

The conducting of proposed investigations will contribute to the sustainable use of MAP in Bulgaria and Romania and to the development of knowledge based pest management of Medicinal plants in Europe.

### ACKNOWLEDGMENTS

This survey is funded in the framework of bilateral scientific and technological cooperation between Bulgaria and Romania

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## INVASIVE SCALE INSECTS OF ORNAMENTAL PLANTS IN BULGARIA AND CHINA

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**Key words: invasive scale insects, ornamental plants, Bulgaria, China**

## **ABSTRACT**

*In the framework of bilateral scientific and technological cooperation between China and Bulgaria, signed by the Ministry of Science and Technology of the People's Republic of China and the Ministry of Education and Science of the Republic of Bulgaria a two year project will be done. There has been increased interest in recent years in utilization of native and non-native ornamental plants in urban area, because of the beauty and diversity they lend to the landscape. The addition of new ornamental plants to the urban landscape often results in the introduction of new pest and disease problems. In attempting to deal with insects, one of the major pests that feed on ornamentals are scale insects. The objective of this project are as follows: 1) to develop a preliminary list of scale insect species of ornamental plants in Bulgaria and China based on literature source; 2) study of species composition and distribution of scale insects on ornamental plants in Bulgaria and China; 3) assessment on pest status for dominant species in both country; 4) evaluation the possibility of invasion for dominant scale insects via ornamental plants trade between China and Bulgaria. The realization of this project will revise the information concerning scale insect species of ornamental plants in Bulgaria and China. New data are expected to be added to the scale insect fauna of ornamental plants in Bulgaria and China. An annotated check list of scale insects of ornamental plants will be made for Bulgaria and China. This information will be useful for both Chinese and Bulgarian Plant Protection and Quarantine services. Predict which scale insect species are the most likely candidates for future invasions into the urban area in China and Bulgaria.*

## **INTRODUCTION**

There has been increased interest in recent years in utilization of native and non-native ornamental plants in urban area, because of the beauty and diversity they lend to the landscape. The addition of new ornamental plants to the urban landscape often results in the introduction of new pest and disease problems. In attempting to deal with insects, one of the major pests that feed on ornamentals are scale insects (Arruda et al., 1996). Owing to the lack of natural enemies in their new habitat, high reproduction capacity and specific morphology (protective plates, wax powder, body parts sclerotized), the effective management is a real problem (Komosińska 1961; Dziejicka 1988; Łagowska 1995; Ben-Dov and Hodgson 1997). They cause damage to plants directly by sucking their sap, and indirectly by injecting toxic salivary secretions attracting ants, transmitting pathogens and encouraging the development of sooty-mold (Lara, 1992; Zucchi et al., 1993). The main harmfulness of scale insects consists in sucking the plant sap what affects the growth, leads to defoliation, withering of shoots or the entire plant. A secretion of honeydew which coats the plant surface impedes the assimilation and photosynthesis. Honeydew accumulates different dust and pollutants but first of all it is a perfect medium for sooty mould which covers plants with a black film (Dziejicka 1988; Kosztarab 1996; Ben-Dov and Hodgson 1997) Besides their impact on the commercial value of ornamental plants, these insects also affect urban landscape. Although scale insects are common, they are probably the most misidentified of all insect groups. They are generally small and often mimic various plant parts, such as bark and buds. The information about species composition of scale insects will allows us to predict possible pest problems with a specific plant in a given area and to make plans beforehand to combat the problem. In some cases plants relatively immune to scale insect problems can be selected while those with especially severe problems may be avoided.

Scale insects cause major problems in agricultural and ornamental ecosystems (Miller et al., 2005). They are commonly transported with plant material and because of their small size and habitat of feeding in concealed areas are frequent invasive species (Miller et al., 2005) causing billions of dollars in damage annually (Kosztarab 1990).

First data concerning scale insect studies in Bulgaria are given by Tjorbadjiev in 1938. He reported 23 species of scale insects on 24 different host plants. Since then a few studies have been conducted with scale insect fauna of ornamental plants in Bulgaria (Tjorbadjiev, 1938; Tzalev, 1968; Kozár et al., 1979).

First data concerning scale insect studies in China is given by Maskell in 1897, he reported 40 species and 3 subspecies of scale insects on different plants. Since then, though many scientists such as Ferris, Borchsenius, Takahashi, Tang Fang-de, and Yang Ping-lan have done research on Chinese scale insect fauna, about 1000 species were recorded now, comparative to the vast land of China, there still have much work to do on coccids, especially on scale fauna of ornamental plants (Tang, 1977,1995; Xu and Yang ,2007).

The objective of the project are as follows: 1) to develop a preliminary list of scale insect species of ornamental plants in Bulgaria and China based on literature source; 2) study of species composition and distribution of scale insects on ornamental plants in Bulgaria and China; 3) assessment on pest status for dominant species in both country; 4) evaluation the possibility of invasion for dominant scale insects via ornamental plants trade between China and Bulgaria.

### **MATERIALS AND METHODS**

The buds, branches, stems, root system and leaves of ornamental plants infested by scale insects will be examined for scale insects from different area in Bulgaria and China. Collections will be made from April to October 2009-2010. In laboratory collected scale insects will be stored in 70% alcohol. Collected scale insects will be mounted on microscope slides and identified using different keys. Categorization of scale insect host plant specificity will be based in large part on classic definitions in which polyphagous is used for species that live on a variety of non-related plants, plants from different families, oligophagous is defined as species that lives on a reduced number of non-related host plants and monophagous as species that feed on one plant of the family. The density of scale insects on plant fragments examined will be carried out based on a 5 degree scale as follows:

- 0- lack of scale insects;
- 1- single scale insects;
- 2- up to 25% of surface affected by scale insects;
- 3-up to 50%affected by scale insects;
- 4-up to 100% of surface affected by scales (mass density)

Determination of a new host records and new scale insects will be based on a search of the literature or Scale Net.

### **EXPECTED RESULTS**

The realization of the project will revise the information concerning scale insect species of ornamental plants in Bulgaria and China. New data are expected to be added to the scale insect fauna of ornamental plants in Bulgaria and China. Collected scale insect species will be compared and classified according to their family, host plant specificity, plant origin, plant form and density. An annotated check list of scale insects of ornamental plants will be made for Bulgaria and China. This information will be useful for both Chinese and Bulgarian Plant Protection and Quarantine services. Species composition, distribution and impact of scale insect species of ornamental plants already existing in Bulgaria and China will be studied. Predict which scale insect species are the most likely candidates for future invasions into the urban area in China and Bulgaria. The established collaboration will give opportunity for future work between scientist from Bulgaria and China in the area of scale insect studies.

## CONCLUSION

The realization of the project will give opportunity to develop an annotated check list of scale insects of ornamental plants for Bulgaria and China. This information will be useful for both Plant Protection and Quarantine services, because most of the scale insects are introduced with plant material. New data are expected to be added to the scale insect fauna of ornamental plants in Bulgaria and China. Using this information we try to predict which scale insects are the most likely candidates for future invasions concerning ornamental plants in Bulgaria and China. Assessment on pest status for each species in both countries will be made. Evaluation the possibility of invasion for each pest scale insects via ornamental plants trade between China and Bulgaria will be predicted.

## ACKNOWLEDGMENTS

This survey is funded in the framework of bilateral scientific and technological cooperation between China and Bulgaria, signed by the Ministry of Science and Technology of the People's Republic of China and the Ministry of Education and Science of the Republic of Bulgaria.

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## **CERCETĂRI PRIVIND MORFOLOGIA ȘI BIOLOGIA CIUPERCII *STIGMINA CARPOPHILA***

### **RESEARCH ON THE MORPHOLOGY AND BIOLOGY OF THE *STIGMINA CARPOPHILA* FUNGUS**

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**Keywords:** *Stigmina carpophila*, fungus, morphology, conidia

### **ABSTRACT**

*Ciuperca Stigmina carpophila care provoacă ciuruirea micotică a frunzelor și pătarea fructelor sămburoșilor atacă cu diferite intensități piersicul, caisul, vișinul, cireșul și prunul.*

*În România este destul de răspândită, fiind foarte comună în livezile neîngrijite, pierderi mari provocând în anii cu condiții favorabile.*

*Pe lângă studiul simptomatologiei, un aspect important îl constituie cercetarea asupra morfologiei și biologiei acestei ciuperci.*

*Materialul biologic folosit a fost reprezentat de frunze, lăstari, fructe, flori și muguri ale speciilor de sămburoase.*

*Izolarea patogenului s-a realizat pe un mediu de cultură des uzitat format din cartof-glucoză-agar (CGA). Din observațiile făcute (date biometrice obținute din dimensionarea a 100 de conidii din populațiile obținute pe mediul de cultură CGA) cele mai mari conidii au fost întâlnite la piersic, iar cele mai mici au fost receptate la cais.*

*Germinarea conidiilor a început la 2 °C (1-3%), cu un optim termic cuprins între 16 și 24 °C (25-80%) și scăzând către 30 °C la 5%. S-a constatat o sporulare progresivă începând cu temperatura de 2°C, cu un maxim (în ceea ce privește diametrul coloniei) atins la valoarea de 20°C, urmând o descreștere spre 30°C.*

*Stigmina carpophila is a plant pathogen that causes mycotic spots on leaves and fruit of the drupes; the attack has various intensity on peach, apricot, sour cherry, cherry and plum trees. In Romania, it is highly spread in overgrown orchards, and it causes great losses in favourable years. Together with the symptoms of this fungus, it is important to study its morphology and biology. The biological material consisted of leaves, offshoots, fruit, flowers and buds from the drupe varieties. The pathogen was isolated on a frequently used culture medium, i.e. potato-glucose-agar (CGA).*

*The observation performed (biometric data resulted from the dimensioning of 100 conidia from the populations obtained on the CGA culture medium), the biggest conidia were seen in peach-trees, and the smallest in the apricot-trees.*

*Conidium germination started at a temperature of 2°C (1-3%), the best temperature was recorded between 16 and 24 °C (25-80%), and it decreased to 5% at 30°C. Progressive spore growth was recorded starting from 2°C, the highest colony growth was reached at 20°C, decreasing to 30°C.*

### **INTRODUCTION**

From the observations performed and the biometric data obtained from measuring 100 conidia extracted from the populations resulted from the GCA culture medium, the biggest conidia were recorded in the peach tree while the smallest in the apricot tree.

Concerning the germination rate of the studied conidia, it was measured on a scale of 0°C to 34°C. In order to establish the thermic threshold of germination, the samples were taken out of the thermostat every two hours.

Part of the experiments related to temperature influence upon incubation were carried out on the peach tree; infection of healthy leaves, offshoots and fruit. Infection was made by using mature conidia and the infected organs were maintained under varied temperatures in a moisture-saturated atmosphere (we used filter paper and moist cotton wool pads).

### **MATERIALS AND METHODS**

The biological material used consisted of leaves, offshoots, fruit, flowers and buds of drupaceous species such as peach, apricot, cherry, sour cherry and plum, and it was sampled from the plantation of the Fruit-Tree Growing Research-Development Station at Băneasa - București.

Pathogen isolation was performed on a frequently used culture medium consisting in potato-glucose-agar (PGA).

The experiments concerning the influence of the culture media on the pathogen growth and development made use of the following nutrient media: Czapek-Dox (control), potato-glucose-agar (PGA), malt-agar (MA) and potato-dextrose-agar (PDA).

In order to determine the biological elements, experiments were performed on the growth and development on several culture media by measuring the colony diameter every three days over a time length of 15 days.

## RESULTS

Morphological characteristics of the *Stigmina carpophila* fungus

The *Stigmina carpophila* fungus has a vegetative system consisting in tal filaments, conidiophores and conidia.

Mycelium: the mycelium hyphae are branched, septated, yellowish-brown in colour, 2-8 $\mu$  in diameters, and sept interval between 10 and 45 $\mu$  in length. The mycelium forms low-size stromes in the subepidermal tissues where fruition (conidiophores and conidia) occur, breaking the epidermis to reach the surface.

Conidiophores are short, non-septated, generally simple, rarely branched, of the same colour as the mycelia, relatively 20-25x3-7 $\mu$  in size. Before the conidium occurs, a typical swallowing may be observed, about 3 $\mu$  in size.

Conidia occur one by one at the extremity of the conidiophores, and are either cylindrical, ellipsoidal in shape or spindle-shaped, measuring about 20-65x10-17 $\mu$  (Table 1); they are slightly yellowish at the beginning but become light brown during their mature stage. They have 1-6 septa (normally 3-4 septa) shaped as barrel bands darker of a darker shade. Each conidia germinates through 1-3 infection filaments.

Regarding the influence of temperature on the conidium germination, there were no viable conditions after 24 hours in the vases subject to temperatures of 0-2 °C, as well as in those exposed to temperatures of over 30°C. Conidium germination started at 2°C (1-3%), the best temperature was recorded between 16 and 24 °C (25-80%), and it decreased to 5% towards 30 °C.

Following the development of the *Stigmina carpophila* colonies on the PGA culture medium, from the data shown in Table 2 we observed that the highest development occurred 12 days after sporulation. Progressive sporulation can be noticed starting 2°C, the highest colony diameter being reached at 20°C, followed by a decrease towards 30°C.

Incubation time is variable according to temperature and attacked organ. We could draw the conclusion that incubation time is lower at high temperatures, the best time being recorded between 20 and 26°C.

In order to assess the nutrient value of the four culture media tested, we took into account the colony size and sporulation. All observations and determinations were made under controlled laboratory conditions at a constant temperature of 2 °C, each variant in 4 repetitions. Observations were performed 3, 6, 9, 12 and 15 days after seeding. The data in Table 3 show that the fungus recorded the best behaviour on the PGA, followed by CDA, culture media.

## CONCLUSIONS

The longest conidia (20-65 $\mu$ ) were recorded in the peach tree, while the shortest in the apricot tree (20-35 $\mu$ ).

The best temperature interval for *Stigmina carpophila* conidium germination varied between 16 and 24°C.

The highest sporulation of the *Stigmina carpophila* fungus was recorded around 20 °C.

The MA medium sporulation is equally low, even though it is much higher compared with the control.

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**Table 1**

**Conidia size in the species under study**

Fruit-tree species	Conidium size (μ)	
	Length	Width
Cherry	25-40	12-16
Cour cherry	22-38	10-14
Plum	20-39	11-16
Peach	20-65	10-17
Apricot	20-35	11-14

**Table 2**

**Sporulation and conidium diameter of *Stigmina carpophila* fungus under the influence of temperature**

Temperature °C	Sporulation	Colony diameter (mm)
0	-	-
2	+	4
4	+	6
6	+	10
8	+	12
10	++	15
12	++	20
14	++	25
16	+++	40
18	+++	48
20	+++	55
22	+++	50
24	+++	40
26	++	25
28	+	10
30	+	2
32	-	-

**Table 3**

**Growth and sporulation of *Stigmina carpophila* fungus on different culture media**

Culture medium	Observation length (days)					Sporulation
	3	6	9	12	15	
	Colony diameter (mm)					
Czapek Control	14.0	15.6	18.6	20.1	24.3	+

PGA	17.1	29.2	42.8	52.9	72.3	+++
MA	17.0	27.5	38.2	45.3	50.1	+
CDA	16.9	28.7	41.5	51.0	70.8	+++

Legend: (-) – absent sporulation; (+) low sporulation; (++) average sporulation; (+++) high sporulation

## **THE ELABORATION OF AN INTEGRATED PROTECTIVE SYSTEM OF THE RAPE CROP AGAINST THE ATTACK OF THE DISEASES AND THE PESTS**

## **ELABORAREA UNUI SISTEM DE PROTECȚIE INTEGRATĂ A CULTURII DE RAPIȚĂ FAȚĂ DE ATACCUL BOLILOR ȘI DĂUNĂTORILOR**

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**Keywords :**rape, pests, diseases, chemical control,biological control.

### **ABSTRACT**

*Cercetările au avut ca scop stabilirea unui sistem de protecţie a rapiţei prin utilizarea produselor chimice şi biologice, pentru prevenirea atacului bolilor şi dăunătorilor acestei culturi.*

*În lucrare se prezintă rezultatele studiilor, realizate în anii 2007-2008, privind utilizarea atât a mijloacelor chimice cât şi a mijloacelor biologice. Biopreparatele obţinute din bacterii entomopatogene şi ciuperci antagoniste, active faţă de unii dăunători şi fungi ai rapiţei pot diminua sau elimina pesticidele chimice din schema tratamentelor fitosanitare, devenind astfel o componentă a protecţiei integrate a culturii.*

*Din categoria produselor biologice fac parte bacteria *Bacillus thuringiensis*, care este activă faţă de larvele unor specii de insecte dăunătoare culturilor de rapiţă şi ciuperca *Trichoderma viride*, eficientă în inhibarea creşterii şi dezvoltării principalilor agenţi patogeni prezenţi în sol sau pe sămânţă.*

*Pe baza datelor obţinute a fost elaborată o schemă de combatere integrată a agenţilor de dăunare din culturile de rapiţă.*

*Prin introducerea metodelor biologice în tehnologia de protecţie se va asigura diminuarea reziduurilor toxice din recoltă, precum şi protejarea mediului înconjurător.*

### **INTRODUCTION**

In the culture of rapeseed, which occupies the land from September until July of next year, to create a agroecosistem the rape plant is dominant, although competing weeds and developing them. Following the density and the ability to offset kidnapped, it creates a microclimate with humid air, reduce temperature and brightness. These conditions are very favorable development of pathogens and pests.

Chemical protection is a key component of modern agriculture, whose technologies are scientifically substantiated. The use of pesticides in the fight to defend crop is still topical, with all the drawbacks of their (the destruction of natural biological balance, the emergence of resistance phenomena, polluting toxic residues to humans and animals) as security in the defense of cultures.

Therefore, it is necessary to reorient research to an integrated concept of fighting in which to enter and biological methods. In this context, the paper presents results on the protection of culture through the use of rape as a means chemical and the biological.

If the protection of these cultural perspective, issues of combating chemical pathogens, pests and weeds are known or have made bigger steps in the diversification of means of protection (Iliescu et al., 1987; Oancea, 1998; Bîlteanu , 2001; Diaconu & Mateiaş, 2004; Hălmăjean, 2006; Mantu, 2007, Popov and Raranciuc, 2007), issues concerning the use of biological resources, clean, are much less addressed, practically have a new technology and crop protection kidnapped in our country (Sesan, 2005; Sesan & Groza, 2007).

The results of research carried out in two years contribute to improving methods of protection of cultural rape.

### **MATERIAL AND METHODS**

The research was conducted at SCDA Caracal, ICDPP Bucharest and the University of Bucharest in the period 2007-2008.

The experiences have been organized to test the chemical and biological treatments to the seed and vegetation and have made notaries on their effectiveness in combating pests and pathogens.

## RESULTS OBTAINED

### A. Treatment of rape seeds

The fungicides and the insecticides applied in the treatment of the seeds have provided a good protection of plant soon after sunrise, the attack against product by *Phyllotreta spp* *Psiliodes spp* and later by *Pieris brassicae* (a larvae density of 4 / sqm) but also against pathogens *Fusarium sp.* and *Pythium de Baryanum*. Treatment with insecticides of rape seed in the area RDAS Caracal is relevant to save the culture, as pests that attack during emergent cause by the reduction in density greater extent in comparison with the attack caused by diseases of the emergency. Such production in untreated witness was only 1790 kg / ha, and the treatment of seeds with fungicides production was 1920 kg / ha.

Chemical control led to a production of 3740 kg / ha. Efficacy of combined insecticides and fungicides applied in the treatment of seeds resulted in achieving higher yields of rape, provided statistically the 3795-3840 kg / ha (Table 1)

Action of the biological product and effectiveness was tested against pathogens on the seed and in the soil (*Pythium ultimum*, *Rhizoctonia Solana*, *Sclerotinia sclerotiorum*, *botrytis cinerea*, *Fusarium spp*, *constant spp*) at the University of Bucharest and RDAS Caracal.

At the University of Bucharest, was tested in the greenhouse and in the field the biological product, Trichosemin 25 PTS, obtained from *Trichoderma viride* (isolate Td50), to treat seed rape, compared with an untreated witness and a standard chemical fungicide (procymidone 50).

The observations consisted of determining the number and percentage of sunrise and healthy plants, the variations compared with the standard version of (chemical fungicide) and a witness without treatment.

In Table 2 biological activity of the biological product based on *Trichoderma viride*, Trichosemin 25 PTS, has been highlighted by the number and value of the percentage of plants east and healthy compared with standard chemical (procymidone 50) and untreated witness.

In all cases, at the biological product tested, the percentage of sunrise and healthy plants was higher than 47% to witness untreated.

In the standard rate of sunrise and healthy plants has exceeded 30% of the variance witness (without treatment).

**Table 2**

### **Testing biopreparatului Trichosemin 25 PTS to protect the culture of rape variety Hydromel against pathogens**

Testarea biopreparatului Trichosemin 25 PTS pentru protejarea culturii de rapiță din soiul Hydromel față de patogenii seminali și telurici

Varianta	Răsărire după 8 zile		Diferență față de martor %)
	Număr plantule	% plantule	% plantule
Trichosemin 25 PTS – 1g/mp	100	147	+47
Standard chimic (Procymidone 50) – 1g/mp	90	130	+30
Martor (netratat)	70	100	Mt.

In the experimental field of RDAS Caracal, the biological product Trichosemin 25 PTS, obtained from *Trichoderma viride* (isolate Td50) at a dose of 1 g / sqm, has been tested to treat seed rape, compared with a witness untreated.

The biological activity of the biological product Trichosemin 25 PTS has been highlighted by the values of the percentage of plants east and healthy compared to untreated witness (Table 3).

In the biological treatment with the percentage of sunrise and healthy plants was higher by 26% than the untreated witness.

There were no differences in comments made after a period of 14 days more to the emergented.

These results fall on the line that derived from other cultures industrial plant oil (sunflower, soybeans) for grains and legumes (beans, soy, Chickpea) (Baicu & Săvescu, 1986; Sesan et al., 1997, b).

**Table 3**

Testing, in the field of the biological product Trichosemin 25 PTS to protect the culture of rape variety of Manitoba to the pathogens on the seed and in the soil-RDAS Caracal – 2008

**Testarea, în condiții de câmp, a biopreparatului Trichosemin 25 PTS pentru protejarea culturii de rapiță din soiul Manitoba față de patogenii seminali și telurici-SCDA Caracal – 2008**

Varianta	Răsărire după 8 zile		Diferență față de martor (%)	
	Nr. plantule	%	Nr.	%
Trichosemin 25 PTS – 2 g/mp	86	126	+18	+26
Martor (netratat)	68	100	Mt.	Mt.

**B. The treatments on the vegetation to control diseases;**

Referring to the diseases that attack rapeseed during the growing season, has watched the influence of different treatments on the evolution of pathogens. By applying two treatments with fungicides, in the autumn and in the spring were obtained crops free of diseases that have ensured production 3890 kg / ha, significant witness to the untreated (Table 4).

**C. The treatments on vegetation to control pests;**

To prevent attack specific pests that affect crops rape in the spring, were made two treatments in correlation with the evolution of the pests. The first treatment was done in the growth stage 30 –stem elongation, to control *Ceutorrhynchus quadridens* and the second treatment at the growth stage 59 -60, the flowering. The efficacy of the treatment 72 hours

after treatment was 95-98% in control *Ceutorrhynchus quadridens* species and between 93-95% in control *Meligethes aeneus* species.

The treatments carried out to prevent pest attack specific *Meligethes aeneus*, *Ceutorrhynchus* spp, *Dasineura brassicae*, etc.. affecting crops of rape led to the saving of between 970-1080 kg / ha (table 5).

The biological product based on the *Bacillus thuringiensis* has been tested by ICDPP Bucharest in the field to control *Phyllotreta* spp and *Colaphellus sophiae*

**Table 5**

**The efficacy of insecticide treatments applied by the vegetation in combating pests specific to the fall-rape seed  
RDAS CARACAL**

Eficacitatea unor insecticide aplicate prin tratamente pe vegetație în combaterea dăunătorilor specifici la rapița de toamnă-  
SCDA CARACAL

Nr crt	Varianta experimentală	Doza l/ha	Eficacitate (%)		Producția		
			<i>Meligethes aeneus</i>	<i>Ceutorrhynchus quadridens</i>	Kg/ha	Dif.	%
1	Proteus 110 OD	0,4	94	98	3950	1040	136
2	Byscaia 240 OD	0,25	94	95	3960	1050	136
3	Nurelle D 50/500 CE	0,4	93	95	3990	1080	137
4	Mospilan 20 SP	0,15	91	96	3880	970	133
5	Mavrik 2 F	0,2	94	97	3920	1010	135
6	Karate zeon	0,15	95	97	3970	1060	136
7	Martor netratat	-	-	-	2910	Mt.	100

Eficacitate la 72 ore de la T2 DL 5% 200kg/ha  
DL1% 274  
DL 0,1% 372

From the results obtained after 7 days of treatment, biological product Bt-T7 had an efficacy of 87.28 against *Phyllotreta* spp. and 88.21% of blue beetle (*Colaphellus sophiae*) (Tables 6-7).

**Table 6**

**The degree of attack of insects and *Phyllotreta* spp effective product Bt-T7**

Gradul de atac al insectei *Phyllotreta* spp și eficacitate produsului Bt -T7

Varianta	Doza	3 zile de la T <sub>1</sub>		5 zile de la T <sub>1</sub>		7 zile de la T <sub>1</sub>	
		GA%	E%	GA%	E%	GA%	E%
Martor netratat	-	41,23	-	52,6	-	65,43	-
Bt -T7	3%	18,87	56,3	12,92	74,4	10,2	87,28
Dipel 2X	3%	17,28	60,6	13,34	75,3	9,48	86,5

**Table 7**

**The degree of attack of insects and *Colaphellus sophiae*  
effective product Bt-T7**

Gradul de atac al insectei *Collaphellus sophiae* si  
eficacitate produsului Bt -T7

Varianta	Doza	3 zile de la T <sub>1</sub>		5 zile de la T <sub>1</sub>		7 zile de la T <sub>1</sub>	
		GA%	E%	GA%	E%	GA%	E%
Martor netratat	-	44,20	-	50,60	-	62,13	-
Bt - T7	3%	23,17	58,4	13,42	76,3	10,40	88,21
Dipel 2X	3%	21,23	61,6	14,44	75,7	11,42	87,53

Effectiveness close or similar value were obtained with similar product Dipel 2x used as a witness (86.5% față of fleas and 87.53 versus blue beetle). The efficiency confirm the potential insecticide revealed in laboratory tests of insect against the test *Tenebrio Molitor*.

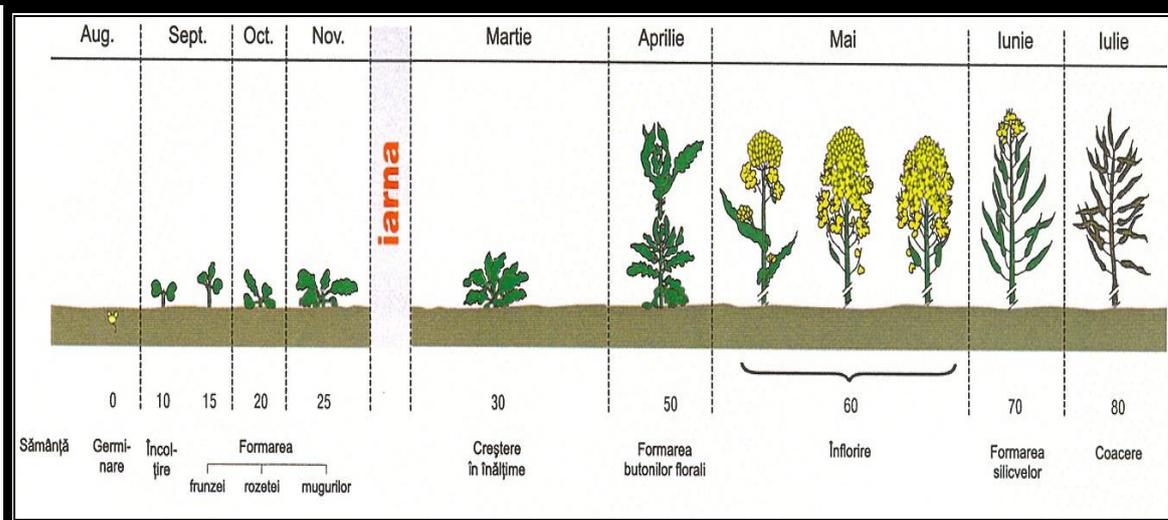
Following the results to conceive an integrated system to combat diseases, pests, which is prezentet in Figure 1.

### CONCLUSIONS

- Insectofungicidele applied in the treatment of seeds have provided a good protection of plants against pathogens that are transmitted through soil and seed and soil pests;
- Biological products based on *Trichoderma viride*, provide protection against pathogens (*Pythium ultimum*, *Rhizoctonia Solana*, *Sclerotinia sclerotiorum*, *botrytis cinerea*, *Fusarium spp.*) and favored a sunrise uniform kidnapped;

**Fig. 1 Scheme- integrated protection of the rape-Caracal  
Schema de protecție integrată a culturii de rapiță-Caracal**

<p>Tratamente pe vegetație (combaterea bolilor)</p> <p>Fungicide chimice</p>	↔	Criptovegetație	↔
<p>Tratamente pe vegetație (combaterea dăunătorilor)</p> <p>Insecticide chimice Insecticide biologice</p>	↔		↔
<p>Tratament sămânță</p> <p>Fungicide chimice Fungicide biologice Insecticide chimice</p>	↔		



- treatments on vegetation by pesticides and biological products based on *Bacillus thuringiensis* have reduced harmful the pests default and attack enemies;
- The introduction of biological insecticides effectiveness comparable to the best chemical insecticides, will also contribute to the reduction of chemical residue from crop.
  - Reducing the number of treatments in the scheme of protection kidnapped can be achieved through treatment while fighting for Concurrent more agents;
- The data shows that the culture of rape, where it provides all the links in the best technology, ensuring production is ensured by establishing protective measures against harmful organisms;
  - By combining all elements of technology, the culture of rape, can create the framework for this culture to express the biological potential for the production of seeds.

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Table  
1

### The effect of in the treatment with the fungicides and the insecticides applied at the seeds rape, on the attack of the specific pests and pathogens and the production RDAS CARACAL

Efectul unor fungicide și insecticide aplicate în tratamentul seminței de rapiță asupra răsării plantelor, atacului produs de dăunători și agenți patogeni specifici și a producției  
SCDA CARACAL

Varianta experimentală	Doza I, kg/t	P% Plante răsărite	GA% atac produs de:		F% atac produs de:		E %	Producția Kg/ha
			<i>Phyllotreta spp.</i> <i>Psilliodes ssp.</i>	<i>Pieris brassicae</i>	<i>Fusarium sp</i>	<i>Pythium de Baryanum</i>		
Martor netratat	-	95	5,1	3,6	2,8	1,0	Mt	1790
Cruiser OSR	15,0	100	1,6	1,7	0,6	0,1	68	3840***
Gaucho 600 FS + Semnal 500 FS	0,5+6,0	100	1,2	1,9	0,9	0,0	68	3795***
Chinook 200 FS+ Netratat cu fungicid	20,0	96	2,1	1,9	2,4	0,9	42	3740***
Netratat cu insecticide +Semnal 500 FS	0,5	97	5,0	3,3	0,5	0,0	30	1920

<b>DL5%</b>	<b>0,63%</b>	<b>0,51%</b>	<b>0,44%</b>	<b>0,50%</b>	<b>259</b>
<b>DL 1%</b>	<b>0,89</b>	<b>0,77</b>	<b>0,61</b>	<b>0,70</b>	<b>364</b>
<b>DL 0,1%</b>	<b>1,25</b>	<b>1,08</b>	<b>0,86</b>	<b>0,99</b>	<b>514</b>

Table 4

**The effect of treatment with fungicides applied to vegetation on attack caused by specific pathogens and rapeseed production  
RDAS CARACAL**

Efectul tratamentelor cu fungicide aplicate pe vegetație asupra atacului produs de agenții patogeni specifici și a producției la rapița de toamnă  
SCDA CARACAL

Nr. crt.	Varianta experimentală	Doza l, kg/t	Momentul tratamentului	GA% atac produs de:			E %	Productia Kg/ha	MMB g
				<i>Alternaria brassicae</i>	<i>Erysiphe communis</i>	<i>Phoma lingam</i>			
1	Martor netratat		-	3,2	9,7	2,3	Mt	3684	3,80
2	Folicur Solo 250 EW	0,5	toamna	0,3	6,1	0,1	57	3810	3,81
3	Folicur Solo 250 EW	0,5+1,0	toamna+primăvara	0	0,2	0,1	98	3890	3,80
4	Folicur Solo 250 EW	1,0	primăvara	2,9	0,2	2,2	65	3760	3,82
5	Topsin 500 SC	1,25	primăvara	3,0	0,3	2,1	64	3780	3,82
				DL5%		4,8%		152	
				1%		6,5		214	
				0,1%		8,8		302	

∴

# CERCETĂRI PRIVIND ATACUL CIUPERCII *STIGMINA CARPOPHILA* LA POMII SÂMBUROȘI ÎN INFECȚII NATURALE ȘI INFLUENȚA UNOR FUNGICIDE ASUPRA MICELIULUI ȘI CONIDIILOR CIUPERCII ÎN CONDIȚII DE LABORATOR

## RESEARCH ON THE *STIGMINA CARPOPHILA* ATTACK UPON DRUPACEOUS TREES IN NATURAL INFECTIONS AND FUNGICIDE INFECTION UPON FUNGUS MYCELIA AND CONIDIA UNDER LABORATORY CONDITIONS

C. R. Zală, I. Văcăroiu Stelica Cristea

**Keywords:** attack degree, fruit trees, fungus, fungicides

### ABSTRACT

*Notarea atacului unor boli este reprezentat valoric prin: frecvență (F%), intensitate (I%) și grad de atac (G.A.%).*

*Pentru a avea parte de o informație cât mai exactă asupra stării de sănătate a parcelelor s-a procedat la notarea atacului/pom la fiecare al treilea rând de pomi și s-a determinat atacul pe două etaje în pomul respectiv, făcând o medie; deplasarea având loc pe diagonala parcelei.*

*În lucrare este prezentat gradul de atac al ciuruirii micotice a frunzelor de sămburoase în urma determinării acestuia în variantele netratate ale experiențelor cu fungicide ce au avut loc pe parcursul anilor 2005, 2006 și 2008. Valorile medii sunt la nivel de specii, calculate pe baza rezultatelor obținute la diversele soiuri ale speciilor cireș, vișin, prun, piersic și cais.*

*La nivelul anilor în care au avut loc cercetările, în 2008 condițiile climatice au fost cele mai favorabile, în zona Bucureștiului, în ceea ce privește manifestarea simptomelor de ciuruire a pomilor sămburoși.*

*Experiențele de testare ale acțiunii a șase fungicide asupra ciupericii *Stigmina carpophila* s-au efectuat în laborator pe mediul de cultură CGA.*

*The attack of some diseases is represented by: frequency (F%), intensity (I%) and attack degree (A.D.%). In order to obtain exact information on the lot health, the attack/tree relationship was recorded for every third tree row by determining the attack on two levels of the respective tree and calculating the average; measurements were made on the diagonal of the lot.*

*The paper presents the attack degree of the mycotic leaf spotting in the drupaceous trees resulting from their study on the untreated variants of the fungicide-treated lots (2005, 2006 and 2008). The average values were treated per species, based on the results obtained from various varieties of the following species: cherry, sour cherry, plum, peach and apricot tree. Regarding the leaf spotting symptoms in the drupaceous trees, the year 2008 recorded the most favourable weather conditions of the experimental years in the Bucharest area. The laboratory experiments focused on the action of six fungicides upon the *Stigmina carpophila* fungus grown on a CGA culture medium.*

### INTRODUCTION

Leaf and fruit spotting in the fruit trees caused by the fungus *Stigmina carpophila* (Lév.) M.B. Ellis is a frequent diseases which is known in all the drupe-growing countries due to its variable attacks on the apricot, peach, cherry, sour-cherry, plum and other fruit trees.

The disease was first described in France in 1846. In Romania, it was observed on peach, cherry and plum trees in 1928 when the first paper on the phytosanitary status was published in our country.

The disease has recently gained economic importance, together with the increasing fruit-tree plantations and the weather conditions more favourable to the occurrence and development of the pathogen.

The present paper is aimed at presenting the attack degree of the fungus *Stigmina carpophila* on the drupaceous species under natural infection conditions, and the action of some fungicides on the fungus mycelium and conidia under laboratory conditions.

### MATERIALS AND METHODS

The research performed on the attack degree of the leaf-hole mycotic disease in the drupaceous species was focused on measuring the disease in the untreated variants of the fungicide-based experiments carried out in the years 2005, 2006 and 2008.

The following drupaceous fruit-tree species were studied: cherry, sour cherry, plum, apricot and peach.

The average values are concerning the species by summing up the results obtained from different varieties of the above-mentioned species.

The values of the attack degree are expressed procentually, resulting from the multiplication of disease frequency by disease intensity divided by 100.

The studied fungicides were the following: Alcupral 50 PU, Folpan 50 WP, Captan 50 PU, Dithane M-45, Sumilex 50 WP and Rubigan 12 EC.

The results based on their action were related to the diameter of the colonies in the untreated control.

### RESULTS

The data shown in Table 1 indicate that the year 2008 provided the most favourable weather conditions for the occurrence of the leaf-hole symptoms. As concerns the least favourable years, infection by the *Stigmina carpophila* fungus was recorded in the year 2006. In the case of the fruit-tree species, the lowest attack degree was seen in the plum tree whereas the apricot tree proved to be the most susceptible over the three years, recording a peak in the year 2008 (an average attack of 85%).

As it can be easily noticed from Table 2 which presents the results of the tests on the development of fungus colonies influenced by the application of six fungicides under laboratory conditions, the fungicides Dithane M 45, Sumilex 50 WP and Rubigan 12.5 EC were the most efficient; however, Dithane M 45 was over 50% more efficient than the other two fungicides mentioned. On the other hand, Alcupral 50 PU was the least efficient, as its application resulted in the development of colonies about 1/3 of the control size.

These results are highly important for the future use of the fungicides, and will be taken into consideration in the recommendations for the treatment of the orchards.

### CONCLUSIONS

During the three experimental years, the attack of *Stigmina carpophila* constantly manifested the same action on the susceptibility of the host species; the decreasing order of the attacked species was: apricot, cherry, sour cherry, peach and plum trees.

Compared to the other experimental years, the year 2008 was the most favourable for the *Stigmina carpophila* fungus.

Considering the fungicide action on the *Stigmina carpophila* fungus on a CGA medium, Captan 50 PU and Folpan 50 WP recorded the complete inhibition of colony formation.

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**Drupe behaviour to *Stigmina carpophila* pathogen under natural infection conditions**

Species	Attack degree (%)		
	2005	2006	2008
Cherry	52.0	44.0	60.0
Sour cherry	46.0	35.0	47.5
Plum	12.0	8.0	12.5
Peach	78.4	65.0	85.0
Apricot	39.0	27.0	41.0

**Table 2**

**Results concerning some fungicide action upon *Stigmina carpophila* colonies on a PGA nutrient medium**

Fungicide	Exposure time (days)					Assessment of fungicide action
	3	6	9	12	15	
	Colony diameter (mm)					
Control - untreated	17.1	29.2	42.8	52.9	72.3	-
Alcupral 50 PU – 0.2%	5.0	12.5	19.4	23.8	28.2	+
Folpan 50 WP - 0.3%	0	0	0	0	0	+++
Captan 50 PU - 0.2%	0	0	0	0	0	+++
Dithane M 45 - 0.2%	0	0	0	2.1	3.9	++
Sumilex 50 WP - 0.1%	0	0	3.5	6.1	8.5	++
Rubigan 12 EC - 0.04%	0	0	2.9	5.7	8.2	++

Legend: (+) low action; (++) high action; (+++) very high action

## SECȚIUNEA 4: MANAGEMENT,

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### **WORKING GROUP 4: MANAGEMENT, AGRICULTURE MECHANIZATION AND CADASTRE**

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### **EXPERIMENTALLY RESEARCHES CONCERNING TO IMPROVE THE MACHINES FOR ADMINISTER SOLID CHEMICALS FERTILIZERS**

*T. Alexandru, M. Glodeanu*

**Cuvinte cheie:** aparat de distribuție centrifugal, uniformitate de distribuție, performanțe de lucru  
**Keywords:** centrifugally distribution device, distribution uniformity, work performances

#### **ABSTRACT**

*În lucrare este prezentat și analizat procesul de lucru al mașinilor de administrat îngrășăminte chimice solide. De asemenea sunt expuse soluțiile tehnice adoptate pentru îmbunătățirea performanțelor de lucru ale acestora, precum și ale indicilor calitativi de lucru și energetici, pentru varianta experimentală prezentată.*

*In this work is presented and analyse the work process ensure by the machines for administer solid chemicals fertilizers. Also are presented technically solutions used for increase their work performances, work and energetically quality index, for the experimentally variant studied.*

#### **INTRODUCTION**

In time agriculture has know great increases, proportionally with mechanization and chemically degree and also with water ensuring degree of agriculture crops. An very important aspect in achieving a modern and efficient agriculture is rational using of chemicals. Cultivation without administration optimal rates of chemicals establish low efficiency, with a decrease quality, because of green pollution.

#### **MATERIAL AND METHOD**

Chemicals rate on surface unit depend on functionality and constructive parameters of centrifugal distribution device and also on supplying flow and work regimen of machine.

The dependence between these parameters and the distribution mode of chemicals on soil may be achieve studying the work process of a centrifugal distribution device. This process consist on three phases:

- supplying the device with chemicals;
- remove chemicals particles on the distribution disk;
- uniform distribution of particles on the soil.

Supplying with material of the distribution apparatus is made by measuring devices and

conduct cones. The measured chemicals fall down through the supplying device [2]. The projection contour of these is delimited by the curve  $C_a$  (fig. 1).

About one material particle action the following forces:

- $F_i$  – inertia force,  $F_i = mr\omega^2$ ;
- $F_f$  – friction force,  $F_f = \mu G$ ;
- $G$  – weight of the particle;
- $N$  – normal reaction of particle on disk .

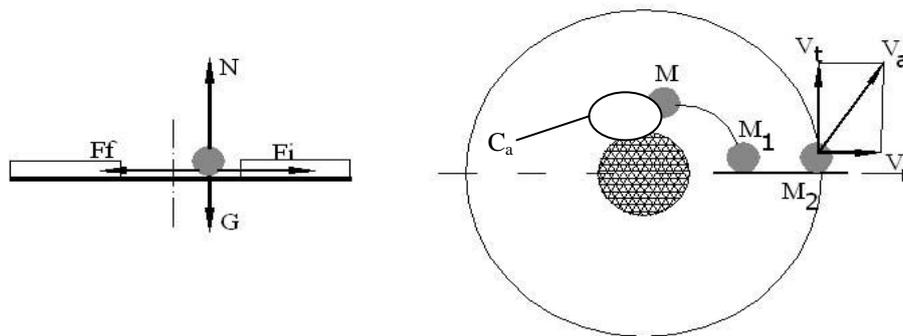
For that the material may be centrifuged it must be carry out the condition  $F_i \geq F_f$ , respectively:

$$r \geq \frac{\mu \cdot g}{\omega^2} \quad (1)$$

where:  $m$  is the mass of the chemical particle;

$\omega$  – angular velocity of the disk;

$\mu$ – friction coefficient between the particle and disk.



**Fig. 1 Forces which suing about on one chemical particle.**

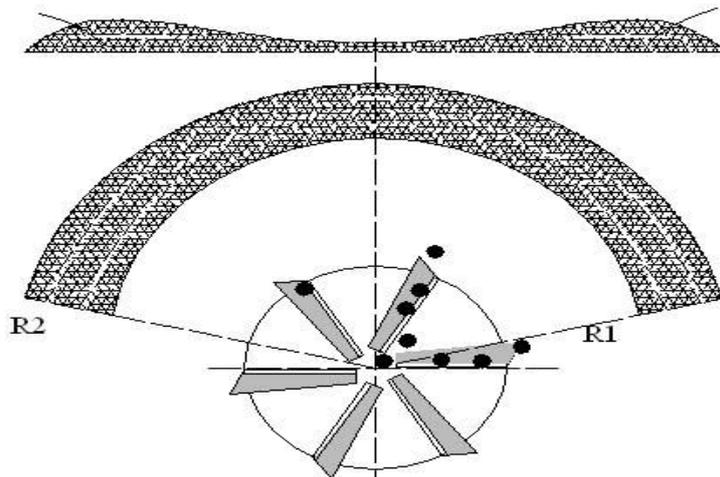
The supplying device must be adjust in such way, that the material fall down on disk at a ray greater than  $r$ . The particles fall down on disk, through centrifugal force moved against pallets after directions in spiral shapes ( $MM_1$ ), followed by a remove on the lenght of pallets ( $M_1 M_2$ ). The particles leave the disk pallete with velocity  $v_a$ , which is represent by relation:

$$\vec{v}_a = \vec{v}_r + \vec{v}_t \quad (2)$$

where:  $v_t$  is the transport velocity and  $v_r$ , the relative velocity of the particle.

Because the chemicals particles are of different shapes and dimensions, these are disposed on soil on a section with circular wreath shape. Particles with a increased weight and also with aerodynamic shapes will be disposed on a circle with  $R_2$  ray. The slightest particles with less aerodynamic shapes will be disposed on a circle with  $R_1$  ray [1, 3].

On transversal direction, the chemicals uniformity distribution is variable (fig. 2) and depend on chemical granulation structure. Having in view the presented considerations, the engineering of machines achieved in our country must satisfy two important demands: efficiency in functioning and simplicity in construction.



**Fig. 2. Chemicals scheme distribution.**

Analysing the machines achieve in our country (MIC-04; MIS-400) are necessary the following improves:

- the measuring device (fig. 3) is made by two disks with three knives, at which the adjusting passage section of chemicals are achieve through turning the mobil disk given the fixed disk, in limites  $0,0006...0,02 \text{ m}^2$ ; the opening of the knives measuring device is achieve by a mechanism with teeth sector (fig. 4), which may be suing from the tractor cabin;



**Fig. 3. Measuring device with knives.**



**Fig. 4. Adjusting system of chemical flow.**

- the centre of trickling cones must be a little towards tractor laterally right, given the centre of the disk, for increasing the spreading uniformity (fig. 5) the adjusting process is made by screws which fixing the oblique material conducting cones;



**Fig. 5. Oblique conducting cones of the material.**

- for increasing the distribution uniformity of chemicals, the disk of the distribution device is equipped with six pallets; the diameter of the disk is increased at 600 mm, for ensuring a greatest wid.

## RESULTS AND DISCUSSIONS

The experimentations achieved in real and laboratory conditions, made with U 650 tractor (fig. 6) aid to establish through direct measures: *total work breadths* ( $B_t$ ) (work breadths through on are spread chemicals indifferent of quantity); *effective work breadths* ( $B_{ef}$ ) (breadths at which the material quantity gathered in test boxes is greater than 50% from average quantity gathered in one box). On base of these measurements are establish: *the uniformity of distribution on breadth work on transversal direction*( $U$ ); *symmetry of spread*; *error given the adjust rate* ( $\Delta$ ); *optimal work breadth* ( $B_{opt}$ ).



**Fig. 6. The improve variant of the machine for administer solid chemicals.**

In frame of the tests were establish the following index:

- Quality work index:*
  - total work breadth ( $B_t$ ), in m;
  - effective work breadths ( $B_{ef}$ ), in m ;
  - optimal work breadth ( $B_{opt}$ ), in m ;
  - variation coefficient (a);

- uniformity of distribution in vertical plane (U), in %;
  - symmetry of spread.
- b) *Energetically index*:
- effective work velocity ( $v_e$ ), in km/h;
  - hourly fuel consumption (q), in l/h;
  - fuel consumption at  $10^4 \text{ m}^2$  (Q), in l/ha;
  - hourly work capacity at effective time ( $W_{ef}$ ), in ha/h;

### Quality work index

The values of work quality index are presented in table 1.

**Table 1**

### Work quality index values

$\Phi$ disk [mm]	Adjusting position	Chemical type	Total breadth $B_i$ [m]	Geometrically non symmetry [m]	Work breadth $B_i$ [m]	Spread quantity [g]	Non symmetry of quantity [g]	Average quantity [g/box]	Non uniformity distribution degree	Uniformity U [%]
600	5	Urea	17,25	+0,25	15,5	74,5	- 0,5	1,20	0,166	86,4
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	17,50	0	15,5	85,6	+ 2,0	1,38	0,157	87,3
		N <sub>12</sub> P <sub>52</sub>	17,50	0	15,5	85,4	- 0,2	1,38	0,162	87,8
	10	Urea	17,25	+0,25	15,5	484,9	- 0,5	7,82	0,133	86,7
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	17,50	0	16,0	491,2	- 1,2	7,67	0,137	86,3
		N <sub>12</sub> P <sub>52</sub>	18,50	0	17,5	535,1	+ 1,7	7,64	0,150	87,0
	14	Urea	17,50	0	16,0	1470,3	+ 13,2	22,97	0,165	88,5
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	18,00	0	16,5	1571,9	- 1,9	23,82	0,148	87,2
		N <sub>12</sub> P <sub>52</sub>	19,50	0	18,0	1618,9	- 3,9	22,48	0,174	86,6
450	6	Urea	10,50	0	9,0	64,3	- 0,5	1,79	0,195	87,5
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	10,50	0	9,0	81,6	- 1,6	2,27	0,240	86,0
		N <sub>12</sub> P <sub>52</sub>	11,00	0	9,5	96,2	+ 1,2	2,53	0,230	87,0
	10	Urea	10,75	0	9,5	472,9	+ 3,2	12,44	0,213	88,7
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	11,00	0	10,0	503,7	+ 2,7	12,58	0,226	87,4
		N <sub>12</sub> P <sub>52</sub>	11,00	0	10,0	508,3	+ 1,1	12,71	0,224	87,6
	15	Urea	11,00	0	10,0	1543,7	+ 12,1	38,59	0,240	86,0
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	11,50	0	10,5	1583,3	- 5,7	36,63	0,220	88,0
		N <sub>12</sub> P <sub>52</sub>	11,50	0	10,5	1604,4	- 14,8	38,20	0,326	87,4
400	4	Urea	8,75	+0,25	8,0	79,1	+ 0,7	2,47	0,180	87,0
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	8,50	0	8,0	81,8	+ 0,2	2,56	0,178	87,2
		N <sub>12</sub> P <sub>52</sub>	9,00	0	8,5	82,8	- 1,0	2,43	0,212	83,8
	8	Urea	8,50	0	8,0	518,5	+ 6,5	16,20	0,168	88,2
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	9,00	0	8,0	531,0	+ 1,4	16,59	0,173	87,7
		N <sub>12</sub> P <sub>52</sub>	9,50	0	8,5	586,1	- 1,3	17,24	0,178	87,2
	12	Urea	9,50	0	8,0	1478,8	+ 2,0	46,21	0,185	86,5
		N <sub>15</sub> P <sub>15</sub> K <sub>15</sub>	9,50	0	8,5	1610,0	- 7,4	47,35	0,175	87,5
		N <sub>12</sub> P <sub>52</sub>	9,75	+0,25	8,5	1661,3	+ 13,1	48,86	0,188	86,2

From analyse data based from table 1 it has been ascertained that:

- centrifugal spread breadth of chemicals in vertical plane depend on geometrically and cinematic characteristics of the disk and also aerodynamic qualities, weight of particles and chemicals flow;
- work breadths in presented test conditions are:
  - for the disk with 400 mm diameter (MIS–400) : 8,5...9,0 m;
  - for the disk with 450 mm diameter (MIC–04) : 9,0...10,5 m;
  - for the disk with 600 mm diameter (experimentally variant) : 16,0...18,0 m;
- at the minimum opening of supplying device, at MIC–04 variant it has been ascertained that the distributed chemicals quantity is smallest than 64,3 g;
- The minimum values of the interval for all disks correspond with chemical with the lowest density (urea, with 0,795 kg·dm<sup>-3</sup>); the maximum values correspond with the chemical at least weight (N<sub>12</sub>P<sub>52</sub>, with 1,1 kg·dm<sup>-3</sup>);

Differences between the administered spread quantities, at right and left are decrease at the variant with 450 mm, diameter of the disk.

### **Energetically index**

The values of the energetically index is presented in table 2.

**Table2**

**Values of energetically index**

Name of index	Symbol	Measure unit	Average value
<b>Effective work velocity</b>	<b>V<sub>e</sub></b>	<b>km/h</b>	<b>6,1</b>
<b>Hourly work capacity at effective time at 15,5 m work breadth (disk Φ 600)</b>	<b>W<sub>ef</sub></b>	<b>ha/h</b>	<b>9,34</b>
<b>Hourly fuel consumption</b>	<b>q</b>	<b>l/h</b>	<b>4,78</b>
<b>Fuel consumption at 10<sup>4</sup> m<sup>2</sup></b>	<b>Q</b>	<b>l/ha</b>	<b>0,512</b>

### **CONCLUSIONS**

Analysing the processed values results that the unit formed by U 650 tractor and the studied machines achieve an adequate index, work capacity and fuel consumption

- Comparing the work breadths results a improve of machine work performances, which ensure work breadths of 15...18 m;
- The minimum chemical rate is 48 kg/ha (at the experimentally variant), 71,6 kg/ha (at MIC–04), respectively 100 kg/ha at MIS–400;
- The uniformity of distribution in vertical plane is decreased at variant MIC–04, being of 67,6...80,5%;
- Spread chemicals uniformity on work breadth has increased values, between 86,0 and 88,7%, prevalent towards superior values for all disks.

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# CONSIDERAȚII PRIVIND ORGANELE DE LUCRU ALE MAȘINILOR UTILIZATE LA PREGĂTIREA TERENULUI ÎN VEDEREA SEMĂNATULUI

## CONSIDERATIONS ON THE SEEDBED MACHINERY DEVICES

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**Key words:** device, disk, thorn, chisel

*Rezumat: Lucrarea prezintă câteva considerații generale legate de organele de lucru ale mașinilor utilizate pentru pregătirea patului germinativ în vederea semănatului. Sunt prezentați parametrii constructivi și funcționali ai organelor active, care se interconectează, iar prin valorile lor se prezintă destinația mașinii.*

*Abstract.*

*The paper presents few considerations on the machinery devices for preparing the seedbed. There are presented the constructive and functional parameters that interconnect and by their values the task of the machinery is set.*

### INTRODUCTION

The soil preparation for drilling can be achieved by various tools, including different harrows, rollers, and tiller or milling machines. The most used are disks, thorn harrows, tillers and lately, combined tools including tillers and mills.

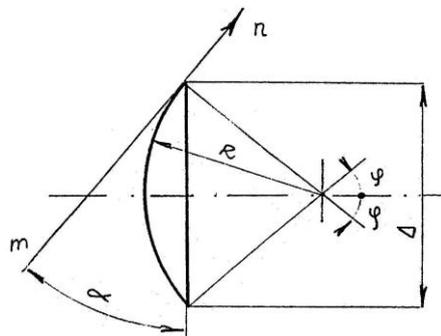
### MATERIAL AND METHOD

#### The disk harrow devices

The disk harrows are usually used for loosening the plowed land in order to prepare the seedbed when the soil crumbles are crushed and the soil is leveled at the 5-15 cm, the soil preparation as stubble or after corn at 15-20 cm for drilling, eliminating the plowing, and tillage between rows with orchards or vineyards.

The disk device is characterized by a series of constructive and functional parameters that interconnect and their values determine the task of the machinery.

In the figure 1 there is presented the disk diameter  $D$  and the curve radius of its concave surface. The two parameters influence directly the effect on soil.



**Fig. 1 The  $D$  and  $R$  disk parameters:**  
( $\alpha$  working angle ;  $m - n$  disk moving direction).

From the 2.1. figure there results:

$$D = 2 \cdot R \cdot \sin \varphi \quad (1)$$

where the  $\varphi$  angle can have different values in function of the destination and machinery type.

The maximal depth  $a_{\max}$  is:

$$a_{\max} = \frac{D - d}{2} \quad (2)$$

from where:  $D = 2a_{\max} + d$  (3)

where:  $d$  is the exterior diameter of the collar socket for outdistance (reel).

Generally, the disc diameter is determined in function of the machinery destination, namely on its depth with the following formula:

$$D = k \cdot a \quad (4)$$

where  $k$  is a number whose value vary from 3 to 8 in function of the machinery destination (field harrows  $k = 4 \dots 6$ ; stuble harrows  $k = 6 \dots 8$ ; orchard harrows  $k = 4 \dots 6$ ; heavy harrows  $k = 3 \dots 6$ ).

If we will perform an equatorial section through the disk we will see the following parameters:

- **the working angle**  $\alpha$  formed by the forward direction and  $m - n$  and its rotation plan  $A_1B_1$ . The working depth, cutting up and turning the plough depend on the magnitude of this angle. Along with the increasing of  $\alpha$  angle, the machinery resistance increases as well as the possibility to catch the soil land vegetal debris between disks.

- **the declination angle**  $\beta$ , is formed between the disk rotation plan and the vertical plan. This angle is  $20^\circ$  and can be found only with ploughs. This declination ensure the reduction of the vertical component of the soil that tends to pull the disk out from the soil.

- **the posterior cutting angle**  $\varepsilon$  is formed by the  $A_1O_1$  cone generator (the exterior cutting edge) and the forward direction. The normal functioning of the disk is ensured by the positive values of this angle ( positive value of this angle  $\varepsilon$  is when the forward direction does not cross the cone). With low values of this angle the disk penetration is lowered, the equilibrium is instable and the pulling force increases.

- **the  $\omega$  angle** is formed by the rotation plan  $A_1B_1$  and the cone generator. In function of the type and destination of the machinery, the  $\omega$  angle has the following values: for ploughs  $\omega = 42^\circ \dots 45^\circ$ , for harrows  $\omega = 37^\circ \dots 40^\circ$ .

- **the sharpening angle**  $i$  is formed by the cone generator and the tangent to the disk concavity to the cutting edge:  $i = 13^\circ \dots 15^\circ$ .

The dependency between these two angles is given by the following formula:

$$\alpha = \omega + \varepsilon = \varphi + i + \varepsilon \quad (5)$$

- **the posterior cutting angle**  $\varepsilon_a$  (figure 2)

The set up dependency between the equatorial sections between  $\alpha = \omega + \varepsilon$  angles do not ensure an exact presentation of these working parameters. This is because as the section plan is located under the equatorial diameter, the  $\varepsilon$  angle change its value, such way that at the soil level, with the distance (the working depth) over the furrow bottom, the  $\varepsilon$  angle changes its value to  $\varepsilon_a$ . Also in figure 2, the length of the curve with  $D_a$  distance  $a$ ;  $D_c$  is the length of the circle portion;  $\omega_a$  is the value of the  $\omega$  angle at distance  $a$ .

In the existing constructions with harrows there is respected the following condition:

$$\varepsilon_a \geq i \text{ or } \varepsilon_a = 3^\circ \dots 5^\circ.$$

### The working devices of the thorn harrows

The thorn harrows are formed by several part with the width between 0.6 and 1.8 m. A harrow part is formed by a frame where the working devices are placed. In function of the weight per thorn  $g_0$ , the thorn harrows can be split in: heavy harrows ( $g_0 = 2 - 4,5$  daN), average harrows ( $g_0 = 1,2 - 2$  daN) and light harrows ( $g_0 = 0,6 - 1$  daN).

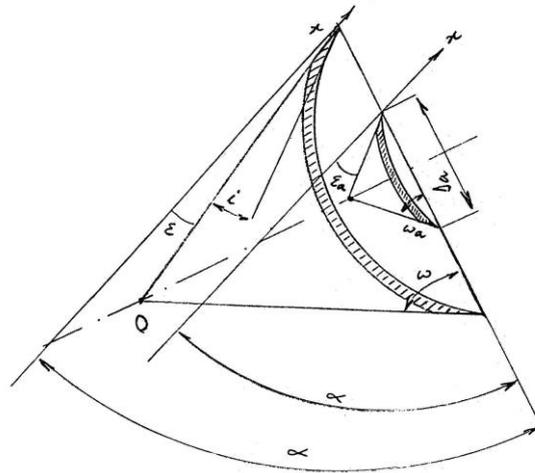


Fig. 2 The disk parameters in cross view at the soil surface

The thorns used for harrows have various dimensions and forms (fig. 3).

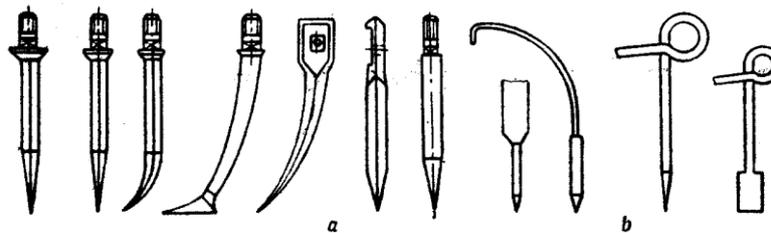


Fig. 3 Harrow thorns forms

The straight thorns with square section (fig. 3,a) are used for normal depth harrows that work in average and heavy soils. The thorns with square section and curved tip are used for high depth harrows.

The circular and elliptical thorns (fig. 3,b) are used for light soil harrows.

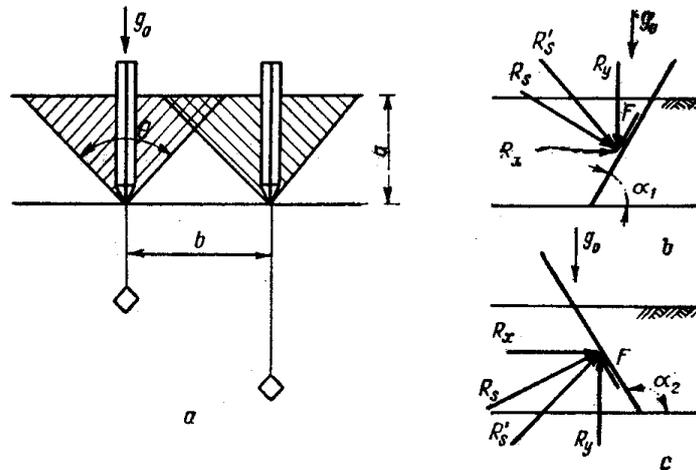
While working, under the action of the weight  $g_0$  that press on the thorn and due to the translation movement, the thorn enter into the soil at a depth  $a$ . (fig. 4,a) and its anterior edge cuts the soil. Due to the smashing action of the thorn and movement of the soil particle the soil layer is crushed.

By thorn movement into the soil, it loosens the soil on a triangular shape, the sides of the triangle forming an angle of  $\theta = 50 - 70^0$ . The soil is not even tilled on depth so there are formed ridges whose height depends on the  $b$  distance between the neighborhood tracks of the thorns.

The thorns can be straight or reclined (the case of the reclining thorns harrows). If the thorn is positioned at an angle  $\alpha_1 > 90^0$  (fig. 4,b), there is a force on it  $R'_s = R_s + F$ ,  $R_s$  is the soil reaction and  $F$  - friction force. In this case, the depth of the thorn into the

soil is made under the action of the following force  $g_0 + R_y$ ,  $R_y$  being the vertical component of the  $R'_s$ .

When  $\alpha_2 > 90^0$  (fig. 4,c), the  $R_y$  component of  $R'_s$  force being oriented opposite to the  $g_0$  force, the tendency of the thorn to enter into the soil is lowered.



**Fig. 4 The sketch of the working process**

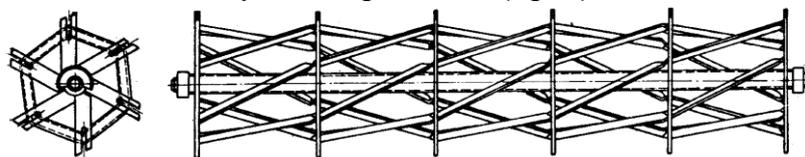
The harrows with the thorns under an angle of  $\alpha_1 < 90^0$  have a better stability.

The useful length of the thorn (the distance from the tip to harrow frame) is of 150 – 300 mm. In general,  $l = (2 - 2,5)a$ , where  $a$  is the working depth of the harrow.

**The working devices with the helicoidally harrows**

The helicoidally harrows are used for the crushing, loosening and leveling of the upper layer, usually used for seedbed preparation (tillers, thorn harrows, etc.) finishing the tillage preparation for drilling.

Constructively, they are made of wire pieces (with circular or rectangular crossing) or blade, mounted on a helicoidally working surface (fig. 5)



**Fig. 5 Helicoidally harrow**

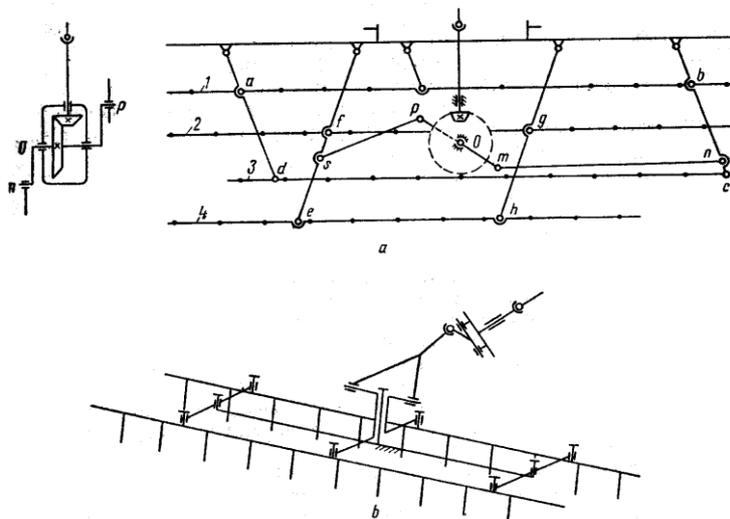
**The working devices with the oscillate harrows**

The oscillate harrows are used for the seedbed preparation of vegetable, potatoes, sugarbeet, etc.

These harrows have the working devices as circular thorns with the same length or different lengths that are mounted on bars that are oscillated during the working process.

The working depth of the thorns is  $a = 10 - 18$  cm.

In the figure 6,a there is shown the sketch of an oscillate harrow where the thorns are mounted on four bars. The 1 and 3 bars are mounted on the quadrature mechanism  $a-b-c-d$  and the 2 and 4 bars that are mounted on  $e-f-g-h$ , mechanism. The power for these two mechanisms come from the tractor by  $Oms$  and  $Ops$  mechanisms.



**Fig. 6 Sketches of oscillate harrows**

During the working process, the thorns receive translation movements that are perpendicular on the forward direction and describes different trajectories (sinusoidal curves) having a strong effect on the soil. There is obtained a good crushing and loosening of the soil on the entire depth.

In the figure 6,b there is shown the sketch of an oscillate harrows whose thorns are mounted on two bars driven by a special mechanism receiving power from the tractor. In this case, the thorns describe similar trajectories yet with different time peaks. The width of the oscillate harrows is 2,5 – 4 m.

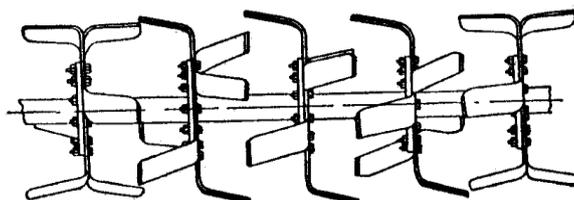
### **The working devices of the soil milling machines**

All above mentioned working devices are passive which means that they are not directly driven by the tractor. These working devices are either pulled or pushed and if they are rolled, this move is not due to the direct power of the tractor but because of the contact with the soil, respectively momentum of friction.

In the case of the soil milling machines, the working devices are directly driven by the tractor and its working devices become active.

The soil milling machines are designed for the soil crushing, loosening and leveling at depths of 6...25 cm. These machines can be used for soil preparation at depths of 18...25 cm, replacing plows for 6...15 cm (seedbed preparation or mechanical hoeing).

The working device of the milling machine is the rotary with knives that is driven by the tractor and can work in strips or on all width. The rotary (fig. 7) is formed of an ax with knives.



**Fig. 7 The rotary of the horizontally mill machine**

The rotaries of the milling machines can be an horizontally or a vertically ax. The knives are mounted at equal distances either on the collars or on axes. The knives (fig. 8) have different forms and parameters in function of the soil and the required parameters.

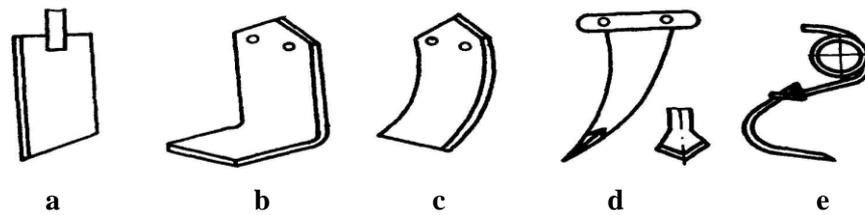


Fig. 8 Mill knives

The knives are mounted, usually, on rigid disks with the lateral blades mounted alternatively on the right and left.

In order to ensure the function without shocks the knives are mounted after one or many wires on the left or right with the constant angular distance those actions successively.

The basis feature of the working process of the soil mills is the good preparation of the soil in order to be drilled, mixing and loosening the soil layers and the vegetal debris. Their disadvantages is the higher fuel consumption in comparison with the other tilling tools.

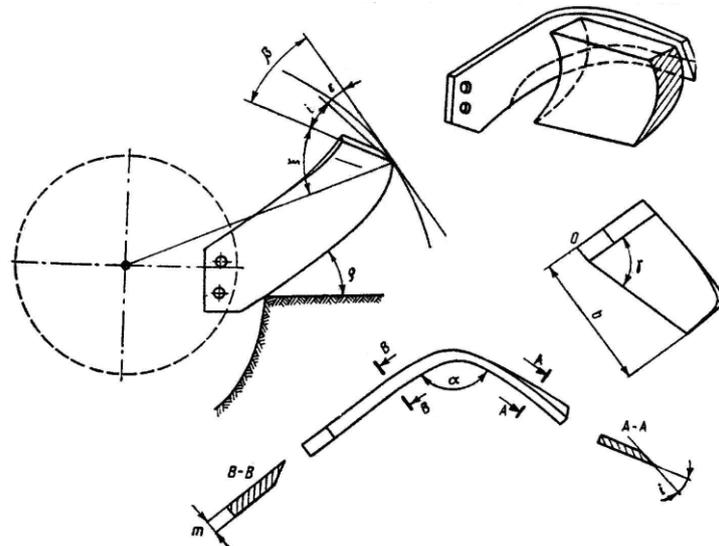


Fig. 9 The geometrical parameters of the L shape knives

The knife is mounted on a rotary (fig. 9) such way the vertical edge to be declined at an angle of  $\rho \cong 30^\circ$ . In this manner, the sharpness of the soil crumble is made step by step.

The horizontal part of the knife (the wing), in the working position is characterized by the anterior cutting angle  $\beta$  (the angle between the anterior surface of the knife and the tangent to the the curve described by the knife) and the posterior cutting angle  $\varepsilon$  ( $\beta = i + \varepsilon$ ). There is need to ensure for  $\varepsilon$  values of 6 - 10°.

The energy consumption for soil part taking away is minimal when  $\beta = 20 - 25^\circ$ .

The wing is vertically disposed under an angle of  $\alpha = 95 - 100^\circ$ , in the working position, forming an angle of  $\xi = 60 - 65^\circ$ .

The  $\gamma$  angle of the horizontal position of the cutting edge is  $50 - 70^\circ$ . The sharpening edge is  $i = 15 - 20^\circ$ .

The working edge of the L shape knives is 9 – 15 cm, in function of the mill type and the thickness is 4 – 8 mm.

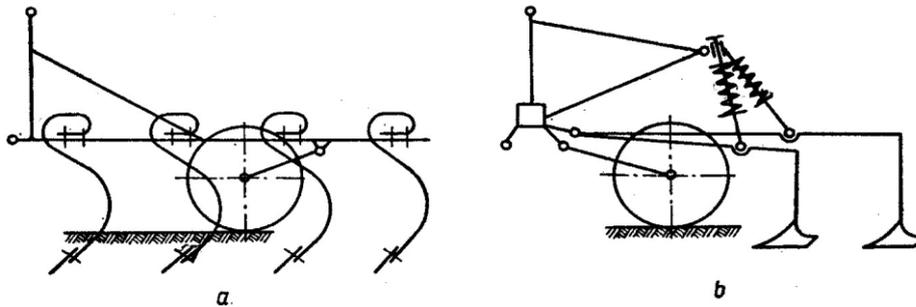
The rotary diameter is 350 – 550 mm with the seedbed mills.

The mounting of the knives on the rotary is made rigidly (more often) by means of articulated mechanisms.

### THE WORKING DEVICES OF THE TOTAL HOEING TILLERS

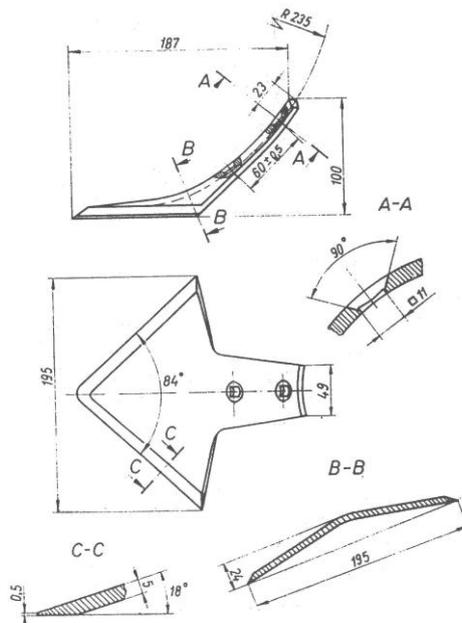
The totally tillers are mainly used for soil preparation, seedbed preparation, soil crunching and loosening at 6 – 18 cm, and weed control.

The total tillers can be equipped with claw devices (knife and chisel) or arrows mounted on elastic supports (fig. 10,a) or working devices arrow shape mounted on rigid supports (fig. 10,b).



**Fig. 10 The sketch of totally tillers**

In the fig. 11 there is presented the arrow knife for seedbed preparation type 4, according with STAS 7247-84.



**Fig. 11 Arrow knife for seedbed preparation type 4**

## CONCLUSIONS

1. The seedbed preparation is influenced both by the soil conditions ( soil type, oisture, weeding degree, etc.), or the crop features and mostly on the machinery that ar part of the technology

3. None of the working devices, passive or active, satisfy all soil management requirements for the specific work in certain conditions

4. By combining more working devices on the same machinery or on separate frames that work with the same tractor there can be achieved the required working conditions as: the working depth, the uneven of the working depth, crushing, leveling, soil mixing, destroying of undesired vegetation

5. The working devices as thorns, knives, arrow knives, rollers, stars or blades do not satisfy the punctual requirements of the seedbed preparation, so there are used combined tools ( e.g. ACPG3 that have knives for deep loosening, mill and roller).

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# OPTIMIZAREA PARAMETRILOR DE BAZA AI AGREGATELOR AGRICOLE PRIN METODA MULTIPLICATORULUI LAGRANGE

## THE OPTIMIZATION OF THE BASIS PARAMETER OF THE MACHINERY UNITY USING THE LAGRANGE MULTIPLICATOR METHOD

*Mircea Bădescu, Loredana Elena Dicu, Cristian Vasile*

**Key words:** optimization, Lagrange multiplier method

**Rezumat:** Reducerea consumului de energie in utilizarea agregatelor agricole cuprinde, printre altele, corelarea capacității de lucru a acestora cu dimensiunile parcelelor de lucru, care in condițiile actuale ale agriculturii românești sunt repartizate pe o plaja valorica foarte mare. Una din metodele eficiente de optimizare este reprezentata de elaborarea unui model matematic care reprezintă legătura dintre funcția scop și cea de restricție. Rezolvarea modelului matematic pentru diferite date concrete din exploatare, ne prezintă valorile optime necesare parametrilor de lucru ai agregatelor in funcție de mărimea parcelelor.

**Abstract:** *The energy saving methods includes the correlation of the tillage capacity with the size of the working plots that in actual conditions of Romanian agriculture are distributed on a wide range. One of the efficient optimizing methods is a mathematical model that is the link between the goal and restriction function. The solving of the mathematical model for certain data show us the optimal values needed for the working parameters of the machinery units in function of the size of the working plots.*

### INTRODUCTION

The energy consumption with tillage is a paramount element for making the farm activity efficient and saving this energy is very important. Besides the designing, building, adjustment and working with the machinery as well as the setting up of the farming processes, there is possible to optimize the working parameters of the machinery units using mathematical models that correlate the speed of the tractor with and the width of the machinery unit with the length and the width of the plot.

### THE RESEARCHING METHOD

The stages of the method are the following:

-the elaboration of the goal function the sets up the functional relation between the fuel consumption and its parameters

$$y=f(x_1, x_2, \dots, x_n)$$

-the setting up of the restriction functions that are the functional relation between the machinery unit parameters and the level of certain parameters that are imposed by the in place working condition.

$$F_k(x_1, x_2, \dots, x_n)=0$$

- the differentiation between the goal restriction functions and make them equal of zero

$$dy = \sum_{i=1}^n \frac{\partial y}{\partial x_i} dx_i = 0$$

$$dF_1 = \sum_{i=1}^n \frac{\partial F_1}{\partial x_i} dx_i = 0$$

$$dF_2 = \sum_{i=1}^n \frac{\partial F_2}{\partial x_i} dx_i = 0$$

$$dF_m = \sum_{i=1}^n \frac{\delta F_m}{\delta x_i} dx_i = 0$$

There are formed  $n$  equations with  $n$  unknown values by summing the differentials of the goal and restriction functions using the Lagrange multiplier in the following way.

$$\frac{\delta y}{\delta x_i} + \lambda_1 \frac{\delta F_1}{\delta x_i} + \lambda_2 \frac{\delta F_2}{\delta x_i} + \dots + \lambda_m \frac{\delta F_m}{\delta x_i} = 0$$

Having the goal and restriction functions there can be formed using the Lagrange multiplier the following function:

$$\phi(x_1, x_2, \dots, x_n, \lambda_1, \dots, \lambda_m) = y + \lambda_1 F_1 + \dots + \lambda_m F_m$$

The formula #1 can be derived in relation with all  $x_i$  variables and the all partial derivatives will be equal zero. There will results  $m + n$  equations. By solving these equations there will be gained the solutions of the system.

The experimental results on the optimization of a complex machinery unit using the Lagrange multiplier method

The objective is to determine the optimal working speed  $V_{opt}$  and the working width  $B_{opt}$  with minimal fuel consumption for tillage an even soil taking account that the pulling force is influenced by the working speed and the free charge moving of the machinery unit at the end of the plot is  $l_i + m_1 B$  where  $l_i$  = the length of an free charge turning back and  $m_1$  - the turning back parameter.

The goal function for the energy consumption study can be established by summing the consumed energy at the charge regime  $P_s T_s$  and the energy consumed at free charge moving  $P_g T_g$ :

$$E = P_s T_1 + P_g T_g = P_s \frac{CL}{BV_1} + P_g \frac{C}{BV_g} (l_i + m_1 B)$$

In formula 2  $C/D$  is the number of passing multiplied by the length of the plot  $L$ , equals the total length during the working process. This length divided by the working speed  $V_i$  equals the working time,  $T_1$  at the machinery unit movement during the tillage. The same reasoning has to be done for the second part of the formula (2).

In the second formula the power  $P$  and  $P$  are established in function of the pulling force of the machinery and the movement speed with certain working regimes.

$$P_g = f_m g_s BV_g + f_v g_s BV_g^2$$

$$P_s = f_m g_s BV_i + f_v g_s BV_i^2 + KBV_i + K_v BV_i^2$$

Where:

$g_s$  = the weight of the unit of the working width.  $Nm^{-1}$

$V_i$  = the working speed,  $ms^{-1}$

$V_g$  = the free of charge speed,  $ms^{-1}$

$f_m$  = the coefficient of rolling resistance

$K$  = the pulling force resistance of the unit from the width of the machinery,  $Nm^{-1}$

$K_v$  = the increasing coefficient of the pulling resistance of the machinery due to speed,  $Nsm^{-1}$

$K_s$  = coefficient of using the shift time.

By replacing the  $P_s$  and  $P_g$  from the second relation by formulas given by the relations 3 and 4 there is obtained:

$$E = f_m g_s B V_i + f_v g_s B V_i^2 + K B V_i + K_v B V_i^2 \frac{CL}{B V_i} + f_m g_s B V_g + f_v g_s B V_g^2 \frac{C(m_1 B)}{B V_g} \quad (5)$$

During work,  $V_g = V_i$ , then goal function became:

$$E = f_m g_s CL + f_v g_s V_i CL + KCL + K_v CL V_i + f_m g_s C l_i + f_m g_s C m_1 B + f_v g_s V_i C l_i + f_v g_s V_i C m_1 B, \quad (6)$$

The restriction function is given by the relation of the working capacity.

$$\frac{W}{B V_i} - K_s = 0$$

The goal and restriction functions is derived in function of the parameters that we want to get the optimal values for.

$$\frac{dE}{dV_i} = f_v g_s CL + K_v CL + f_v g_s C l_i + f_v g_s C m_1 B$$

$$\frac{dE}{dB} = f_m g_s C m_1 + f_v g_s C m_1 V_i$$

$$\frac{dF_1}{dV_i} = -\frac{BW}{B^2 V_i^2}$$

$$\frac{dF_2}{dB} = -\frac{V_i W}{B^2 V_i^2}$$

Using the Lambda multiplier there can be obtained a system with three equations and three unknown values.

$$f_v g_s CL + K_v CL + f_v g_s C l_i + f_v g_s C m_1 B - \lambda \frac{BW}{B^2 V_i^2} = 0$$

$$f_m g_s C m_1 + f_v g_s C m_1 V_i - \lambda \frac{V_i W}{B^2 V_i^2} = 0$$

$$\frac{W}{B V_i} - K_s = 0$$

By solving the system we will get:

$$V_{opt} = \sqrt{\frac{f_m g_s m_1 W}{K_s (f_v g_s L + K_v L + f_v g_s l_i)}} \quad [m/s] \quad (7)$$

$$B_{opt} = \sqrt{\frac{W(f_v g_s L + K_v L + f_v g_s l_i)}{f_m g_s m_1 K_s}}, \quad [m] \quad (8)$$

$$W = 0.36 V_{opt} B_{opt} K_s, \quad [ha/h] \quad (9)$$

$$E_{min} = C(f_m g_s L + f_v g_s L V_{opt} + KL + K_v L V_{opt} + f_m g_s l_i + f_m g_s m_1 B_{opt} + f_v g_s l_i V_{opt} + f_v g_s m_1 V_{opt} B_{opt}), [J] \quad (10)$$

The charge pulling power can be calculated with the relation 4.

$$P_s = f_m g_s B V_l + f_v g_s B V_i^2 + K B V_i + K_v B V_i^2, \quad [W] \quad (11)$$

The effective power of the engine can be established using the outturn  $\eta$  of the tractor and the formula:

$$P_e = \frac{P_s}{\eta}, \quad [W] \quad (12)$$

*Exercise: we need to optimize the working parameters of a complex machinery unit for seedbed preparation and drilling for the following working conditions:*

- $g_s=8000 \text{ N/m};$
- $f_m=0,18;$
- $f_v=0,01 \text{ s/m};$
- $K=3500 \text{ N/m};$
- $K_v=100 \text{ Ns/m}^2;$
- $L=500 \text{ m}, 1000 \text{ si } 1500 \text{ m};$
- $C=50 \text{ m}, 100 \text{ si } 150 \text{ m};$
- $K_s=0,8;$
- $l_i =50 \text{ m};$
- $m_1=50 \text{ m};$
- $W=11,1 \text{ m}^2/\text{s};$
- $\eta=0,6.$

The calculus made using the 7 ... 12 relations is written in the table 1.

**Table 1**

Working parameters		Plots length	500	1000	1500
$E_{min}$ [KJ]	C=50 m		147 928	288 407	419 806
	C=100 m		295 857	576 825	839 613
	C=1500 m		443 786	865 222	1 259 420
$V_{opt}$ [m/s]			2,727	1,949	1,597
$B_{opt}$ [m]			5,087	7,117	8,685
$W$ [ha/h]			3,994	3,994	3,994
$P_s$ [kw/h]			75,338	73,389	72,504
$P_e$ [hw]			125,56	122,31	120,84

## CONCUSIONS

From the analysis of the calculated data there results the need to use, on large surfaces, wide machinery units. Also, there was established the minimal fuel consumption  $E_{\min}$  for plots with different lengths and widths, which corresponds with the working speed  $V_{\text{opt}}$  and the width of the machinery unit  $B_{\text{opt}}$ .

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# STUDIU PRIVIND TEHNOLOGIA ȘI SISTEMELE DE LUCRĂRI CONSERVATIVE ALE SOLULUI FOLOSIND GRAPELE CU DISCURI

## STUDY ON TECHNOLOGY AND CONSERVATIVE SYSTEMS FOR SOIL PROCESSING THROUGH DISK HARROWS

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**Keywords:** technology, disk harrow, tillage system

### **ABSTRACT**

*Lucrarea cuprinde un studiu privind tehnologia și sistemele conservative de prelucrare a solului în vederea semănatului. utilizând grapele cu discuri.*

*This work contains a study on technology and conservative systems for soil processing for sowing through disk harrows.*

### **INTRODUCTION**

The soil processing operation are usually mechanically performed using tools or machinery to change the soil properties with tools accessories and machines to change the soil properties and to create the necessary life conditions for the crops.

The agricultural conditions vary very much a lot from one area to another (type of soil, climate). Even the plants species demands are different. As a result, the concrete objective of soil processing are: achievement of physical, chemical and biological properties (for example refining and settling); weeds or noxious agents or pests extirpation and control; the fertilizer, pesticide and vegetable remnants mixing; creating the optimum conditions for the incorporation of crop seed plants, etc. Man has developed soil processing because he wanted to grow different species of plants. But in many cases this activity has become excessive as operations number, as intensity, time of performance, types of machines etc that reflect negatively on the soil properties (the destruction of the structure, low humus content, refining etc). Excessive tillage stimulates the intense oxidation process and therefore decreases the content of organic substance from the soil, increasing the soil erosion, in addition the heavy traffic and too often leads to an increase of compactness and as a consequence trigger other negative phenomena. A serious consequence of the excessive operations of ploughing is the drastic reduction of a wide number of fauna species especially of earthworms which have an important role in favorable soil properties forming (constant aggregate formation, soil draining etc)

### **GROUND BASE AND METHOD**

The elaboration of a soil processing technology, scientifically grounded is an acute necessity especially in the case of an intense agriculture, of an increasing negative influence of tractors and agricultural machines upon the soil, of the danger of environment contamination. The soil processing technology must guarantee considerable productions, but at the same time to stimulate the soil preservation and environment protection.

Both in the specialized acknowledged literature or in the agricultural practice there are presented two groups of high technologies for soil processing:

- classical technology (conventional);
- conservative technology;

Classical technology (conventional) includes mandatory ploughing, which reversed the layer and the preparation of a germinative layer. Often, the ploughing is preceded by

another superficial operation using disk harrow, rotary harrow etc and is followed by several other operations (usually 1 ... 3) to prepare the germination layer.

Within conservative technology the majority of writers establish the following system types:

- reduced tillage system
- system ditches
- system of tillage in narrow strips
- no till system –sowing

The tillage operation performed by disk harrows leads to great results in grinding, mixing and preparing the soil.

Worldwide, prestigious firms tend nowadays to produce disk harrows fitted with additional bodies for grinding and leveling located behind the disk batteries to perform soil tillage with a higher quality than other harrows.

### **System of operations for soil conservation, SLCS**

It is a classic system that has gradually ensured the increase of production. As a result of diminishing the content of organic substance, the internal oxidation, the structure deterioration, increasing of soil erosion, this classic system has triggered some worrying negative phenomena.

Due to excessive operations of ploughing we can notice a drastic reduction of a wide number of fauna species especially of earthworms which have an important role in the formation of stable aggregates, soil drainage, etc.

Thus, at the end of the first half of our century, arose the necessity to create a system of operation for soil conservation which stimulates plants growth, but which avoids the basic technology deficit, and which maintains and improves the productive potential of soil.

SLCS firstly means the reduction of negative effects in comparison with the classical system.

As a conclusion of what was presented above, the System of operation tillage preservation SLCS, comprises a great number of solutions, differentiated after the indicators used to eliminate the ploughing, totally or for a number of years, maintenance of vegetable remnants upon the surface of the soil, totally or at least 30% of the total, reduction of the operations number and other technical measures which lead to soil preservation.

Minimum tillage system means normally a reduced number of tillage. Please note that in the specialized acknowledged literature or in practice, sometimes at the minimum tillage group are incorporated into work in narrow bands. As it was conceived and put into practice in USA the minimum tillage system involves the following main requirements:

**A.** main tillage is without ploughing and is performed using the polisher or the disk harrow, rotary harrow, paraplow, arrow tiller Only in rare cases we admit once at 3-5 years the ploughing with the turning of the land.

**B.** a reduced tillage in comparison to basic system

**C.** vegetable remnants, before basic tillage (often simultaneous with the harvesting of the previous plant) and partially through basic tillage are buried superficially, so that a percent of 30..60% (depending on the type of minimum tillage system) remains at the soil surface, having the main role, in most cases of humus this requirement is mandatory for minimum tillage system. The vegetable remnants are only partially covered by the soil in order to have protection against the wind and the rainfall crossing on slope.

Among the various solutions of minimum tillage system according to the precise conditions (soil, climate, soil slope and technical equipment) we mention: the system with polish, the system with disks, the system with rotary harrow the system with arrows tiller

and the system ploughing-sowing in one pass. The denomination of each system results from the working machine which performed the basic soil tillage.

Usually, the tools used in working the soil have active mechanisms built and placed as to incorporate only part of the vegetable debris. It should be noted that the soil with a high content of clay that is worked with brush in wet condition is not fritter. Following polish remain narrow lanes and soil quickly returned to original condition. The soil work is of good quality if you are executed it when the soil is relatively dry.

Applying a minimum tillage system leads to the following:

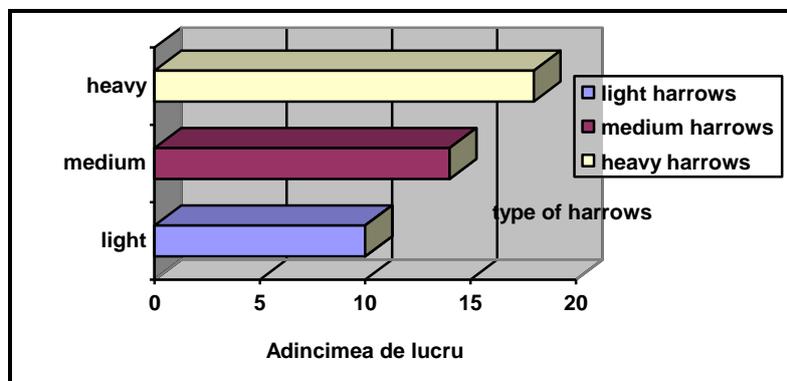
- ◆ endowment with specific agricultural equipment;
- ◆ need to carry out works to be sufficient for the formation of an appropriate germination layer;
- ◆ adoption of effective measures to destroy weeds;
- ◆ resolve the problem of plant remnants and scumbag stable;
- ◆ management of fertilizers and amendments.

In the work of the soil, the major objective is the soil refining, which provides conditions for the roots growing and in addition the extirpation of weeds, both the annual ones which arise from seeds and the deep-rooted perennial. Other objectives are the reduction of compaction and improvement of soil structure.

**The analysis on the depth of the preparation of germinative layer executed by disk harrows** is shown in figure 1.

The depth of the preparation of germinative layer executed by disk harrows depends on the following parameters:

- the specific pressure on disk;
- the attack angle of the disc batteries;
- the diameter disks



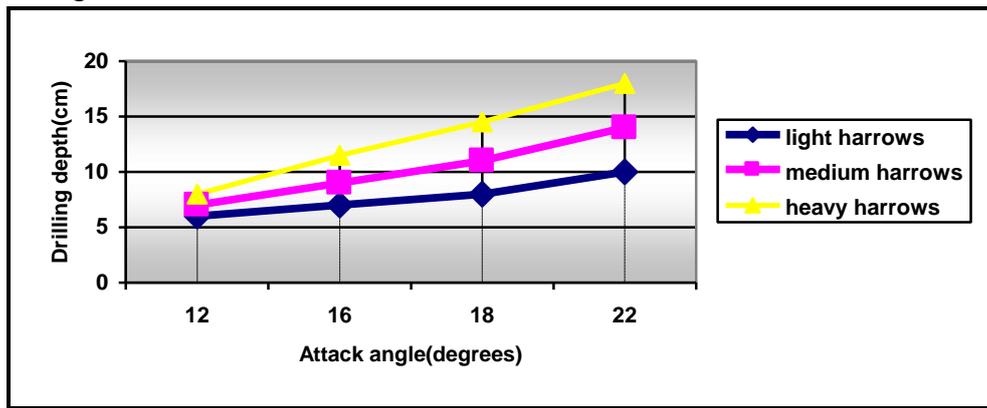
**Fig.1. Variation in working depth depending on type of disk harrow**

The specific pressure on disk is the functional and constructive parameter of harrows limiting the maximum working depth depending on their type (light, medium and heavy). The values analysis of depth of the preparation of germinative layer performed by disk harrows depending on their type is exemplified in the diagram from figure 2, which shows:

- light disk harrows which achieves drilling depth of 6...10 cm long,
- medium disk harrows which achieves drilling depth of 7...14 cm long;
- heavy disk harrows which achieves drilling depth of 8..18 cm long.

The attack angle of the disk batteries is another parameter related to the working depth of the harrows.

The variation analysis on the values of depth of the preparation of germinative layer performed by disk harrows depending on the attack angle of the disks is exemplified in the diagram from figure 2, which shows:



**Fig. 2. Variation in working depth depending on attack angle of disks**

For the value of a 12° of attack angle of the disc we obtain minimum values of working depth (cm):

- To light harrows 6
- To medium harrows 8
- To heavy harrows 10

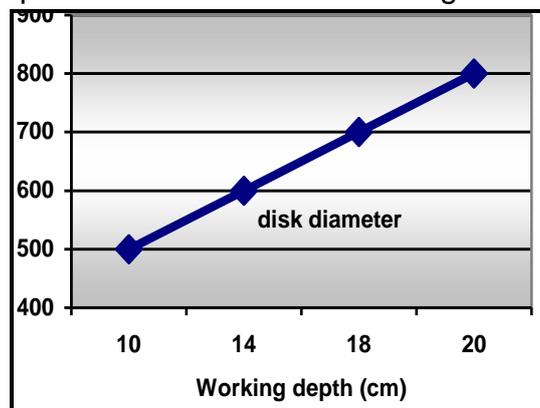
For the value of a 22° of attack angle of the disc we obtain maximum values of working depth (cm):

- To light harrows 10
- To medium harrows 14
- To heavy harrows 18

There are obtained different values of the working depth at the same attack angle of the disks due to the different specific pressure of the harrows. Minimum values are achieved to lower specific pressures and the maximum ones are achieved to higher specific pressures.

To obtain higher working depths in certain working conditions, the disk harrows should be charged with additional weight to increase specific pressure on disk.

**The disks diameter** of harrows batteries is another constructive parameter that depends on the working depth. Its variation is shown in figure 3.



**Fig. 3. Variation in working depth depending on disk diameter**

Analyzing the change of working depth depending on the diameter disks, according to the diagram from figure 3, shows the following:

- disks with a diameter of  $\Phi 500$  can achieve maximum working depth of 10 cm;

- disks with a diameter of  $\Phi 600$  can achieve maximum working depth of 14 cm, etc.

Analyzing the three parameters that influence the working depth of disk harrows can be concluded that they are closely related to each other and that can not skip any one, then, when you consider the promotion of a new disk harrow.

### **Period of ground works using disk harrows**

The ploughing should be harrowed once were made because they strengthen, can not be grind and the water loss increases through evaporation. Ploughings processing with disk harrows is made on the diagonal following the furrows direction to level their ridges.

In general, the period of ground works using disk harrows is the same with the one of ploughings (spring, summer and fall), except autumn ploughing which remains raw to freeze (for grinding) over the winter.

In spring it is recommended that in case of frozen ploughing the soil processing shall be performed only using combiners because these don't produce tilling in the operating process. It is not appropriate to use disk harrows in case of frozen ploughing, because in the operating process does not produce tilling, and at the same time a large quantity of water is lost through evaporation.

In spring it is not appropriate to use disk harrows in case of frozen ploughing, because in the operating process the processed soil is ploughed (dry part is placed above and below the damp rises above) large quantity of water is lost through evaporation.

In this case is indicated that the processing of soil should be performed only using combiners because these don't produce tilling in the operating process.

Agricultural works on the ground no-till (stubble ploughing) is in general made immediately after cereal or legumes harvesting because the ground remains free (shadiness) and intensifies water evaporation.

The works of maintaining soil (destruction of weed and soil refining) on the ranges from wine and fruit plantations (till or no till) is performed as often as necessary, from spring until autumn.

### **Rules for obtaining germination layer of high quality executed by disk harrows**

In order to obtain a germination layer of high quality executed by disk harrows it is necessary to respect certain general rules:

- attack angle of the disks should be the same on all batteries and appropriate for the regulated working depth;
- batteries from the front should work at the same depth with the rear;
- working direction should be on the diagonal following the plowing direction;
- the number of passages should be appropriate to obtain the regulated working;
- ploughing processing must be made immediately or within a very short period;
- speed work must be appropriate;
- land slope must be processed along the level curves to protect the soil against erosion.

### **CONCLUSION**

By judicious soil works, in full harmony with the other factors of vegetation, agricultural producer can maintain, enhance soil fertility and manage the production process so as to obtain favorable economic results and products of high quality.

So the ploughing is the largest consumer of fuel, so that should be sought machines and new technologies to ensure its replacement in the technology of plant production.

Otherwise it is solved the fundamental problem to optimize energy consumption that is been translated finally into minimum cost of production at farm level.

The technology for soil processing should be determined depending on several factors: soil type, degree of soil deterioration (erosion, compaction, etc.) environmental factors in which the work is performed (moisture, temperature); culture that is meant to be founded on the land in question, etc.

In the technology of soil processing the systems of operations for soil preservation presents a number of advantages over the classic such as:

- a reduction in energy consumption;
- maintaining the plant remnants to the soil surface;
- a reduction in the number of operations, and other machinery leading to soil conservation.

The systems of operations for soil preservation bring to the forefront minimum tillage system, in which the processing of soil with the disk has a special importance.

We noticed as factors needed to obtain a germination layer the possibility of choosing the attack angle of the disk to disk harrows, the specific pressure on disk and their diameter which judiciously selected can cover works of good quality with working depths between 6-18 cm.

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# ANALIZA ENERGETICĂ A SISTEMULUI DE LUCRU TRACTOR MAȘINĂ DE PRELUCRAT SOLUL PE RÂND

## THE POWER ANALYZE OF THE WORK SYSTEM OF THE TRACTOR-AGRICULTURAL MACHINERY FOR THE PROCESSING BY TURNS OF THE GROUND

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Cuvinte cheie: energetică, sistem de lucru, parametri, model dinamic, model energetic  
Keywords: energetic, work system, parameters, power model, energy balance

### ABSTRACT

Lucrarea prezintă un model de analiză energetică a sistemului de lucru tractor mașină de prelucrat solul pe rând, ținând seama de parametrii agregatului, cerințele tehnologice, regimul de lucru, condițiile de mediu, ce influențează procesul de lucru al agregatului. Sunt elaborate două modele, unul dinamic, altul energetic, care caracterizează agregatul mobil și o schemă pentru calculul bilanțului energetic.

The research (work) presents a model of energetic analysis of the working system tractor-row tillage machine, taking into account the aggregate parameters, the technological requirement, mode of operation, environmental conditions which affect the working process of the aggregate. There have been elaborated two models: a dynamic one and a energetic one which characterize the mobile aggregate, and a sketch to calculate the energy equation.

### METHODS USED

The tractor-agricultural machinery for the processing by turns of the ground work system is a complex technical system (fig. 1), which transform, energetically, the consumed quantity of the combustible Q in engine, in the work process, in the outlet under the form of W executed work:

$$W=f(S_j, C_t, M_k, R_j, Q) \quad (1)$$

where the drive sizes are:  $S_j$  -the parameters of the aggregate,  $C_t$  -the technological requirements and  $R_j$  -the work regime, and as factors of perturbation of the process are the environment conditions  $M_k$ .

The purpose function of the model is the power efficiency of the work system. For this reason it can be regulated, eventually, the parameters of the aggregate (the work regime) and partially from the agro technical requirements.

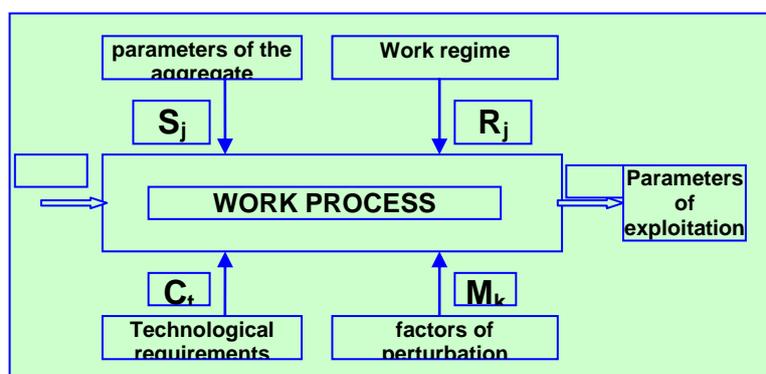


Fig. 1 The factors which influence the work process of the tractor- agricultural machinery technical system.

The structure of the mobile aggregate compound from tractor and the equipment for the processing by turns of the ground having as active organ the milling with vertical rotor operated hydrostatically may be realized on two models, as it follows:

- the dynamic model which point out the actions and the reactions of the system components
- the power model (fig. 2), which point out the transmitting flux of the energy from the axle of the engine to the movement system ( $E_d$ ) and to the work equipment by the power plug ( $E_a$ );

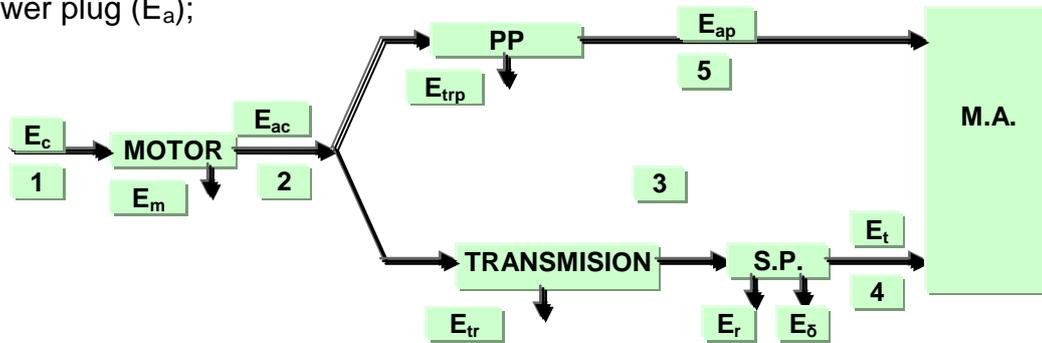
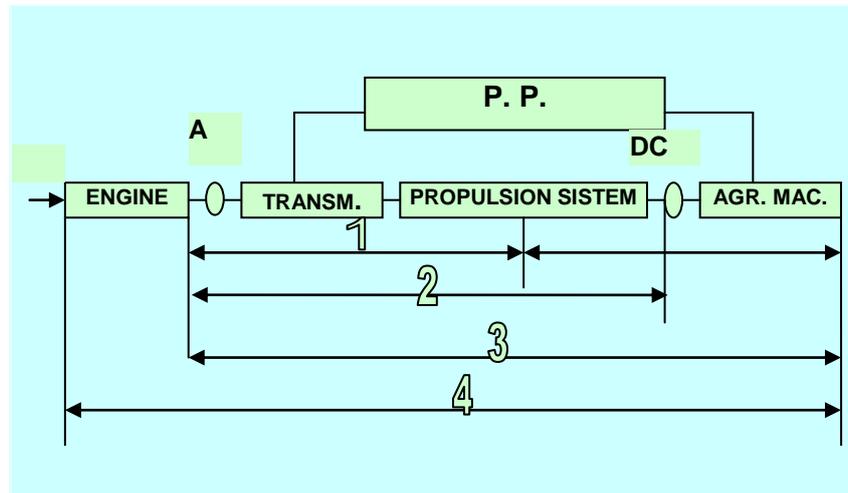


Fig. 2 The power structure of the mobile aggregate (power model).

In accordance with what is pursued, four calculus models of the energy balance can be elaborated (after the place where the energy consumption is pursued) and namely (fig. 3):

- at the tractor's drive wheels, 1
- in the coupling points of the machine from the unit, 2
- at the engine's crankshaft, 3
- at the entrance into the engine, 4.



The unit's energy balance, from the viewpoint of the presented energy model, is given by the relation:

$$E_c = E_m + E_t + E_{ma} \quad (2)$$

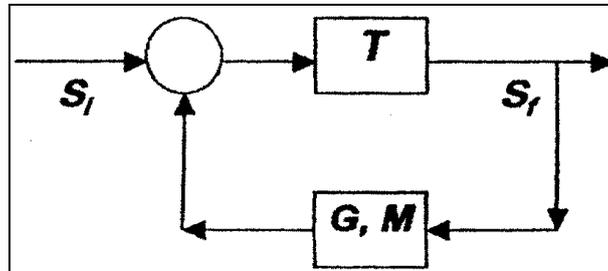
this represents the equality between the transmitted energy by fuel combustion in the engine  $E_c$  and the sum of the consumed energies by the engine  $E_m$ , the tractor  $E_t$  and the agricultural machine  $E_{ma}$ .

The tractor unit's energy balance + the soil processing equipment, having as operative device the milling machine with upright rotor according to the selected energy model, are calculated on the basis of the measured and recorded values in working real conditions at the experimental attempts.

With that end in view, the experimental determinations are effectuated according to the test methodology of the mobile agricultural units.

**The mathematical model for the energy analysis of the soil processing operation with the milling machine.**

By analysing from the systemic point of view, the interaction between the operative device and soil can be seen as a mechanical system with reaction process (fig. 4).



**Fig. 4 The soil-operative device mechanical system.**

The system's components have the next significations:

$S_i$  is the soil initial state;

$S_f$  - the soil final state;

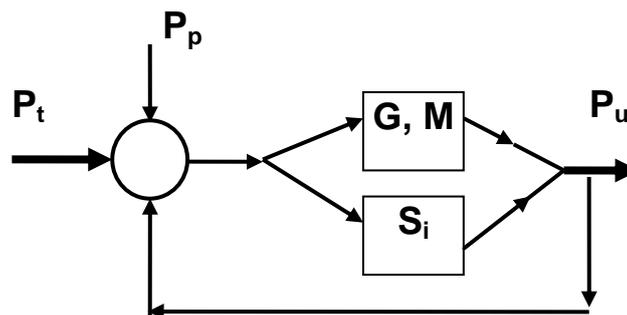
$G$  - the aggregate parameter that characterizes the operative device's geometry;

$M$  - the aggregate parameter that characterizes the operative device's kinematics;

$T$  - the soil's transforming function from the initial state  $S_i$  into the final state  $S_f$ .

In accordance with the initial state  $S_i$  and the agrotechnical demands imposed on the final state, the functional constructive parameters that characterize the soil processing operative device, are established.

By analysing from the energy point of view the soil's transformation from the  $S_i$  state into the  $S_f$  state we obtain the energy system from the figure 5, where  $P_p$  is the wasted energy in the soil mechanical processing operation (purpose fuction) that should satisfy the minimum condition.



**Fig. 5 The soil – operative device energy system.**

From the energy point of view, the milling machine working operation is presented in the figure 6.

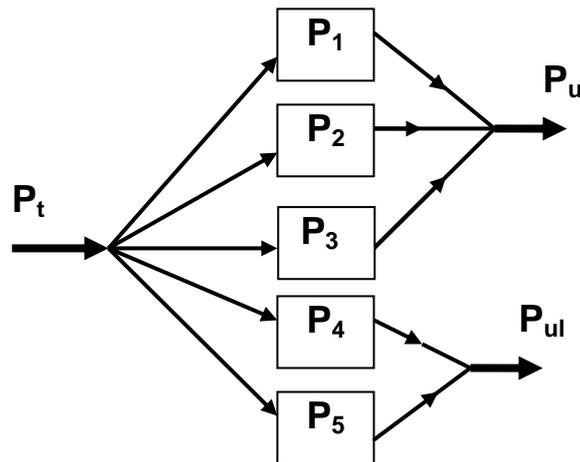


Fig. 6 The  $P_i$  energy components in the case of the soil processing with the agricultural milling machines.

In the figure 6 the following notations were made :

$P_1$  – the necessary power for the milling machines' driving idly;

$P_2$  – the necessary power for the soil cutting;

$P_3$  – the necessary power for the soil throwing;

$P_4$  – the necessary power for the energy station's displacement;

$P_5$  – the intake thanks to the milling machine's displacement idly.

The total power at milling will be:

$$P_t = \sum_{i=1}^5 P_i, \quad (3)$$

The necessary power for the milling machine driving idly, is given by the relation:

$$P_1 = \frac{M_p \cdot \omega_p}{1000 \cdot \eta_p} ; [\text{kW}] \quad (4)$$

where:  $M_p$  is the torsion moment at the power plug;  
 $\omega_p$  - the angular speed of the power plug.

The power needed for the soil cutting is determined by following the relation of the mechanical work:

$$L = F \cdot s$$

where the cutting force  $F$  is:

$$F = k_f \cdot A$$

where  $k_f$  represents the friction resistance coefficient [N/ cm<sup>2</sup>] and  $A$  is the surface of the cutting section.

From this result:

$$L = k_f \cdot A \cdot s$$

$$A = \rho \cdot r_c \cdot b$$

$$L = k_f \cdot \rho \cdot r_c \cdot b \cdot s$$

The power that is necessary for the soil cutting is determined with the relation:

$$P_2 = \frac{\rho \cdot r_c \cdot b \cdot k_f \cdot s \cdot z \cdot \omega}{2 \cdot \pi \cdot 1000} [\text{kW}] \quad (5)$$

where:

$s$  - the lead of the milling cutter [m];

$\rho$  - the cutter's angle of spinning when it travels the ground [rad];

$r_c$  - the curvature radius of the surface described by the cutter's rotation and translation movement [cm];

$b$  - the cutter's working width [cm];

$z$  - the number of cutters on the rotor;

$k_{fr}$  - the coefficient that shows the influence of the cutter's soil friction on the level of energy consume in the process of soil cutting;

$\omega$  - the angular speed of the rotor.

The power consumption used for throwing the soil is given by the relation:

$$P_3 = \frac{1}{2} \cdot m \cdot v_s^2$$

$$m = B_{rot} \cdot a \cdot v_m \cdot \gamma$$

$$P_3 = \frac{B_{rot} \cdot a \cdot v_m \cdot \gamma \cdot v_s^2}{2 \cdot 1000} \quad [\text{kw}] \quad (6)$$

where:  $m$  is the mass of soil thrown by the rotor's cutters per time units;

$v_s$  is the throwing speed of the soil;

$B_{rot}$  is the working width of the milling cutter's rotor;

$\gamma$  is the volume mass of the soil [kg/m<sup>3</sup>];

$a$  is the working depth of the cutter.

The throwing soil speed  $v_s$  is approximately equal with the periferical speed of the milling cutter's rotor  $v_p$ . By replacing the speed with the periferical speed of the rotor in the expression of the general power needed for the soil throwing  $P_3$  we obtain the relation

$$P_3 = \frac{B_{rot} \cdot a \cdot v_m \cdot \gamma \cdot v_p^2}{2000} \quad [\text{kw}] \quad (7)$$

but

$$\lambda = \frac{v_p}{v_m} \quad (8)$$

The expression for the power consumption for throwing the soil becomes:

$$P_3 = \frac{B_{rot} \cdot a \cdot \gamma \cdot v_p^3}{2000 \cdot \lambda} \quad [\text{kw}] \quad (9)$$

The power that is necessary for the displacement of the energetically base is given by the following relation:

$$P_4 = P_r + P_{\square} + P_{tr} \quad (10)$$

$$P_r = \frac{f \cdot G \cdot v_m}{1000} \quad [\text{kw}] \quad (11)$$

$$P_{\delta} = P_e \cdot \eta_{tr} \cdot \delta \quad [\text{kw}] \quad (12)$$

$$P_{tr} = P_e \cdot (1 - \eta_{tr}) \quad [\text{kw}] \quad (13)$$

where:  $P_r$  is the power lost by the tractor spinning;

$P_{\delta}$  is the power lost by skidding;

$P_{tr}$  is the power lost in the tractor's transmission;

$\delta$  is the skidding coefficient;

$\eta_{tr}$  is the mechanical efficiency of the transmission.

The power used because the displacement of the milling cutter is represented as follows:

$$P_5 = \frac{f \cdot G \cdot v_m}{1000} \quad (14)$$

where:  $G$  is the weight of the cutter;

$f$  is the running resistance coefficient;

$v_m$  is the traveling speed of the car.

The total power usage is given by the relation:

$$P_{tot} = P_t - P_{im} \quad [\text{kW}] \quad (15)$$

The power with whom the cutter's rotor pushes the aggregate tractor-milling cutter  $P_{im}$  can be expressed as a product between the resistance force  $F_R$  which acts following the direction of movement and the car speed  $v_m$  like this:

$$P_{im} = \frac{F_R \cdot v_m}{1000} \quad [\text{kW}] \quad (16)$$

## CONCLUSION

The energetically analysis of the exploitation process of the soil represents an efficient optimizing method of the functional parameters of the process and the geometrical parameters of the active organs. This analysis has its roots in the dividing of the entire process in elementary subprocesses that can be described by mathematical relations that can express the process referring to its quantity. By determining the energy afferent to each subprocess it can be highlighted the contribution of each operation (cutting, throwing, spinning etc.) to the total energetically consume of the respective process, the influence factors of the energy consumed in the process can be optimized.

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# PROGRAMELE CU FINANȚARE EUROPEANĂ – ȘANSĂ DE REVITALIZARE A AGRICULTURII ROMÂNEȘTI

## THE PROGRAMS WITH EUROPEAN FINANCING – CHANCE TO REINFORCE THE ROMANIAN AGRICULTURE

Mioara Borza

Key words: agriculture, development, financing, progress, viability

### ABSTRACT

*Agricultura românească s-a confruntat cu probleme numeroase și complexe și a înregistrat o serie de neajunsuri în perioada postdecembristă, din cauze multiple și variate, între care se pot prezenta ca fiind cele mai recunoscute: lipsa surselor financiare, tehnologia învechită, slaba pregătire profesională, forța de muncă îmbătrânită și în scădere, lipsa de atractivitate a sectorului.*

*Dintre factorii care au contribuit la scăderea performanței în sectorul agricol românesc și înregistrarea de rezultate tot mai slabe de la un an la altul, ne propunem să analizăm, în lucrarea de față, problematica finanțării în agricultură. De asemenea, se urmărește analiza impactului accesării surselor de finanțare, din programele europene, asupra creșterii competitivității agriculturii românești în ansamblu, precum și modalitățile de revitalizare a acestei componente esențiale a unei economii puternice. În vederea aderării României la Uniunea Europeană au fost pregătite o serie de etape specifice, una din cele mai importante fiind finanțarea agriculturii.*

*În ansamblu, ne propunem să analizăm problemele principale care apar la întocmirea proiectelor din agricultură și în implementarea lor, întrucât este mai mult decât evident faptul că manifestarea profesionalismului și seriozității în această direcție reprezintă una din căile sigure și obiective de redresare a sectorului agricol românesc, de revitalizare a agriculturii și, implicit, de asigurare a contribuției la creșterea performanțelor economice naționale.*

*The Romanian agriculture is confronted with numerous and complex problems; after December '89 it was registered a series of drawbacks, because of multiple and varied facts, between which we can describe as be most recognized: the absence of the financial sources, the obsolete technology, deafly professional preparation, the grown old and on the decrease labor, the lack of attractiveness for this sector.*

*Among the factors which conduced to the diminution of performance in the Romanian agricultural sector and the registration of weakly results from a year to other, we propose to analyze, in this paper, the problems of financing in the agriculture. Also, is followed the accession impact of the financial sources, from the European programs, about the competitively growth in the Romanian agriculture on the whole, as well as the methods of revitalization of this essential components of a great economy. For the adhesion of our country to the European Union were prepared a series of specific stages, between very important is the financing of agriculture.*

*On the whole, we propose to analyze the main problems which appear in the situation of the elaboration the agricultural projects and into their implementation, because is more than obvious that the manifestation of the professionalism and earnestness in this direction represents one of the secure and objective ways for the straightening of the agricultural Romanian sector and, by default, for the assurance the contribution to the growth of national economic performances.*

## INTRODUCTION

Nowadays, the national economy – as a whole – is subject of a major process of reformation and continuous adjustment to the mechanisms of market economy. We should also mention the necessity to speed up the process of social and economic development, as the alignment to the European economic standards is hindered by the fact that the economy of our country has long been a centralized economy.

One of the economic branches where we can strongly sense the transformations caused by at least two directions of reorientation (adjustment to the market economy and the necessity to integrate into the European economy) is agriculture. Romania benefits from an agricultural potential of development distinctively superior, but insufficiently and incorrectly exploited. If one thinks that the agricultural surface of Romania represents around 25% of the total agricultural surface of the eastern and central European countries and the population weight employed in agriculture is of 49%, the Romanian agriculture could really become competitive on the international market and could significantly contribute to the general economic development. These goals could be accomplished after the identification of present difficulties faced by this sector and after the establishment, respectively the application, of concrete and relevant measures that could wear down these difficulties and the causes of their apparition or diminish their unfavorable effects. The major problems faced by the national agriculture and for which solutions must be urgently found are: the discrepancy between the level of development of the national agriculture and that of other members of the European Union, differences of the living standard between the rural and the urban environment, the weak development of the rural non-agricultural economy, the low level of development of the rural infrastructure, the weak professional training of farmers, the aged workforce etc.

In this context of proving the urgent necessity of development of the Romanian agricultural sector, there comes a financial and economical “incentive” really important for the acceleration of the adjustment rhythm to the European economic standards: the non-refundable financing programs; the Romanian agriculture enjoys the highest level of financing within the European Union.

We consider that through the access to such funds, the Romanian agriculture has real chances of improvement and of minimizing the differences from the agriculture of the developed European countries. The essential condition is that these programs should be known by all the present and potential entrepreneurs from the agriculture and food-related industry, that the contiguous information should be disseminated at regional level and the accepted ideas and project should be put into practice for the general benefit of the public.

## MATERIAL AND METHOD

Presently, Romania enjoys the possibility of accessing European funds for multiple and diverse goals. Agriculture plays an important role among the economic sectors aimed at and for which considerable efforts are done for the development and the alignment to the European standards. Thus, substantial amounts of money are being granted for the Romanian agricultural sector that can be absorbed through special funds. These are instruments mainly oriented towards the elimination of economic and social disparities among the development regions, the accomplishment of social and economic cohesion that is based on a policy that relies on three essential objectives: convergence, regional competitiveness and occupation, territorial cooperation.

The most important funding categories intended for the development of Romanian agriculture are:

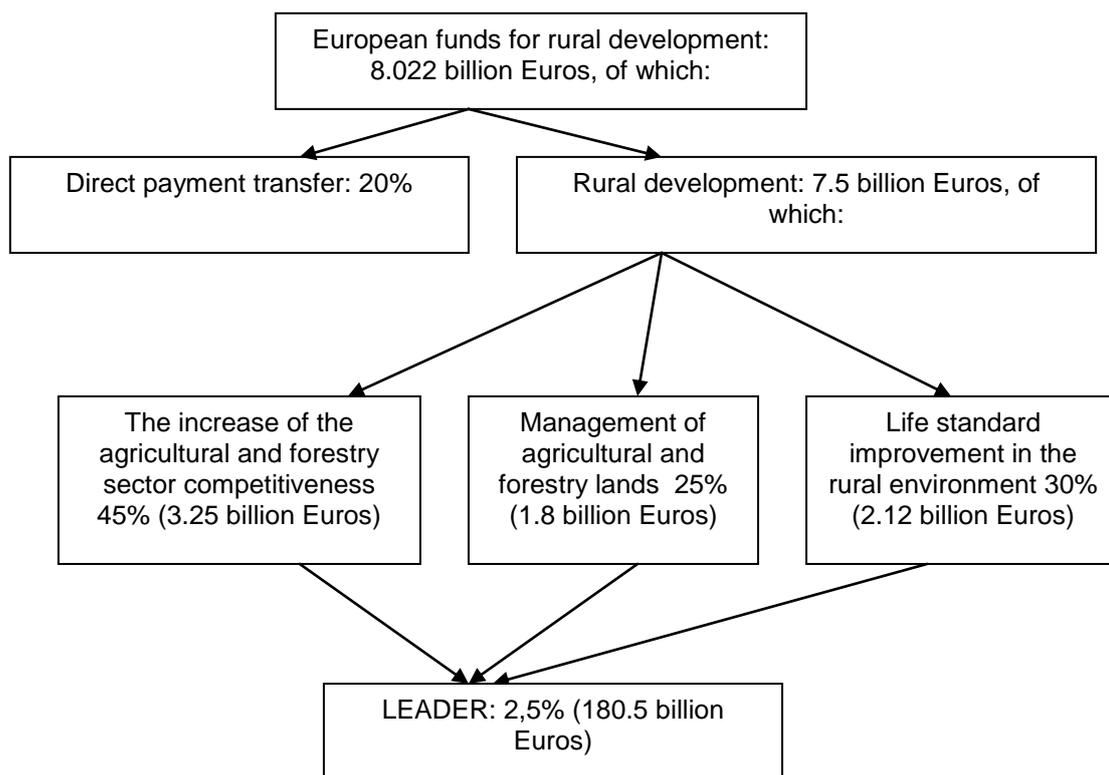
- The European Fund for Regional Development;
- The European Social Fund;

- The Cohesion Fund;
- The European Fund for Agriculture and Regional Development;
- The European Fund for Agricultural Warranty;
- The European Fund for Fishing.

The basic document that puts into practice the development measures of the national agriculture is the National Program for Rural Development (PNDR) for the period 2007-2013. Besides the new funding programs for the Romanian agriculture, in our country there have already been other programs such as: Phare, ISPA, SAPARD, The Farmer, The Program Life Annuity etc. Most of these programs have accomplished their goals as positive evolutions have been registered in the Romanian agricultural sector, but there are still some unsolved issues.

Compared to the funding programs before the adherence, we can notice the much stronger impact of the new programs whose significant elements are: the sums granted are much bigger, the programs are much better disseminated among those interested, the promotion is much more active, the rural environment as a whole has obviously improved. Figure no. 1 is relevant for the highlighting of the financial grants destined for agriculture and for rural development, for the 2007-2013 period, being structured on priority areas of development.

**Figure 1 The European funds' granting for the rural development in Romania**



Source: information taken from the Ministry of Agriculture site (<http://www.maap.ro>)

Out of the European funds that are active on the agricultural market in our country, we would like to examine more analytically The European Fund for Agriculture and Rural Development.

The European Fund for Agriculture and Rural Development (FEADR) contributes to the promotion of a sustainable rural development within the European Community and represents a completion of the market policies and a support of the incomes applied within the framework of the common agricultural policy, of the cohesion policy and of the

common policy for fishing. The FEADR Program relies on a series of objectives intended to support the development, the progress and the competitiveness in the Romanian agriculture. Among the most important objectives we can mention:

- the improvement of the competitiveness in agriculture and silviculture through the support of the process of restructuring, development and innovation;
- the improvement of the rural environment and space through the support of land management;
- the improvement of life quality in the rural environment and the promotion of the diversification of economic activities in order to increase the incomes and the possibilities to acquire an additional income.

The access to European funds is made according to agricultural activity sub-fields, these being also named „measures”. The main eligible fields in Romania for agricultural financing are:

- modernization and establishment of processing units for raw materials (milk, meat, fish);
- financing vegetal farms (field cultures, cereals, technical plants, etc);
- financing the zootechnical farms (milk cows, sheep, goats, pigs, etc);
- financing the B&Bs /the touristic chalets from the rural environment.

The main organizational axes of the FEADR funding program are:

*Axis 1 – Improvement of the competitiveness in the agricultural and forestry sectors*

*Axis 2 – Improvement of the rural environment and space*

*Axis 3 – Improvement of life quality and the diversification of the rural economy*

*Axis 4 – Leadership*

For a better understanding and knowledge of the fields that interest the potential beneficiaries of the FEADR program, we find useful the presentation of the sub-fields that depend of the priority axes.

*Axis 1 – Improvement of the competitiveness in agricultural and forestry sectors*

- measures for the dissemination of knowledge and improvement of the human potential through: professional training and informational activities, employment of young farmers, early retirement of the farmers and of agricultural workers, the use of counselling services;

- measures for restructuring and development of physical asset as well as the promotion of innovation through the modernization of the agricultural exploitations, improvement of the economic value of forests, the increase of the added value of the agricultural and forestry products, cooperation for the execution of new products, improvement and development of the infrastructure necessary to the evolution and to the adjustment to the agricultural and forestry sectors, rebuilding the potential of the agricultural production affected by natural calamities and establishment of some adequate prevention measures;

- measures for improving the production and agricultural products quality through the support of farmers in order to adjust to the required standards, adopted on the basis of the community legislation, encouraging the farmers to participate to the alimentary quality schemes, the assistance of the producers'groups in the informational and promotional activities for the products that constitute the object of some alimentary quality schemes;

- transitional measures regarding the support of the agricultural exploitations of half-subsistence that are on the way of restructuring, the support of establishment of the producers'groups.

*Axis 2 – Improvement of rural environment and space*

- measures concerning the sustainable use of agricultural fields through payments made to farmers from the mountainous regions in order to compensate for the disadvantages caused by their geographical location, payments to farmers who live in

other regions than in the mountains, payments for the agricultural environment, support for the non-productive investments;

- measures concerning the sustainable use of forestry lands through support for the first forestation of agricultural lands, support for the first forestation of non-agricultural lands, payments for the forested environment, support for the reconstruction of the forestry potential and adoption of some prevention measures.

*Axis 3 – Life quality in the rural environment and the diversification of the rural economy*

- measures of diversification of rural economy: diversification towards non-agricultural activities, support for the establishment and development of micro-enterprises in order to promote the entrepreneurial spirit and the consolidation of the economic material, promotion of touristic activities;

- measures to improve the life quality in the rural environment: basic services for economy and for rural population, renovation and development of villages, preservation and valorification of the rural heritage;

- a measure for the assurance of formation and information of economic agents from the areas that are contained in Axis 3;

- a measure regarding the acquirement of competences and the animation with a view to the establishment and application of a local development strategy.

*Axis 4 – Leader*

- local development strategies for each region, conceived for strict rural areas at sub-regional level;

- public-private partnerships at local level, also named "local action groups";

- an ascending approach with a decisional power for the local action groups regarding the establishment and application of some local development strategies;

- a conception and a multisectorial implementation of the strategy, based on the interaction between the actors and the projects from different sectors of the local economy;

- the implementation of some innovative approaches;

- the implementation of some cooperation projects;

- the interconnection of partnerships at local level.

Briefly, we can notice the diversity of the orientations approached through FEADR. Thus, if the investors prove they are responsible and anchored in the practical reality, following up the actions they have to undertake not only for the present, but also for the future, they have all the chances to carry out promising activities within the national economy development.

Another fund, already actual for the rural development in Romania and of great importance for the stimulation of the diversification of activities and rural economy development is The European Fund for Fishing (FEP). It is intended to help the fulfillment of the economic, social and environmental sustainability through the minimization of fishing practices and the preservation of the marine environment. The objectives that must be attained through the development of this fund in Romania are: the facilitation of the implementation of the Common Policy for Fishing and the diversification of activities within the fishermen's communities.

The European Fund for Fishing is structured on five priority axes:

- the adjustment of the fishing fleet of the Community;

- the aquaculture, the internal fishing, processing and marketing;

- common interest measures;

- sustainable development of the fishing areas;

- technical assistance.

Thus, together and simultaneously with the activity of the other structural European funds, FEP has the role of contributing to the progress and to the sustainability of the rural economy from our country.

The agricultural sector in Romania will be able to access EU funds worthing around 12 billion Euros during the period 2007-2013. Starting with the year 2010, the community support for the Romanian agriculture will only be given to farms, namely to the agricultural enterprises, and not to the households – which are prevalent in the present – as these don't prove either their efficiency or their contribution to the rural economy.

Thus, it is aimed to transform as many subsistence farms as possible into family farms specialized on commerce, because only the agricultural units that produce mainly for the market are viable from an economic point of view. This mechanism aims at stimulating the farmers to give up the production strictly intended for self-consumption and to transform the individual agricultural subsistence households into commercial mini-farms with products for both the internal and the external market.

The agricultural farms in Romania could receive money from European funding for goals such as: agricultural equipment acquisitions, modernization of farms, creation of agricultural enterprises, silos and slaughterhouses building, modernization of infrastructure, creation and modernization of the processing units for agricultural raw materials etc. These fundings are done with the help of some specific programs, through some viable projects whose eligibility will be demonstrated after the analysis within the commissions created especially for this aim. Within such programs and in order to carry out the most convincing programs, the farmers must know and follow some specific steps. The most important procedures are: submittance of a statutory declaration at a notary or at the townhall that will help them declare their household a family farm, the elaboration of a business plan, the detailed study of the financing guide.

Subsequently, the financing files are marked according to several criteria: the age category (the young receive higher grades), the personal asset brought in the investment (an existing material base represents a distinctive advantage), the professional status (the agricultural graduates are at an advantage).

For example, The Ministry of Agriculture, Forests and Rural Development (MAPDR) granted to farmers, through the Farmer Program, launched in 2006, credits worthing 224,1 million LEI (over 64 million Euros) for the acquisition of agricultural equipment or for the completion of the fundings obtained through the SAPARD program. The amounts are taken from the Fund for the Credit of Agricultural Investments. Under these circumstances, the farmers can get credits from diverse financial institutions and subsequently, the ministry covers the requested sums. The first payments within the Farmer program were made in March 2006.

Within the same program, the Farmer, it was created a fund intended to cover the credits for the co-financing of the projects within the SAPARD program and the National Program for Rural Development.

After the completion of the SAPARD program, the financing of the Romanian agriculture has become active for the investment projects of the farmers, through the Agricultural European Fund for Rural Development (FEADR).

In this context, it is important to recognize the role of the SAPARD program, which allowed the approval and financing of 4,713 agricultural projects, with a total value of 1.49 billion Euros. All the projects significantly contributed to the decongestion of the Romanian agricultural system, to the stimulation of the entrepreneurial initiative in the rural environment and to the start of an ample and complex process meant to recognize the importance of agriculture for the Romanian economy.

In financial terms, we can notice the considerable value of the amounts granted to the Romanian agricultural sector through the FEADR program. In Table 1 we present the value of the funds budgeted per measures within this program.

**Table 1**

**The Value of the funds budgeted per measures through the FEADR program  
(in Euros)**

Measure	Name	Total funds granted	of which the contribution of the Romanian Government	EU contribution
121	Modernization of agricultural exploitations	991.827.895	20%	80%
123	Increase of the added value of agricultural and forestry products	1.071.174.126	20%	80%
312	Support for the creation and development of small enterprises	383.429.681	20%	80%
313	Encouragement of touristic activities	544.222.774	20%	80%
322	Restoration, village development, improvement of basic services for the rural economy and population and valorification of the rural heritage	1.546.087.425	20%	80%

*Source: Informational data provided by the Agency of Payments for Rural Development and Fishing ([www.apdrp.ro](http://www.apdrp.ro))*

The data from Table 1 indicate the considerable value of the European financial contribution to the stimulation of the development and revitalization of Romanian rural agriculture. One can observe the diversity of the fields of interest, the sums granted at a very high level and the low level of the national contribution. That is the reason we believe that this chance of recovery for the Romanian agricultural sector shouldn't be missed, as it represents a sure and guaranteed way towards economic and social progress, not only for the rural environment but also, indirectly, for the entire national economy.

### THE OUTCOMES OF THE RESEARCH

As a result of the submittance of projects that required European funding in order to support the development of all branches of activity in the national agriculture, there have been several positive outcomes, a real stress being put on the increasing interest of entrepreneurs and farmers in Romania towards progress, competitiveness and development. This is considered to be an ascending tendency, compared to other funding programs that opened new roads in the ongoing non-refundable grants from the Romanian agriculture.

In order to reinforce the statements according to which the new funding programs are well anchored in the initiatives and the activities of the Romanian farmers, we shall present a synthetic situation of the project submittance within FEADR. Thus, during the May session of the year 2008, the following results have been registered, being resumed according to the intervention measures:

*1. Measure 121 „Modernization of agricultural exploitations”*

The amount granted for each session was of 57.856.627 Euros, the number of the submitted projects was 627, of which 216 were selected.

The main directions that the farmers chose within the project submittance for Measure 121 were: modernization of zootechnical and vegetal farms, agricultural equipment and machines acquisition, modernization of the technical and material base, extension and modernization of agricultural farms, establishment of plantations and vegetable farms, building of zootechnical farms, etc.

Regarding the distribution on development regions of the approved projects, one can notice that the projects from the western and southern parts of the country were

favoured, while for counties such as Vaslui, Constanța, Galați, Brăila (especially the eastern part) the list of the unapproved projects is relatively long.

### *2. Measure 123 „Increase of the added value of agricultural and forestry products”*

The amount granted for each session was of 103.072.495 Euros, the number of the submitted projects was 170, of which 40 were approved.

The farmers that submitted projects and obtained the funding approval within this measure focused on various areas such as: modernization of agricultural activity, acquisition of cereal storing systems, modernization of mills, construction of silos, construction of alimentary ingredients plants, construction of wastewater treatment plants, construction of slaughterhouses and refrigerated warehouses, construction of fodder plants, improvement of marketing flows, foundation of wine plants etc. The areas that were superior in terms of projects' number are Transilvania and Muntenia, at the opposite end being Moldova.

### *3. Measure 322 „Restoration, village development, improvement of basic services for the rural economy and population and the valorification of the rural heritage”*

The amount granted for each session was of 103.072.495 Euros, the number of the submitted projects was 170, of which 40 approved.

The fields of interest and applicability, prevalent for this measure are: modernization of village roads, asphaltting the roads, potable water suppliace, sewage systems creation, treatment of used and wastewaters, improvement of basic services, modernization of arterial roads. From the point of view of territorial distribution, one can observe a relative equilibrium among all geographical, social and economic development areas in the country.

## **CONCLUSIONS**

The agricultural sector in Romania can prove its competitiveness and can be viewed as a vital sector of the national economy, only by taking into account some minimum requirements, which are not impossible to accomplish. Therefore, if the geographical and physical potential and the available human resources are strong points in the development of rural economy, to which contributes also the financial and informational support from the European Union, the minimum requirements that should be accomplished are: willingness, initiative and interest in a competitive and valuable national agriculture. One can remark that these conditions are directly linked to the quality of the human resources that in our country need significant improvement, starting with the mentality and continuing with the professional training specialized on fields of interest.

The funding programs from European non-refundable sources represent nothing but the support of national economic interests and a favourable incentive for the economic growth in Romania. This situation should be intensively exploited during the present period, as the chance for recovery and revitalization of the Romanian agriculture is now given to us at its fullest.

Although, during the almost 20 years of transition from the centralized economy to the market economy the development has made timid and slow paces, with the integration into the European Union there are real chances to speed up the progress rhythm. The agriculture – the path to economic development of the countries with a strong economy – is an essential step in the recovery and revitalization of the Romanian economy, being a field of interest adequate for the entrepreneurial spirit and able to prove the existence of the real capacity to follow the right paths of socio-economic development.

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# STUDIUL PRIVIND ZONELE TURISTICE CE SE POT DEZVOLTA PE TERITORIUL JUDEȚULUI DOLJ

## THE STUDY CONCERNING TOURISTICAL AREAS THAT MAY BE DEVELOPED ON DOLJ COUNTY TERRITORY

*Călina Jenica, A. Călina, M. Miluț, A. Croitoru, C. Buzatu*

**Key words:** resources; potential; touristical area; tourism forms.

### ABSTRACT

*Analiza situației existente în domeniul turismului pe teritoriul județului Dolj pune în evidență faptul că, acesta dispune de un potențial turistic variat atât din punct de vedere al resurselor naturale, cât și din punct de vedere al resurselor antropice. În prezent acest potențial turistic este insuficient valorificat. Capacitățile de cazare existente sunt puțin diversificate, gradul de modernizare este scăzut, iar nivelul investițiilor și al investitorilor străini este încă redus. În corelație cu complexitatea și valoarea potențialului turistic, precum și cu preabilitatea pentru diferite forme de turism, pe teritoriul județului se pot contura patru zone turistice: zona turistică Craiova; zona turistică Dunărea; zona turistică Jiul Inferior; zona turistică Piemontul Getic.*

*The analysis of existent tourism situation in Dolj County territory make a point that is a varied touristical potential from point of view of natural and human resources. Presently, this touristical potential is insufficiently capitalized. The existent accommodation capacities are scanty diversified, the modernizing degree is low, and the level of investments and foreign investors are yet scanty. In correlation with touristical potential complexity and value, also with preability for different forms of tourism, on county's territory may be defined four touristical areas: Craiova touristical area; Danube touristical area; Inferior Jiu touristical area; Getic Piedmont touristical area.*

### INTRODUCTION

Dolj County is situated in South Romania, on Danube and Jiu inferior flow, inside great geographical unit Romanian Plain. Location on Danube bank alongside 150 km inscribe the County in "Danubian Region" from where are participate territories from 8 counties (Romania, Bulgaria, Yugoslavia, Croatia, Hungary, Austria, Slovakia and Germany), and by fluvial sailing axe Rhine – Main – Danube is assured junction between Black Sea and North Sea.

Construction of future road and rail bridge, across Danube, between Calafat and Vidin, open European Lane IV (Berlin / Nürnberg – Praga – Bratislava – Constanta / Salonic / Istanbul) on Dolj County territory and represent, the most important element for development of rural tourism.

Therewith, whereness in border zone with Bulgaria create the possibility of development in cooperation of an active trans – border area having as main centers Calafat (Romania) and Vidin (Bulgaria) cities and also localities pair Rast – Low and Bechet – Oreahovo.

Touristical potential of Dolj County is principally constitute by Danube Everglade and Inferior Jiu everglade, which gives an attractive natural background, especially for hunting and fishing tourism. At these may be added values of national cultural patrimony, represented by numerous monuments of architecture, museums existing even in rural places, also villages with ethnographical elements.

## MATERIAL AND METHODES

The paper concisely analyzes the existent situation in tourism field on Dolj County territory and pretability for different forms of tourism. Methodologically, at evaluation of touristic phenomenon were used:

- observation, information obtaining – as underlying method, being distinguished some aspects as: touristical surroundings, touristical resources, touristical infrastructure, and so on;
- description, facts presentation – as way of restoration, presentation of all observed elements;
- analysis, investigation – which suppose the implication of some instruments, techniques and methods of prominence and explanation of relations established between touristical phenomenon elements.

## RESEARCH RESULTS

The analysis of existent situation in tourism field on county territory distinguish a varied touristical potential from point of view of natural resources (relief with terraces that descend from north to south, large Danube everglade with sloughs, thicket, parks with willow and poplar, sand dunes from Calafat and Desa, forests nearby urban areas, vineyards from Segarcea and Dabuleni, lakes from Danube area and beside Craiova used for pleasure, belvedere points on Danube valley at Calafat and Cetate, balneary resources at Gighera etc.), also from point of view of resources build up by people ( historical monuments with national or local value, generally concentrated in Craiova, and also in other localities that have monasteries and churches, manor house, museums, also rural localities with significant ethnographically fund).

Presently this touristical potential is insufficient capitalized. Existent accommodation capacities (1328 places) are scanty diversified and are concentrated in Craiova municipality (65 %), and the modernization rank is low. Utilization index of capacities in function is very low, respectively 27,4 %, towards 34 ,5 % country average and 41,8 % South-West region average.

Rate of turnover at commercial societies with tourism activity is low, while is show an relative highly interest for this type of activity, reflected into obtained incomes level from tourism in Craiova and Calafat area (communes Ciupercenii Noi, Desa, Motatei). Foreign investor's number in tourism (80) and investments level is still small. Opportunities for touristical activity development are determined by turistical potential and county geographical position which is crossed by European roads ( E 70, E 79), an international railroad (Bucharest – Caracal – Craiova – Drobeta Turnu Severin – Caransebes – Timisoara – Jimbolia), hold an airport in Craiova and poins for border passing to Bulgaria at Calafat and Bechet. The relative dense road network, part of it modernized, are crossing the county, joint him at neighbor touristic areas (North Oltenia). At local level the road condition is poor.

Construction of future road and rail bridge Calafat – Vidin will have a special impact on touristical activity, both by intensification of person's transit that may be attracted in local touristical circuits and by opening of a new perspective that may rich Calafat area from landscape point of view. Also opening of the IV lane and modernization and development of bridge infrastructure will allow Dolj county integration into international turistical circuits.

In correlation with complexity and value of touristical potential and also with pretability of different forms of tourism, on Dolj territory may be defined four touristical areas:

- Craiova touristical area - distinguished by numerous possibilities that offer for local resources capitalization in transit tourism and weekend tourism. Craiova municipality, which concentrate the most important architectural and historical objectives, represent the main area glamour. Water glasses and woody hills next to Craiova encourage development of loiter, amusement and nautical sports.
- Danube turistical area through position and structure of touristical resources congregate optimum conditions for development of fishing and hunting tourism or pleasure tourism (cruises). In this context, must be tell that, at east of Rast locality, Danube Everglade is embanked, and is practiced agriculture and pisciculture in arranged conditions. Can be recommended elaboration of ecological and economical studies concerning capitalization of touristical potential of Danube Everglade by re inundate of some past sloughs. In the same area are mineral water resources at Gighera and Desa, presently none capitalized. Bridge construction will advantage transit tourism in area Calafat – Cetate.
- Inferior Jiu touristical area by resources capitalization, respectively lakes and forests from Jiu everglade and by adequate touristical improvement, will develop the weekend tourism and sporting hunting or fishing tourism. Also vineyards from Sadova sustain rural tourism.
- Getic Piedmont touristical area, with a high density of historical monuments, is recommended for cultural and transit tourism towards touristical areas from North Oltenia.

Touristical resources, existing in different balance into the four areas, make the object to a politics of putting in value, into strategy of development for touristical activity through:

- sustenance, modernization and extending of touristical material base;
- inter-county and trans-bordering cooperation for the future promotion of actions for tourism attraction in south-west area of country;
- staff training and preparation.

Parallel with those development directions, the main objective is environment protection by pollution factors combating, conservation and protection of natural resources and values of cultural patrimony.

Strategy of touristical functions development and consolidation implicate tourism development in straight coordination with general economical development, for the reconversion of disponibilized labour from secondary to tertiary sector.

Torism development supposes to assure with priority the accessibility at primary points of turistical interest, action that must antecede other investments from tourism area. This challenge is correlated with necessity of modernization and development for communication ways, assessed by construction of Calafat – Vidin bridge.

At national level will be realized in perspective the highway Bucharest – Craiova – Drobeta Turnu Severin – Lugoj – Timișoara – Moravita and expressways on locations Calafat – Craiova – Pitesti – Brasov – Bacău, Calafat – Drobeta Turnu Severin, Deva – Petrosani – Targu Jiu – Craiova – Bechet, which will join the county territory to national and international traffic.

Is proposed development of Craiova and Calafat as main centers for touristical coordination, for those will take prior measures for modernization and extending of touristical base, and also services diversification.

## CONCLUSIONS

1. Dolj County disposes by a varied touristical potential from point of view of natural resources and anthropic resources. Presently this touristical potential is insufficient capitalized.
2. In correlation with complexity and value of touristical potential, also with pretability for different forms of tourism, on county territory may be defined four touristical areas: Craiova touristical area, Danube turistical area, Inferior Jiu touristical area, Getic Piedmont touristical area.
3. Touristical resources have different weight in the four areas and may be valorized by politics for touristical activity development through: maintenance, modernization and expansion of touristical material base; inter-county and trans- border cooperation to promote actions of tourism attraction in south-west area of Romania.

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# PREMISELE DEZVOLTĂRII TURISMULUI CULTURAL ÎN ZONA HOREZU

## PREMISES OF CULTURAL TOURISM DEVELOPMENT IN HOREZU AREA

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**Key words:** resources; potential; touristical area; cultural and religious tourism.

### **ABSTRACT**

*Zona Horezu beneficiază de condiții naturale deosebit de favorabile practicării turismului, fiind avantajată de lipsa factorilor de poluare și de un potențial turistic de excepție care permite practicarea unor variate forme de turism. Diversitatea, volumul și valoarea potențialului cultural-religios existent favorizează variate modalități de petrecere activă a timpului liber, de odihnă și recreere și cunoștere prin practicarea unor forme de turism specifice. În această zonă a Olteniei de Nord, sunt păstrate monumente istorice de valoare universală - Mănăstirea Hurez - monument UNESCO, precum și un important tezaur de artă religioasă. Horezu reprezintă un important centru monahal național și contribuie la conservarea spiritualității și culturii ortodoxe românești, la sud de Carpați. La Horezu se lucrează una dintre cele mai frumoase ceramici din România, atât datorită formelor perfecte pe care le execută olarii, cât și a decorului foarte delicat, obiecte realizate pe deja cunoscuta roată a olarului.*

*Horezu area capitalize on natural conditions highly favorable for tourism practice, being advantaged by pollution factors privation and an exceptional touristic potential that allow practice of varied forms of tourism. Diversity, volume and value of existent cultural-religious potential, encourage varied modalities of active passing the free time, repose, recreation and knowledge by practice of some specific forms of tourism. Into the North Oltenia area, are maintained historical monuments with universal value – Hurezi Monastery – UNESCO monument, also an important treasury of religious art. Horezu represents an important national monachal centre and contribute to preservation of Romanian orthodox culture and spirituality, on the south of Carpathians.*

*There is made one of the most beautiful pottery from Romania, both to perfect forms that the potter execute and to dainty decor of objects obtained on a potter's wheel.*

### **INTRODUCTION**

The analyzed area is border on north with Capatanii Mountains, Cerna River on west, Otasau River on east and Oltet Piedmont on south. Relief is composing by hills situated in two rows and by lowland lanes from which is evidenced as size, Horezu Basin.

In Horezu area was contoured along time an unitary demographical area of culture, with common traditions, linguistically and cultural elements. From numerous rural places which secular are gravitate unto Horezu borough were chosen to represent the area five rural places from Horezu basin: Costesti, Maldaresti, Vaideeni, Tomsani and Slatioara.

These were developed as satellite centers of Horezu town, because exist a permanent administrative and cultural link, favored by very small distances between these (Horezu – Costesti: 7 km, Horezu – Maldaresti: 2 km, Horezu – Vaideeni: 6 km, Horezu – Slatioara: 8 km, Horezu – Tommsani: 6 km).

Horezu area benefit by favorable natural condition for cultural tourism practice, being favoured by pollution factors privation and by exceptional cultural and historical potential.

## **MATERIAL AND METHODES**

Cultural tourism is also named visiting tourism because, its practice invariable suppose “visiting “of some objective or some group of objectives. Its purpose is very complex:

1. instruction by knowledge enrichment ;
2. recreation on spiritual plain by some truth understood;
3. knowledge of new phenomenon.

To determinate this type of tourism is fundamental the knowledge needs, recreation situating by second plain.

Cultural tourism economical efficiency is most scanty between all types. The phenomenon is explained by its transit character and invoking of touristical infrastructure only in exception cases. Cultural tourism is especially oriented for objectives of anthropic origin.

Existence of some touristical resources, concentrated at mostly in Horezu, followed by communes Costesti and Maldaresti, was determined a development of tourism materialized by general and specific infrastructure, utilities, visiting facilities, touristical structures.

Methodologically, in touristical phenomenon evaluation was utilized:

- observation, information receive – as main method, being evidenced aspects as: touristical environment, touristical resources, touristical infrastructure , etc.;
- description, facts presentation – as way of restoration, of presentation of all observed elements;
- analysis, investigation – which suppose the implication of some set of instruments, techniques and methods of evidence and explanation for links established between touristical phenomenon elements.

## **RESEARCHES RESULTS**

### *1. General geographical considerations*

Well under covered by North Capatanii Mountains and South Oltet Piedmont, Horezu Basin offered favorable conditions for human life and activity development. Climate is characterized by moderate temperatures, without big thermal contrasts between seasons, with relative abundant precipitations and slow speed winds. The characteristic phyto – geographical element is the forest, with dominant species of holm and beech in under – Carpathian area and pine and fir species in mountain area. The fragmented relief and long persistence of “mosnean” property, make that forest is well conserved. Mountain nude, without forests and covered by pastures and grasslands, are used of local people for ovine breeding.

Mountain pastures and grasslands flora, by an impressive diversity, function of altitude, are reach the landscape with multicolored floristically species. Arable land limited as surface, was induce the local people to use with ingenuous others resources of natural landscape: construction wood, clay for crockery, stone for carved, vegetal fiber, sheep wool and goat hair for tissue and others.

Identity and value of some biodiversity elements or geological natural elements with scientifically value, was determined inclusion of Buila – Vanturarita Massif in protected

areas category, in conformity with Law no. 5/2000, named Buila – Vanturarita National Park, its borders pass on small surface on Horezu town administrative territory.

## *II. General infrastructure*

Area position in rapport with DN 67 and DN 65 C, important way of access and existence of a rich patrimony in touristical resources, was allow and favored general infrastructure development, specifically tourism infrastructure and main utilities.

Horezu locality is passed by DN 67 (Rm Valcea – Horezu – Tg. Jiu – Motru – Drobeta Tr. Severin), an important road artery that link two main European highway: E 81 (border point RO/ UA – Halmeu – Satu Mare – Cluj Napoca – Sibiu – Rm. Valcea – Pitesti – Bucuresti) and E 79 (border point H / RO – Oradea – Deva – Petrosani – Tg. Jiu – Craiova – Calafat – border point RO / BG); DN 65C (Horezu – Balcesti – Craiova); national road network on administrative territory totalize 6 km; DJ 665 (Horezu – Vaideeni – Polovraci – Baia de Fier – Novaci – Curtisoara / DN 66 / E 79); DJ 669 (Dealul Ulmului – Romani); county road network have about 5 km; DC 139 (Horezu – Maldaresti); DC 142 (Horezu – Ursani ); DC 143 (Horezu – Olari – Tanasesti); DC 146 (Horezu – Romanii de Jos); DC 147 (Romanii de Jos – Neagota); communally network roads is registering over 21 km.

## *III. Cultural – historical touristic potential*

Diversity, volume and value of cultural – religious potential existent in Horezu area favorize diferent modalities of active spend of free time, repose, recreation and knowledge practice of specific forms of tourism.

*Hurez Monastery aggregate* (at 4 km from Horezu, in Romanii de Jos village), fonded by Constantin Brancoveanu in 1694 year, have a valuable museal collection, also an interest library (about 4000 volumes). The monastery functioned as important culture centre between 1688 – 1714 years; in 1999 year was inscribed on mondial patrimony book, being declared UNESCO monument.

*Historical centre of Horezu town*, an built-up fund, with over a century age and historical and architectural value.

*Ursani Church*, with titular saint “ Church entry of God Mother” and “St.Joan the Baptist” – founded in 1800 year by Ioan Ursanu, architecture monument, add on Law 5/2000 list, unique in Romania by naïve picture from internal walls.

*Horezu Church*, with titular saint “ Church entry of God Mother” – founded by Ioan Ursanu in 1804 year, monument of architecture.

*Covresti Church* with titular saint “ St. Vasile”, founded in 1826 by Stanciu Covrea, architecture monument.

*Romanii de Sus Church* with titular saint “ St. Michail and Gavril” founded in 1877, monument of architecture.

*Church* with titular saint “All Saints Sunday” (Horezu town), which was belong to past Balanesti hermitage – architecture monument.

- Elements of etnocultural patrimony are represented by:
  1. *Olari ceramics centre* – Horezu is the most important enamelled ceramics centre, with an permanent ethnographical exhibition ( to Cultural House and potter master workshops); the cromatics of ceramics pieces is characterized by utilisation of scantyu number of colours (principaly the brown – pot background is green, blue,white and bricky), but gives charm of composition by ornaments and under enamel brightness; the used clay is founding only on Ulmului Hill area (Horezu);
  2. *traditional architecture* – old houses with threshold, specifical for ethnographical area “ Under Mountain Oltenia”;
  3. *folk suite*, in two colors, white and black, alike Marginimea Sibiului area, or Oltenian, where pregnant colour is red;

4. sewings, tissues and Oltenian carpets, handicrafts with less and less spread. *Art gallery*, hosted by “Constantin Brancoveanu” Cultural House, a museal collection of traditional ceramics objects, folk suits, wood handiwork objects or musical instruments;

*Ethnofolklorical manifestations:*

1. *Faire of folk ceramics “Hurez cock”* (first Sunday of June) is a manifestation destined for all pottery masters from Romania, on the XXXV-th edition;
2. *Horezu town Days* – manifestation that imply traditional ethnocultural events.

Diversity, volume and value of cultural and religious potential existant on Horezu town territory favorize varied modalities to active spend of free time, by rest, recreation and knowledge practicing specific forms of tourism.

*Cultural and religious tourism* is favorised by a rich heritage, which subscribe Horezu area on first top values of Romanian cultural patrimony , being surpassed, as religious objectives number and value, only by North Moldova – Bucovina. In north Oltenia area are kepted historical monuments of universal value – Hurez Monastery – UNESCO monument, also an important religious art thesaurus. Horezu represent an important national monastic center and contribute to conservation of Romanian spirituality and ortodoxe culture, on the south of Carpathians.

Ethnocultural tourism – the area character and tradition was oriented the habitants for romanian handicraft activities, as pottery, manualy tissues (folk suits, Oltenian carpets), religious painting. At Horezu is working some of the most beautiful ceramics from Romania, because of perfect forms and delicate beckground, obejects realised on well knowed potter’s wheel. Every one of modelated pottery forms from Horezu, with a chromatic based on ochre, green and brown, reember the enamelled pottery worked with centuries, since Constantin Brancoveanu age (XVII-th century).

The existance of ethnocultural centers, keeping of old traditional handicrafts, some of them with unique value at national and european level, attract annually numerous tourists, in transit or for holiday spending.

Local trditional exibitions, “*Hurez cock*” and “*Horezu town Days*” are an occasion of meeting of village’s sons, to establish human connections between local people and guests, between the ones gones in other places and the remained ones, between local administration representants and various invitated personality, and for the town habitants an occasion to capitalize local resources, to passing of free time or relaxation.

*Rural tourism.* Development of rural tourism in Horezu area is supported by existance of some places where the traditions known by many generations, ancestral holidays and handicrafts becomed art, are at its home. Rural tourism promoting will provide a durable and well-balanced development for this space of Romanian values traditions keeping.

#### IV. Accomodation offer

In 1989 year in Horezu cultural – historical area was existing only 2 classical accomodation units (Horezu Turistic Hostel and 3 Oaks Turistic Complex with a total of 124 places number. In 2006 year, number of units was 12, these summing a total number of 170 places. As units number is observing a major increase, by insertion of 10 guest-houses in accomodation circuit. In the same time, accomodation places number grow aproximately with 37 %, becoming to 170 places.

Accomodation capacity in monastery – Hurez Monastery with a total number of 20 accomodation places (source:Horezu Local Council).

If is considering and posibility of accomodation at Hurez Monastery, also accomodation places available in villas (secondary residences), then total number of accomodation places in Horezu outrun 190 places.

## CONCLUSIONS

Cultural tourism is favorised by a huge heritage, which subscribe Horezu area in top category of Romanian cultural patrimony, being surpassed as religious objectives and value, only by North Moldova – Bucovina. Into this area are maintained historical monuments with universl value as Hurezu Monastery – UNESCO monument, also an important religious art thesaurus. Horezu represents an important national monachal centre and contribute to maintaining of Romanian spirituality and orthodox culture, on South of Charpatians.

Rural tourism development in Horezu area is supported by existance of some places where the customs are knowed by many generations, ancestral holidays and handicrafts becoming art are at its home. Rural tourism promoting will provide a durable and well-balanced development for this space of Romanian values traditions keeping.

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# ANALIZA STRUCTURILOR AGRARE DIN COMPARTIMENTUL DE SUD AL DEPRESIUNII JIJIA-BAHLUI

## THE ANALYSIS OF AGRARIAN STRUCTURES FROM SOUTH COMPARTMENT OF JIJIA – BAH LUI DEPRESSION

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**Key words:** land fund, agricultural exploitation, technical and economic indicators

### ABSTRACT

*Structurile agrare sunt efectul relațiilor agrare și cuprind: structura de proprietate, structura fondului funciar pe categorii de folosință, structura efectivelor de animale, structura de producție, structura tehnologică (mecanizare, chimizare etc), structura (forma) de exploatare funciară și tipurile de exploatații agricole, veniturile fermierilor, rețeaua de distribuție a materialelor necesare agricultorilor, rețeaua de prelucrare a materiilor prime din agricultură, rețeaua de valorificare a produselor agricole primare și a produselor alimentare, rețeaua financiară de creditare și de asigurare și rețeaua de asistență tehnică de specialitate. Toate aceste rețele împreună cu exploatarea agricolă se constituie într-un sistem complex, care definește structura agrară prezentă într-un teritoriu. Metodologia diagnozei structurilor agrare trebuie concepută pentru a evidenția și caracteriza cât mai fidel posibil situația dezvoltării agriculturii la un moment dat.*

*Principalul obiectiv al lucrării este identificarea răspunsurilor la următoarele întrebări:*

- Care sunt tendințele structurii agrare în Uniunea Europeană și România?*
- Care sunt caracteristicile și particularitățile structurilor agrare în compartimentul de sud al depresiunii Jijia-Bahlui?*

*Agrarian structures are the effect of agrarian relations and include: the structure of ownership, the structure on the land fund on use categories, livestock structure, the structure of production, technological structure (mechanization, chemicals use etc.), structure (form) of land exploitation and types of holdings agriculture, farmers' incomes, the distribution network of materials necessary for farmers, the processing network of agricultural raw materials, the net capitalization of primary agricultural products and foodstuffs, the network's financial credit and insurance network and technical assistance. All these networks together with the farm are meant to be a complex system, which defines the agrarian structure present in a territory. The methodology diagnosis of agrarian structures should be designed to highlight and characterize as closely as possible the development of agriculture at a time.*

*The main objective of the paper is the identification of the following problem answer:*

- Which are the tendencies of agrarian structures in European Union and Romania?*
- Which are the characteristics and particularities of agrarian structures in the south compartment of Jijia – Bahlui depression?*

## INTRODUCTION

The south compartment of Jijia – Bahlui depression is located in N-E part of the county of Iasi and corresponds to inferior Jijiei Plain. The inferior Jijiei Plain has the next neighbors: The superior Jijiei Plain in N, Central Moldavian Plateau in S, The Suceava Plateau in V and the Prut meadow in E. Geomorphologic, the area falls within the Plain of Moldova, Jijia-Bahlui depression.

The territory perimeter covers total areas of 1807 kmp within there are: 1 city, 1 town, 22 communes and 113 villages.

The list of towns in the south compartment of Jijia – Bahlui depression

### I. Towns

1. Iași (Iași county)
2. Podu Iloaiei

### II. Localities

#### Iași County

- |                    |                   |
|--------------------|-------------------|
| 1. Plugari         | 12. Movileni      |
| 2. Șipote          | 13. Românești     |
| 3. Andrieșeni      | 14. Dumești       |
| 4. Coarnele Caprei | 15. Lețcani       |
| 5. Fîntînele       | 16. Reditu        |
| 6. Vlădeni         | 17. Popricani     |
| 7. Belcești        | 18. Horlești      |
| 8. Focuri          | 19. Valea Lupului |
| 9. Gropnița        | 20. Aroneanu      |
| 10. Bălțați        | 21. Miroslava     |
| 11. Erbiceni       | 22. Holboca       |

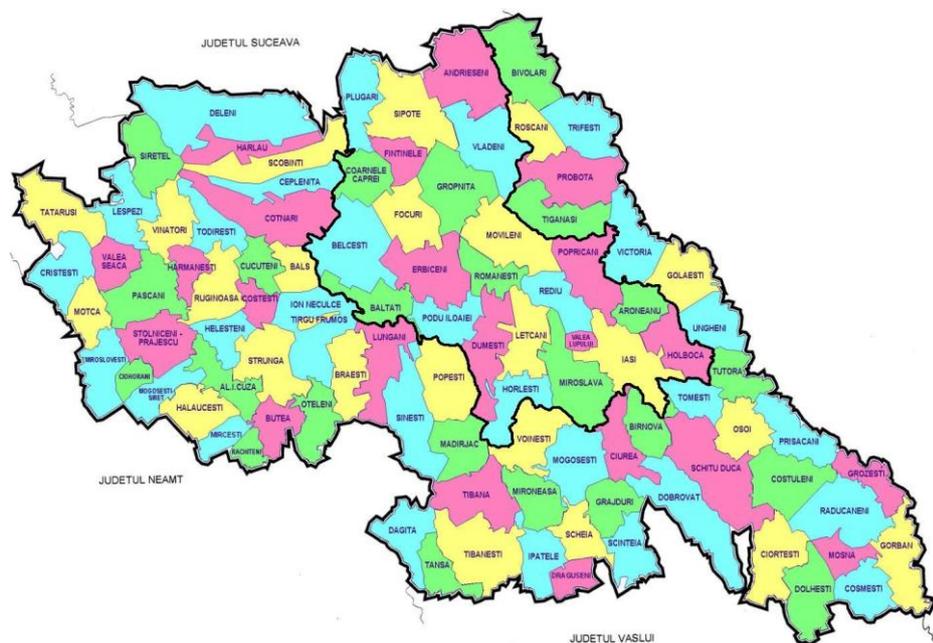


Fig. 1. Localities from the south compartment of Jijia – Bahlui depression

## MATERIAL AND METHOD

Data needed on “The analysis of agrarian structures from south compartment of Jijia – Bahlui depression” were obtained from the Statistical Year book from the period considered for the study and Statistics Direction of the County. To analyze the evolution of the studied phenomena were used as the main statistical indicators: agricultural area, agricultural land per capita, the structure of agricultural land by use category, the structure of crops in arable land, density (cargo) animals to 100 meters, the size of holdings, the size of holdings, forms of farming, resources for work.

## RESULTS AND DISCUSSION

In the EU, the definition of rural areas, in addition to population density and number of inhabitants, is taken into account and other criteria, such as modifying in time of the demographic situation (natural growth, rate of migration) and socio-economic characteristics that GDP / loc., the share of agriculture in GDP, the unemployment rate, the share of those employed in agriculture, the percentage of those employed part time, etc. [1].

In Romania after conceptual clarification and after the presentation of regional and rural policies in the European Union, studies show that rural area represent 89.2% (212.7 thousand km<sup>2</sup>) of the total area of the country (238.8 thousand km<sup>2</sup>) and includes 45.1% (9743.9 thousand inhabitants) of the total population (21623.9 thousand inhabitants) (table 1).

**Table 1**

**The size of rural area in the south compartment of Jijia – Bahlui depression - 2005**

Specification	Area		Population		The population density	
	km <sup>2</sup>	%	pers.	%	pers./km <sup>2</sup>	%
România-total	238391	100.0	21623849	100.0	90.7	100.0
The rural area - România	212715	89.2	9743952	45.1	45.8	50.5
Iași county-total	5476	100.0	813943	100.0	148.6	100.0
Rural area - Iași	5190	94.7	437788	53.8	84.4	56.8
The south compartment of Jijia – Bahlui depression	1807	100.0	426069	100.0	235.7	100.0
The rural area of the south compartment of Jijia – Bahlui depression	1769	97.9	120069	28.2	67.8	28.7

Source: Romanian Statistical Year Book 2006

## Resources and land fond

### 1. The agricultural area

Of the total 130.800 hectares at the end of 2006 as representing the land fund of the south compartment of Jijia – Bahlui depression, the share is held by: agricultural area 91.200 ha, 60.400 ha of arable land, 21.100 ha grassland, 4.600 hectares meadows, 5.000 ha plantation the vineyards and orchards (table 2).

Table 2

## The structure of the land fund on use categories – 2006

Specification	Iași County		Research area	
	Thousand hectares	%	Thousand hectares	%
<b>Land fond– total, of which:</b>	<b>547.6</b>	<b>100.0</b>	<b>130.8</b>	<b>100.0</b>
<b>The agricultural area– total, of which:</b>	<b>381.4</b>	<b>69.6</b>	<b>91.2</b>	<b>69.6</b>
-arable	253.2	46.2	60.4	46.2
- grassland	88.1	16.1	21.1	16.1
- meadows	19.6	3.6	4.6	3.5
-vii și pepiniere viticole	12.3	2.2	3.0	2.3
- vineyards and orchards	8.2	1.5	2.0	1.5
<b>Suprafața neagră - total</b>	<b>166.2</b>	<b>30.4</b>	<b>39.7</b>	<b>30.4</b>
Păduri și alte terenuri cu vegetație forestieră	98.2	17.9	23.4	17.9
Ape și bălți	12.4	2.3	3.0	2.3
Alte suprafețe	55.6	10.2	13.3	10.2

Source: Romanian Statistical Year Book 2007

The structure of agricultural land by category of use, characterized in general the potential for agricultural production, the directions of specialization of agriculture and general profile of production [2]. Another important indicator of quality of the land fund is the structure of crops in arable land (table 3).

Table 3

## The structure of the cultures in arable land (hectares)

Specification	Iași County	Research area	Iași County	Research area	Iași County	Research area
	2004		2005		2006	
	TOTAL of which majority private ownership	<b>248840</b>	<b>59472</b>	<b>236.783</b>	<b>56591</b>	<b>238669</b>
	<b>244715</b>	<b>58487</b>	<b>232.325</b>	<b>55526</b>	<b>234171</b>	<b>55967</b>
Cereal crop total of which majority private ownership	154583	36945	172473	41221	160055	38253
	153080	36586	170577	40768	158604	37906
For grain legumes total	2731	653	2023	484	2086	499
of which majority private ownership	2685	642	1909	456	1994	477
Oil Plants total	34614	8273	31406	7506	37837	9043
of which majority private ownership	33727	8061	30470	7282	36282	8671
Vegetables total	11928	2851	11651	2785	11773	2814
of which majority private ownership	11870	2837	11620	2777	11137	2662
Green fodder of arable land total	30139	7203	11055	2642	17876	4272
of which majority private ownership	29016	6935	10012	2393	17658	4220
Not sowing area and lands total	4752	1136	3844	919	4325	1034
of which majority private ownership	4740	1133	3780	903	4325	1034

Source: Romanian Statistical Year Book 2005-2007

## 2. Livestock

In territorial, the load of animals to 100 ha of agricultural land is presented dispersed (table 4.).

Table 4

Animals per 100 ha of land (heads)

Anul	lași County	Research area	lași County	Research area	lași County	Research area
	2004		2005		2006	
Cattle total	32.6	7.7	29.3	7.0	30.7	7.3
of which majority private ownership	32.5	7.8	29.2	6.9	40.5	9.7
Pigs total	54.9	13.1	72.3	17.3	74.3	17.8
of which majority private ownership	55.0	13.2	73.0	17.4	75.2	17.9
Sheep and goats total	91.6	21.9	76.4	18.3	77.8	18.6
of which majority private ownership	92.8	22.1	77.3	18.5	103.5	24.7

Source: Romanian Statistical Year Book 2005-2007

## Work resources

Demographic size of a zone is the central pole of economic analysis, because the population elements that characterize it express the development potential of a territory (table 5).

Table 5

Work resources – 2006

Specification	lași County		Research area	
	2006	% against total	2006	% against total
Total employees, of which Women	296.4	100.0	155.4	100.0
	140.1	47.3	74.9	48.2
Agriculture	102.5	34.58	53.7	34.56
Fishing and fish culture	0.2	0.07	0.1	0.06
Industry	55.8	18.83	29.2	18.79
Electricity, gas and water	4.5	1.52	2.36	1.52
Construction	17.7	5.97	9.28	5.97
Trade	32.9	11.10	17.25	11.10
Hotels and restaurants	4.1	1.38	2.15	1.38

Transport, mail, storage and communications	12.0	4.05	6.29	4.05
Financial intermediation	2.4	0.81	1.26	0.81
Real estate transactions and other services	12.5	4.22	6.55	4.21
Public administration	4.7	1.59	2.5	1.61
Education	22.7	7.65	11.90	7.66
Health and welfare	18.9	6.38	9.91	6.38
Other activities of the national economy	5.5	1.85	2.88	1.85

Source: Romanian Statistical Year Book 2007

The potential of agricultural holdings

**Agricultural exploitation is the fundamental entity of agricultural structures and the local economy. It is being studied spatially by analyzing the physical dimensions of the indicator with the average area and organizational by measurement of associative behavior (table 6).**

Table 6

***The average agricultural area used (ha) in the south compartment of Jijia – Bahlui depression***

<b><i>Specification</i></b>	<b><i>No. of farms</i></b>	<b><i>The agricultural used area -ha-</i></b>	<b><i>The average used area -ha-/ for a farm</i></b>
<i>Individual farms</i>	535 17	76982.28	1.44
<i>Unities with juridical personality</i>	264	51444.32	194.86
<i>Firms./Agricultural associations</i>	25	9228.94	369.16
<i>Commercial firms</i>	51	17302.63	339.26
<i>Public unities</i>	83	24301.25	292.79
<i>Cooperates unities</i>	-	-	-
<i>Other type</i>	105	611.48	5.82

## ***CONCLUSIONS***

1. According to data in 2006, in rural area from researched zone the average area of individual farm is 1.44 hectares, representing a very low level compared with the average area of the farm at the national level and especially the communitarian farm of 18.7 ha.

2. The average area of the associative farm, according to the Ministry of Agriculture and Food (MAA), the average size, in the rural area of this type of farm, is smaller than in researched area compared with the national average, respectively 194.86 hectares over 431.1 ha.

3. The complete diagnosis of agrarian structures provide information necessary for development of policies, which could refer, for example, for improving the exploitation of agricultural land, agricultural infrastructure and ways to exploit the most efficient possible the potential of each specific areas.

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# ASPECTS REGARDING THE ECONOMICAL EFFICIENCY OF THE MAIN AGRICULTURAL PRODUCTS REALIZED AT S.A. AGROIND BEREZENI, VASLUI COUNTY

## ASPECTE PRIVIND EFICIENȚA ECONOMICĂ A PRINCIPALELOR PRODUSE AGRICOLE REALIZATE LA S.A. AGROIND BEREZENI, JUDEȚUL VASLUI

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**Key words:** efficiency, agriculture, products

### ABSTRACT

*The study was made on the S.A. "AGROIND" Berezeni, which was founded at 4<sup>th</sup> of November 1991, on the base of 36/1991 law.*

*At the present time, the firm holds an agricultural surfaces of 3727,18 hectares and a number of 686 associates.*

*S.A. "AGROIND" Berezeni had diversified the activity and the production and economical financial results, place it in one on the first places in the Vaslui County and also in Moldova area.*

*In the year 2007, the total income obtained from the capitalization of the agricultural products (vegetal and animal) reach 3,985 mil lei, and 1069,2 lei on the agricultural hectare.*

*From the value of production, in the year 2007, the firm registers a gross profit of 1,34 mil lei, with a rate of gross profit of 50,6 %.*

*From all the vegetal products, the most efficient proved to be the rape, with a gross profit per hectare of 876 lei and a rate of gross profit of 58,8 %, and in the animal husbandry, the cow milk registers a gross profit of 2250 lei per foraged cow, and a rate of gross profit of 52,9 %.*

*Studiul s-a efectuat la S.A. "AGROIND" Berezeni, care a fost înființată la data de 4.XI.1991, în baza legii nr.36/1991. În prezent, unitatea deține o suprafață agricolă de 3727,18 hectare și un număr de 686 asociați. S.A. « AGROIND » Berezeni și-a diversificat activitatea, iar rezultatele de producție și economico-financiare o plasează pe primele locuri în cadrul județului Vaslui și în zona Moldovei.*

*În anul 2007, veniturile totale obținute din valorificarea producției agricole (vegetale și animale) au ajuns la 3,985 mil. Lei, revenind 1069,2 lei/ha agricol. Din valorificarea producției marfă, în anul 2007, unitatea a înregistrat un profit brut total de 1,34 mil. Lei, cu o rată a profitului brut de 50,6 %.*

*Dintre produsele vegetale, cea mai eficientă s-a dovedit a fi rapița, cu un profit brut pe hectar de 876 lei și o rată a profitului brut de 58,8 %, iar în creșterea animalelor, laptele de vacă a înregistrat un profit brut de 2250 lei/vacă furajată, cu o rată a profitului brut de 52,9 %.*

### MATERIAL AND METHOD

S.A. « AGROIND » Berezeni is a private agricultural unit, which was founded by disbanding the former agricultural production cooperative in the commune Berezeni, Vaslui County. The unit has a complex structure in which field crops, viticulture and vegetable growing combine harmoniously with livestock farming.

To highlight the hierarchy economically of the main agricultural products made from SA « AGROIND » Berezeni in the period 2005-2007, had been used a system of technical-economic indicators, of which we mention: the share of cultivated area in arable land, the average yield per hectare and animal feed, the total production, production for sale,

production costs, unit prices, revenues, expenses in 1000 lei revenue, gross profit and gross profit rate.

### OBTAINED RESULTS

In the structure of arable cultivation, the highest share had been occupied by wheat and corn (*tab. 1*).

**Table 1**  
The evolution of crops structure in arable land in SA "AGROIND" Berezeni, in the period 2005-2007

The group of cultures/culture	2005	2006	2007	The average of the period	% of total
<b>The arable cultivated surfaces, from which:</b>	<b>3341</b>	<b>3341</b>	<b>3341</b>	<b>3341</b>	<b>100.0</b>
<b>1.Cereals – total, from which:</b>	<b>1961</b>	<b>1800</b>	<b>1724</b>	<b>1828.3</b>	<b>54.7</b>
-wheat grains	1100	1100	1100	1100	32.9
- maize grain	700	650	574	641.3	19.2
- barley	50	50	50	50	1.5
- other cereals	111	-	-	37	1.1
<b>2. Technical plants – total, from which:</b>	<b>830</b>	<b>991</b>	<b>1067</b>	<b>962.7</b>	<b>28.8</b>
- sunflower	450	374	350	391.3	11.7
- rape	250	537	667	484.7	14.5
- sugar beet	130	80	50	86.7	2.6
<b>3. Forage plant - total, from which:</b>	<b>550</b>	<b>550</b>	<b>550</b>	<b>550</b>	<b>16.5</b>
- alfalfa	350	350	350	350	10.5
-corn silage	200	200	200	200	6.0

From analysis of the presented data was find that, while the share of sunflower crop in the arable land was reduced from 13.5% (2005), at 10.5% (in 2007), to rape, the phenomenon was conversely, from 10.5% in 2005 to 20.0% in 2007.

**Yields per hectare and total production** had an upward trend (*tab. 2*).

**Table 2**  
The evolution of the yields and total production of the main agricultural products made from SA "AGROIND" Berezeni, Vaslui County, in the period 2005-2007

The Product	U.M.	2005	2006	2007	%/2005	Average 2005-2007
Wheat grains	Kg/ha	3000	<b>1100*</b>	3460	115.3	<b>2520</b>
	tones	3300	1210	3805	115.3	<b>2772</b>
Maize grains	Kg/ha	3500	<b>500*</b>	3930	112.3	<b>2615</b>
	tons	2450	325	2256	92.1	<b>1677</b>
Sunflower	Kg/ha	1900	<b>800*</b>	1143	60.2	<b>1323</b>
	tones	855	299	400	46.8	<b>518</b>
Rape	Kg/ha	1800	<b>815*</b>	1751	97.3	<b>1413</b>
	tones	450	437	1168	295.6	<b>685</b>
Sugar beet	Kg/ha	36615	<b>10000*</b>	25000	68.3	<b>26182</b>
	tones	4760	800	1250	26.3	<b>2270</b>
Caw milk	l/cap	4750	4880	5000	105.3	<b>4875</b>
	hl	6412	7546	9000	140.4	<b>7653</b>
Sheep milk	l/cap	30	30	32	106.7	<b>30,6</b>
	hl	255	271	276	108.2	<b>267</b>

\* partial damaged

Because 2007 was unfavorable for agriculture, the average of period under review, **the obtained yields** were relatively modest: 2.5 - 2.6 tones / ha in wheat and maize for human consumption, 1.3 - 1.4 t / ha, the sunflower and rapeseed, 26.2 t / ha in sugar beet. At cow's milk and sheep, yields have been rising due to both the development of positive herd, and the average production per animal feed.

Of the total production achieved, most were for sale, which resulted in achieving high income from one year to another (**tab. 3**).

For example, if in average on analyzed period, the wheat and maize **production for sale** represented only 40.6% (of wheat) and 20.4% (of corn), to other agricultural products throughout the production was intended for sale.

**The selling prices** had an upward trend, with the exception of sunflower, at that price decreased by 5.0%, while on the other products the prices had a margin of variation between 11.8% (sheep's milk) and 68.8% (rape).

Due to the influence of production for sale evolution, but mostly selling prices, revenue had an upward trend, with the exception of sugar beet and sunflower.

**Table 3**

**Production for sale, sales prices and revenues at the main agricultural products in SA "AGROIND" Berezeni, Vaslui County, in the period 2005-2007**

The Product	Indicators	U.M.	2005	2006	2007	%/2005	Average 2005-2007
Wheat grains	Prod. for sale	tones	1300	520	1560	120.0	<b>1126.7</b>
	Medium price	lei/t	360	850	450	125.0	<b>476.9</b>
	Income	Thousand lei	468	442	702	150.0	<b>537.3</b>
Maize grains	Prod. for sale	tones	250	325	450	180.0	<b>341.7</b>
	Medium price	lei/t	340	1200	450	132.4	<b>660.8</b>
	Income	Thousand lei	85	390	202.5	238.2	<b>225.8</b>
Sunflower	Prod. for sale	tones	855	299	400	46.8	<b>518.0</b>
	Medium price	lei/t	1000	1100	950	95.0	<b>1006.4</b>
	Income	Thousand lei	855	328.9	380	44.4	<b>521.3</b>
Rape	Prod. for sale	tones	450	437	1168	259.6	<b>685</b>
	Medium price	lei/t	800	1200	1350	168.8	<b>1197.7</b>
	Income	Thousand lei	360	524.4	1576.8	438.0	<b>820.4</b>
Sugar beet	Prod. for sale	tones	4760	800	1250	26.3	<b>2270</b>
	Medium price	lei/t	100	95	125	125.0	<b>104</b>
	Income	Thousand lei	476	76	156.3	32.8	<b>236.1</b>
Caw milk	Prod. for sale	hl	6412	7546	9000	140.4	<b>7652.7</b>
	Medium price	lei/hl	80	85	100	125.0	<b>89.5</b>
	Income	Thousand lei	513	641.4	900	175.4	<b>684.8</b>
Sheep milk	Prod. for sale	hl	255	271	276	108.2	<b>267.3</b>
	Medium price	lei/hl	100	110	120	120.0	<b>110.29</b>
	Incomes	Thousand lei	25.50	29.81	33.12	129.9	<b>29.48</b>

Of the seven agricultural products analyzed in 2007 compared with 2005, the largest increases were reported in rape (4.4 times), maize grains (2.4 times) and cow's milk (1, 8 times).

**In the structure of income**, on average during 2005-2007, the largest share had the rape (27.9%), followed by the cow's milk (22.4%), wheat grains (17.6%) etc. on the last place was placing the milk sheep with a share of only 0, 77%.

If we report to the total obtained income through the capitalized of those seven agricultural products analyzed (**the average of the period**) in the arable area of the unit, produces a value of 912.7 lei / ha, and for a worker, 44,843 lei, representing a level of labor productivity rather high.

**Economic efficiency of analyzed agricultural products** was influenced by several factors, including pedo climatic conditions, production costs and selling prices have occupied the first place (**tab. 4**).

Table 4

**The evolution of expenditure in 1000 lei revenue, gross profit and profitability rate to the main agricultural products in SA "AGROIND" Berezeni, Vaslui County, in the period 2005-2007**

The product	Indicators	U.M.	2005	2006	2007	%/ 2005	Average 2005-2007
Wheat grains	Expenditure in 1000 lei revenue	lei	944.4	1411.8	726.7	76.9	<b>977.8</b>
	Gross profit/loss	Thousand -lei	26	- 182	191.9	738.1	<b>12.0</b>
	<b>Profitability rate</b>	%	5.88	-29.16	37.61	31.73	<b>2.27</b>
Maize grains	Expenditure in 1000 lei revenue	lei	794.1	1783.3	844.4	106.3	<b>1378.8</b>
	Gross profit/loss	Thousand lei	17.5	-305.5	31.5	180.0	<b>-85.5</b>
	<b>Profitability rate</b>	%	<b>25.92</b>	<b>-43.92</b>	<b>18.42</b>	<b>-7.50</b>	<b>-27.46</b>
Sunflower	Expenditure in 1000 lei revenue	lei	920	1454.5	807.4	87.8	<b>1005.6</b>
	Gross profit/loss	Thousand lei	68.4	-149.5	73.2	107.0	<b>-2.6</b>
	<b>Profitability rate</b>	%	8.69	-31.25	23.85	15.16	<b>-0.50</b>
Rape	Expenditure in 1000 lei revenue	lei	812.5	114.2	629.6	77.5	<b>759.8</b>
	Gross profit/loss	Thousand lei	67.5	-59.9	584.0	865.2	<b>197.2</b>
	<b>Profitability rate</b>	%	<b>23.07</b>	<b>-10.24</b>	<b>58.82</b>	<b>35.75</b>	<b>31.64</b>
Sugar beet	Expenditure in 1000 lei revenue	lei	1200	2368.4	688	57.3	<b>1211.5</b>
	Gross profit/loss	Thousand lei	-95.2	-104.0	48.8	-	<b>-50.2</b>
	<b>Profitability rate</b>	%	-16.66	-57.77	45.34	65.00	<b>-17.52</b>
Caw milk	Expenditure in 1000 lei revenue	lei	654.5	652.1	653.8	99.9	<b>653.6</b>
	Gross profit/loss*	Thousand lei	243.1	301.8	405.0	166.6	<b>316.8</b>
	<b>Profitability rate</b>	%	<b>52.77</b>	<b>53.33</b>	<b>52.94</b>	<b>0.17</b>	<b>53.02</b>
Sheep milk	Expenditure in 1000 lei revenue	lei	900	827.3	841.7	93.5	<b>886.8</b>
	Gross profit/loss	Thousand lei	2.55	5.15	5.24	205.5	<b>4.31</b>
	<b>Profitability rate</b>	%	11.11	20.88	18.81	7.70	<b>17.14</b>

\*including subsidies

Unfavorable weather conditions for agriculture in 2006 had a negative effect on financial results.

Thus, to the analyzed five vegetal products were recorded losses, which were recorded between 59.9 thousand lei (*the rape*) and 305.5 thousand lei (*to maize grains*).

In 2007, to all vegetal products was realized the highest level of profit, which ranged between 31.5 thousand lei (*to maize grains*) and 584 thousand lei (*the rape*), with a rate of profitability between 18.42 % (*of corn grains*) and 58.82 % (*the rape*).

Also to the two analyzed animal products, the highest profit achieved in 2007, first being the "milk cow", with a total profit of 405 thousand lei and a rate of profitability of 52.94 %.

Expenditure in 1000 lei income had a downward trend, with the exception of 2006, when to the vegetal products, the indicator registered the highest values: 1114.2 lei (*to rape*) - 2368.4 lei (*to sugar beet*).

In animal products, the indicator was below the value of 1000 lei, with the general trend of slight decrease.

On average, during the analysis from the analyzed seven products, milk cow, rape, sheep's milk and wheat grains were profitable, while maize grain, sugar beet and sunflower, recorded losses.

**The level of profitability** was differential to four agricultural products, the highest level achieving the cow's milk, with a rate of gross profit profitability of 53.02 % (*period average*), while to the wheat grain, the level was minimal (2.27 %).

In maize grain, **the loss rate** was highest (-27.46 %), while the rape, there was the minimum (- 0.50 %). **Expenditure in 1000 lei income**, averaged over the three analyzed years, were falling between 653.6 lei (*cow's milk*) and 1378.8 lei (*to maize grains*), confirming the conclusions presented above.

## CONCLUSIONS

1. The Agricultural Society "AGROIND" Berezeni is one of the agricultural units of the private type, which was established under law no. 36/1991.
2. In the structure of arable land cultivated during the period 2005-2007, cereal grains occupied 54.7%, technical plants, 28.8 % and fodder plants, 16.5 %.
3. The unit has a complex development, livestock farming being represented by cattle and sheep. Of the overall population of 321 cattle, dairy cows representing 56.1 % and the herd sheep, 66.7 % out of a total of 1295 head.
4. With the exception of 2006, when weather conditions were unfavorable for vegetal production, in 2007, all seven agricultural products were considered profitable, with a rate of profitability that signed up between 58.82 % (*the rape*) and 18.42 % (*from corn grains*).
5. In 2007, the unit earned a gross profit total of 1.34 million lei, with a gross profit rate of 50.6 %, being 360 lei gross profit per agricultural hectare.
6. To increase the economic efficiency of agricultural production in SA "AGROIND" Berezeni, is necessary to attract European funds, to equip and modernize farms and sectors, expanding the area equipped for irrigation, the implement of integrated agricultural system, based on a successful management and direct performance marketing.

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# ASPECTE PRIVIND TURISMUL RURAL ÎN ZONA BANATULUI

## NOTES ON RURAL TOURISM IN THE BANAT AREA

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**Cuvinte cheie:** turism rural, forme de turism, potențial turistic

**Key words:** rural tourism, tourism types, tourism potential

### **ABSTRACT**

*Banatul se caracterizează printr-un potențial turistic remarcabil, reprezentat de multitudinea obiectivelor naturale, cât și a celor de factură culturală deosebită. Astfel, Munții Banatului, prin varietatea și originalitatea cadrului natural, morfologia de ansamblu, particularitățile climatice, de faună și floră, care definesc specificul fondului turistic natural în acest spațiu, reprezintă o arie cu un potențial deosebit de important în dezvoltarea unor activități în domeniul turistic.*

*Potențialul agricol poate susține practicarea unui turism rural de rezonanță în zona Banatului. Micile întreprinderi axate pe activități de turism, ar putea facilita includerea mai multor gospodării rurale în circuitul economic, la care s-ar adăuga desfășurarea unor activități meșteșugărești.*

*În prezent, întreprinderi mici în domeniul turistic sunt în zona Brebu-Gârâna (considerate sate turistice), Oravița, Bozovici, Teregova, Domașnea, Poiana Mărului (în Munții Țarcu), Complexul turistic Semenic, potențialul turistic existent, fiind încă slab valorificat, ca urmare a resurselor financiare scăzute ale populației. De asemenea, în localitățile de la contactul Dealurilor Lugojului cu Munții Poiana Ruscă (Nădrag, Tomești, Fârdea, etc.) turismul reprezintă o oportunitate în apariția și dezvoltarea IMM-urilor cu activități turistice.*

*The Banat area is characterised by a remarkable tourism potential due to both its numerous nature sites and to its cultural attractions. Thus, the Banat Mountains, due to the variety and originality of the natural landscape, to their morphology on the whole, to their climate, flora and fauna features that define the specificity of the natural tourism funds in the area, represent an area with a particularly important potential in the development of some activities in the tourism field.*

*Its agricultural potential can support important rural tourism practices in the Banat area. Small enterprises whose main activity is tourism, could facilitate the enlisting of more rural households in the economic circuit to which we should add some handicraft activities.*

*At present, there are small tourism enterprises in the following areas: Brebu-Gârâna (considered tourism villages), Oravița, Bozovici, Teregova, Domașnea, Poiana Mărului (in the Țarcu Mountains), the Semenic Tourism Complex, but their tourism potential is still underrated because of the low financial resources of the population. Likewise, in the localities on the bordering line between the Lugoj Hills and the Poiana Ruscă Mountains (Nădrag, Tomești, Fârdea, etc.) tourism still represents an opportunity in the appearance and development of small and medium enterprises acting in the field of tourism.*

### **INTRODUCTION**

Rural tourism cannot develop apart from the traditional activities in the rural area. For the tourism offer to have a high value, it is necessary to raise the economic value of adjacent activities. This principle aims not only at the attractiveness of the rural environment, but at activities specific to life in the countryside.

A land with old historical and cultural traditions, the Banat area of today is part of the ethno-graphical landscape due to its museum institutions that concentrate life, work,

and culture exhibits and due to genuine proofs of material and spiritual life in a number of rural localities in the area.

Old Romanian customs should be practiced by agri-tourism service suppliers to attract tourists in agri-tourism areas. These customs are more frequently practiced during winter time periods, i.e. at Christmas Eve and at New Year's Eve. Celebrating Christmas Eve and New Year's Eve according to traditions is a unique chance to know directly the most precious values of folk spirituality. The poetry of the Christmas carols, of the dances, music, and gestures, and the impressive diversity of ceremonial costumes with a symbolic value enhances curiosity and makes us want to decipher the vital rhythms that used to regulate so harmoniously the relationships between man and cosmos, between man and environment, between man and people.

## TYPES OF TOURISM IN THE BANAT AREA

The Banat's area tourism resources can generate a large number of tourism types, such as:

1. *Traffic tourism*: it can be practiced on the main transit traffic arteries along the Mureş River Valley, the Timiș – Cerna Valley, the Danube River Valley, the Transylvanian Iron Gate, the Crișul Alb River Valley, the Banat's Mountains, or as itinerant tourism to visit tourism sites of interest in the area. In the Banat's Mountains, in the Poiana Ruscăi Mountains, in the Zarand Mountains or in the Metaliferrous Mountains there are theme tourism circuit rings depending on the tourism resource categories that attract tourists.

2. *Spa tourism*: the Banat area attracts due to its mineral and thermal waters whose therapeutic value is valorised through a satisfactory network of spas. Among them, Băile Herculane ranges first as a spa of international fame, followed by some regional-national interest spas such as Moneasa, Lipova, and Buziaș, and by some spas of local interest such as Calacea.

3. *Recreation tourism*: it is practiced in all tourism resorts, in localities relying on recreational facilities on river banks or in glades, for the weekend or during holidays. The reserve lake in Surduc, administered by the village of Fârdea, covers the area between Fârdea, Mîtnicul Mic, Gladna, and Surducul Mic. The building of the dam started in 1972, the lake reaching in 1977 almost 25 million m<sup>3</sup> and an area of 362 ha. The second building stage started in 1988 and aims at reaching 51 million m<sup>3</sup> over an area of 538 ha. The main goal of the reserve lake of Surduc is to supply the city of Timișoara with tap water through the Bega Canal, to prevent floods and, of course, to allow angling and hunting. Measuring 462 ha, it is the largest lake in the Timiș County. The lake is surrounded mainly by deciduous tree forests and by haymaking fields and is bordered by a number of cottages (over 270). The fauna in the area is extremely rich, which makes it a particularly attractive hunting area. The most frequent wild animals are the hedgehog, the hare, the skunk, the pheasant, the wolf, the fox, the wild boar, the deer, and even the bear. Around the lake or in the neighbouring villages, the owners of the cottages supply tourists with accommodation facilities.

4. *Business tourism*: the three counties making up the Banat area constitute a good business opportunity for foreign investors both due to its economic traditions and to the opportunities of exploiting from a tourism point of view the disabled areas such as the Moldova Nouă – Pescari Depression, Anina, Sasca Montană, Rusca Montană – Rușchița, Ocna de Fier – Dognecea, Mehadia, Secu, Doman; the mono-industrial areas such as Nădrag, Tomești, Margina; or the assisted areas such as Jimbolia.

5. *Cultural and historic tourism*: this type of tourism is developed due to a rich network of historical and archaeological sites, historical and architectural monuments, and museums, which allow the practice of cultural, urban, and week-end tourism. Such important historical sites are as follows: the medieval cities of Arad, Timișoara, and Reșița;

the numerous medieval castles such as the Hunyad Castle in Timișoara, the castles in Macea, Curtici, Sofronea, Mănăștur, Șiria, Pâncota, Conop, Săvîrșin, Birchiș, Mintia, Sântămăria Orlea, Banloc, and Ciacova; the monasteries and the wooden or stone churches dating from times immemorial and attesting the beginnings of Christianity in Romania.

6. *Mountain tourism*: it is practiced through hitch-hiking in the mountains: Zărand, Codru Moma, Banatului, Poiana Ruscăi, Țarcu, or in the depressions: Almăjului, Brebu Nou – Gărâna.

7. *Cave tourism*: the existence of breath-taking caves in the area, with very particular formations or crossed by subterranean water-courses, attract numerous tourists.

8. *Sports tourism*: the mountain area is particularly favourable to winter sport practice. The mountain resorts Semenic and Muntele Mic are notable for their relatively developed accommodation facilities (rather quantitatively than qualitatively); other important points of attraction are the winter sport facilities in the Parâng, Vâlcan, and Retezat Mountains. Active tourism, sport tourism, and adventure tourism activities showed that they still need to develop a relevant local organisation. As a result of the union of three villages – Slatina Timiș, Armeniș, and Teregova and of the town of Caransebeș which all cover the area of the Țarcu – Muntele Mic mountain area, they established, at the end of 2000, an association for the promotion of tourism in the area (Asociația de Promovare Turistică a zonei Țarcu – Muntele Mic – PROMOTOUR).

9. *Hunting and angling tourism*: the area is well-known for its excellent hunting opportunities. Though fish resources of the Danube are notorious, there is almost no fish food offer in the area, while existing ones lack in quality. Trout offers from the few fisheries in the area are low, which makes food services appeal to raw material from other areas.

10. *Youth tourism*: this form of tourism is valorised through the following tourism facilities:

- The Nădrag Camp: located in the Poiana Ruscă Mountains, 350 m high in the mountains, this camp covers 0.4 ha and has 120 places in 2 villas of 24 rooms each. It has a kitchen, showers, football and handball grounds, chess and table tennis tables;

- The Poieni Village Camp: located in the Poiana Ruscă Mountains 312 m high in the mountains, near Pietroasa, it covers 2.0 ha and has 250 places in villas of 27 rooms each. It has all the necessary facilities, but they need capital refectation and is not operating at present because of that;

- The Poieni Strâmbu Camp: it is located near the Poieni Village Camp, on the area of the village of Pietroasa, 382 m high in the mountains. It has 140 places in 2 villas and 1 chalet. The camp has supplementary facilities such as: kitchen, protocol room, showers, central heating, sports grounds, and disco.

11. *Other types of tourism*: they have the same relevance for the area and constitute an alternative for the re-launching and the development of the disabled areas: religious, ecumenical tourism, cruise tourism – along the Danube River Valley and along the Bega Canal; urban tourism – in the 36 towns of the area, with architectural patrimony and with all kinds of museums: history, archaeology, fine arts, nature sciences, mineralogy, ethnography, technique – some of which in the open; inter-cultural tourism in the D.C.M.T. (Dunăre-Criș-Mureș-Tisa) Euro-Region; culinary tourism for the local cuisine; classical tourism organised in hotels, motels, chalets, and camping sites, over a well-developed network of hotels such as the Padeș Hotel in Făget. In Tomești, the Valea lui Liman Motel has 53 places in the motel and 60 places in the camping site. In the neighbourhood of Nădrag, the Căpriorul chalet has 44 places in the chalet and 20 places in cottages.

## MATERIAL FUND AND TOURISM ACTIVITIES IN THE BANAT AREA

Tourism in the area is less developed than in other parts of the country such as the Prahova Valley, for example, or Southern Transylvania, with its two tourism poles, Sibiu and Braşov, the Black Sea Littoral, or Bucovina.

To also note the presence of some traditional spas in the area (Băile Herculane, Geoagiu-Băi, Moneasa, Lipova, and Buziaş). Nature reserves and protected areas in the Banat area can be grouped as follows: national parks – the Nerei – Beuşniţa Gorges, the Caraşului – Semenic Gorges, the Domogled – Valea Cernei Gorges; natural parks – the Iron Gates. Despite all this, the offer of tourist services is still low (low quality of tourist services, low training of the personnel involved in tourism activities, lack of networks).

In 2004, the Banat area had 3,461,000 places per day, i.e. 6.4% of the places/day in the entire country. Analysing the shares of the different types of accommodation, we can see that shares above the average belong to inns (31.1%) located along the European roads as well as to tourist villas (8.0%), more adapted to the modest demand spread along the year. Chalets and student camps (5.3% and 4.2%, respectively) are below the regional average.

Analysing the lodging accommodation facilities of the Romanian Banat area, we can see that there was a slight dominance of the mountain Banat in 2004 (53.85%) compared to the plain Banat (46.15%), the great variety of the mountain tourism potential being almost equalled by the main regional plain pole, the city of Timişoara.

Analysing the structure per types of accommodation establishments, we can see that the mountain area dominated among hotels and motels, student camps, rural and agri-tourism boarding houses, while the plain area shares the largest number of bed & breakfast, villas, camping sites, and inns.

A global analysis of the accommodation facilities per types of units shows the high concentration of hotels (73.27%), followed by urban bed & breakfast units (7.54%). The same goes for the plain area, where the share of the urban bed & breakfast establishments is larger (11.27%), while the mountain area comes second (5.68%) with its student camps.

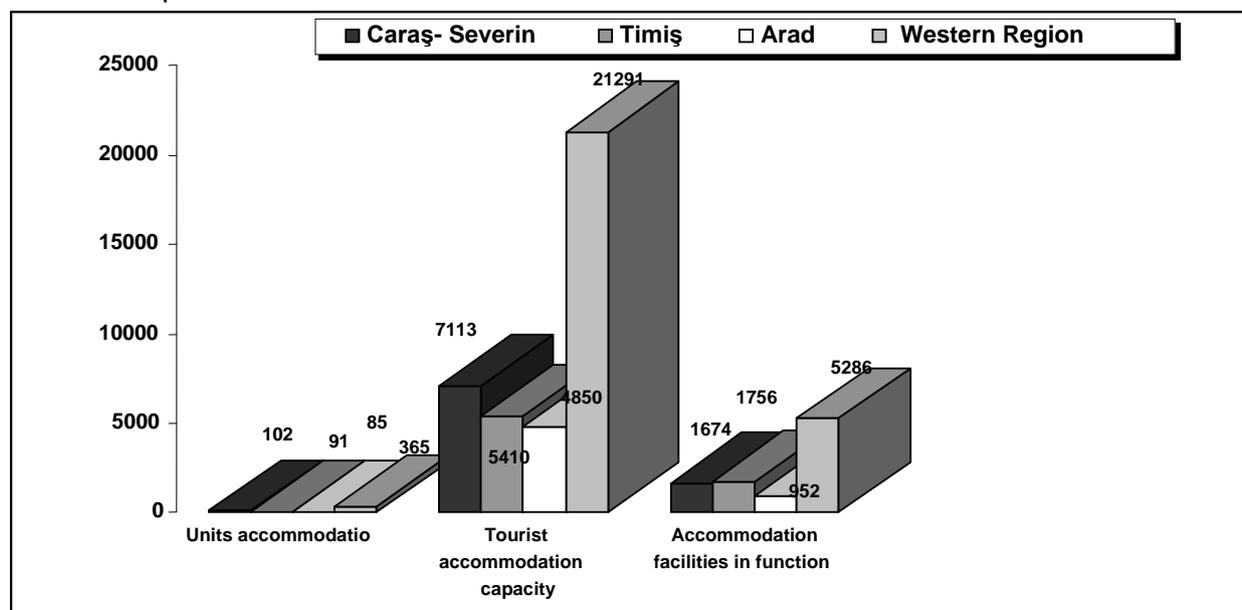


Figure 1. Tourism-economic development indicator in 2005  
Sursa: [www.regiuneavest.ro](http://www.regiuneavest.ro)

The distribution of the tourism facilities from the point of view of the sleeping accommodation facilities per areas is as follows:

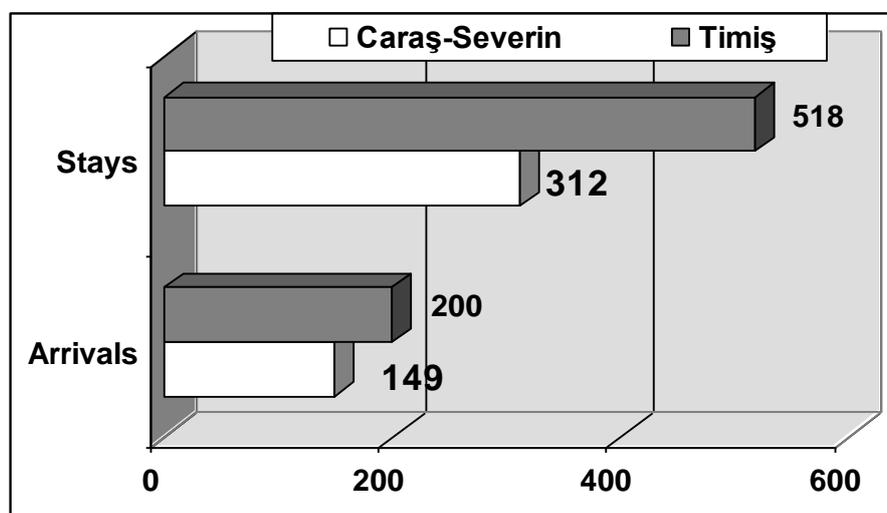
1. The town of Reșița: Hotel Semenic, Boarding House Mony Feith, Villa Arsenal;
2. The Secu Resort: Villa Pietricica, Hotel Restaurant Turist, Villa Splendid, Șura Ortacilor;
3. The Semenic Resort: Hotel Restaurant Gozna, Hotel Nedeea, Hotel Semenic, Hotel Central, Vile Birta Group 600, Hotel Dușan și Fiul;
4. The Gărâna – Trei Ape Resort: Motel Gărâna, Hotel Perla Trei Ape, Boarding House La Răscruce, Boarding House Peczi, Boarding House Briza Muntelui, Boarding House Gotschana, Agri-tourist Boarding House Wolsberg, Boarding House Motel Austria, Boarding House Paula, Challet Gărâna;
5. The Văliug-Crivaia Resort: Brigitte S.R.L, Boarding House Casa Hubertus, the Eugen SRL Cottage Complex;
6. The town of Caransebeș: Armexim Comprod S.R.L, Hotel Carla, Motel Tibiscum, Motel Concordia, Hotel Twerasco, Boarding House Șansa, the Muntele Mic-Poiana Mărului Resort, Hotel Scorilo, the Zăvoi Village, Poiana Mărului, Challet Cuntu, the Muntele Mic Resort, Challet Sebeș, the Muntele Mic Resort, Boarding House Dalwec, the Poiana Mărului Resort, Boarding House Lupul Singuratic, the Poiana Mărului Resort, Boarding House Iepurașul, the Muntele Mic Resort;
7. The town of Băile Herculane: Complex Afrodita, Complex Apollo, Hotel Coronini, Hotel Decebal, Complex Diana, Complex Hercules, Complex Roman, Hotel Dacia, Hotel Domogled, Hotel Minerva, Hotel Cerna, Boarding House Claudia, Villa Belvedere, Boarding House Matei, Motel Perla Neagră;
8. The town of Moldova Nouă: Hotel Dunărea, Chalet Dunărea;
9. The town of Anina: Hotel Mărghitaș, Hotel Steier;
10. The town of Oravița: Motel Caraș, Chalet 7 Brazi, Chalet Pajura, PD Lilyanne Com. SRL;
11. The town of Bocșa: Chalet Medreș, Chalet Stejarul, Motel Izvor.

**Table 1**

**Tourist activity of the Banat area in 2005**

Region/County	Arrivals	Stays	Use indices (%)
<b>Caraș-Severin</b>	149,000	312,000	32.8
<b>Timiș</b>	200,000	518,000	29.5
<b>Western Area</b>	536,000	1,836,000	34.7

Source: Anuarul Statistic al României, 2006



**Figure 2. Tourist activity of Banat area, 2005**

## CONCLUSIONS

Tourism does not work in the Banat area as it should because central level strategy is inconsistent for this part of the country, changing all the time because tourism development and promotion are not a priority for local authorities, except for a few cases.

The high agri-tourism potential in the area resulted in a number of proper bed & breakfast and tourism products. The picturesque of the mountain areas, the variety of flora and fauna, the springs of mineral and thermal waters, the game fund together with architectural elements, with the folk art and the folklore allow the practice of rural tourism.

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# POSSIBILITIES FOR DURABLE DEVELOPMENT OF THE AGRICULTURE IN THE GALAȚI AGRO-ECONOMICAL ZONE THROUGH THE ATTRACT OF EUROPEAN FUNDS

## POSSIBILITĂȚI DE DEZVOLTARE DURABILĂ A AGRICULTURII DIN ZONA AGROECONOMICĂ GALAȚI PRIN ATRAGEREA FONDURILOR EUROPENE

*Dima Fl. M., Chiran A., Gîndu Elena, Drobotă Benedicta*

Key words : durable agriculture, development, performance

### ABSTRACT

*The durable development is a world concept that points out the connection between environment and economical grow.*

*In the world Commission report for the environment and rural development from the United Nations presented in 1997, the durable development is defined as "the development that satisfied the present necessity without compromise the future generation capacity to satisfy their own necessity".*

*The agro-economical zone of Galați has 8 localities situated in the Siret and Prut meadow with an agricultural surface of 51,4 thousand hectares represented 14,7 % from the agricultural land of Galați County.*

*About 60 % of the surface, belong to the private societies and commercial private societies with juridical personality and the difference is in the property of individual household (28,0 %), the family association without juridical personality (8,3 %), and unities with a majority of public capital (4,4 %).*

*The authors propose to point out the sources and the possibilities of assuring the funds for durable development of agriculture from the agro-economical zone of Galați, in correlation with The National Strategic Plan for Rural Development during 2007-2013.*

*Dezvoltarea durabilă este un concept mondial, care vizează legătura dintre mediu și creșterea economică. În Raportul Comisiei Mondiale pentru Mediu și Dezvoltare Rurală din cadrul Națiunilor Unite, prezentat în 1997, dezvoltarea durabilă este definită ca fiind "dezvoltarea care satisface necesitățile prezentului fără a compromite capacitatea generațiilor viitoare de a-și satisface propriile necesități".*

*Zona agroeconomică Galați cuprinde teritoriul a 8 localități situate în Lunca Siretului și Lunca Prutului, cu o suprafață agricolă de 51,4 mii hectare, reprezentând 14,7 % din terenul agricol al județului Galați. Circa 60 % din suprafața agricolă aparține societăților agricole private și societăților comerciale agricole private – cu personalitate juridică, iar diferența se află în proprietatea gospodăriilor individuale (28,0 %), a asociațiilor familiale fără personalitate juridică (8,3 %) și a unităților cu capital majoritar de stat (4,4 %).*

*Autorii și-au propus să evidențieze sursele și posibilitățile de asigurare a fondurilor pentru dezvoltarea durabilă a agriculturii din zona agroeconomică Galați, în corelație cu Planul Național Strategic de Dezvoltare Rurală din perioada 2007-2013.*

### MATERIAL AND METHOD

The study was conducted in the agro economical area Galați, which includes 8 localities, with a total population of 135,549 inhabitants, 124,330 of which are domiciled in the city of Galați. Of the working population of the studied area, 37.1% work in agriculture,

returning 1.99 hectares / person working in agriculture, of which 1.78 hectares of arable land.

The agro economical area Galați present favorable conditions for cultivation field plants, vegetables and vine.

Also in the field of livestock, major share holds sheep and dairy cows.

## OBTAINED RESULTS

The strategy in the short term and long term proposed by National Plan for Agriculture and Rural Development has the following objectives:

- *sustainable development of a competitive agro alimentary sector;*
- *increasing the standard of living in the countryside;*
- *development of rural economy;*
- *the development and diversification of economic activities;*
- *human resources development.*

For all of these strategic objectives will be given priority to investments that allow the implementation of the communitarian acquis.

The strategy of developing the production plant in Romania has as priority objective, the increase of productivity, improving quality of products harvested with impact on domestic consumption and creating cash for export.

Applying the measures to support the activities of the plant will cause: *revitalizing sectors of vegetables and fresh fruit, fruit tree plantations and vines, vegetables produced in greenhouses heated and industrialization of fruit and vegetables, tobacco, hops, herbs, potatoes - improving performance of producers associative forms under the laws in force and a gradual reduction of the difference in performance between manufacturers in Romania and the Member States.*

It will also ensure diversification of production and development marketing channels, production of quality raw materials for processing industries and create new jobs in rural areas and an optimal delivery to the consumer.

Financial aid beneficiaries are farmers from the vegetal sector, individuals and / or legal entities, which are register into the Agricultural farms/ Register farms / and other accounts which exploit agricultural land, individually or in combination forms according with legislation in force, and recognized Producer Groups / Preliminary recognized and recognized producer organizations, in order to obtain agricultural production.

After analysis of the situation in the vegetal sector, were identified priority directions and specific problems:

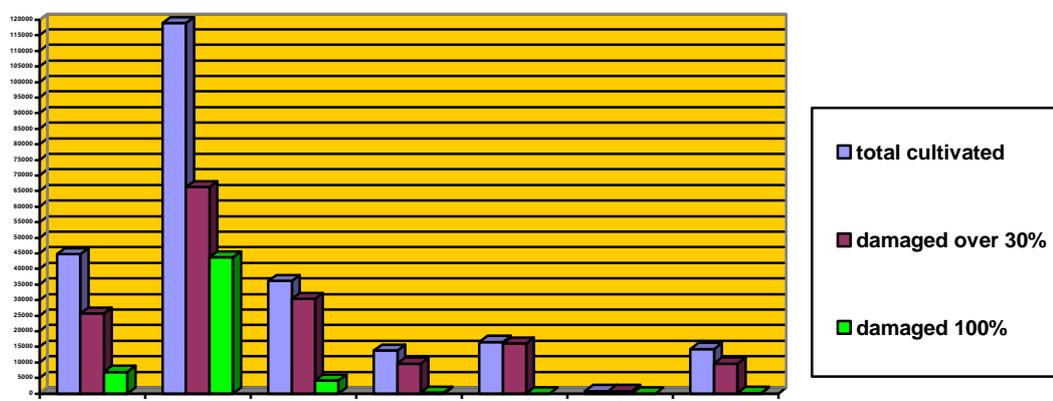
- *absorption of EU funds to finance specific areas of activity;*
- *best supporting recovery of agricultural production through efficient allocation of budgetary resources and promoting measures to increase the competitiveness of Romanian products.*

The specific objectives of vegetal production development referring to the following aspects:

- *the implementation of direct support schemes on area and national complementary support;*
- *efficient allocation of budgetary resources to support farmers in the vegetal production;*
- *application of market mechanisms to specific common market organizations, in order to establish agricultural markets (the mechanism of intervention for cereals, private storage, other measures of the market);*
- *stabilize prices of agricultural products from producer;*
- *maintenance of cultivated areas;*
- *ensure consumer needs;*

- *improving trade balance.*

In the agro economical area Galați, the excessive drought phenomena has affected large areas of agricultural land in the years 1996,1997, 2001, 2003, 2007. Only in 2007 were affected by extreme drought and high temperatures crops seeded in autumn, spring crops, vineyards and plantations of trees (fig. 1).



**Fig. 1 – Situation of natural damages on crops in the agro economical area Galați (2007)**

Thus, from the area seeded with wheat, 15.3% was fully damaged and 57%, in part. In maize, 36% of the cultivated area was full damaged, and sunflower at 11.5%.

In the agro economical Galați area, facilities for irrigation, draining and combating soil erosion are as follows (tab. 1).

**Table 1**

**Situation of irrigation arrangements, draining and combating soil erosion in the agro economical area Galați**

The arrangement	Irrigations – net area	Draining	Combating soil erosion
<b>1. Brateșul de Sus, from which :</b>	<b>5,083</b>	<b>12,097</b>	<b>-</b>
- 4 OUAI	5,083	-	-
- ANIF	-	12,097	-
<b>2. Câmpia Covurlui, from which :</b>	<b>115,416</b>	<b>39,161</b>	<b>146,348</b>
- 24 OUAI	77,923	-	-
- ANIF	37,475	39,161	146,348

**Source :** work out data after the records processed by the Office of Land Improvements Galați

Drought excessive and persistence in time, accompanied by high temperature causes harvest lost for not irrigated culture.

The budget programs of the crop field, aimed at implementing schemes for direct payments, additional payments and direct payment scheme for sugar, and also a direct payment scheme area for energy crops.

The budget programs for horticultural crops, which are necessary for the implementation of direct payment schemes are broken down as follows:

- *financing from the state budget for the implementation of the single payment scheme area;*
- *for the application of national direct complementary payments;*
- *support costs for vegetables, fruits, life-wine, potato, medicinal and aromatic plants, flowers, tree and ornamental plants.*

Direct payments per unit of area would include between 42 euro / ha in 2007 and 167 euros / ha in 2015. Crops structure is set according to market requirements.

Variation 2 is based on a less optimistic scenario, which takes into account possible delays in the agenda of governmental and nongovernmental bodies involved in the process of market reform in the arable crops in Romania (tab. 2., tab. 3., tab. 4.).

**Table 2**

The estimate of direct payments for plants grown in arable land, in the period 2007-2015 – mil. EURO -

Specify	2007	2010	2015
	% of the total under Regulation 1782/2003		
	25	40	100
Wheat and rye	94,86	151,78	379,449
Barley and two-row barley	25,56	40,90	102,249
Maize	136,861	218,97	547,438
Sorghum	0,063	0,108	0,252
Sunflower	18,26	29,21	73,030
Soybeans	2,19	3,51	8769,6
Textile plants	0,077	0,123	0,3087
Other cultures	14,82	23,70	59,2677
<b>TOTAL</b>	<b>292,691</b>	<b>468,305</b>	<b>1170,764</b>

Sursa : work out data after the records and reports of O.J.C.A. Galați

**Table 3**

Estimating the direct payment per hectare per crop, in the version that the conditions for full granting in the period 2007-2015 - euro / ha -

Culture	2007	2010	2015
Wheat and rye	42	67	167
Barley and two-row barley	45	72	180
Maize	48	80	192
Sorghum	23	40	93
Sunflower	20	33	82
Soybeans	31	50	124
Textile plants	55	88	221
Other cultures	42	67	167
<b>Total direct payments /ha</b>	<b>42</b>	<b>66</b>	<b>167</b>

Sursa : work out data after the records and reports of O.J.C.A. Galați

Direct payments to eligible hectares would suffer a decrease of 30%, reaching a level of only 29 euro / ha in 2009 and of 117 euros / ha in 2015.

The absorption of communitarian funds is an objective in itself of the post-accession strategy, taking into account the significant contribution that these funds will have to recover gaps over the development of the EU Member States. Access to these resources by European cohesion policy is one of the main economic benefits.

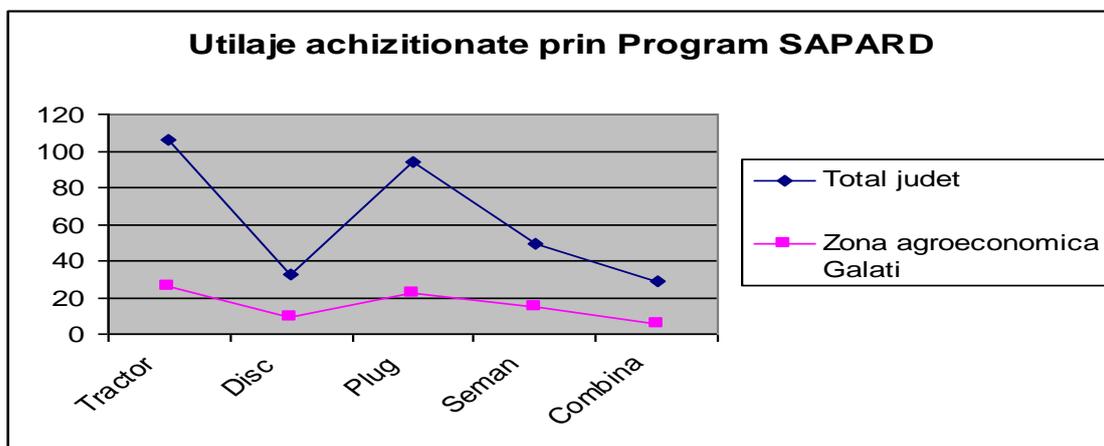
**Table 4**

The estimate of direct payments for plants grown in arable land, in the version of accomplish the granted conditions in a proportion of 70% during 2007-2015

Specify	UM	2007	2010	2015
	%	Direct payments - % din total		
		25	40	100
Direct payments	mil. euro	204,88	327,81	819,534
Surface reference	ha	7012666	7012666	7012666
<b>Direct payments /ha</b>	<b>euro/ha</b>	<b>29</b>	<b>47</b>	<b>117</b>

Sursa : work out data after the records and reports of O.J.C.A. Galați

In the period 2003 - 2006, at Galați County were submitted by Agricultural corporations, Commercial and PFA projects through SAPARD programs and The Farmer program for Measure 3.1, an amount of 72.85 mil. lei. From the 117 realized projects in the Galați County, for Galați agro-economical area have been received and implemented 24 projects. A large part of the projects approved had the object of purchasing tractors, agricultural machinery and equipment (**fig.2**).



**Fig. 2 – Equipment purchased by Sapard Program in the county of Galați and the agro economical Galați area**

With the integration of Romania into the European Union and PNDR approval, farmers were unable to access projects by the FEADR program. **At Galați county level** there is a request for projects aimed in particular the purchase of agricultural performance machineries.

By making this investment will achieve the following objectives:

**a) technical objectives**

- the purchase of tractors, combines, cars, machinery, equipment, etc., which increase labor productivity, improving quality of agricultural products, the introduction of advanced technologies, improving working conditions;
- construction and/or upgrading operational buildings leading to ensuring compliance with standards;
- diversification of production according to market requirements, development of new products and introduction of new technologies.

**b) economic - financial objectives**

- reducing production costs and increase the economic profitability of the farm;
- increase in gross added value (VAB) to farm;
- increase economic viability;

**c) environmental objectives**

- reducing harmful emissions and better management of wastes resulting from production;
- reducing emissions of ammonia (and other gases), particularly in the livestock farming by meeting animal health standards, hygiene and animal welfare;
- ensuring compliance with the requirements of plant protection, ecological etc.;
- increasing the use of renewable energy sources and improving the effectiveness of their use.

For the agro economical Galati zone the proposed projects by FEADR had a total of 5.55 million Euros (20.66 million USD).

Under the number aspect, against the total county, in the agro economical Galați zone were provided projects 18 tractors (15.0 %), 11 plows for tractor (14.0 %), 26 grape disc (26.0 %) 12 sowing machine (22.0 %), 6 combine (13.0 %), as results in **figure 3**:

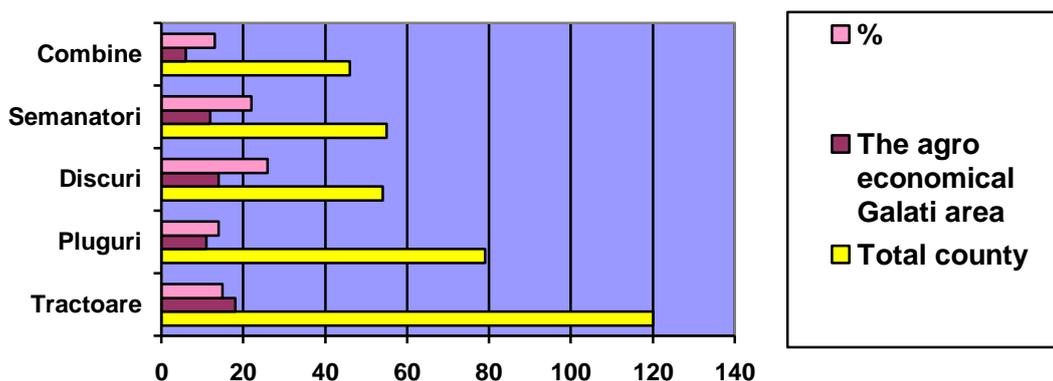


Fig. 3

Tractors and agricultural machines provided in the investment projects at Galați county and the agro economical Galați area

The impact of vegetal production development cover the following directions:

- *impact on the business environment;*
- *social impact;*
- *environmental impact.*

Romanian rural area diagnosis indicates the need for sustainable rural development, which involves promoting and implementing a policy that can develop in a balanced and efficient way the urban and rural areas in Romania.

Development of livestock production in the county of Galați in the agro- economical Galați area can be achieved by fulfilling the fundamental strategic objective which is *strengthening of market economy and adaptation of livestock production in Romania to the requirements of the European Economic Community*. Achieve this fundamental objective requires long-term formation of a modern livestock, which based on specific mechanisms of market economy, allowing the use of the natural and human resources to ensure food security and strengthening the position in the market to trade in animal products, both on the domestic market and export.

Analyzing the current situation on animal breeding in the agro-economical Galați area, compared to the Galați county, can appreciate that, although there is potential in terms of areas needed to ensure the base forage in the research area have developed a very few farms that produce for marketing and to meet European standards. That is why most of the production achieved in this area is oriented to family consumption.

Starting from present situation, have developed a series of projects designed to support economical and financial the livestock producers to revive and develop in the future this livestock sector (**tab. 6**).

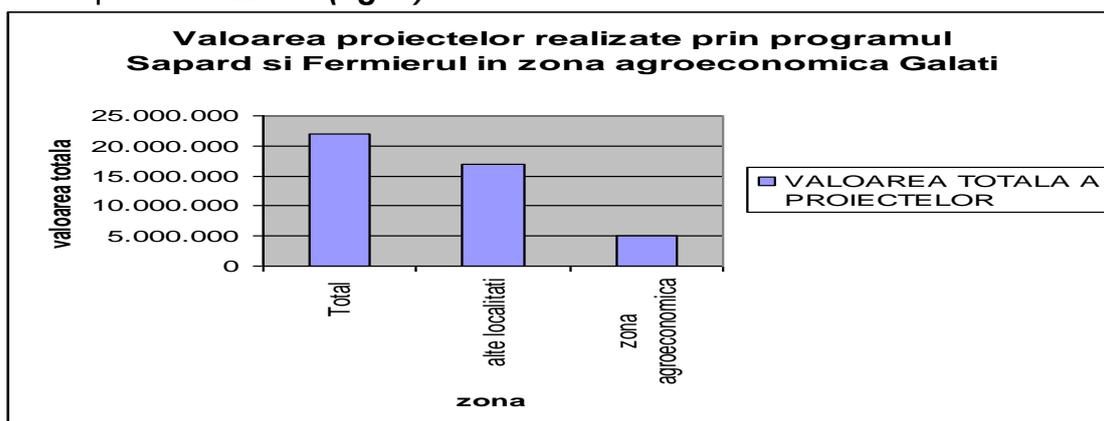
Table 6

Projects in the agro-economical Galați area through SAPARD and The Farmer programs

Crt. No.	Beneficiary	The total value - lei	Locality	Program	The investment profile
1.	S.C. AVIHENS CO.S.R.L.	1,419,562	Șendreni	The Farmer	Poultry
2.	S.C. AGROCON VM S.R.L.	2,632,891	Smârdan	The Farmer	Pigs
3.	P.F.A. Sava Alexandrina	893,400	Galați	Sapard	Milk cows
<b>TOTAL VALUE</b>		<b>4,945,853</b>			
<b>TOTAL COUNTY</b>		<b>21,957,775</b>			

Sursa : work out data after the records and reports of O.J.C.A. Galați

Of the total value of projects in Galați County, the projects in the agro economical Galați area represents 22.5% (**fig. 4**).



**Fig. 4. – The value of projects completed by the Sapard and The Farmers programs in the agro economical Galați area**

To achieve the objectives of developing livestock in the county of Galați and, in the agro economical Galați area, it is necessary to ensure support from the state, but also by attracting European funds grants. In this context have been developed and will run several budgetary programs aimed at following:

#### A. FINANCIAL SUPPORT - STATE AID

1) Support the improvement of animal populations, through:

1.1. The leadership of genealogical records:

- bovine 7.5 lei / head

- sheep 3.68 lei / head

1.2. Making official control of milk production in sheep and goats:

- official control of milk production in sheep and goats: 5.18 lei/head;

- official control of wool production from sheep: 0.50 lei/head;

- official control of skin production in sheep: 1.0 lei/head;

- official control of meat production in sheep/goat: 0.80 lei/head

1.3. Entering at the farm of techniques, biotechnology and modern practice of reproductive animal species, namely the purchase of containers for conservation seminal frozen material with capacity of over 20 liters and dynamic autonomy over 90 days:

- 3 500 lei/buc

1.4. Support costs of testing the male reproductive:

- steers: 1 000 lei / head;

- wethers / billy goat: 50 lei / head;

1.5. Support costs for conducting the National dissection test for authorized the equipment for the classification of pig carcasses according to classification system EUROP for determining the mathematical formula for calculating the percentage of muscle tissue in the cabinet, for pigs in Romania:

- 800 lei / head.

2) To support improving the quality of animal products:

2.1. Improving the quality of meat production through the financial backing to implement the system of carcasses classification:

- pig carcasses E: 120 lei / cabinet;

- pig carcasses U: 100 lei / cabinet;

- cattle carcasses: 100 lei / cabinet;

2.2 Improving the quality and production parameters of increase herds by supporting meat and egg production, as follows:

- sows from commercial farms which came from reproduction farms in the pure breed or hybridization, the first calving,

- 150 lei / head;

- poultry meat - chicken broiler: 1.6 lei / head;

2.3. Improving the quality of the production of honey bees by supporting the families of bees:

-20 lei / family of bees;

2.4. Improving the quality and hygiene of cow's milk for processing in order to achieve quality standards of the European Union, and support for milk delivered to the total number of germs (NTG) less than or equal to 100.000/ml and a number of somatic cells more than 400,000 / ml. :

- 0.3 lei per liter;

3) Support measures for the production and marketing of apiculture products:

3.1. Supporting the purchase of medicines to combat varroasis:

-6 Lei / family of bees;

3.2. Supporting restocking in hives on national territory by acquiring queens from local race:

-15 Lei / stock of bees.

## B. NATIONAL COMPLEMENTARY DIRECT PAYMENTS

It is accord national complementary direct payments as follows:

- for cattle on the farm with minimum 3 cattle heads and the minimum age of 6 months;

- for sheep on farms with at least 50 adult sheep;

- for goats, on the farm with a minimum of 25 adult goats.

## CONCLUSIONS

1. The development stages of sustainable agriculture in Romania are based on a series of major objectives such as:

- *fiscal stimulation and other specific means of small farms (short term)*

- *increase in the number of profitable family farms, producing agricultural products for the internal and external market (medium term);*

- *increase in the number of family farms with modern management, producing agricultural products competitive on foreign markets and a significant contribution to the achievement of gross domestic product (long term);*

2. Sustainable rural development must be addressed within the agricultural policy and employment, taking into account the need to achieve the following:

- *modernize farms and providing financial support for young farmers;*

- *promotion of infrastructure for tourism and agricultural activities and encourage local agricultural complementary activities;*

- *ensuring a better access to services and utilities (water, sewerage, communications networks, natural gas etc.).*

- *halting depopulation of rural areas by initiating programs to improve the workers profession and of persons able to work in small and medium-sized farms.*

3. Analyzing the structure of crops in the period 2002 - 2006, shows that the agro economical Galati area is an area where it can practice a performance agriculture. The variety of crops that are suitable in the area, allows farmers to choose a diversifying crop structure to adapt to market requirements.

Hilly field allows full mechanization of agricultural works and use performance machinery of high capabilities.

4. Of all the 16 main crops examined, only seven crops (vegetable-roots tomatoes, dried onions, corn for silage, rye and wheat, cabbage and sunflower), the average yield per hectare has had a positive influence on the evolution of total production, while at other

cultures in which the average yield per hectare has been declining, the influence was negative.

5. For the agro economical Galati area, the increase of vegetables share in the daily diet is expected to be quite significant, now it is only 23-25%. The general objectives of the vegetable growing its adaptation to new conditions of the European market, which requires the coexistence of the three categories of strategies: *"conventional" technology, "rational" technology, "ecological" technology*. The need of modernization and development of agricultural production by expanding the share of horticultural production will lead to diversification the vegetables assortments in the two large vegetable basin: Tecuci and Galati.

6. In the field of livestock, raising cattle represent the species with greatest impact on the food balance of the population. Prospects to improve cattle are dictated by the consumption of milk and meat, and the demand-supply for these products.

7. In the agro economical Galati area, the most breeding farms are small. For example, in the case of *"cows and heifers"* farms, those with 1-2 head represented 98.5%, those for *"sows and sows for breeding"* ,98.9%. In the case of *"fattening pigs"*, most farms have a share with an effective *"under 3 heads"* (99.8%), the holdings of goats and sheep, dominating with effective *"under 10 heads"* (93.7 - 86.7%), and at poultry farms, 84.0% have an effective *"under 25 heads."* All these examples demonstrate that there is a possibility to concentrate livestock in a smaller number of farms with a herd of animals to ensure farm viability, sustainability and efficiency.

8. In the analyzed period, investments made in the field of livestock have been relatively small and have resulted in the means for collecting and processing feed, equipment for milking, cooling and analysis the milk quality, generators to produce electricity.

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# STUDIU DE CAZ PRIVIND APROVIZIONAREA CU GRÂU A POPULAȚIEI MUNICIPIULUI IAȘI

## CASE STUDY REGARDING THE WHEAT SUPPLY FOR THE IASI CITY POPULATION

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**Key words:** supply, wheat, Iași

### ABSTRACT

*Iasi city is an important economic center of Romania. The main industries are metallurgy, medicine (antibiotic), textiles and alimentary one. The banking sector and the information have been soaring in recent years, many banks and software companies are present in the city.*

*Iași is also an important regional trading center; here there are more malls (others are under construction) and more hypermarkets.*

*In recent years, outside Iasi, have grown an average of 225 ha of wheat, achieving a total production of 570 tons, quite insufficient quantity against the annual consumption needs of the population of this city.*

*After calculation, results that the annual wheat supplied required for the population of Iasi is about 68,000 tons.*

*Starting from this value, the authors have proposed to recommend several options for the supply of wheat that can be used by wheat processors and consumers from Iasi. The versions most effective are those involving the presence of as few intermediaries.*

*Municipiul. Iași este un centru economic important al României. Industriile principale sunt metalurgia, medicamentele (antibiotice), textilele și industria alimentară. Sectorul bancar și cel al informației au luat avânt în ultimii ani, numeroase bănci și companii de software fiind prezente în oraș.*

*Iașul este, de asemenea, un centru comercial regional important, aici existând mai multe [mall - uri](#) (altele fiind în construcție) și mai multe [hypermarket - uri](#).*

*În ultimii ani, în extravilanul municipiului Iași s-au cultivat în medie, 225 ha cu grâu, realizându-se o producție totală de 570 tone, cantitate cu totul insuficientă față de necesarul de consum anual al populației acestui oraș.*

*În urma calculelor efectuate, a rezultat faptul că, necesarul anual de grâu de aprovizionat pentru populația municipiului Iași este de circa 68000 tone.*

*Plecând de la această valoare, autorii și-au propus să recomande mai multe variante de aprovizionare cu grâu, care pot fi folosite de către procesatorii sau consumatorii de grâu din cadrul municipiului Iași. Variantele mai eficiente sunt acelea care implică prezența a cât mai puțini intermediari.*

### INTRODUCTION

The Iași city is in the east of Romania, in Moldova Plain. The city is on Bahlui River, a tributary of Jijia, which flows into the River Prut (**fig. 1**).



**Fig. 1 – The location of Iași city**

Iași city is the Iași County, with a total population of 315,214 inhabitants, registered on 1 July 2007.

Also, Iași is an important economic center of Romania. Main industries are: metallurgy, medicine (antibiotic), textiles and alimentary. The banking sector and the information have been soaring in recent years, many banks and software companies are present in the city.

In Moldavia, Iași is distinguished as one of the most important regional trade center; there are many shops, supermarkets and hypermarkets, general or specialized.

## **MATERIAL AND METHOD**

The studies were conducted in the county of Iași and aim to developing the most effective strategies for supply with wheat the Iași population. In this sense it was establish the annual supply of wheat depending of the number of inhabitants (sets, floating and in transit), the area cultivated with wheat outside the city and the average annual consumption of wheat per person (equivalent flour).

It was also examined the storage capacity and the wheat processing units from the city.

## **OBTAINED RESULTS**

Supplying a city with wheat can be achieved through a large distributor; it can be three types of supplies (**tab. 1**).

Choosing a variant supply depends on what relations are established between the operators in the channel, which are influenced by: the nature of the product, the techniques of transport, type of company behavior of operators in phases command and dispatch, etc.

The area cultivated with wheat outside Iași, annually provides a total production of 570 tones of wheat, which is very little compared with the wheat consumption of population.

After calculations, result that there is an annually need for supply of 67,290 tons of wheat (**tab. 2**).

Table 1

## Types of supply of a locality with wheat

Options of wheat supply	Advantages	Inconvenience
<b>DIRECT</b> provider-store	Optimize the supplied quantities	It can not optimize the storage capacities
	The absence of stocks	
	There is no signal about the interruption of links with the end - detail unit of sale	
<b>BY STOCK</b> producer - provider platform - warehouse storage distributor - platform distributor - shop	Optimize upstream transportation, one invoice, one transport	Additional financial expenses
	Possibilities of achieving a high level of business and financial operations regarding the market	Risks relating to slow sales Various risks, fires, strikes
<b>BY TRANSIT</b> manufacturer - supplier platform - distributor platform - shop	Lack of stocks	Not knowing the exact quantities of wheat grain ordered by type (for pasta, bread), due to rounding orders
	The rhythmic functionality of storage capacity	Traders are not satisfied
	Optimize transport downstream: through the ability of a vehicle that serves multiple suppliers, may be included several types of wheat grains	

Source: 1

In the county of Iași, there are 14 bases with a storage capacity of 240.3 thousand tons. Of these, 6 are unused. In the city of Iași there is one storage basis, with a capacity of 56 thousand tons (**tab. 3**).

The 134 units in the processing of wheat in the county of Iași have a capacity of 1376.65 tone/24 hours and those 60 from Iași city have a capacity of 762.6 tone/24 hours, representing 55.4% of total (**tab. 4**).

Depending on the destination of wheat were developed several variants of supply that can be used by processors and consumers of wheat in the city.

The most effective variants are those involving the presence of as few intermediaries (**tab. 5**).

## The calculation of wheat supplied requirements of Iași city Table 2

City population of Iași *) - no. of inhabitants	315,214
The area cultivated with wheat in 2006 *) - ha	225.00
Total wheat production in 2006 *) - tones	570.00
Annual average consumption of wheat / person - kg / year *)	243.83
Total annual consumption of wheat - tones	76,859.86
Total annual supplied requirement - tones	76,289.86
Needs supplied -%	99.26

Sursa: \*) DADR Iași, INSSE, USDA

Table 3

### Bases for grain storage in the county of Iași (silos and warehouses)

The number of wheat storage bases			Capacity - thousand tons
Total county	Used	14	240.3
	Unused	6	65.2
Iași city	Used	1	56
	Unused	-	-

Source: DADR Iași

Table 4

### Wheat units processing in the county of Iași

Types of units of wheat processing		Number	Capacity (tone/24 ore)
Manufacture of wheat flours	Total county	37	786.7
	Iași city	5	408.4
Manufacture of bread and pastry products	Total county	94	507.95
	Iași city	52	272.2
Manufacture of pasta	Total county	2	48
	Iași city	2	48
Manufacture of biscuits	Total county	1	34
	Iași city	1	34

Source: DADR Iași

Table 5

### Variants of supply with wheat of Iași population

Crt. No.	Wheat destination	Supply variants
1	Consumption - flour	Producers → Processors (Mill) → Package → Consumers
		Producers → Producer groups → Processors (Mill) → Package → Consumers
2	Consumption – products results through processing	Producers → Processors → Consumers
		Producers → Processors (Mill) → Processors → Consumers
		Producers → Producer groups → Processors (Mill) → Processors → Consumers
		Producers → Producer groups → Processors (Mill) → En-gross → Processors → Consumers
		Producers → Gross markets → En-gross → Processors (Mill) → Processors → Consumers
		Producers → Producer groups → Cereal bourse → En-gross → Processors (Mill) → Processors → Consumers
3	Feed	Producers → Consumers
		Producers → Wholesale → Consumers
4	Seed	Producers → Consumers
		Producers → Wholesale → Consumers

## CONCLUSIONS

1. The need of wheat supplied of Iasi city is 76289.86 tons, representing 99.26% of total consumption, which require the elaborating of supply strategies, which can lead to decrease the costs of transport and storage of wheat.

2. Depending on the destination of wheat is recommended the following supply variant:

- for flour consumption, the best supply variant is:

Producers' → Producer groups → Processors (Mill) → Package → Distributors → Stores → Consumers,

because through producer groups it can be better negotiated the purchase price of wheat necessary for processing.

- for consumption - products results through processing, the best possibility of supply is:

Producers' → Producer groups → Processors (Mill) → Processors → Distributors → Stores → Consumers,

because it is wanted to have as few intermediaries to results a lower price for the finished product.

- for feed and seed the best supply variant is:

Producers' → Conditioning Units, Dosage and Packaging → Stores → Consumers,

because through the quality of seeds and feed produced, economic results will be higher as a result of favorable prices.

3. It is recommended that in the process of supply to be fewer intermediaries to increase efficiency, to adopt the vertical integration of firms.

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# STRATEGII PRIVIND PIAȚA ȘI DISTRIBUȚIA CEREALELOR BOABE ÎN JUDEȚUL IAȘI

## STRATEGIES REGARDING THE DISTRIBUTION OF CEREALS GRAINS IN IASI COUNTY

*Drobotă Benedicta, Gîndu Elena ,  
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**Key words:** strategies, market, distribution, cereal  
**Cuvinte cheie:** strategii, piață, distribuție, cereale

### **ABSTRACT**

*Market strategy summarizes the agricultural firm attitude towards the market and its possibilities to influence and adapting to market requirements. It realized the connection between business and environmental realized products on present and future markets and aims the objectives of that period.*

*Compared with other goods, cereals trade showed some differences arising from their nature. Agricultural production is realized in certain geographical areas and basins, and consumption takes place across the country.*

*In developed countries, modern farm system ensures the distribution of agricultural and agro alimentary products and through specific channels, forming a distribution system that covers the national territory, the products being transported from one part to another in search for a profitable markets.*

*In Iasi County, cannot developed general strategies on the distribution of cereals grains, but specific ones, depending on the size of farm (area of held land) and other factors. The market strategies are to increase the surfaces for the farms that are less than 100 ha, and for those with a larger area, will put an emphasis on the quality of the products and increase the market share. It recommends the adoption of strategies based on shorter distribution channels, which will include groups of producers.*

*Strategia de piață sintetizează atitudinea firmei agricole față de piață, posibilitățile ei de influențare a acesteia și de adaptare la cerințele pieții. Ea realizează conexiunea firmă și mediu dintre produsele realizate și piețele prezente și viitoare și vizează obiectivele din perioada respectivă.*

*Comparativ cu celelalte mărfuri, comerțul cu cereale prezintă unele deosebiri generate de natura acestora. Producția agricolă se realizează, în anumite zone geografice și bazine specializate, iar consumul are loc pe întreg cuprinsul țării.*

*În țările dezvoltate, sistemul agroalimentar modern asigură distribuția produselor agricole și alimentare prin canale specifice, care formează un sistem de distribuție ce acoperă teritoriul național, produsele fiind transportate de la un capăt la altul al țării în căutarea unei piețe profitabile.*

*În județul Iași, nu se pot elabora strategii generale privind piața și distribuția cerealelor boabe, ci strategii specifice, în funcție de dimensiunea exploatației agricole (suprafața de teren deținută) și alți factori. Strategiile de piață au în vedere creșterea suprafețelor de teren pentru exploatațiile care au mai puțin de 100 ha, iar pentru cele cu o suprafață mai mare, se va pune un accent deosebit pe calitatea produselor obținute și creșterea cotei de piață. Se recomandă adoptarea unor strategii ale distribuției bazate pe canale de distribuție mai scurte, în care să se includă și grupurile de producători.*

## INTRODUCTION

**Market strategy** is a component of marketing policy and has the following characteristics:

- *reflects the company concept regarding the evolution of his activities, his principles and rules of conduct on the feature market;*
- *is it done through a set of techniques and tactics, which ensures the transposition into practice of general policy of marketing;*
- *rising functions and mobilize adequate resources to achieve the strategic objectives proposed;*
- *presume decision documents assumed for elaborating strategic alternatives that will choose the appropriate strategy for each product.*

**Basic coordinates of marketing strategy are:**

- *studying market requirements;*
- *meet market requirements;*
- *achieve a maximum efficiency.*

Compared with other goods, trade in cereals present differences arising from their nature. Agricultural production is realized in certain geographical areas and river areas, and consumption takes place across the country. Trade features with grain products are mainly as follows:

- *the activity has a pronounced seasonal character;*
- *the supply distribution network requires, given the zoning of agricultural production and development of differentiated products in the country, purchase/selling relations between suppliers and buyers from different counties;*
- *the dispersion throughout the country of distribution units;*
- *sales of products for high volume and with a relatively low value in comparison with other goods, as the long-distance transport generates a high level of spending.*

**Specific to cereal products** appears to offer which is related to the production area which condition also the circuit of capitalization, so that they may be grasp the following situations:

- *only in the plain areas are bidding for cereal products whereas harvested quantities exceeding self consumption having market destination;*
- *in hilly areas the entire cereal production is intended for food and feed self consumption or for other consumers in the area;*
- *in pre mountain and mountain areas the distribution circuit is limited to taking quantities of grain from other areas.*

In developed countries, modern agro alimentary system ensures the distribution of agricultural and agro alimentary products through specific channels, forming a distribution system that covers the national territory, the products being shipped long-distance in order to find a profitable market.

## MATERIAL AND METHOD

The study was conducted in the county of Iasi and aims the developing of the best strategies for the distribution of cereals grains, depending on the size of agricultural farms.

## OBTAINED RESULTS

Depending on the company's position towards the agricultural market, it is recommended following options of market strategies (**tab. 1**).

Table 1

## Options of market strategies

Crt. no.	The strategy of agricultural and/or agro alimentary firm	Strategic options
1	Position of agricultural and / or agro alimentary firm to the market dynamics	The strategy of increasing the market activities The strategy of maintaining the market activities The strategy of restriction the market activities
2	Position of agricultural and / or agro alimentary firm to the market structure	The undifferentiated strategy The differentiated strategy The concentrated strategy
3	Position of agricultural and / or agro alimentary firm to the market changes	The active strategy The adaptive strategy The passive strategy
4	Position of agricultural and / or agro alimentary firm to the market requirements on agricultural and agro alimentary products quality	The high demanding strategy The medium demanding strategy The reduced demanding strategy
5	Position of agricultural and/or agro-alimentary firm to the competition level	The offensive strategy ( strategy of increasing market share) The defensive strategy (the strategy of maintaining market share and the strategy of restrain market share) The strategy of price competitiveness The strategy of competitiveness without the price direct influence Competitive strategies of differentiation (quality, packaging, advertising, delivery, etc.)

Source: 2

In modern marketing, distribution includes:

- *the merchandise route until the final consumer;*
- *channel of distribution;*
- *the economic operations which marks the goods passage of successive to enter in consumption (sale, purchase, lease, consignment, etc.).*
- *physical distribution and logistics;*
- *technical device that carries out operations (net of units, equipment, personnel).*

The components of the distribution are: channels of distribution, physical distribution, wholesale and retailers, the first two involving the development of appropriate strategies.

**Distribution is done in two main ways:**

- *through direct contact between producer and consumer (for specific production goods);*
- *through specialized channels, in which case the producer and buyer does not come into direct contact – it is the most common way for consumer goods.*

### **Types of distribution channels:**

1. **Channel of direct distribution** (*without intermediaries*) - is met if the products are sold in peasant or agro alimentary markets, near the farm etc.

**Farmers' → Consumers**

2. **Short channel** - implies that, between producers and consumers to interpose a single intermediary.

**Farmers' → Wholesale with integrating function of detail → Consumers**

3. **Long channel** - presupposes the existence of at least two intermediaries interposed between producers and consumers. This type of distribution channel provides products over large distances, to the place of production; the intermediaries must ensure management of stocks to avoid stock ruptures.

**Farmers' → Wholesale → Retailers → Consumers**

In general, agents or intermediaries intervene when the distributor or producers are big, with a large area of activity.

**In the county of Iasi**, can not be developed general strategies on the distribution of cereals and grains, but specific strategies depending on the size of farm (area of held land).

Thus, in the county of Iasi, from the total of 250 farms, 16 have less than 10 hectares of agricultural land, 107 operating between 11 and 100 hectares and 127, have more than 100 hectares. In these holdings are added the individual farmers, which the majority are producing for self consumption.

Depending on the size of farm were developed specific strategies for distribution aimed at developing the production of cereal grains in the county of Iasi (*tab. 2*).

## **CONCLUSIONS**

1. Recommended marketing strategies aimed at increasing land for farms that have less than 100 hectare, and for those with a larger area, it is recommended to achieve high quality products and increase market share.

2. The most effective channels of distribution are those in what it occur the producer groups. The role of the producer groups is to jointly the market of individual farmers' products.

3. The producer groups which meet certain conditions can obtain subsidies from the European Union, which may represent a chance to farmers to consolidate the economic power through negotiating prices of products, reduced transportation costs and the achievement of higher profits.

4. Producer groups will pursue the following objectives:

- *planning and production modification according to demand of consumption shown on the market (conditions of quality, quantity, location);*
- *promoting the supply concentration of producers group and placing on the market for products of its members;*
- *reducing costs of production and stabilize prices at the producer;*
- *promoting the use of cultivation practices, production techniques and management of wastes that do not harm the environment, particularly for the protection of water quality, soil and landscape and the maintenance and / or promoting biodiversity.*

Table 2

**Strategies on the distribution of cereals grains in the county of Iași depending on the size of the farm**

<b>The agricultural surface</b>	<b>No. of farms</b>	<b>Characteristic</b>	<b>The proposed market strategy</b>	<b>Proposed distribution channels</b>
Under 10 hectare	16	A small portion of production is for sale	<p><b>The strategy of increasing the market activities</b> –the increase of the area of land cultivated with cereals and therefore the production for sale</p> <p><b>Differentiated strategy</b> - offering products to several people who have low incomes and search products directly from producers or peasant markets</p>	<p>Producers → Consumers</p> <p>Producers → Peasant Markets → Consumers</p>
11-100 hectare	107	An important part of the production is for sale	<p><b>The strategy of increasing the market activities</b> – the increase of the area of land cultivated with cereals and therefore the production for sale</p> <p><b>Active strategy</b> – improving activities and technology</p>	<p>Producers → Producer Groups → Peasant Markets → Consumers</p> <p>Producers → Wholesale → Stores/Industrialization → Consumers</p> <p>Producers → Producers Groups → Wholesale → Stores/Industrialization → Consumers</p>
Over 100 hectare	127	Over 98% of production is for sale	<p><b>Adaptive strategy</b> – adapting the activities to market changes</p> <p><b>The strategy of high demanding</b> - quality products</p> <p><b>Offensive strategy</b> - to increase of market share</p>	<p>Producers → Producers Groups → Gross market Wholesale → Stores/Industrialization → Consumers</p> <p>Producers → Cereal bourses → Wholesale → Stores/Industrialization → Consumers</p> <p>Producers → Producers Groups → Cereal bourses → Wholesale → Stores/Industrialization → Consumers</p>
<b>TOTAL</b>	<b>250</b>			

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# CHIVE BULBS CONDITIONING MACHINE. WORKING QUALITATIVE INDEXES

Ganea Ioan, Brătucu Gheorghe

## ABSTRACT

*The paper presents the experimental results obtained during the tests performed with onion and chive bulbs conditioning machine, that has been designed and achieved at INMA Bucharest.*

**Keywords:** *chive bulbs, conditioning, working qualitative indexes.*

*Bulb vegetables crops (especially onion and garlic) take an important place in Romania's agriculture: taking into account the data from "Statistic Annual Book – 2007" it results that the latest 5 years were cultivated the following crops:*

- *dry onion ~ 35 thousands hectares,*
- *garlic ~ 14 thousands hectares,*

*representing 310 up to 400 thousands yearly, respectively from 54 to 85 thousands tons of garlic, the average production per hectare being for dry onion of ~ 10 t/ha, and for garlic of ~ 5 t/ha.*

*In order to set up onions crops by planting (chive) bulbs it is necessary (like for any seeding material) to : choose the appropriate variety and qualitatively (removing the impurities), and quantitatively sort (upon shape and size) the respective seeds .*

*Within INMA concerns- solving the problem of seeds conditioning represents one of the major cares – according to agrotechnical requirements imposed by the standards in force :*

- *ensuring chive cleaning and sorting at 94% purity, respectively of onion at 97% purity and at the sizes appropriate to STAS 5910 for chive and respectively STAS 1424 for onion ;*
- *the mechanical damages must not surpass 3% for chive and 5% for onion ;*
- *the chive percentage appropriate to bulbs must not surpass 10%.*

*This way has been created the experimental model of bulb vegetables conditioning machine (chive, onion, garlic) which includes as principal novelties also claimed in patent no. RO 121802/2008 the following :*

- *double possibility of driving the oscillating sieves system : from the electrical engine fed through the source of specialized assembling rooms respectively through PTO of a 26-45 HP tractor, the operation being able to be performed directly in field, in stationary regime ;*
- *possibility of changing the air current direction, air which does not blow towards the user but sucks up the impurities, leading them into a calming cyclone, also endowed with a collecting system of impurities ; therefore, this system ensures sain environmental conditions to operators.*

*This machine is designed at separating the useful material from soil and other vegetal impurities as well as sorting the bulbs in conformity with their sizes in view of obtaining fractions suitable to quality requirements imposed by agrotechnical standards in force.*

*The utilization domain includes agricultural enterprises specialized in vegetables, state and private vegetable associations, etc.*



During the tests performed at UNISEM the machine has been electrically operated, achieving a volume of 14 t at chive bulbs sorting.

The machine was equipped with sieves with circular holes whose sizes were : 25, 20, 16 and 7,1 mm ; the pitch angle of sieves 1 and 2 on the upper separating level was of  $3^{\circ} 10'$  and the pitch angle of sieves 3 and 4 on the lower separating level was  $5^{\circ} 30'$ .

The matter which had to be separated belonged to two varieties (fig. 5) for which were determined the characteristics shown in table no. 1 :

Table no.1

Crt number	Characteristic	M.U.	Value	
			Variety 1	Variety 2
1	Bulbs shape	-	spherical	spherical
2	Mass of 100 bulbs	g	362	232
3	Bulbs diameter			
	- minimum	mm	10	10
	- maximum	mm	28	15
	- average	mm	18.87	12.02
4	Impurities content (soil and vegetal remains)	%	6.93	43.33

The material rate of flow has been situated within 0.33 and 0.40 kg/sec.

The purity of varieties obtained after the separating process has been determined through the analysis of physical and biological purity :

- the physical purity, which indicates the impurities content (soil and vegetable remains) in mass of bulbs sorted at each sieve level is the following :
  - for sieve 1 – holes of 25 mm : purity index = 99.25% ;

- for sieve 2 – holes of 20 mm : purity index = 97,64% ;
- for sieve 3 – holes of 16 mm : purity index = 96% ;
- for sieve 4 – holes of 7.1 mm : purity index = 94.31%

The varieties resulted from the first two sieves represent the useful matter of II<sup>nd</sup> quality and the other two of I<sup>st</sup> quality.

- the biological purity, indicating the content of bulbs of other size than requirements of quality technical conditions (STAS 78) is shown in table no.2 :

Table 2

Index of biological purity	Average determined value			
	Sieve 1	Sieve 2	Sieve 3	Sieve 4
Bulbs having the size required by the other quality class	8.72	9.57	0	0
Bulbs under 7 mm, but not less than 5 mm	0	0	2.48	2.48
Bulbs over 25 mm, but not exceeding 28 mm	3.65	0	0	0

The mechanical damages of bulbs during the sorting process by crushing, cutting or scratching have not had important values – maximum 0.8% in all cases ; even those were superficial, not being able to change the germination capacity.

In order to evaluate the losses, the following fractions have been calculated :

- bulbs collected in the bag of impurities of calming cyclone = 0.02% ;
- bulbs arrived on the soil due to different causes = 1.22%.

Therefore, the whole losses being of 1.24%, they can be recovered by periodical recuperation.

The working capacity has been directly influenced by the continuous and steady supplying. The tests for determining the qualitative working indexes performed under a rate of flow with chive of 0.3 – 0.4 kg/s have emphasized the machine capacity of suitably processing this quantity of matter. For these input data, respectively an average rate of flow of 0.35kg/s, the hourly working capacity of the machine at chive bulbs sorting, calculated at effective time was :

$$W_{ef} = 0,35 * 3,6 * 10^3 = 1260 \text{ kg/h}$$

The working capacity per shift (8 hours) for a coefficient of using the working time  $k=0.7$  had the value :

$$W_{sch} = W_{ef} * k * 8 = 1260 * 0,7 * 8 = 7056 \text{ kg/shift.}$$

Furthermore, the machine runs in regime of minimum pollution of environment by sucking up the light impurities into a calming cyclone and afterwards, sacking them, ensuring at the same time the optimum working conditions for the personnel performing chive conditioning operations.

## CONCLUSIONS

On the basis of observations registered during the tests, the following conclusions can be drawn regarding the machine operations :

- rapid and easy passage of machine from working position to transport position and vice-versa ;
- easy manipulation of commands when starting and stopping the machine ;
- easy access for performing the adjustments and technical maintenance ;
- the operators working with this machines are protected both in terms of safety and environmental conditions, the environment pollution being removed by the system of absorbing the dust and other impurities and collecting them in cloth sacks ;

- possibility of extending the machine's range of use to sorting other products (ex. medicinal plants).

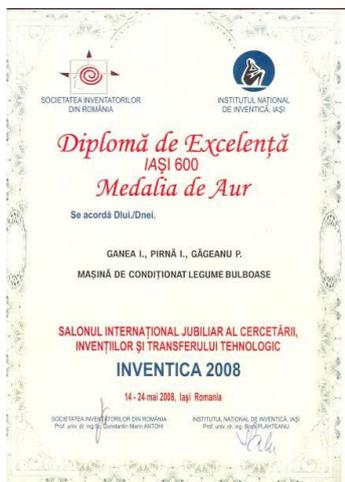
From the analysis of the results regarding the varieties purity, we can observe that :

- physical purity diminishes along with sieves holes diameter ;
- in the working conditions shown above the physical purity of obtained varieties is over 94% in all cases, accordingly to standards in force ;
- varieties biological purity (fractions of size belonging to other class of dimensions) being under 10% frames within the standards in force.

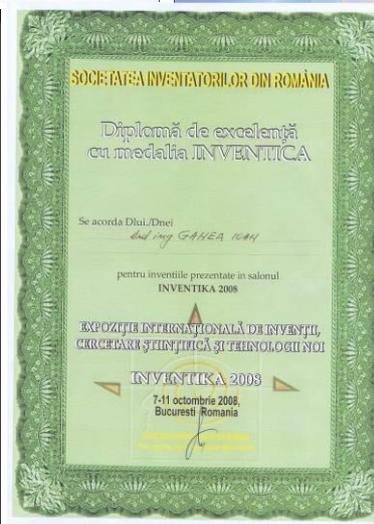
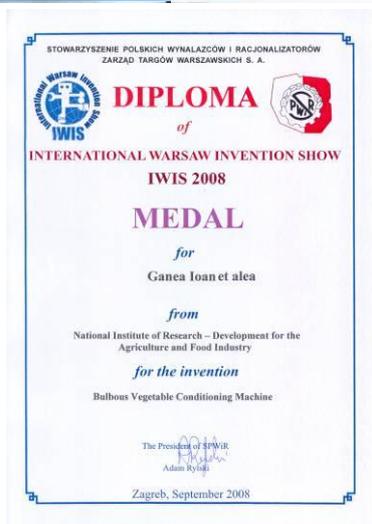
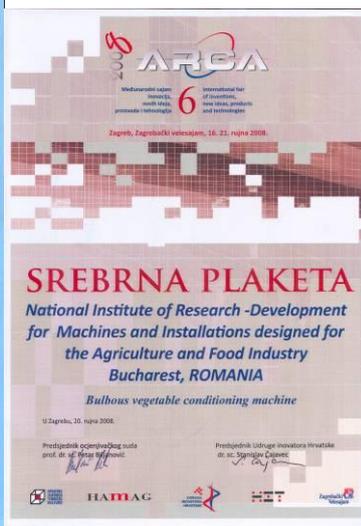
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# STUDIUL COMPORTĂRII ÎN REGIM DINAMIC AL SISTEMELOR ELECTRONICE DE REGLARE A DEBITULUI DE LUCRU CU VITEZA DE DEPLASARE UTILIZATE LA AUTOMATIZAREA PROCESULUI DE LUCRU AL MAȘINILOR DE STROPIT

## BEHAVIOUR STUDY IN DYNAMIC REGIEMEN OF ELECTRONIC ADJUSTING SYSTEMS OF LIQUID FLOW VARYING WITH DISPLACEMENT VELOCITY USED FOR AUTOMATIZE THE WORK PROCESS OF SPRINKLING MACHINERY

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**Cuvinte cheie:** system de reglare, inerție, eroare, normă

**Keywords:** Adjusting system, inertia, error, liquid rate

### ABSTRACT

*Utilizarea pe scară largă a sistemelor electronice de corelare automată a debitului de lucru cu viteza de deplasare la mașinile de stropit a devenit o necesitate în vederea asigurării stabilității normei de lichid la hectar – cerința majoră impusă acestor tratamente de combatere a bolilor și dăunătorilor. De aceea este necesar a studia comportamentul în regim dinamic al acestor sisteme de reglare, pentru a determina eroarea de aplicare a tratamentului, în special sub aspectul inerției manifestată de acest tip de sisteme de reglare.*

*Using on a large scale of electronic adjusting systems of liquid flow with displacement velocity, at sprinkling machinery become a necessity in order to ensure the stability of liquid rate – the most important demand impose for the technologically process for diseases combat and pest control. That is the reason for study the behaviour in dynamic regimen of these adjusting systems, for establish the error of liquid rate application, especially from inertia point of view shown by these.*

### INTRODUCTION

Electronic equipments for monitoring, supervision and control of the working process at sprinkling machinery win in constant mode a great importance in agricultural engineering.

In accordance with the international requires concerning the restrictions of using the products for plants protection, these equipments must be easy for use, fiable, precisely and to posses accurate devices for measure and control.

Having in view that these systems show a little inertia during the adjusting process it is necessary to achieve a behaviour study in dynamic regiment ,in order to analyse the longitudinal distribution of agro-pharmaceutical solution and also the influences of time answer behind of systems efficiency.

### MATERIAL AND METHOD

For studying the behaviour in dynamic regimen of electronic adjusting systems which equipping the most of sprinkling machinery it was feigned on a stand the real work process of a machine automatized with a such automatic regulator [1, 3]].

The establish of the error of liquid rate application is made in case of a gradual variation of displacement velocity (at a constant regimen of the engine ) for two types of such automatic regulators (Agromatix with slow valve ,Agromatix with fast valve) .

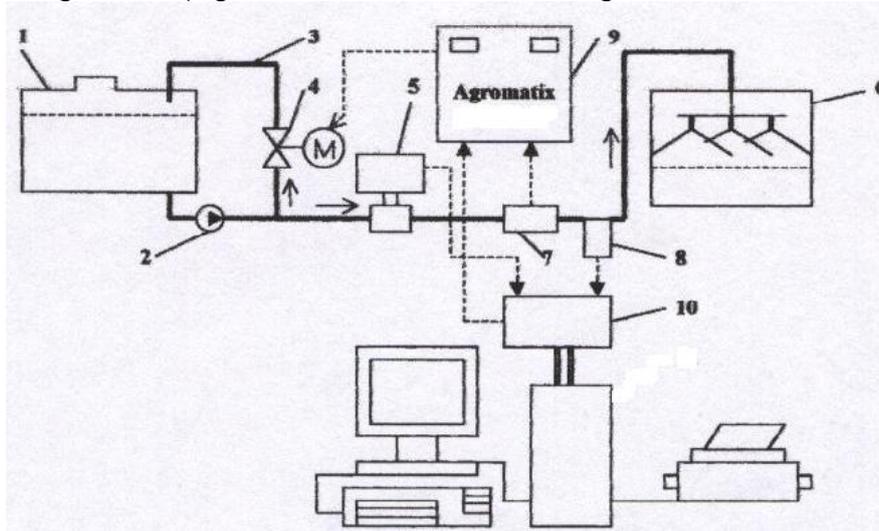
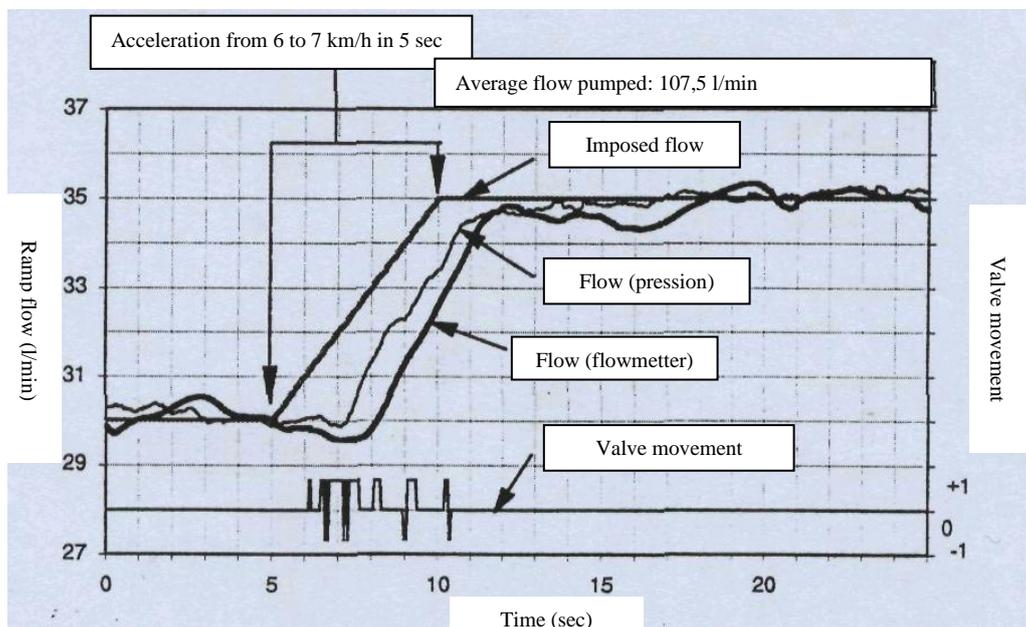


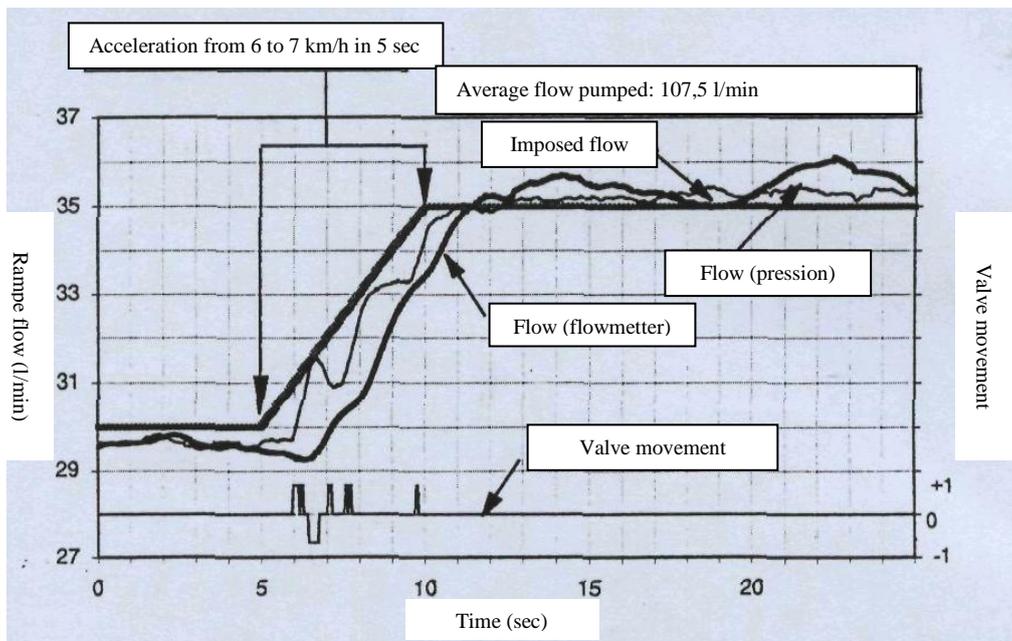
Fig 1. Scheme of the stand used for feign the work process: 1-tank, 2-pump, 3-return circuit in tank, 4-adjusting valve, 5-device for measuring the liquid flow,6-gathering box, 7,8-presion transducers, 9-Agromatix regulator, 10-central unit.

The evolution in time of the adjusting valve is establish thought a simple method which consist to process the electric tension at the outlets of the suing electric engine. These values of tension are sent to computer [2]. The feign of a gradual and constant variation of displacement velocity was achieve with aid of digital frequency devices. The work conditions imposed for the experiment were: liquid rate, 200 l/ha, work wide of the rise, 15 m, regimen of displacement velocity variation gradual constant of 6 et 7 km/h, in 5 sec. The analyse of the adjust flow (figure 2) was achieve using a processing data program, made in *QUICK BASSIC* language. The same processing data program allow to calculate the error of treatment application ( $e$ ), with aid of relation:

$$e = \frac{Q_r - Q_p}{Q_p} \cdot 100 \text{ [%]} \quad (1)$$

where:  $Q_r$  is the real flow, in l/min and  $Q_p$  is the imposed flow , in l/min.





**Fig. 2.** The evolution of the adjust flow in comparison with the imposed flow, in case of a gradual speed variation of 6 et 7 km/h, in 5 sec: a) Agromatix with slow valve , b) Agromatix with fast valve

Also, the same program allow to calculate the distances and surfaces about on are the errors from respective class (table 1).

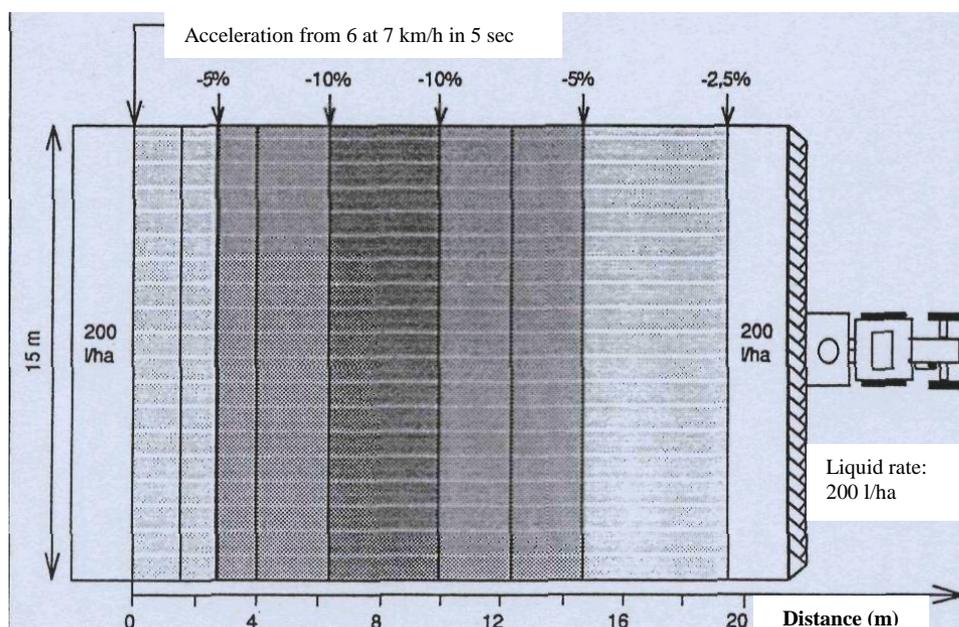
**Table 1**

**The influence of displacement velocity variation of 6 et 7 km/h, in 5 sec, about on longitudinal distribution of sprinkling solution**

Regulator type	Class of the error [%]	Average error [%]	Distance [m]	Cumulate distance [m <sup>2</sup> ]	Surface [m <sup>2</sup> ]	Cumulate surface [m <sup>2</sup> ]
<b>Agromatix with slow valve</b>	- 10 at - 7,5	- 8,63	4,73	4,73	70,95	70,95
	- 7,5 at - 5	- 6,45	2,91	7,64	43,63	114,59
	- 5 at - 2,5	- 3,76	2,41	10,04	36,09	150,57
<b>Agromatix with fast valve</b>	- 7,5 at - 5	- 6,61	5,63	5,63	84,40	84,40
	- 5 at - 2,5	- 4,04	4,23	9,85	63,42	147,82

The obtained results are similar also in the case of positive or negative values of displacement velocity variation.

The influence of displacement velocity variation about on precision treatment application, studied from the point of view of the inertia shown by the used regulators is presented in figure 3.



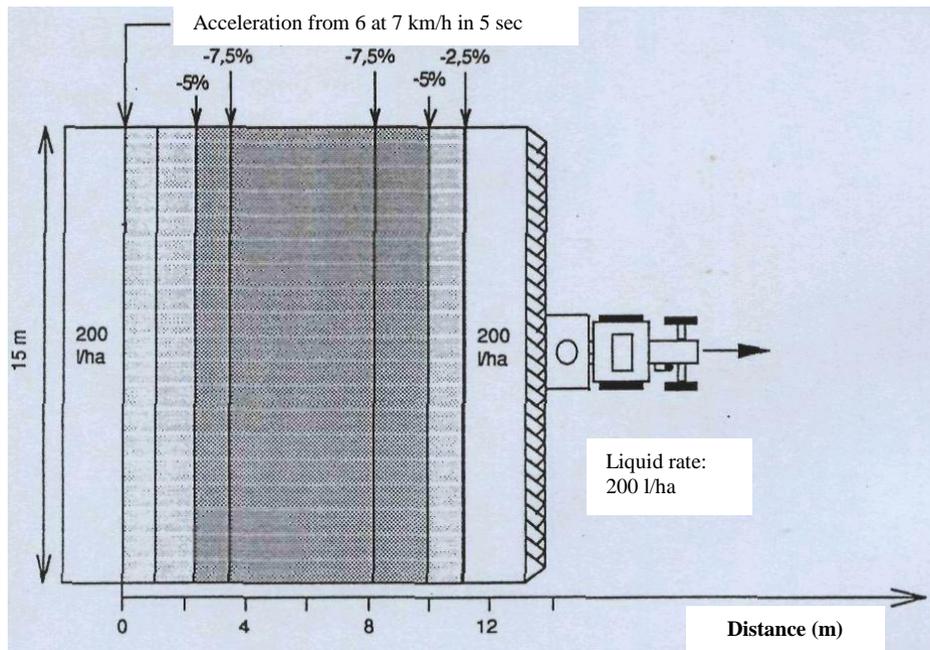


Fig.3. The consequences of speed variation of 6 et 7 km/h, in 5 sec about on longitudinal distribution of sprinkling solution: a) Agromatix with slow valve , b) Agromatix with fast valve

## CONCLUSIONS

1. At first view the errors of treatment application are comparatively great :it must having: in view that the values used for rising the follow characteristics are calculate with aid of measurements achieve with the flow device equipped with flow transducer: this device having his own inertia, the respectively values are exaggerated, the regulator working in reality faster.
2. Using regulator equipped with fast valves allow to obtain a better time answer and also a significant decrease of surfaces on which are not ensure the imposed liquid rate: the cumulate value of these surfaces are not significant from the economic point of view and of the report of advantages offered by these systems.
3. After exceed of the inertia, the regulators ensure very good stability of liquid rate and a satisfactory distribution on longitudinal direction.

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# CONSIDERATIONS REGARDING THE POSSIBILITIES OF ECOLOGICAL AGRICULTURAL PRODUCTS MARKETING IMPLEMENTATION (CASE STUDY AT VALEA ASĂULUI ASSOCIATION, BACĂU COUNTY)

## CONSIDERAȚII PRIVIND POSIBILITĂȚILE DE IMPLEMENTARE A MARKETINGULUI PRODUSELOR AGRICOLE ECOLOGICE (STUDIU DE CAZ LA ASOCIAȚIA VALEA-ASĂULUI, JUDEȚUL BACĂU)

*Hamureac S., Chiran A., Elena Gîndu, Benedicta Drobotă*

Cuvinte cheie : marketing, ecologie, sistem

Key words: marketing, ecology, system

### ABSTRACT

*Globally, in 2007 the cultivated surfaces in ecological system was 23 million hectare, from which about 5 million hectare in European Union.*

*In Romania, in 2003, were register 117 ecological farmers, from which 42 in vegetal production, 28 in animal production and 48 farmers. In 2007, the number of ecological farms was 2920.*

*The technical and organizational frame in which there are produced, processes, imported, exported and capitalized the agro alimentary ecological products in Romania, is legally established by more normative acts, form which the Emergency Ordinance of the Government no. 34/2000 regarding the ecological agro alimentary products, MAPAM Order no. 527/2003 – regarding the system of inspection and certification in ecological agriculture, The Low of agricultural exploitation no. 166/2002, the Order 721/2003 regarding the approval of import and export rules of agro-alimentary ecological products, etc*

*The case study point out the results obtained through the implementation of ecological agricultural product marketing in the Association Valea Asăului, Asău commune, Bacău County.*

*La nivel mondial, în anul 2004, suprafața cultivată ecologic era de 23 milioane hectare, din care circa 5 milioane hectare în Uniunea Europeană. În România, în anul 2003 erau înregistrați 117 fermieri ecologici, din care 42 în producția vegetală, 28 în producția animală și 48 agricultori. În anul 2007 numărul fermelor cu profil ecologic a ajuns la 2920.*

*Cadrul tehnic și organizatoric în care se produc, se procesează, se importă, se exportă și se comercializează produsele agroalimentare ecologice în România este reglementat din punct de vedere legal, prin mai multe acte normative, între care Ordonanța de Urgență a Guvernului nr. 34/2000 – privind produsele agroalimentare ecologice, Ordinul MAPAM nr.527/2003 privind sistemul de inspecție și certificare în agricultura ecologică, Legea exploatațiilor agricole nr. 166/2002, Ordinul 721/2003 privind aprobarea regulilor de import și export a produselor agroalimentare ecologice etc.*

*Studiul de caz vizează rezultatele obținute prin implementarea marketingului produselor agricole ecologice din lapte la Asociația Valea-Asăului din comuna Asău, județul Bacău.*

### MATERIAL AND METHOD

The paper is based on a bibliographic study regarding the agro alimentary ecological products marketing from European Union in view of implementation in the Romanian conditions.

In the paper is presented also a case study conducted in Association Valley-Asăului of Asău commune, Bacău County.

## OBTAINED RESULTS

During 1993-1998, the share of organic farms has increased considerably, so that in 2000, represented one of the agricultural sectors the most dynamic in the European Union.

With the appearance of European legislation on the functioning of ecological farms, tens of thousands of farms have opted for the organic production.

From the published data (1, 2, 3, 8) results that on 1.01.1997 the organic agricultural area in the EU countries represented 1.16% of the total cultivated area, the weights of the biggest signing in Sweden (8.86%), Austria (8.62%) and Finland (3.68%).

Under the absolute, the largest area planted in the ecological system is hold by Italy, Germany, Austria and Sweden.

In the European Union in period 1986 -1999 the area cultivated in ecologic system increased annually by about 25 %, the biggest increase was founded in the countries of Scandinavia Peninsula and the Mediterranean countries.

On 31.12.2000, in the 15 countries of the European Union until 1 May 2004, almost 3.8 million hectares were ecologically administrated by over 130,000 organic farms, which had 2.9% of the agricultural area and about 2% of the total number of farms.

If you include new countries entering the EU and EFTA countries, the number of farms that have adopted ecological system of production is approaching 140,000 and ecologically land administration exceeds 4.1 million hectares.

As regards the breakdown by continents in the number of organic farms, the highest share held Europe (37.7 %), followed by Latin America (39.9 %), Africa (15.4 %) and Asia (13, 3 %).

In continental Europe, in 2003, in Italy was working 56,440 ecological farms, with an average area of 21.8 ha, in Germany, 14,703 farms with 43.0 ha / farm, in France, 10,364 farms with 40.5 ha / farm, etc.

In 2004, of the ten new countries joined the European Community, the largest area cultivated in the ecological system before accession were in the Czech Republic and Hungary, while the smallest area was in Cyprus.

As regards the share occupied by organic farms compared to the total number of farms in 2004, the first state to Poland, with 1787 farms, followed by Hungary with 1040 farms and Slovenia with 883 farms

The average area of organic farms, in the 10 states of Central and Eastern Europe before accession, was 715.9 hectares in Slovenia, 333.5 hectares in the Czech Republic, 101.1 hectares in Hungary; 88 9 hectares, in Latvia etc.

According to statistical published data (8), in 2004, the total area cultivated in ecological systems worldwide was approximately 23 million ha and that of the European Union more than 5 million ha, accounting for 2 % of the total agricultural area of the European Union, for as more than a year this area to reach 6.3 million ha.

In Romania, the agricultural area cultivated in ecological system has increased significantly in recent years, from 17,438 hectares in 2000 to 110,400 ha in 2005, following that up to the end of 2008, the area cultivated in the ecological system to hold a share of 1.7%, representing about 250,000 ha and at the horizon of 2010 to reach about 400,000 ha, respectively, 2.72%.

In Romania, in 2003 were recorded 117 ecologist farmers, of which 42 in the production plant, 28 in animal production and 48 farmers with individual farms. In 2007 the number of farms with ecological profile reached 2920.

From a legal viewpoint, the acceptance of ecologic farming appear the first time in the European Council Regulation no. 2092/91 regarding the production plant, so that later appear Regulation no.1804/99 which aimed the animal production.

Implementation of agro alimentary ecological products marketing in Romania can not be done without a legal support so needed. Technical and organizational framework in which products are manufactured, processed, is imported, exported and sold agro alimentary ecological products in Romania is covered legally by a series of acts, among which we mention:

- *Government Emergency Ordinance no. 34/2000 – regarding the agro alimentary ecological products;*
- *Order MAPAM no.527/2003 on the system of inspection and certification in ecological farming;*
- *Farms Law No.166/2002;*
- *Order 721/2003 on the approval of the rules of import and export of agro alimentary ecological products, etc.*

As regards the market share of ecologic products in the markets of European Union countries, during 2001-2003 they were pretty low.

During 2001-2003, the largest market share of ecologic products on the European market was registered in Austria.

Romania still lacks a developed market for ecologic production. Ecologic products market in Romania is in training, particularly generated by the offer.

The ecologic food market in Romania is influenced by the demand from foreign markets, which explains that most of the basic products of the Romanian ecologic sector are intended for export. However, in recent years, the market absorbed a big enough share of ecologic agricultural products.

As regards the export of ecologic products in Romania, he saw a significant increase from 2003.

In 2004, the turnover of distributors in the domestic market was approximately one million Euro and exports were close to 15 million Euros.

When referring to the period 2005-2006, were oriented to export approximately 30% of ecologic products of vegetal origin, about 20 % of milk products and 66 % of the honey bee.

Romanian ecologic products are exported especially in Germany, Switzerland, the Netherlands and Italy.

The prices of ecologic products are superior to those applied to conventional products, a phenomenon that is most obvious in the case of products intended for export.

In the process of implementation the ecologic marketing in Romania is recommended to use the guide regarding the production, organization farm and capitalization of ecologic products from Germany.

Diversion to ecologic farming must be based on the adoption of new concepts on the production and capitalization of ecologic products.

The most important ecological areas of marketing in which is must be taken strategic decisions for establishing distribution routes and communication with consumers, as well as regular contact with the market, to launch new assortments in accordance with the requirements and tastes of consumers.

German specialists recommended the lists analysis for verification of the characteristics of ecologic products. In this way, the setting of ecologic policy will reflect better the correlation between needs, demand and price.

In order to ecological Romanian producers not have difficulties with regard to the distribution of production, it is necessary the establishment of bio regional associations to take these objectives relating to the distribution market.

These bio regional associations should take care also by the offer of ecologic agricultural products in the major supermarkets for ecologic products to enter on the Romanian new segments of the ecologic products market.

Planning the means of production by taking into account the principles of marketing is also an important aspect of the conversion plan from conventional agriculture to ecologic farming.

Case Study on the production and marketing of organic agricultural products was conducted at Valley Association of Asăului - Asău commune, Bacău County.

As shown, ecologic agriculture in Romania is in the pioneering stage. However, it may be considered to be realized a series of steps, including appropriate legislation of the European Union, which allows the organization and operation of farms in agricultural ecological system.

Case study aimed the obtained results through implementing of the ecological agricultural products marketing, realized at Asăului Valley Association of Asău commune, Bacău County.

The company was founded in 2004 and is following the nomenclature of ecologic products from cow's milk (the offer):

- *fresh consumption milk;*
- *cheese diet;*
- *ridden cheese;*
- *feta;*
- *clotted cheese;*
- *butter;*
- *cream;*
- *pressed cheese.*

It is an association of traditional ecological products, with a simple technology.

The Association holds a micro farm in Asău commune in mountainous area, with 20 dairy breed, Brună race, purchased in 2004 from S.C.A.Z. Secuieni.

In regard to used technology, they are respected according to rules of the European Union.

The shelter has a roof under European standards, with certified spaces, with electric light and water adductions by a free fall spring.

The ration *is based on the following types:*

- *natural hay from spontaneous flora;*
- *hay;*
- *green alfalfa;*
- *fodder beet with a mixture of corn grains.*

The collected milk transport is made with stainless steel, and ecological finished products are transported by a car equipped with refrigeration facility.

After collection, the milk is skimmed. The milk for clotted cheese production and Feta is clotted with clot certified ecologically.

As regards the promotion, the company had a good support from DADR Bacău, by participating in various exhibitions (free) in the country and abroad.

The producer has participated with farm products to the highest-profile fair that takes place in Germany in Nuremberg.

Also, the company's products have been promoted under fairs organized in Strasbourg - France.

On national plan, the firm products have been promoted by the media (interviews, broadcasts, newspapers, magazines).

In connection with the effectiveness of ecologic products, the company had oriented by the slogan:

"More satisfaction than efficiency – more from pleasure, from the desire to eat healthy"

Analyzing the obtained results it is pointed out the increase of ecologic products profitability, so that in 2007, compared with 2005, net profit increased by 21 times (tab. 1):

**Table 1**

**The turnover, production costs and profitability of ecological production at Asău Association, Bacău County (2005 -2007)**

Year	The turnover -lei	The total costs -lei	Net profit - lei	Rate of net profit - %
2005	260415	259161	1254	0,48
2006	246472	246260	212	0,09
2007	672773	646363	26410	4,08
Average	393220	383928	9292	2,42

As level, the profitability has been quite low, especially in the first two years following the completion of some pretty high costs. Prices had a very low margin compared to unit costs, leading to the achievement of certain expenses at 1000 lei turnover of 976.4 lei.

## CONCLUSIONS

1. In Romania, the implementation of agro alimentary ecological products marketing is still in the began phase. However, in certain areas (including Moldavia), a number of operators have launched several ecological activities. One such unit is Asăului Valley Association of Asău commune, Bacau County, which produces a range of ecologic products from cow's milk.

2. The capitalization of ecologic products is done on the internal market (hospitals, dormitories for children, their own shops, various naturist companies, private individuals) and the capitalization was based on participation in various specific exhibitions in the country and abroad.

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# CERCETĂRI EXPERIMENTALE ASUPRA PROCESELOR DE LUCRU ALE SITELOR PLANE

## EXPERIMENTAL RESEARCHES ON FLAT SIEVE WORKING PROCESSES

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**Cuvinte cheie:** site plane, regimuri de alunecare, mișcare relativă.

**Key words:** flat sieves, sliding regimes, relative motion.

### ABSTRACT

Separarea semințelor din vraf se realizează prin vibrația sitelor plane.

Eficiența procesului de curățire al sitelor sistemului de curățire depinde de următorii factori: înclinarea sitelor, dimensiunile sitelor, gradul de încărcare al sitelor, caracterul mișcării relative a semințelor față de site, respectiv de indicele cinematic al sitelor.

Pentru încercările experimentale s-a folosit selectorul mașinii de curățat semințe MCS-5/2,5 la care s-a modificat debitul de alimentare și unghiul de înclinare al sitelor.

***The separation of seeds from the heap is effected thanks to the vibration of the flat sieves.***

***The efficiency of the cleaning process of the sieves from the cleaning system depends on the following factors: the inclination of the sieves, the sieves size and mainly of the character of the relative movements of the seeds on the sieve, respectively the cinematic regime of the sieves.***

For the experimental tests, it was used the selector of the seed cleaning machine MCS-5, where the supply discharge and sieve inclination angle were modified.

### INTRODUCTION

The operation of separation of seeds from the layer on the sieves of seed cleaning and sorting machines takes place due to the phenomenon of material stratification in its components, which are differentiated after their density and also, due to the state of sifting of the seed layer on the separation surface, produced by the motion of sieves.

In order to verify the results, obtained in the theoretical study, experimental tests were performed, where there were determined the time and velocity of displacement of the material on the oscillating sieve surface, the degree of separation of components from the mixture, subjected to sifting process and the sieve productivity, all these as functions of the kinematical parameters of the motion of cleaning system, respectively of the rotative speed of the shaft of driving mechanism, the amplitude and frequency of oscillations.

In order to obtain concluding results, the experimental tests were performed in working conditions, on the cleaning and sorting machine.

All determinations were effected at different inclinations of oscillating sieves and different rotative speed of the driving shaft. In all variants of work, the tests were performed in more repetitions, the results presented in this paper being the average of these repetitions.

## MATERIALS AND METHOD

The state of sifting is defined by the character of relative motion of the material on sieves: failure of relative motion (relative rest), relative motion in one direction or in both directions, with or without detachment.

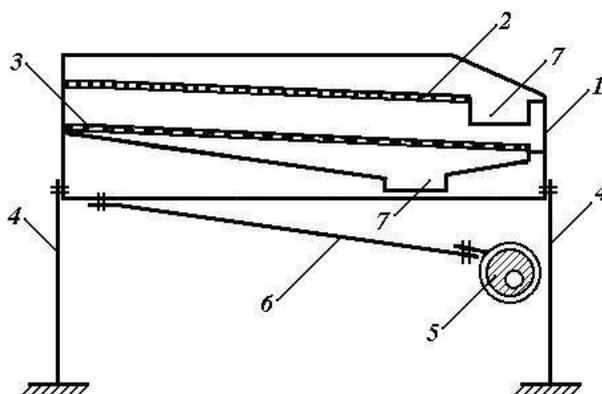
The theoretical studies show that an efficient separation of seeds in the layer on the sieve takes place when it is assured to the material a state of sifting, defined by a relative motion, in both directions, on the sifting surface, with the tendency of detachment and a resultant motion, to the sieve extremity which is opposite to the one where the sieve is supplied with material.

The forces which act on the seeds, situated on the sieve surface of the cleaning system and which can induce to the material a certain state of sifting, are the forces of inertia. The orientation of these forces (together with all other forces which act on the material) was presented within the framework of the theoretical study.

The uniformity of testing conditions was assured by using a constant debit of supplying and sieves with the same constructive characteristics. In all cases, the layer of material, submitted to the cleaning process, presented the same initial degree of purity. In this way, the obtained results could be appreciated by comparison and it was possible to establish optimal variants of work for the flat oscillating sieves.

For the experimental tests, it was used the selector S-5 (fig.1) of the seed cleaning machine MCS-5/2,5, which allows the modifying of the debit of supplying, angle of inclination of sieves and rotative speed of driving shaft.

For all experimental determinations, there were used identical probas of seeds, with the mass of 25 kg. It is mentioned the fact that the same proba was not used to effect more determinations, because the material can change its properties after the passing through the selector. The tests were effected with identical samples of wheat, resulted from the direct harvesting in field with the combines of the Didactic Station of Timișoara.



**FIG.1. DRIVING MECHANISM OF SIEVES**

**1-sieve frame, 2-top sieve, 3-bottom sieve, 4-springs, 5-shift with eccentric, 6-crank, 7-collecting trough.**

For each determination, it was measured the time of separation of the material. At the collecting troughs, from the initial material, subjected to cleaning, there are obtained four aprons, as follows:

- cleaned seeds, collected to the central trough of the selector;
- small impurities, collected to the trough of the selector;
- big impurities, collected to the trough of the selector;
- small seeds, collected to the trough of the selector.

The chaff, dust and light impurities, evacuated by the ventilator, were neglected, because they represent a very small percentage in the mass of product.

On the basis of the quantities of material, collected to each trough of evacuation, during a proba, it was calculated the percentage of material from each apron, related to the mass of material of the proba (corresponding to the testing period). In parallel, it was calculated the purity of material, collected to the central trough of the selector and the losses of good seeds in the big impurities, for the established period of test.

## RESULTS OF RESEARCHES

The first experimental tests, concerning the driving of flat sieves of the selector, had as aim to establish the time and velocity of displacement of seeds on the surface of flat sieves, as a function of the imposed kinematical parameters (rotative speed of the driving shaft, angle of inclination of sieve, debit of supplying with material). For this aim, the superior sieve was replaced by an inclined plan (blind sieve), made of steel plate sheet, with the equal dimensions to the ones of the superior sieve. The coefficient of friction between the material and the inclined plan has the value  $\mu = 0,37$ .

The experimental determinations were realized for the following values of the modified parameters:

- angle of inclination of sieves: 2°, 4°, 6° and 8°;
- rotative speed of driving shaft: 360, 380, 410 and 470 rot/min;
- debit of supplying with material: 0.83 kg/s; 1.11 kg/s and 1.40 kg/s.

The results concerning the time of displacement of the proba of material (25 kg) on the oscillating plan are presented in table 1.

**Table 1**

**Time of displacement of proba of material on the surface of oscillating plan [s]**

No.	Angle of inclination [degrees]	Debit of supplying [kg/s]	Rotative speed of driving shaft [rot/min]			
			360	380	410	470
1	2	0.83	124	116	101	83
		1.11	165	154	132	111
		1.40	206	193	165	139
2	4	0.83	114	106	92	77
		1.11	151	139	122	102
		1.40	189	174	153	128
3	6	0.83	104	95	85	70
		1.11	138	127	114	94
		1.40	173	159	142	117
4	8	0.83	93	89	80	63
		1.11	124	119	107	84
		1.40	155	148	133	105

As a function of the time of displacement of proba of material on the surface of oscillating plan and of dimensions of the oscillating plan, it was determined the time of displacement of seeds on the surface of oscillating plan (table 2).

**Table 2****Time of displacement of seeds on the surface of oscillating plan [s]**

No.	Angle of inclination [degrees]	Debit of supplying [kg/s]	Rotative speed of driving shaft [rot/min]			
			360	380	410	470
1	2	0.83	21,71	20,31	17,68	14,53
		1.11	28,89	26,96	23,11	19,44
		1.40	36,07	33,79	28,89	24,34
2	4	0.83	19,96	18,56	16,11	13,48
		1.11	26,44	24,34	21,36	17,86
		1.40	33,09	30,47	26,79	22,41
3	6	0.83	18,21	16,63	14,88	12,26
		1.11	24,16	22,24	19,96	16,46
		1.40	30,29	27,94	24,86	20,49
4	8	0.83	16,28	15,58	14,00	11,03
		1.11	21,71	20,84	18,73	14,71
		1.40	27,14	25,91	23,29	18,39

From the analysis of data, centralized in table 2, it results that the time of displacement of seeds on the surface of the oscillating plan decreases with the increasing of the rotative speed of the driving shaft and of the inclination of the oscillating plan. The time of displacement of seeds on the surface of the oscillating plan increases with the increasing of the debit of supplying.

**Table 3****Velocity of displacement of seeds on the surface of the oscillating plan [m/s]**

No.	Angle of inclination [degrees]	Debit of supplying [kg/s]	Rotative speed of driving shaft [rot/min]			
			360	380	410	470
1	2	0.83	0,62	0,67	0,77	0,93
		1.11	0,47	0,50	0,59	0,70
		1.40	0,37	0,40	0,47	0,56
2	4	0.83	0,68	0,73	0,84	1,00
		1.11	0,51	0,56	0,63	0,76
		1.40	0,41	0,44	0,51	0,60
3	6	0.83	0,74	0,81	0,91	1,10
		1.11	0,56	0,61	0,68	0,82
		1.40	0,45	0,48	0,55	0,66
4	8	0.83	0,83	0,87	0,97	1,23
		1.11	0,62	0,65	0,72	0,92
		1.40	0,50	0,52	0,58	0,74

The velocity of displacement of seeds on the surface of the oscillating plan is as bigger as the time of displacement is shorter and inversely. The velocities of displacement of seeds on the surface of the oscillating plan, as a function of the debit of supplying, angle of inclination of the oscillating plan and rotative speed of the driving shaft are centralized in table 3.

The degree of separation of components in the mixture of seeds constitutes the index of qualitative appreciation of the cleaning process. Of course, the target is that its value to be as bigger as possible, in order to obtain a pure final product, without impurities and with minimal losses of seeds of the base culture. In general, for the seeds which are designated to seeding, their purity must be over 98%, and for the seeds, designated to consummation, over 94%.

Within the framework of the effected determinations, it was watched the dependence of the degree of separation and of the productivity of the oscillating sieves of the selector, as a function of the debit of supplying with material, angle of inclination of the sieves and rotative speed of the driving shaft. The tests were performed with identical probes of seeds with a content of impurities of 10%. After the separation of mixture, there were balanced the aprons, collected to the collecting troughs of selector (selected seeds, big impurities, small impurities and light seeds), obtaining by dividing to the total mass of proba (25kg), the degree of separation, expressed by percentage.

The productivity of flat sieves of the selector, respectively their capacity of work on time unit, is the most important economical criterion of appreciation of the process of seed cleaning. The target of the theoretical and experimental studies is the increasing of productivity, without affecting the degree of separation of components and the purity of the final product.

In order to determine this index and establish its dependence on the parameters of cleaning system, it was acting as in the previous case, using identical probes of seeds, with 10% content of impurities. It was measured the duration of a working cycle and it was calculated the corresponding productivity of sieves in  $[g/m^2s]$ , for each determination.

In table 4 it is presented the productivity of the oscillating sieves of the selector.

**Table 4**

**Productivity of oscillating sieves of selector  $[g/m^2 s]$**

No.	Angle of inclination [degrees]	Debit of supplying [kg/s]	Rotative speed of driving shaft [rot/min]			
			360	380	410	470
1	2	0.83	348	368	432	512
		1.11	428	460	540	640
		1.40	576	616	704	860
2	4	0.83	376	408	464	556
		1.11	472	512	584	700
		1.40	624	672	776	928
3	6	0.83	412	444	500	608
		1.11	520	560	624	756
		1.40	684	752	840	1016
4	8	0.83	464	480	536	680
		1.11	576	600	664	848
		1.40	768	804	892	1136

## CONCLUSIONS

By analyzing the values, centralized in the table 1 - 4, the following conclusions concerning the experimental study can be formulated:

- The purity of the cleaned material, expressed by the degree of separation of the components of mixture (aprons) is as bigger, as the rotative speed is bigger and the debit of supplying is smaller;

- The purity of selected material decreases with the increasing of inclination of sieves;

- The degree of separation varies inversely proportional to the flowing velocity, i.e. as bigger is the velocity of displacement of seeds on the surface of sieves, as smaller is the purity of the selected product.

- The productivity of sieves increases with the increasing of the rotative speed of the driving shaft;

- The productivity of sieves increases with the increasing of the velocity of displacement of seeds on the sieves;

- The productivity of sieves increases with the increasing of the angle of inclination of sieves;

- The productivity of sieves increases with the increasing of the debit of supplying with material.

As a final remark, it must be mentioned the aspect that the purity of the selected material decreases by increasing the productivity of sieves.

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# REDUCEREA NIVELULUI VIBRAȚIILOR TRACTOARELOR ȘI COMBINELOR AUTOPROPULSATE UTILIZÂND DISPOZITIVE SEMI- ACTIVE CU FLUID MAGNETO-REOLOGIC

## DECREASING OF VIBRATION LEVEL AT TRACTOR'S AND SELF PROPELLED COMBINES USING SEMI-ACTIVE DEVICES WITH MAGNETO-RHEOLOGICAL FLUID

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**Cuvinte cheie:** amortizor, fluid magneto-reologic, vibrații.

**Key words:** damper, magneto-rheological fluid, vibrations.

### ABSTRACT

*Scăderea nivelului vibrațiilor tractoarelor și combinelor autopropulsate are drept scop mărirea fiabilității mașinilor și a perioadei de lucru. Un alt motiv important în acest sens constă în îmbunătățirea condițiilor de lucru pentru personal, deoarece scăderea nivelului vibrațiilor conduce la reducerea nivelului de zgomot asupra corpului uman.*

*În lucrare se prezintă unele metode de reducere a vibrațiilor și zgomotului utilizând fluide magneto-reologice.*

*The decreasing of vibration level at tractor's and self propelled combines has as aim the increasing of the machine reliability and the total working period. Another important reason in this direction is the improving of the working conditions for the personnel, because reducing the vibration level it is also decreased the level of noxious noise on the human being*

*Within the framework of the paper there are presented some methods of vibration reduction and noise fighting, using magneto-rheological fluid.*

### INTRODUCTION

Vibration control of tractor's and self propelled combines suspension system has been a very active subject of research, since it can provide a very good performance for tractors drivers. For a long time, efforts were done to make the suspension system works in an optimal condition by optimizing the parameters of the suspension system, but for intrinsic limitation of passive suspension system the improvement is effective only in a certain frequency range.

Semi-active suspensions with magneto-rheological fluids were proposed in the early 1970. The magneto-rheological (MR) fluids are intelligence fluids which have the rheological properties controlled by applying an exterior magnetic field. They represent an excellent interface category between the electronic control blocs and the mechanical components that assure the vibration reducing. When the control system fails, the semi-active suspension can still work in passive condition.

Compared with passive suspension systems, the semi-active suspension system combines the advantages of both active and passive suspensions.

## MATERIALS AND METHOD

Magneto-rheological (MR) fluids (fig.1) are suspensions of non-colloidal ( $\sim 0.05\text{-}10\ \mu\text{m}$ ), multi-domain, and magnetically soft particles in organic or aqueous liquids. Many different ceramic metals and alloys have been described and can be used to prepare MR fluids.

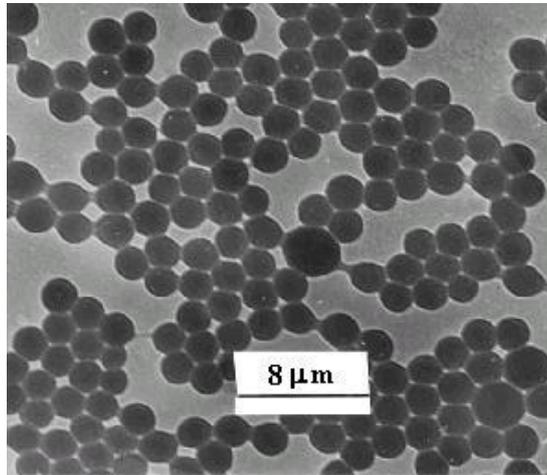


Fig.1 Scanning electron micrograph of iron particles  $\text{Fe}_2(\text{CO})_9$

Particle size, shape, density, particle size distribution, saturation magnetization and coercive field are important characteristics of the magnetically active dispersed phase. Their apparent viscosity changes significantly ( $10^5 - 10^6$  times) within a few milliseconds when the magnetic field is applied. The change in the viscosity is completely reversible when the magnetic field is removed. Once the magnetic field is applied, it induces a dipole in each of the magnetic particles. The inert-particle forces originating from the magnetic interactions lead to a material with higher apparent viscosity. This dipolar interaction is responsible for the chain like formation of the particles in the direction of the field (fig.2).

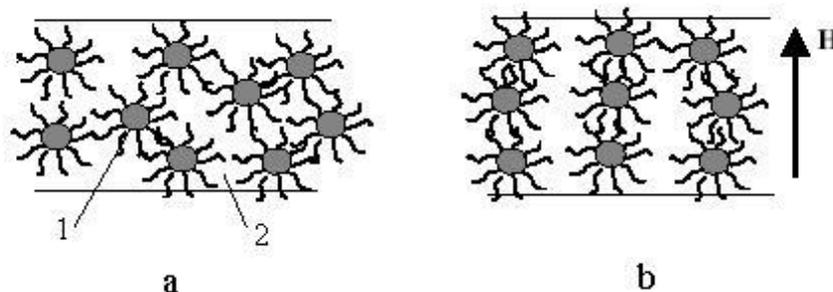


Fig.2. Schematic of the formation of chain-like formation of magnetic particles in MR fluids in the direction of an applied magnetic field

a - no magnetic field    b - magnetic field - H  
1- iron micro-particles; 2- suspending fluid (no polar oils).

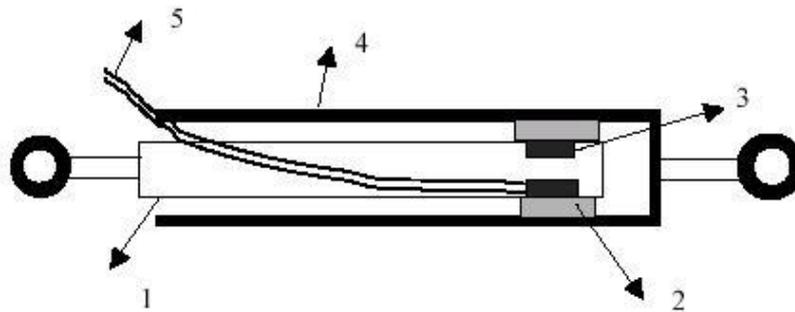
It is also believed that in addition to magnetic interactions between two particles, the formation of the particles contribute to a certain level to the increase in the apparent viscosity.

Particles held together by magnetic field and the chains of the particles resist to a certain level of shear stress without breaking which make them behave like a solid. When this shear stress exceeds a critical value, the structure breaks and the material starts to flow. MR fluid effect is often characterized by Bingham Plastic model.

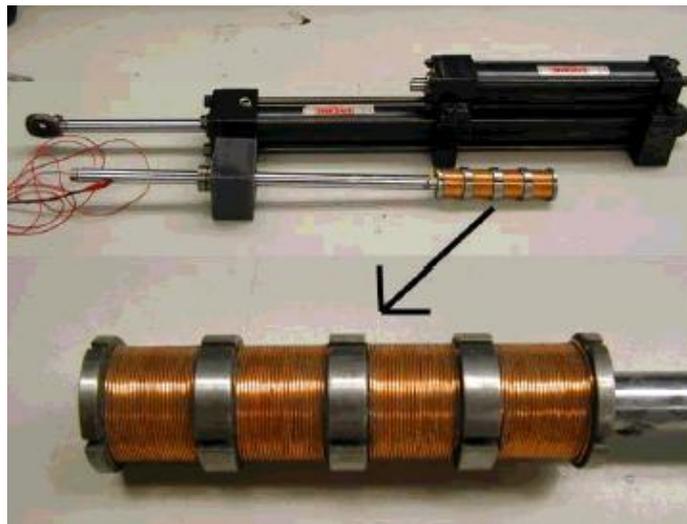
The practical necessities often require attenuation of the vibrations produced by bodies. There-fore, research on active and semi-active dampers has been carried. The

interesting conclusion is that the obtaining of dampers with dynamic attenuation factors requires active media with varying fluidity. The magneto-rheological fluids change fluidity under the action of magnetic fields respectively.

In fig.3 a damper with magneto-rheological suspension is presented. The damper ensemble as shown in fig.4. The magnetic field is applied radially across the gap, perpendicular to the direction of fluid flow. Viscosity of MR fluid in the piston valve will be increased by increasing the electric current through the electromagnet coil, thus resisting the MR fluid flow through the valve and increasing the damping force of the MR damper.



**Fig. 3. MR fluid damper schema**  
1-plastic shaft, 2-sponge saturated with MR fluid,  
3-coil, 4-steel tube, 5-wire supplying current.



**Fig.4. The damper ensemble**

To apply the MR damper in vibration control of tractor's suspension system, the property of the damper should be determined.

A semi-active control method is introduced in this study to demonstrate the application of MR damper in the vibration control of tractor's cabin suspension system. The state variables are the relative velocity between the sprung mass and the unsprung mass, as well as the velocity of sprung mass. When the relative velocity between sprung mass and unsprung mass is in the same direction of the velocity of sprung mass, an electric current is applied to the MR damper, other-wise no damping force is required. But for MR damper it is impossible to provide a zero force, so we should minimize the semi-active damping force without any electric current.

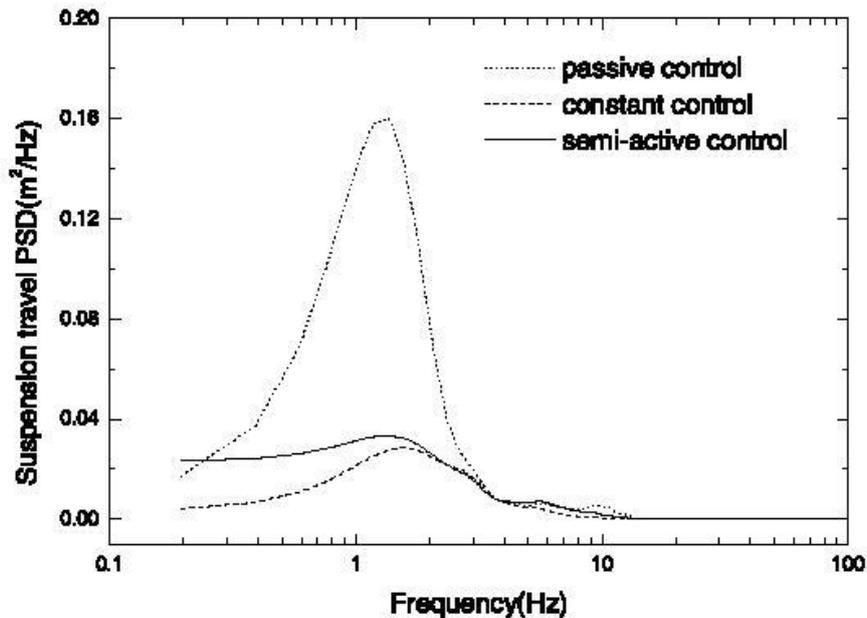


Fig. 5 The suspension travel response

Fig.5 shows suspension travel response under different control strategies. It is seen that suspension travel response around the body resonance is reduced significantly under constant control and semi-active control, but they are unable to reduce the suspension travel response around the wheel hop.

From the simulation results, it can be seen that the semi-active control provides improved performances compared with those of the passive control and constant control.

## CONCLUSIONS

From the study for the MR damper, it has been shown that the MR damper has a very broad changeable damping force range under magnetic field and the damping coefficient increases with the electric current, but decreases with excitation amplitude.

The semi-active control strategy is superior to both the passive control and the constant control strategies. It allows:

- easy mounting on equipments with various destinations;
- easy maintenance.

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# MIJLOACE MODERNE DE REALIZARE A PLANURILOR DE STUDIERE A SOLURILOR PE TEREN

## MODERN MEANS OF MAKING PLANS FOR FIELD SOIL STUDYING

*Gh. Iosif, A. Gradinaru*

### **ABSTRACT**

*As a result of the progresses that technology has made the equipment in the field of terrestrial measurements in the last years it has concluded that it is necessary to realize a digital model of the continuous terrain and with a precision of 20 cm, which requires the use of modern means, especially laserscan technique, combined with GPS, video cameras, sensors. To mention that classic fotogrametic models cannot me used alone. For completing the job in good quality conditions, the FLI-MAP method is recommended.*

### **FLI-MAP Applications**



Acquiring data necessary for efficient topographical studies using classical techniques and/or fotogrametric techniques is difficult, lengthy, insufficient and, in certain cases, does not assure the required precision because of the interpolation of two measurements. Practically, between two profiles the terrain can be in any way. With the aid of the described system, the information is complete and rigorous; furthermore, the productivity is about 1—km per day. The high density of lasers offers, in the particular case of soils, all the necessary information to identify and classify all the physical and chemical elements.



FLI-MAP<sup>®</sup> SYSTEM

## **SENSORS**

The airborne high density LiDAR technology is a innovation of long range sensor detecting techniques that has broken all the barriers of traditional flying. The

FLI-MAP(Fast Laser Imaging and Mapping Airborne Platform) system, can offer sufficient precision in topography and engineering. The high density of laser dots (10-30 dots/m<sup>2</sup>) , the very precise date of the FLI-MAP, together with the imgae covering of the are flown over, allow the cartography of all the data which exist on any existing or theoretic corridor .

## **FLI-MAP**

The acronym FLI-MAP means Fast Laser Imaging and Mapping Airborne Platform. The concept of cartography with the FLI-MAP system was developed and tested for the first time with a scanning laser a on autogiro in the year 1992. After analyzing data, it was obvious that objects could be identifiable in the LiDAR data.

FLI-MAP became fuctional in 1995 as a static system mounted on a Schweizer helicopter. FLI-MAP 2, a mobile system fit for a variety of helicopter models, replaced the first generation in 1999.

## **SYSTEM DESCRIPTION**

The FLI-MAP system integrates some high-tech components into a very efficient instrument for areal measurements.

The two components can be differentiated: the airborne unit and the ground unit. Both are of extreme importance for the FLI-MAP operations.

## **THE AIRBORNE UNIT**

The airborne component of the FLI-MAP system is a frame attached to a helicopter, a computing unit and a pilot interface.

The ground unit of the FLI-MAP component consists of a few base stations and computers for processing. The base stations contain a antenna and GPS receptor, provide electricity and allow uploading data. During the flight these stations upload GPS date into reference points with known coordinates.

## **SENSORS**

The airborne component of the FLI-MAP system is equipped with the flowing sensors:

### **GPS**

The LFI-MAP frame is equipped with two arms on which are the GPS antennas. Next to the GPS antennas is a separate Omnistar antenna. Omnistar is a service created by Fugro that provide accurate D-GPS corrections in real time.

### **INS**

The altitude of the system is determined at a speed of 200 times per second by a IMU (Inertial Measuring Unit) system.

IMU is mounted on the FLI-MAP frame and is capable of accurately determining the orientation of the system by measuring the rotations of the three spatial axes(Roll, Pitch and Heading) and also the speeds and accelerations in the three dimensions.

## THE LASER SCANNER

The FLI-MAP system uses two scanning lasers that provide the redundancy and guarantee the precision and quality of the data.

## VIDEO

Two digital cameras, well mounted, are used in the system to identify objects along the fly path.

## PHOTO CAMERAS

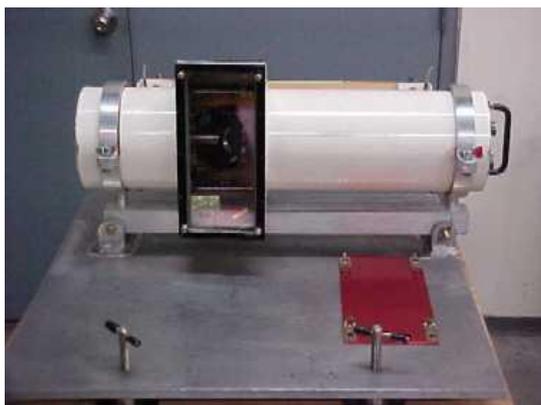
Two high resolution 1/2" CCD digital photo cameras are placed besides the video cameras being oriented in front and down.



*Autogir with FLI-MAP prototype*



Computerized unit inside helicopter



**FLI-MAP laser dispositive**



*Video*



**STRUCTURA PRODUCȚIEI AGRICOLE  
ÎN REGIUNEA DE DEZVOLTARE SUD – EST**

**AGRICULTURAL PRODUCTION STRUCTURE  
IN SOUTH – EST DEVELOPING REGION**

*\*D.M. Medelete, \*R. L. Pânzaru , \*\*G. Ștefan*

**Key words: production, structure, region, weight**

### **ABSTRACT**

*Lucrarea face referire la structura producției agricole în cazul Regiunii de dezvoltare Sud – Est, prezentând modul de evoluție în timp pentru fiecare sector (sectorul de producție vegetal, sectorul zootehnic și sectorul de prestări servicii). În elaborarea lucrării autorii au luat în calcul o perioadă de timp de patru ani (2001 – 2004).*

*The paper, take in consideration the agricultural production from south – east developing region, showing the time evolution way far every sector (vegetal production sector, zootechnical production sector and service sector). In elaboration of this paper, the authors take in consideration a time period of four years – from 2001 to 2004.*

### **MATERIAL AND METHOD**

This works take in consideration statistical data and documentation, so several data sources was used – reports, bulletins, breviary and statistical annuals.

The research method used is represented by time comparison, based on the fixed base and mobile base index.

### **RESULTS AND DISIONSIONS**

At the level of south – east developing region, the analyze of total agricultural production, follows the index structure prominence and it's time evolution between 2001 to 2004.

Table 1, show up the data concerning total agricultural production, by taking in consideration the three component sectors: vegetal production, zoo technical production, and agricultural service sector.

In 2001 year case, general index level was 36074 bil. lei, constituted by soctors contribution of 1014 bil. lei from services, 12217 bil. lei from animal grows sector and 22843 bil. lei accrued from vegetal production sector. As a result of those absolute values, in structure the vegetal production is prevalent with a weight of 63,32 %, followed by zoo technical sector with 33,87 %, last place being take by services sector with a weight of only 2,81 % from total.

A the level of 2002 year, on component sectors was recorded weights of 2,77 % for services, – 1226 bil. lei, 36,06 % for animals growth – 15946 bil. lei and 61,17 % for

#### **Goods and services production - South – East region**

**Table 1**  
**- th lei c.p.-**

Year	Total	Vegetal		Animal		Agricultural services	
		effective	% din total	effective	% din total	effective	% din total
2001	36074	22843	63,32	12217	33,87	1014	2,81
2002	44226	27054	61,17	15946	36,06	1226	2,77
2003	59441	40520	68,17	17628	29,65	1293	2,18

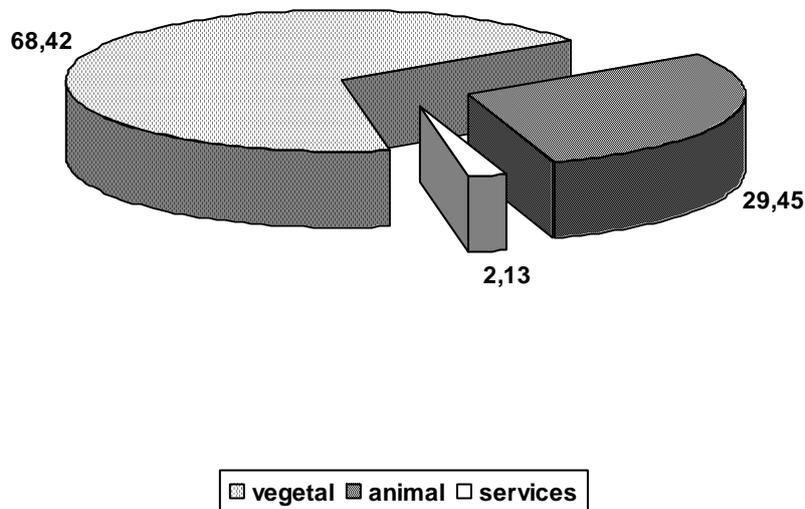
2004	90105	66847	74,19	21905	24,31	1353	1,50
Media 2001 - 2004	57461,5	39316	68,42	16924	29,45	1221,5	2,13

vegetal production sector – 27045 bil. lei, from a total index level of 44226 bil. lei realized at regional level.

If we consider the specific situation of 2003 year, we could observe that total agricultural production reach a level of 59441 bil. lei, level which is based on sectors contribution of 40520 bil. lei – vegetal production, 17628 bil. lei – zoo technical sector and 1293 bil. lei from services sector. On this results, the structure was: 68,17 % vegetal sector, 29,65 % animals growing sector and 2,18 % services sector.

For 2004 year, at the three sectors level of activities from agriculture has been recorded total production of 1353 bil. lei for services, 21905 bil. lei for zoo technical sector and 66847 bil. lei in vegetal production sector case, values which leads to a general level for the index of 90105 bil. lei. The index structure hold variable weights for the three sphere of activity: 74,19 % - vegetal sector, 24,31 % - animal growing sector, 1,50 % - agricultural services sector.

Based on presented data for years 2001, 2002, 2003 and 2004 was establishing the period average with the following structure (Figure. 1):



**Fig.1. Agricultural production in South – East developing region (%)**

- 57461,5 bil. lei – general index level;
- 68,42 % vegetal production sector – 39316 bil. lei;
- 29,45 % zoo technical sector – 16924 bil. lei;
- 2,13 % services sector – 1221,5 bil. lei.

The agricultural production dynamics, at the level of South – East developing region is presented in table 2.

**Agricultural production, South – East region  
- Dynamics -**

**Table 2**

Year	DYNAMICS							
	Total		Vegetal		Animal		Agricultural services	
	lbf	lbn	lbf	lbn	lbf	lbn	lbf	lbn
2001	100	100	100	100	100	100	100	100
2002	122,6	122,6	118,4	118,4	130,5	130,5	120,9	120,9
2003	164,8	134,4	177,4	149,8	144,3	110,5	127,5	105,5
2004	249,8	151,6	292,6	165,0	179,3	124,3	133,4	104,6
Average 2001 – 2004	159,3	63,8	172,1	58,8	138,5	77,3	120,5	90,3

For total agricultural production, the evolution increase during the analyzed period. Fixed base index are strictly supra-unitary, the outrunning of reporting bases being 1,22 times in 2002 year, 1,59 times for period average, 1,64 times in 2003 year case and 2,49 times at the 2004 year level. Concerning the mobile base index situation, the recorded values are supra unitary – from dynamics (122,6 % in 2002, 134,4 % in 2003 and 151,6 % in 2004), the single sub unitary value being 63,8 % for period average.

Vegetal production sector distinguish by an ascendant evolution of production level. Starting on the first dynamical series term – 2001 -, it is recorded the outruns of reporting bases with 18,4 % in year 2002, 77,4 and 49,8 % in 2003 year case, 192,6 and 65,0 % for year 2004. Period average outruns by 1,72 times the 2001 year level, but is inferior beside 2004 year with 41,2 %.

Considering the time evolution of zoo technical production, the recorded trend was ascendant, the dynamics being predominate by supra unitary values, in case of the two index category – fixed base and mobile base. An exception was recorded at the level of mobile index foe period average -26,7 % beside the reference base (2004). The outruns of the first comparison term was 1,30, 1,38, 1,44 and 1,79 times – 2002, for period average, 2003 and respective for year 2004. Annual successive growing, during the dynamical series was 30,5 % in 2002, 10,5 % in 2003 and 24,3 % in 2004.

Services sector for agriculture is characterized through maintaining the growing tendency previously observe: growth of 20,9 % in 2002, 27,5 and 5,5 % in 2003 and 33,4 and 4,6 % 2004 year case. In period average case the first report term is outrun by 1,20 times, and beside the second one the decrease is 9,7 %.

## CONCLUSIONS

For South – East region, prevalent in the vegetal sector – 68,42 %, followed at far range by animal growth with a weight of 29,45 %, and services which represent only 2,13 % from total agricultural production.

In dynamics, the recorded values for period average outruns the reporting bases at the fixed base level index with 72,1% for vegetal sector, with 38,5 % in animal sector case and 20,5% for services and was sub unitary for mobile base index.

The time evolution tendency was increasing at all sector level. This is a positive aspect but it must be followed by a adequate increase of weights for zootechnical sector and services sector.

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**PRODUȚIA ZOOTEHNICĂ ÎN COMUNA ALMĂJ, JUD. DOLJ**  
**ZOOTECHNICAL PRODUCTION IN ALMĂJ COMMUNE, DOLJ COUNTY**

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**Key words: cattle, pigs, milk, meat, production**

## **ABSTRACT**

*Lucrarea analizează efectivul de animale pe direcții de exploatare și producția obținută la nivelul sectorului zootehnic la nivelul comunei Almaj – județul Dolj. Se urmărește astfel evoluția efectivelor de ovine, bovine și caprine utilizate în producția de lapte și carne, dar și producția totală de lapte, carne ouă și miere de albine obținută în perioada 2004-2006.*

*In this work paper it is analyzed the animal effective by direction of exploitation direction and the production obtained at the zoo technical level in Almaj Commune – Dolj County. Therefore it is studied the sheep, goats and cattle number evolution for milk production and total production of meat, eggs, milk and honey bee between 2004 -2006.*

## **MATERIAL AND METHOD**

For the paper writing it was took in consideration the field documentation and statistical consulting of data. So, several sources of data was called – notices of data, primary repot of statistical data, statistical bulletin and breviary.

The research method used is represented by time comparison, based on the fixed base and mobile base index.

## **RESULTS AND DISIONSIONS**

Table 1, shows the animals effective situation, exploited on different production direction – milk, meat, eggs.

For total milk production the situation presented involve three species: bovine, ovine and goats.

At bovine the effectives were situated between 171 heads in year 2004 and 144 heads in 2006 and the period average was 161 heads. The dynamics distinguish a descendant evolution of the index who record a decrease with 1,17 % in 2005 (169 heads) beside 2004 and with 15,79 and 14,79 in 2006 year beside report terms. Period average was inferior to year 2004 level with 5,85 %, but outruns the 2006 year level with 11,80 %.

In ovine case it's observe that the animals number exploited for milk was 54 heads in 2004 year, 61 heads in 2005 (+12,96 %) and 50 heads at the level of 2006 year – decreasing with 7,41 and 18,03 % beside comparison terms. Period average was 55 heads, which represent +1,85 % beside 2004 and +10,0 % beside 2006 years.

If we refer to the goats situation, we could see a period average of 11 heads (+10,0 and -8,34 % beside reference terms), and variation limits of 10 heads at the 2004 and 2005 years level, respective 12 heads in 2006 year case +20,0 % in dynamics.

Meat production is based on exploitation of some species like: bovine, porcine, ovine and goats.

Bovine effectives exploited for meat production vary from 190 heads in year 2006 to 210 heads in 2005, and period average is 198 heads. Beside the first dynamical series term – 2004 (195 heads), the outruns is recorded in 2005 and for period average (7.69 and

**Animal effective on exploiting directions Almăj – Dolj,  
2004–2006**

**Table 1**

Crt. Nr.	Specification	Year									Average 2004-2006			
		2004			2005			2006			Heads effect.	Dynamics		
		Heads effect.	Dynamics		Heads effect.	Dynamics		Heads effect.	Dynamics			Heads effect.	Dynamics	
			l <sub>bf</sub>	l <sub>bm</sub>		l <sub>bf</sub>	l <sub>bm</sub>		l <sub>bf</sub>	l <sub>bm</sub>			l <sub>bf</sub>	l <sub>bm</sub>
1	<b>Milk</b>													
1.1	- bovine	171	100	100	169	98,83	98,83	144	84,21	85,21	161	94,15	111,80	
1.2	- ovine	54	100	100	61	112,96	112,96	50	92,59	81,97	55	101,85	110,0	
1.3	- goats	10	100	100	10	100,0	100,0	12	120,0	120,0	11	110,0	91,66	
2	<b>Meat</b>													
2.1	- bovine	195	100	100	210	107,69	107,69	190	97,43	90,47	198	101,54	104,21	
2.2	- porcine	725	100	100	862	118,89	118,89	818	112,83	94,89	802	110,62	98,04	
2.3	- ovine	35	100	100	29	82,86	82,86	24	68,57	82,76	29	82,86	120,83	
2.4	- goats	23	100	100	27	117,39	117,39	29	126,08	107,41	26	113,04	89,65	
3	Laying eggs birds	4950	100	100	5230	105,65	105,65	5600	113,13	107,07	5260	106,26	93,93	

respective 1,54 %) and decrease in 2006 – 8,53 %. Mobile base index was sub unitary in 2006 – 90,47 % and supra unitary for period average and year 2005 – 104,21 and 107,69 %.

At porcine average index level was 802 heads (+10,62 și -1,96 % beside the report terms), and extreme values was recorded in 2004 – 725 heads and 2005 – 862 heads. The index evolves irregular in time, the increasing from 2005 - +18,89 % , being followed by decreasing in 2006 year -5,11 %.

Ovine distinguish through an slaughtered effective situated between 24 heads – 2006 and 35 heads – 2004, and period average was 29 heads. The index evolved descendent during the analyzed period, recording successive decreasing of 17,14 % in 2005 and 17,24 % in 2006 year case (the period average outruns 2006 year by 1,2 times, but is inferior comparing to 2004 situation – 82,86 %).

In goats case, the slaughtered average effective was 26 heads (+13,04 % beside 2004 and -10,35 % beside 2006 years), with variation limits from 23 heads in year 2004 to 29 heads, in 2006 year case. The index evolved only ascendant during analyzed period, dynamical index being strictly supra unitary – 117,39 % in 2004, 126,08 and 107,41 % in 2006 year case.

Concerning the laying birds, we could see an ascendant evolution 4950 heads in 2004, 5230 heads in 2005 year (+5,65 %), 5600 in year 2006 (+13,13 and +7,07 %). Period average was 5260 heads - +6,26 % beside 2004 year and -6,07 % comparatively with the 2006 year situation.

Table 2 present the evolution of total production recorded at the Almăj Commune.

Total cow milk quantity varies from 5010 hl to 5442 hl, and period average was 5164 hl. The index evolved irregularly in time by increasing with 8,6 % in 2005 beside 2004, followed by a decrease of 7,39 % at the 2006 year level – 5040 hl. Period average outrun the first term by 1,03 times, and the second one by 1,02 times.

The ovine provide a total production of 20 hl – period average, with variation limits form 17 hl in 2004, to 23 hl in 2005 year case. The index evolved irregularly in time, increasing with 35,29 % in 2005 beside 2004, followed by a decrease with 13,05 % in 2006. Period average outrun with 17,64 % the level from 2004 and was equal with the 2006 year one.

Total goats milk production vary from 14 hl in 2005, to 18 hl in year 2006, the average of the period being 15,66 hl. The constituted dynamics distinguish an irregular evolution of index. So this decrease in 2005 with 6,67 % beside 2004 year – 15 hl, and after that, at the 2006 year level is recoded an increase - +20,0 and +28,57 % beside report bases. Period average is superior with 4,40 % beside 2004, but inferior beside 2006 with 13,0 %.

Figures 1 and 2 present the evolution of total production of milk by species.

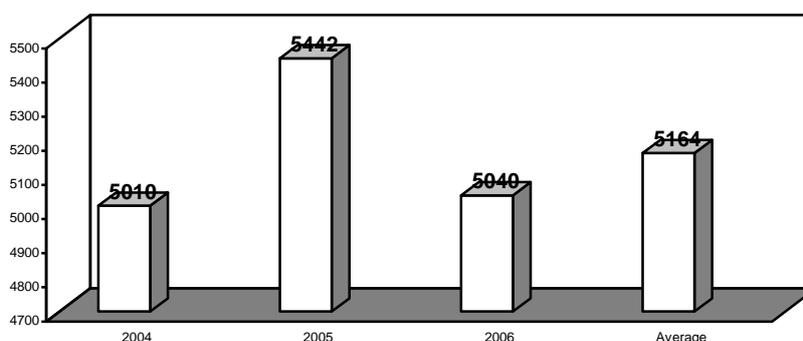
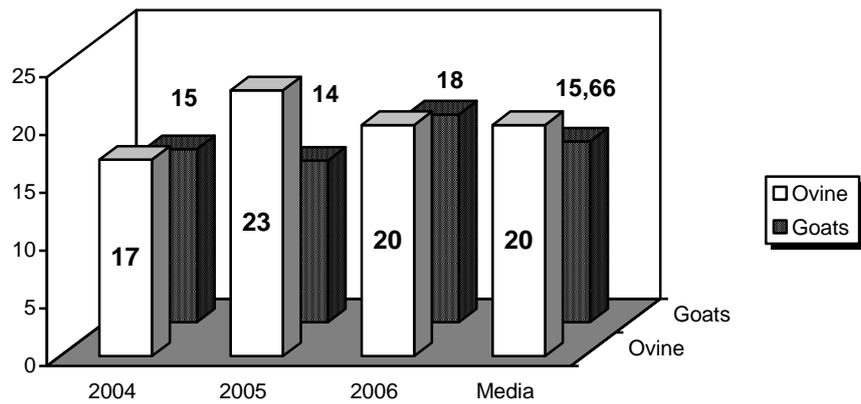


Figure 1. Total production – cow milk (hl)

**Total production obtained at zoo technical level  
Almāj – Dolj,  
2004–2006**

**Table 2.**

Crt.. No.	Specification	U.M.	Year									Average 2004-2006		
			2004			2005			2006			Effective	Dynamics	
			Effective	Dynamics		Effective	Dynamics		Effective	Dynamics				
				I <sub>bf</sub>	I <sub>bm</sub>		I <sub>bf</sub>	I <sub>bm</sub>		I <sub>bf</sub>	I <sub>bm</sub>		I <sub>bf</sub>	I <sub>bm</sub>
1	<b>Milk</b>													
1.1	- cow milk	hl	5010	100	100	5442	108,62	108,62	5040	100,60	92,61	5164	103,07	102,46
1.2	- sheep milk	hl	17	100	100	23	135,29	135,29	20	117,64	86,95	20	117,64	100,0
1.3	- goat milk	hl	15	100	100	14	93,33	93,33	18	120,0	128,57	15,66	104,40	87,0
2	<b>Meat</b>													
2.1	- bovine	t	38	100	100	50	131,58	131,58	42	110,52	84,0	43,33	114,03	103,17
2.2	- porcine	t	67	100	100	108	161,19	161,19	98	146,27	90,74	91	135,82	92,85
2.3	- ovine		0,63	100	100	0,59	93,65	93,65	0,59	61,90	66,10	0,54	85,71	138,46
2.4	- goats	t	0,39	100	100	0,62	158,97	158,97	0,58	151,28	93,55	0,53	135,89	91,38
3	<b>Eggs</b>	Th. pices.	653	100	100	706	108,11	108,11	644	98,62	91,22	667,66	102,24	103,67
4	<b>Honey bee</b>	t	7,9	100	100	11,2	141,77	141,77	11,3	143,03	100,89	10,13	128,23	89,64



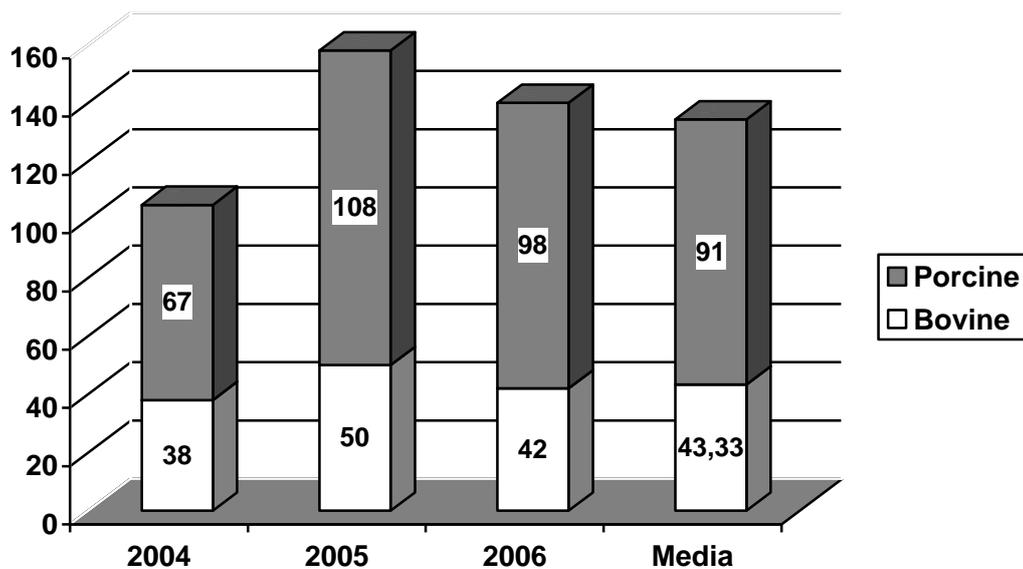
**Figure 2. Total production – ovine and goats milk (hl)**

For meat production it will be analyzed the levels reached for bovine, porcine, ovine and goats.

Bovines have supply a total meta production of 43,33 t – period average with variation limits of 38 t in year 2004 and 50 t in case of 2005 year. The index evolved irregular, recording increase in 2005 beside 2004 years - +31,58 % -, decrease in 2006 year - +10,52 % beside 2004 and -16,0 % comparing with year 2005. Period average outruns by 1,14 times and respective 1,03 times both base of report.

Total swine meat quantity varies from 67 t in 2004 year, to 108 t in 2005, period average being 91 t – in condition of a level for 2006 year of 98 t for the index. The variation of index was irregular in time, the increasing form 2005 - +61,19 % -, being followed by a decrease with 9,26 % recorded in 2006 year case. Period average outrun with 35,82 % the level from 2004, but is inferior to the 2006 one by 7,15 %.

Figure 3 shows the evolution of meat production for bovines and swine.



**Figure 3. Total production of meat – bovine and porcine (t)**

Total ovine meat production was situated between 0,49 and 0,63 t – 2006 and respective 2004 -, the average of index being 0,53 t. The time variation of index is situated on an descending curve, annual successive decreasing being 6,35 % in 2005 and 33,90 % in year 2006. For period average fixed base index was sub unitary – 85,71 %, and those with mobile base outruns the reference term by 1,38 times.

For goats it is recorded an average for index of 0.53 t (+35,89 and -8,62 % beside 2004 and respective 2006), with variation limits from 0,39 t in year 2004, to 0,62 t in 2005 year case. The index evolved irregular, recording an increase in 2005 - +58,97 % and a decrease in 2006 (-6,45 %).

Total production of eggs varies from 644 thousand pieces in 2006, to 706 thousand pieces in 2004, period average being 667,66 thousand pieces. The made dynamics distinguish increasing in 2005 (+8,11 %), decreasing in 2006 (-1,38 and -8,78 %), the average outrunning both reference terms – by 1,02 and respective 1,03 times.

Apiarian sector supply a total production of honey between 7,9 and 11,3 t, with an average of 10,13 t (+28,23 and -10,36 % beside 2004 and respective 2006). The index evolution is ascending in time – the annual successive increasing being 41,77 % in 2005 and 0,89 % in 2006 year.

## CONCLUSIONS

Based on the previous presented data, at the level of Almăj Commune, could be formulated a series of conclusions as:

- the commune appear as a territorial administrative unit of medium size, not being included in the big rural locality number, but a typical one for the north side of the Dolj County;

- At commune level are present the typical zoo technical products, the traditional one – represented by milk, meat, honey, eggs;

- The exploited effectives on production direction follows in time the total effectives;

- under quantity report, the most important zoo technical products obtained in Almăj Commune are represented by cow milk, swine meat, eggs and honey bee.

By analyzing the situation from Almăj Commune, in county context, we could establish the place for this at the level of animal production. In total effective number for county, it was recorded weights of : 0,45 % for bovine, 0,27 % at porcine, 0,15 % for ovine and only 0,13 % at goats

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# ALIMENTARA SI ALIMENTATIE LA NIVEL MONDIAL

## ASPECTS REGARDING FOOD SAFETY AND NUTRITION ON THE GLOBAL SKALE

*Ioana Anda Milin, Anca Brata, Elena Pet, Corina Ruset*

**Key words:** food, nutrition, rational, health.

*Există două determinante majore ale conceptului de securitate alimentară: disponibilitatea și accesul la hrană. Securitatea alimentară la nivel individual nu o asigură implicit și pe cea de la nivel familial, noțiunile de foamete, malnutriție și insecuritate alimentară fiind treptele agravante ale aceluiași proces - accesul îngrădit la o ofertă suficientă de hrană.*

*Deși i se conferă o sferă de cuprindere foarte amplă, totuși, conceptul de securitate alimentară este în ultimă instanță o problemă a familiei sau de nivel individual.*

*Lucrarea analizeaza aspecte legate de securitatea alimentara la nivel individual si national, relatia alimentatie-crestere demografica, alimentatie-rata fertilitatii, alimentatia si sanatatea, aspecte legate de criza alimentara, politica nutritionala etc.*

*There are two major determinants of the food safety concept: availability and access to food. Food safety on the individual level is not a guarantee for the family level, thus hunger, malnutrition and unsafe food are means that lead to the same process – limited access to a sufficient food offer.*

*Even if this concept covers a very large area of interest, food safety is a family problem or at least it regards the individual level.*

*This paper analyses aspects regarding food safety on the individual and national level, the relationship between nutrition and demographic growth, alimentation and fertility rate, nutrition and health, aspects linked to food crisis, food politics, etc.*

### INTRODUCTION

Food safety concept was developed at individual, family, regional, national and global level. Scientifically, at international level, the food safety concept is defined as “everybody’s permanent access to the food necessary for an active and healthy life”. At individual level, is considered to be the right to feed which is the first in the human rights system.

Even if it encompasses a large sphere of problems, food safety is ultimately a family or individual problem. In this context, the three factors that condition the food safety are: food availability, the possibility to have access to food (generally determined by the purchasing power), the desire to have a healthy nutrition.

### MATERIAL AND METHOD RESULTS AND DISCUSSIONS

In order to have complete information about food safety, this must be analyzed by using a system of indicators:

*- indicators of the food consumption demand (the index of prices, the cost of the food, index of the real purchasing power, elasticity of the food demand according to the income and price, indicators of the food consumption rules, indicators of the consumption ratios, etc);*

- *indicators of the food offer* (industrial food production per inhabitant, agro-alimentary production in physical, financial and conventional units per inhabitant, indicators of agro-alimentary products stock, etc);

- *indicators of the food consumption* (food consumption per person, the percentage of food expenses related to the total consumption expenses, indicators of the food basket, indicators of the total food cost, socio-professional and income groups, etc);

- *synthetic indicators of the food safety* (the ratio between cereals stock and cereals consumption at global level, the cereal production variation in the big importing countries, the price variations for the imported food products, etc);

- *indicators of the food safety adjustments* (indicators of the food investments, indicators of the food production subventions, indicators of the consumption price subventions, etc);

- *indicators of the food entropy – insecurity* (indicators of the food deficit according to product groups and basic products, the number of persons which suffer of chronic hunger, number of persons suffering of malnutrition, etc).

In order to understand better the problems related to nutrition and nutrition crises, the following aspects should be analyzed:

### 1. DEMOGRAPHIC INCREASE AND NUTRITION

Between nutrition and demographic increase there are some organic interdependence relations, manifested directly or via other very complex factors.

So, the degree of insuring food safety expressed by the economical development influences the demographical increase typologies, the fertility behaviour, the birth rate and the death rate, which all together give a positive or negative impulse on the socio-economical development.

**Tabel 1**

#### Global demographic and economic growth ratio during 1985-2005

Population growth ratio 1985-2005	Number of economies	PNB mld.\$ 2005	%	Population, mil. inhabitants 2005	%	PNB/loc. \$ 2005	Comparison with the global average %
Over 3,0%	12	296	0,94	158	2,6	1.874	36,0
2,2 – 3,0 %	54	1.186	3,77	1.094	18,1	1.084	20,8
1,5 – 2,1	23	2.560	8,13	1.950	32,2	1.313	25,3
1,0 – 1,4	14	12.949	41,12	1.781	29,4	7.271	139,8
Under 1,0%	39	13.821	43,89	874	14,4	15.814	304,1
Did not supply information	10	681	-	200	-	3.405	

Source: *The World Bank 2006, World development Indicators.*

From the information presented above, we can notice that 1/5 of the planet population has a very high degree of demographic growth (over 2.2%) and has available only 4.7% of the global gross national product. In the same time, 39 economies which own almost 14% of the planet population have a low degree of the demographic growth (under 1%), in some cases this degree is negative, own 44% of the global gross national product and have an average income per inhabitant three times higher than the global average.

## 2. FERTILITY RATIO AND NUTRITION

According to the data published by the Global Bank, as higher the general fertility ratio is, as the development and nutrition level is lower.

**Table 2**

**General fertility index and GNP/capita worldwide**

General fertility ratio (no. of children per an old fertile woman)	Number of economies	PNB - mld.\$	%	Population -mil. inhabitants-	% versus total	PNB/loc. \$
5 children and over	31	308	1,0	534	8,8	577
4,0 – 4,9	18	178	0,6	328	5,4	543
3,0 – 3,9	16	944	3,0	1.421	23,5	664
2,0 – 2,9	32	2.799	8,9	1.033	17,1	2.710
Under 2 children	46	26.615	84,5	2.573	42,5	10.344
Did not supply information	9	649	-	168	-	

Source: *The World Bank 2006, World development Indicators.*

The countries with the lowest income per inhabitant, 543\$ and 577\$, have the highest fertility ratio (4 children and over) and the countries realizing an income of 10344\$ per inhabitant have the lowest fertility ratio, meaning less than 2 children for a fertile woman. According to the following data, the malnutrition is influencing also the expectation of life at birth or the average life duration.

**Table 3**

**Expectation of life in 2005 depending on economical growth**

Expectation of life at birth 2005	Number of economies	PNB mld.\$ 2005	%	Population mil./loc. 2005	%	PNB/loc. \$ 2005
Under 55 years	39	301	1,0	605	10,0	498
55 – 64 years	10	613	1,9	1.405	23,2	436
65 – 69 years	23	2.229	7,1	1.150	19,0	1.938
70 – 72 years	20	1.647	5,2	1.559	25,7	1.057
73 years and over	50	26.580	84,4	1.250	20,6	21.264
Did not supply information	9	123	-	88	-	1.398

Source: *The Word Bank 2006, op.cit.*

We can notice that the countries with a low development level and nutrition level (498 gross national product and 436 GNP per inhabitant) have also a shorter life expectation (under 55 years and under 64 years). The countries with the highest life expectation at birth (73 years and over) have also the highest GNP per inhabitant (20.590\$).

## 3. NUTRITION AND HEALTH

It is no need to demonstrate the organic relation which exists between the health level and nutrition. Of the olden time, there are studies which certify the strong relation between nutrition and the physiological condition of the human body. It is known the fact that an insufficient nutrition represents one of the main causes of the morbidity and the infantile death rate, of the physical and psychical development of the child, of the work

capacity, of the health maintenance during a life time and of the prevention of some acute and chronic diseases.

#### 4. SPECIFIC CONSUMPTION NEEDS OF THE POPULATION

According to the specialised literature these can be expressed by the calorie consumption, by the nutritional factor consumption (proteins, lipids, carbohydrates) and by microelements consumption (minerals, vitamins, etc).

#### 5. INFANTILE DEATH RATE

The specialised studies from different countries show that there is a stronger correlation between the food consumption level per inhabitant and the infantile death rate than between the infantile death rate and the number of doctors per 10000 inhabitants. From the 60 million persons that die every year, 30-40 millions persons die prematurely because of sub-nutrition and belong to the under developed countries. According to the data from the table below, the sub-nutrition influences also the morbidity, the weight level of children.

**Table 4**

**Relation between GNP/capita and percentage of up to 5-year-old underweight children**

	Number of economies	PNB mld.\$	Population - mil. persons	PNB/loc. \$
40% and over	21	775	1.782	435
30% - 39%	13	221	800	276
20% - 29%	21	307	237	1.295
10% - 19%	21	3.551	2.109	1.684
Sub 10%	10	230	75	3.067
Did not supply information	6	26.409	1054	25.056

Source: The World Bank 2006, op.cit.

In those countries where the income per capita is about 435\$, the number of underweight children is over 40% [9] of the 5 years older children and in the countries where the income per capita is 7 times higher than in the first group (3067\$) the percentage of 5 years old underweight children is under 10%.

#### 6. THE INTERNATIONAL PROBLEM OF NUTRITION

Occurred in the attention of the international scientific community because it influences both the present situation and the evolution of many other economical, social and political problems of our century. Despite all the alarm signs, the present situation from the nutrition domain all over the world and the immediate perspectives do not give any reason of self-comfort. In the last decades, the nutrition problem became more acute and got, from qualitative point of view, new features and characteristics. From a national and regional problem, it became a global problem.

Without doubt, the hunger is the serious from the three forms of malnutrition.

Many times, it leads to the death of just born children. In the vision of FAO, in the last decades, there was a certain decrease of this calamity. In 2000, 790 million persons suffering of hunger were registered, compared to 918 million persons in 1970. Even so, at the end of the 20<sup>th</sup> century, it was estimated that almost one person out of five was suffering of hunger. With all the registered decrease, the human kind is still seriously affected by this phenomenon.

If the highest progress in reducing the hunger was registered in Asia and the greatest relative reduction took place in Latin America, in Africa the situation got worst, the number of underweight children doubled in the period 1980 – 1999.

FAO estimates that the highest density of persons suffering of chronic hunger is in sub-Saharan Africa and in South Asia. According to the last studies, in the present there are 800 million persons suffering of chronic sub-nutrition.

**Table 5**

**Great periods of famine in the world**

Period	country / region	Observations
1837 –1838	India	800.000 deaths
1846 –1847	Ireland	2-3 million deaths
1876 - 1878	India	5 million deaths
1876 - 1879	North China	9 – 13 million deaths
1888 - 1892	Ethiopia	33% of population died
1896 - 1897	India	5 million deaths
1932 - 1933	Ukraine	4 - 6 million deaths
1943 - 1944	Bengal	1,5 - 3 million deaths
1946 - 1948	China	30 million persons affected by famine
1966 - 1970	Biafra	2 - 3 million deaths
1973 - 1974	Sahel	1 million deaths
1974 - 1975	Bangladesh	100.000 deaths
1979 - 1981	Uganda	250.000 deaths
1993 - 1994	Oriental Africa	3 million persons affected by famine
1995 - 1996	Oriental and Austral Africa	Civil wars

Source: www. FAO.org

Despite the extraordinary development of the agricultural production, especially in the last half of this century, the famine spectrum on globe wasn't eliminated. According to the information supplied by FAO, in 1996, in Africa, 168 million persons, almost 33% of population was suffering of chronic malnutrition. For the same year, these figures are: in Asia million, in Latin America 59 million (13%), in Middle East 31 million (12%).

We live in a divided world, from nutritional point of view, where some persons eat too much and others too little. The number of overweight persons is, at international level, about 600 millions. In USA, 97 million adults are in this category.

**Table 6**

**Food products consumption/capita and malnutrition share**

	Food consumption (kcal / loc. / day)					
	1964-66	1974-76	1984-86	1997-99	2015	2030
Global Total	2 358	2 435	2 655	2 803	2 940	3 050
Developing Economies	2 054	2 152	2 450	2 681	2 850	2 980
Sub – Saharan Africa	2 058	2 079	2 057	2 195	2 360	2 540
Idem, excl. Nigeria	2 037	2 076	2 057	2 052	2 230	2 420
Middle East and North Africa	2 290	2 591	2 953	3 006	3 090	3 170
Latin America and Caribbean region	2 393	2 546	2 689	2 824	2 980	3 140
South Asia	2 017	1 986	2 205	2 403	2 700	2 900
Eastern Asia	1 957	2 105	2 559	2 921	3 060	3 190
Industrialized economies	2 947	3 065	3 206	3 380	3 440	3 500
Economies in transition	3 222	3 385	3 379	2 906	3 060	3 180

Source : [www.F.A.O.org](http://www.F.A.O.org)

**Table 7****Impact of malnutrition in the developing countries**

	% population				Millions of persons			
	1990-1992	1997-1999	2015	2030	1990-1992	1997-1999	2015	2030
Developing economies	20	17	11	6	815	776	610	443
Sub – Saharan Africa	35	34	23	15	168	194	205	183
Idem, excl. Nigeria	40	40	28	18	156	186	197	178
Middle East and North Africa	8	9	7	5	25	32	37	34
Latin America and Caribbean region	13	11	6	4	59	54	40	25
South Asia	26	24	12	6	289	303	195	119
Eastern Asia	16	11	6	4	275	193	135	82

Source: www. F.A.O. organization

**Table 8****Impact of malnutrition in the developed countries**

	Population (mil.)			kcal / loc. / day			% of population			Mil. persons		
	1997-99	2015	2030	1997-99	2015	2030	1997-99	2015	2030	1997-99	2015	2030
Under 5%	349	1 158	5 129	3 187	3 130	3 150	2	3	3	8	37	178
5 – 10%	1 989	2 162	524	2 999	3 066	2 758	8	6	7	167	134	38
10 – 25%	1 632	1 939	948	2 434	2 644	2 411	21	13	16	349	250	155
Over 25%	586	544	239	1 988	2 085	2 149	43	35	30	251	190	72
Total	4 555	5 804	6 840	2 681	2 850	2 980	17	11	6	776	611	443

Source: www.fao.org

Between the countries where the percentage of overweight population is very high we can mention Russia with 57% and Great Britain with 51%; none of the European countries have much lower results. The statistics concerning the European population health show that in 2000, 26% of men and 21% of women were suffering of fatness. In Greece and Spain, 35% and 32% of men are fat. Many overweight persons live also in the developing countries. In Brazil, for example, over 30% of the population is suffering of fatness. On the contrary, the figures for China and India are 8% and 7%, and for Ethiopia only 2% [99].

In the whole world, the number of overweight persons is competing with the underweight persons. If the sub-nutrition is making victims in the first part of the life, the over-nutrition is downgrading the body in time, occurring at the middle-aged and old people, when the human body is suffering of hard diseases, cancer, and other chronic diseases, among which diabetes with many victims.

## **7. THE ROLE OF INTERNATIONAL ORGANISMS IN THE DECREASE OF THE NUTRITION CRISES**

FAO is the most important international organization which offers assistance for food safety, agriculture, forestry, fish breeding and rural development. This organization helps solving problems like:

- a. Preparation of a special program in food safety for the countries with low incomes and food deficit, focused on actions at national level and with practical characteristic by organising some pilot projects with demonstrative effect and short term results;
- b. A competent, active and correct consulting; FAO must help the governments to apply the complex strategies of the member countries, which should comprise not

- only the agricultural production, but also the commercial infrastructures, the services to promote the products, etc;
- c. FAO must play an important role in the domain of investments, modernization and mobilization, together with other international organizations interested in areas strictly related to the insurance of food safety.

The nutrition problem at international level can improve only by applying scientifically proved agricultural, food and nutrition policies, focused on restoring the unbalanced nutrition due to either insufficiency or abundance.

The percentage of overfeed population from the industrialized countries has increased in the last few years, some persons from these countries passed from a traditional nutrition, dominated by cereals and vegetables, to a “modern” nutrition, rich in fats and sugars. This “transition” of nutrition was determined by the changes from the society (increase of incomes, the migration to the cities, lack of spare time, women emancipation) which led to the changes in nutrition behaviour.

At the opposite side we can find the countries with a low level of industrialization, the poor countries, where the percentage of underfeed population reaches alarming values because of the insufficient available food.

We can say, without mistaking, that the population of the world is divided, from the nutritional point of view, in two categories – underfeed and overfeed – both categories having major effects on the health.

## CONCLUSION

In **conclusion** we can make the following statements:

- The impossibility of a country to ensure food safety can lead to the food crises; the severe lack of food for a great part of the world population is known as food crises. Generally, the food crises is caused by the low productivity of the agricultural exploitations, mainly in the underdeveloped countries, but also by the rate of population growth.

- Many international organizations analyze the food situation at a local, regional and global level, and join their efforts to improve the access to food sources, to improve the food quality and food safety, so that more and more regions of the world could reach food safety.

- The insurance of food safety for each country, and also the development of the rural sector where an important part of the population works, is a great wish which should represent the priority in the micro and macro economical decisions.

- *Food safety, in the developed countries, can be reached in two ways:*

1. from own resources, most of the developed countries have developed an agriculture which fully uses the agricultural potential, even if it does not cover the whole food demand;
2. the uncovered part is insured from importation, these countries having the capacity to pay so that they manage in a high percentage to insure the food safety.

*The food safety in the developing countries is presented as follows:*

- the internal potential is insufficiently valuated and is characterized by low productivity and performance which lead to the incapacity to satisfy the internal food demand;
- the possibility to import is limited due to the incapacity to pay which leads to the incapacity to insure food safety.

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# CERCETĂRI TEORETICE PRIVIND PROCESUL TEHNOLOGIC DE LUCRU AL MAȘINILOR PENTRU TOCAREA RESTURILOR VEGETALE

## THEORETICAL RESEARCHES ON THE WORKING PROCESS OF VEGETAL DEBRIS CHOPPING

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keywords: chopping, vegetal debris, roller, rotary, knives

### ABSTRACT

*Tocarea masei vegetale agricole rămasă după recoltarea produselor principale, precum și distrugerea vegetației spontane de pe terenurile cultivabile sau necultivate, reprezintă un segment important în procesul tehnologic de înființare a culturilor agricole.*

*Lucrarea prezintă sintetizat principalele cercetări teoretice privind procesul tehnologic de lucru al mașinilor pentru tocarea resturilor vegetale.*

*Abstract*

*The chopping of the vegetal debris that remains after the harvesting of the main crop as well as the destroying of the spontaneous vegetation on the cropped and not cropped land is an important segment of the technological process of the field crops.*

*The paper presents the main theoretical researches on the technological working process for chopping the vegetal debris.*

### INTRODUCTION

The main goal of chopping and even dispersal of the vegetal debris is the creating of proper conditions for their burying by plowing and ensuring the good productivity of the machinery. By plowing, the vegetal debris are chopped and incorporated into the soil and by decaying they contribute to the increasing of the organic matter content of the soil.

The using domain of the chopping machines includes the straw cutting, corn stalks, sunflower stems or castor plant, soybean, vegetal crops that remain after the main crop is harvested. Also, they are used to chop the potato stems, herbs and spontaneous vegetation that grow in the field crops.

### MATERIAL AND METHOD

Generally, a chopping machine is composed by a frame that is equipped with a pulling mechanism, wheels, cover, disposing pipe and rotary that is the active part of the machine.

There are known several types of rotary for vegetal debris chopping.

Rotary chopping machines. In the figure 1 there is shown the chopping machine with rotary that is formed by an ax 1 on which, by means of disks 2 there are mounted the knives 3. The knives can have horizontal or vertical sharpness. With the wide machines the cutting table is wider. The counter part is made by a bar with 2-4 sharp edges.

The length of the chopped parts is:

$$l_t = v_t = v \cdot \frac{2\pi}{z\omega} = \frac{60v}{Zn} \text{ [m]} \quad (1)$$

where:  $V$  is the speed of the machinery (the speed of supplying of the rotary [m/s]);  $z$  is the number of the knives on the rotary;  $n$  is the rotational speed of the rotary [rot/min]. In order to ensure a functioning without shocks there is need that the knives on the rotary to be at the end of the supplying door, the following knife to begin the chopping process (fig. 2).

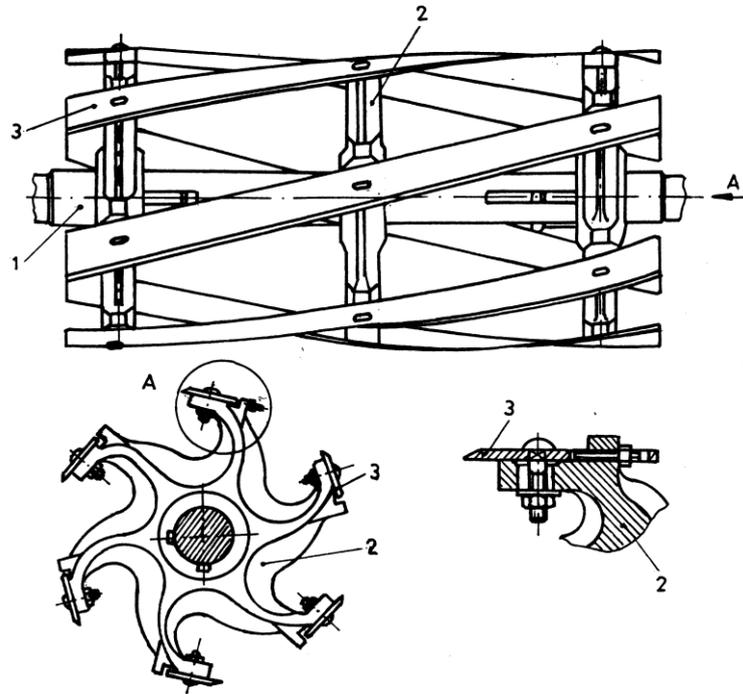


Fig. 1 Rotary chopping device

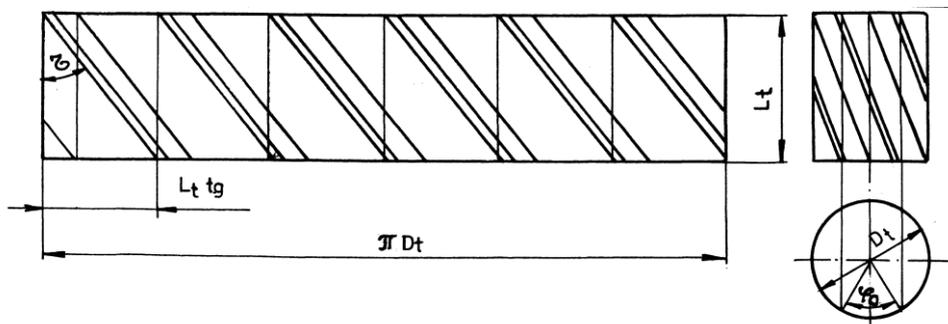


Fig. 2 The repartition of the knives on the rotary

In this way, the momentum that is applied to the chopping device is approximately constant, so the angular speed of the rotary is constant not influencing its equilibrium. Yet, there can be supposed that the construction of the rotary it can reach its equilibrium. Finding such an equilibrium depends on its length,  $L_t$ . So, from the figure 2 there results:

$$\pi D_t = Z L_t t g \zeta = \frac{\rho_0}{2} D_t; L_t = \frac{\rho_0 D_t}{2 Z t g \zeta} \quad (2)$$

From experience there can be known that the proper functioning of the rotary is achieved with the  $L_t=0,3 - 0,8$  m. For more length the machinery must have more sections. Chopping machinery with the knives mounted on a rotary

This kind of machinery is formed by an ax that on which the knives are mounted. The location of the knives on the rotary is like an helix (fig. 3), every knife having its own plan and between them a coverage of  $Ab=7-25$  mm.

These devices are adequate for chopping the vegetal mass and the throwing the material on the soil or in trucks.

During the movement of the machinery (fig. 4), the knives are spinning with high speeds ( $V_p= 30-50$  m/s) and as the machinery advances with the speed  $V_m$  the cutting process take place. The chopping of the material is made with the absolute speed  $V_a=V_m+V_p$ , that is maximal at the bottom of the curve that is described by the knife.

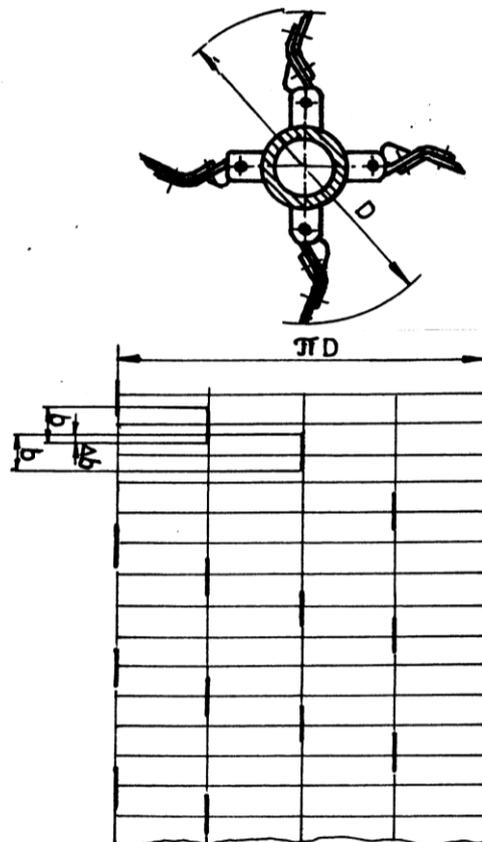


Fig. 3 Articulated chopping machine

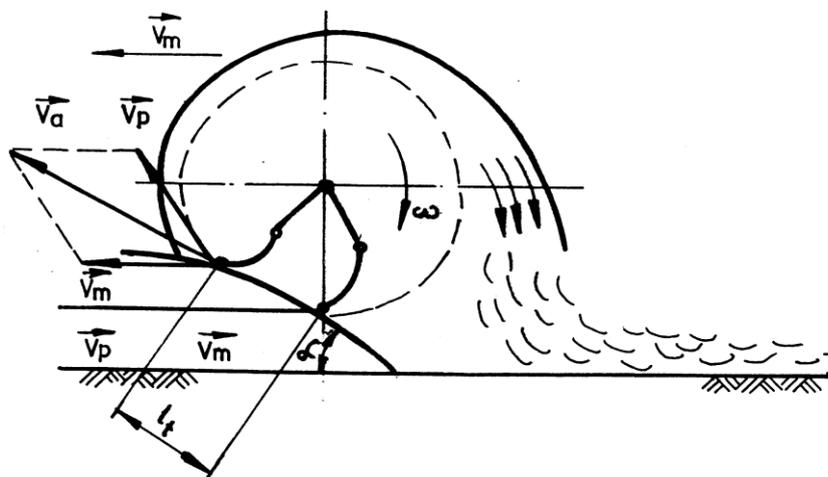


Fig. 4 The functional sketch of the articulated chopping machine

The space run by the machine with a full rotation is:

$$s = v_m \cdot t = \frac{60v_m}{n} \quad (3)$$

The length of the chopped part can be determined with the following formula:

$$l_t \cos\alpha = s = \frac{60v_m}{n} \text{ or}$$
$$l_t = \frac{60 \cdot 10^3 v_m}{n \cos\alpha} \text{ [mm]} \quad (4)$$

where:  $n$  is the rotary spinning speed rot/min;  $\alpha$  is the declination angle of the plant when cut.

## CONCLUSIONS

- The chopping machines with articulated devices are more efficient regarding the working process in comparison with the rotary ones. Yet, due to the construction features of the working devices that differently worked out, the mechanical momentum is different. So, during the working process there appear forces that conduct to a noisy functioning of the machine. Also, due to the radial disposition of the knives, there appear interactions that determine percussions that influence the dynamics of the rotary.

- Analyzing the interaction between the rotary-knives, and the vegetal mass, they describe an open system which means that the system exchange matter with the exterior. During the chopping process, a part of the vegetal mass will become a part of the rotary (of the system) and, reversely, after chopping, the vegetal mass will become a component of the exterior as a chopped mass. So, the matter enters on one side and exit on other side as chopped mass. Regarding the interaction rotary-knives-vegetal mass the study of the rotary conducts to the dynamics of the material systems with variable mass.

- The tendency of the research in this domain so far have imposed the approaching of a theoretical study that show that the statical and dynamical equilibrium of the rotary is paramount for ensuring a proper functioning of the machine, without shocks. One of the practical measures is the even repartition of the knives on the rotary so, the momentum to the chopping device will be constant with no influence on its equilibrium.

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# STUDIUL PRIVIND DOMENIILE OCUPAȚIONALE ÎN COMUNA ALMĂJ, JUDEȚUL DOLJ

## STUDY CONCERNING ACTIVITY DOMAINS IN ALMAJ VILLAGE, DOLJ COUNTY

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**Key words:** activity domain, structure, activity sector, agriculture, public administration, health

### **ABSTRACT**

*Lucrarea face referire la domeniile ocupaționale întâlnite la nivelul comunei Almăj, județul Dolj. Se urmărește precizarea populației ocupate pe domenii de activitate și sublinierea modului de evoluție a acestora, în timp, pentru perioada 2004-2006.*

*The paper takes in consideration the activity domains meet at the level of Almaj Village, Dolj County. It's followed the number of engaged population by activity domain and the evolution way of it during 2004-2006 period.*

### **MATERIAL AND METHOD**

For the paper writing it was took in consideration the field documentation and statistical consulting of data. So, several sources of data was called – notices of data, primary report of statistical data, statistical bulletin and breviary.

The research method used is represented by time comparison, based on the fixed base and mobile base index.

### **RESULTS AND DISCUSSIONS**

Almaj Village is situated on the Jiu river left side, in north part of the Dolj County at 18 km distance of Craiova – residence city – at 25 km from Filiași city and 2500 meters beside DE 70 Craiova – Timișoara.

Almaj Village limits are, in north Brădești village, at east Goești village, at south Ișalnița village and at west, beyond Jiu river Coțofenii din Dos Village. All administrative territory of the village is framed in Olteț platform, which is the south subunit of getic plateau. The high plane with large and smooth back, the rivers valley which have wide corridors and places favorable or inhabiting hold dominion over the relief.

The commune name came from the word „alma” (apple) or „almas” (apple orchard) according to Hungarian toponymy. It's maintained even now a spot on village map which the inhabitants called „merărie”.

For underlining the essential aspects concerning occupational domains meet at the level of Almăj Commune the different occupations was classified by activities like: I agriculture-silviculture; II industry; III goods circulation; IV culture-education; V health; VI public administration; VII other branches.

We notice from the beginning that in industrial domain was add persons who work in this environment but not necessarily to economical agents which function in the village.

Table 1 show the number of persons occupied – by activity domains – at the level of Almăj Village, for the analyzed period and table number 2 shows the dynamics of index.

**OCCUPIED POPULATION BY ACTIVITY DOMAIN  
ALMÄJ COMMUNE – DOLJ COUNTY  
2004 – 2006**

**Table 1.**

Crt. no.	Year	Total inhabitants number	Occupy populatin		Activity domain													
					I		II		III		IV		V		VI		VII	
			Eff.	% from total	Eff.	% from total	Eff.	% from total	Eff.	% from total	Eff.	% from total	Eff.	% from total	Eff.	% from total	Eff.	% from total
1	2004	2211	1041	47,08	793	76,18	187	17,97	9	0,86	27	2,59	6	0,58	10	0,96	9	0,86
2	2005	2195	1030	46,92	779	75,62	189	18,35	10	0,97	21	2,04	8	0,78	12	1,17	11	1,07
3	2006	2074	1020	49,18	770	75,49	185	18,14	11	1,08	21	2,06	8	0,78	12	1,18	13	1,27
4	Media 2004 – 2006	2160	1030	47,68	781	75,83	187	18,15	10	0,97	23	2,23	7	0,68	11	1,07	11	1,07

**OCCUPIED POPULATION DYNAMICS BY ACTIVITY DOMAINS  
ALMÄJ COMMUNE – DOLJ COUNTY  
2004 – 2006**

**Table 2.**

Crt. no.	ACTIVITY DOMAIN	Y E A R						AVERAGE 2004-2006	
		2004		2005		2006		lbf	lbn
		lbf	lbn	lbf	lbn	lbf	lbn		
1	I	100	100	98,23	98,23	97,09	98,84	98,49	101,43
2	II	100	100	101,07	101,07	98,93	97,88	100,0	101,08
3	III	100	100	111,11	111,11	122,22	110,0	111,11	90,91
4	IV	100	100	77,78	77,78	77,78	100,0	85,19	109,52
5	V	100	100	133,33	133,33	133,33	100,0	116,66	87,50
6	VI	100	100	120,0	120,0	120,0	100,0	110,0	91,66
7	VII	100	100	122,22	122,22	144,44	118,18	122,22	84,61
8	TOTAL	100	100	98,94	98,94	97,98	99,03	98,94	100,98

I – AGRICULTURE, II – INDUSTRY, III – GOODS TURNOVER, IV – EDUCATION – CULTURE, V – HEALTH, VI – PUBLIC ADMINISTRATION, VII – OTHER BRANCHES

In year, from a total number of 2211 inhabitants of Almăj Commune, 1041 persons was state as active (47,08 % from total), which by activity domains hold weights – in total active population – of: 76,18 % agriculture – 793 persons; 17,97 % industry – 187 persons; 2,59 % education – 27 persons; 0,96 % public administrations – 10 persons; 0,86 % for goods circulation and other branches – 9 persons; 0,58 % health – 6 persons.

For the year total active persons represented 46,92 % from total population – 1030 persons, by activity domain being: 779 persons in agriculture – 75,62 %; 189 persons in industry – 18,35 %; 21 persons in education – 2,04 %; 12 persons in public administration – 1,17 %; 11 persons in other branches – 1,07 %; 10 persons in goods turnover – 0,97 %; 8 persons in health – 0,78 % from total occupied population.

At the level of 2006 year, for Almăj Commune, was recorded a total number of 1020 active persons, from which, as percentage - by activity domain – was recorded weights of: 75,49 % for agricultural sector – 770 persons; 18,14 % for industry – 185 persons; 2,06 % in education case – 21 persons; 1,27 % at the other activity branches level – 13 persons; 1,18 % for public administration – 12 persons; 1,08 % for goods turnover – 11 persons; 0,78 % for health – 8 persons. An analyze based on previous presented data concerning the average of the period, shows that from a total of 2160 inhabitants, the occupied populations represented 47,68 %, and by activity domains the repartition of the 1030 active persons was (figure 1): 781 persons in agricultural domain – 75,83 %; 187 persons in industrial sector of production – 18,15 %; 23 persons in education and culture – 2,23 %; 11 persons for public administration and other branches of activity – 1,07 %; 10 persons at the goods turnover level – 0,97 %; 7 persons in health domain – 0,68 % from total.

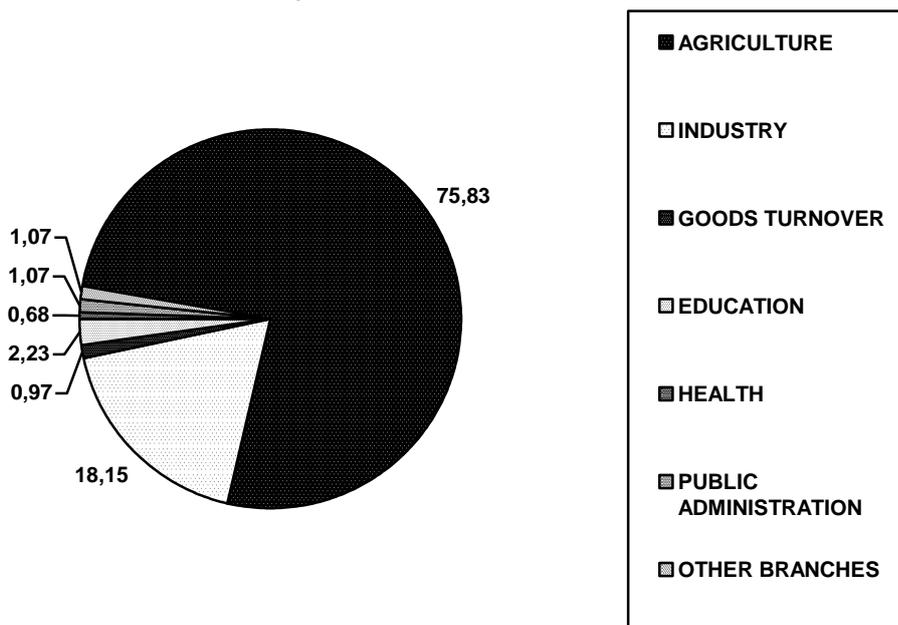


Figure 1. Occupied population structure - average 2004-2006

Occupied population dynamics – on activity domains – distinguish the following aspects:

- for agriculture it is observe a descending evolution of workers number, the recorded decrease – beside report bases - being: 1,77 % in year 2005, 2,91 and 1,16 % in 2006 and 1,51 % for period average (beside 2004). The only supra unitary value from dynamics is the one recorded for the mobile base index in case of period average – 101,43 %;

- for industrial production sector, workers number vary irregular in time, the increase from 2005 (+1,07 %), being followed by the decreasing at the level of 2006 year (-1,07 and -2,12 %). Period average is equal whit those recorded in 2004 year and supra unitary beside 2006 year – 101,08 %;

- if we take in consideration the situation from commercial sector, it's observe an ascending evolution in time for the index, the increasing being of 11,11 % in year 2005, 22,22 and 10,0 % in 2006, 11,11 % for period average – beside 2004. The dynamics is sub unitary only for the period average comparing with the year 2006 – 90,91 %;

- people number from education and culture was decreasing in 2005 year beside 2004 with 22,22 %,ant after that it was stable at the level of 2006 year – equal value for mobile based index. Average of the period is lower beside 2004 with 14,81 %, but outruns the level from 2006 with 9,52 %;

- health care is characterized through an increase of personal number in year 2005 beside 2004 - +33,33 %, followed by an standardize in 2006. For period average, fixed based index was supra unitary - 116,66 %, and those with mobile base was sub unitary - 87,50 %;

- public administration sector records an increase of workers number in 2005 beside 2004 with (+20 %), followed in 2006 by a flatten situation. Period average outrun the 2004 year with 10,0 %, but is lower than 2006 with 8,34 %;

- for other branches of activity, personal number evolves only ascending in time, annual successive increasing being 22,22 % in 2005 and 18,18 % in year 2006. For period average it was recorded values supra unitary in – beside 2004 – 122,22 %, and sub unitary values as well – beside 2006 year – 84,61 %;

- if we consider the general situation of occupied person number, we could see the descending evolution of workers number, the decreasing being of 1,06 % in year 2005, 2,02 and 0,97 % in 2006 and 1,06 % for period average beside 2004 year (the only supra unitary value was 100,98 % for mobile base index in period average case).

## **CONCLUSIONS**

1. At the occupation domain level recorded in Almaj Commune, agriculture is predominant – 75,83 % from total, followed at long distance by industrial production sector – 18,15 %, and ( with small weights) education, public administration, other brances of activity, goods turnover – 2,23, 1,07, 1,07 and respective 0,97 % -, the last place being occupied by health with a weight of only 0,68 % from total occupied population.

2. Under time evolution report of workers number, on activity domain, it is recorded different tendencies. So, for agriculture the workers number decrease with 12 persons, the industry know a constant for the index, education decrease and than the effectives was stabilized, health and public administration are increasing it's number of workers, an ascendant evolution being recorded only for other branches of activity. In this conditions the general trend is descending, affected by the evolution of the first sector of activity - agriculture.

3. As a result of the presented situation at the level of Almăj Commune shown as necessary measures of developing of services sector, the new dimension of agricultural activities – with an accent on specific services for this sector of activity, the reconsider of traditional occupations, the renewing of public administration sector an health care one.

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# STRUCTURA PRODUCȚIEI DE PRUNE ÎN REGIUNEA DE DEZVOLTARE NORD VEST

## PLUMS PRODUCTION STRUCTURE IN NORTH WEST DEVELOPING AREA

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**Key words:** production, structure, plums, area, weight

### **ABSTRACT**

*Lucrarea face referire la structura producției de prune, în cazul Regiunii de dezvoltare Nord – Vest, prezentând ponderea deținută la nivel regional de către fiecare județ component: Bistrița – Năsăud, Bihor, Cluj, Maramureș, Satu – Mare, Sălaj (perioada 2004-2006). În elaborarea lucrării autorii au ținut cont de faptul că Regiunea deține 17,49 % din producția totală de fructe a României și 13,73 % din producția națională de prune (media perioadei analizate).*

*The paper work take in consideration the plums production structure in North West developing area, showing the weight hold at regional level by every county: Bistrița – Năsăud, Bihor, Cluj, Maramureș, Satu – Mare, Sălaj (2004-2006 period). In paper elaboration the author regard the fact that the region hold 17,49 % from total Romanian fruits production and 13,73 % from national plums production (average of the analyzed period).*

### **MATERIAL AND METHOD**

This works take in consideration statistical data and documentation, so several data sources was used – reports, bulletins, breviary and statistical annuals.

The research method used is represented by time comparison, based on the fixed base and mobile base index.

### **RESULTS AND DISIONSIONS**

In table 1 and 2 is presented the structure of regional plums production from 2004 to 2008, and the data concerning the weights hold from national level and the contribution of the species in total fruits production of the region.

Bihor County was recorded a period average of 14345,33 tones participate in area structure with a weight of 18,04 %, which represented 2,48 % from national plums production and 5,04 % from total production recorded in North – West region. In analyzed period, the county was known values for total plumes production of 15429 tones in year 2004 (20,60 % from area total production, 2,99 % from national plumes production and 4,64 % from total fruits production of the region), 16908 tones in year 2005 (representing 22,35 % from total of the area, 2,72 % from national production level and 7,19 % from plums regional production) and a value of 10699 tones plums at 2006 year level (12,16 % from zone total, 1,78 % from plums national level and 3,99 % from regional fruits production).

**REGIUNEA NORD VEST  
 PRODUCȚIA DE PRUNE - STRUCTURA JUDEȚEANĂ  
 2004-2006**

Tabelul 1

Nr crt	JUDEȚUL	ANUL												MEDIA 2004-2006			
		2004				2005				2006							
		tone	Struct.%	% din prod națională de prune	% din prod. totală reg. de fructe	tone	Struct.%	% din prod națională de prune	% din prod. totală reg. de fructe	tone	Struct.%	% din prod națională de prune	% din prod. totală reg. de fructe	tone	Struct.%	% din prod națională de prune	% din prod. totală reg. de fructe
1	BIHOR	15429	20,60	2,99	4,64	16908	22,35	2,72	7,19	10699	12,16	1,78	3,99	14345,33	18,04	2,48	5,04
2	BISTRITA NĂȘĂUD	3085	4,12	0,59	0,93	12362	16,35	1,98	5,25	12336	14,03	2,06	4,60	9261	11,66	1,60	3,25
3	CLUJ	21520	28,75	4,17	6,48	9816	12,97	1,58	4,17	10860	12,35	1,81	4,05	14065,33	17,69	2,43	4,94
4	MARAMUREȘ	3827	5,11	0,74	1,15	15951	21,08	2,56	6,29	11614	13,21	1,94	4,33	10464	13,16	1,81	3,68
5	SATU MARE	20830	27,81	4,03	6,27	10504	13,88	1,69	4,15	15302	17,40	5,71	5,71	15545,33	19,56	2,68	5,46
6	SĂLAJ	10195	13,61	1,98	3,07	10115	13,37	1,62	3,99	27131	30,85	4,53	10,13	15813,67	19,89	2,73	5,56
7	TOTAL	74886	100	-	-	75656	100	-	-	87942	100	-	-	79494,66	100	-	-

**REGIUNEA NORD VEST  
 DINAMICA PRODUCȚIEI DE PRUNE  
 2004-2006**

Tabelul 2

Nr. crt.	JUDEȚUL	ANUL									MEDIA 2004-2006		
		2004			2005			2006			Tone Total	I <sub>bf</sub>	I <sub>bm</sub>
		Tone Total	I <sub>bf</sub>	I <sub>bm</sub>	Tone Total	I <sub>bf</sub>	I <sub>bm</sub>	Tone Total	I <sub>bf</sub>	I <sub>bm</sub>			
1	BIHOR	15429	100	100	16908	109,58	109,58	10699	63,34	63,28	14345,33	92,98	134,08
2	BISTRITA NĂȘĂUD	3085	100	100	12362	4,0 ori	4,0 ori	12336	3,9	99,78	9261	3,0 ori	75,07
3	CLUJ	21520	100	100	9816	45,61	45,61	10860	50,46	110,63	14065,33	65,36	129,51
4	MARAMUREȘ	3827	100	100	15951	4,1ori	4,1ori	11614	3,0 ori	72,81	10464	2,7 ori	90,10
5	SATU MARE	20830	100	100	10504	50,43	50,43	15302	73,46	145,68	15545,33	74,63	101,59
6	SĂLAJ	10195	100	100	10115	99,21	99,21	27131	2,6 ori	2,6 ori	15813,67	155,11	58,29
7	TOTAL	74886	100	100	75656	101,03	101,03	87942	117,43	116,24	79494,66	106,15	90,39

Bistrița Năsăud County, was known an increase of plums production from a level of 3085 tones recorded in 2004 year (4,12 % from area total, 0,59 % from national level and 0,93 % from regional fruits production) to 12362 tones in year 2005 (registering the county with a weight of 16,35 % from region total, 1,98 % from national plums production and 5,25 % from total fruits of the region) reaching a level of 12336 tones at 2006 year level (14,03 % from total, 2,06 % from national plums production and 4,60 % from the regional fruits). So the county average recorded was 9261 tones.

Plums production at the Cluj County level in analyzed period was situated on a sinuous curve, recording a decrease from a value of 21520 tones in 2004 year (28,75 % from zone total, 4,17 % from national plums production and 6,48 % from regional fruits production) to 9816 tones in year 2005 (12,97 % from total, 1,58 % from national and 4,17 % from regional production) followed by an increase, recording a level of 10860 tones in year 2006 (which represent 12,35 % from area total, 1,81 % from national plums production and 4,05 % from fruits regional production).

In Maramureș County, plums average production recorded in analyzed period was 10464 tones (13,16 % from total regional level, 1,81 % from national plums production and 3,68 % from regional fruits production), average constituted from production level of 15951 tones in year 2005 (21,08 % from total, 2,56 % from national level and 6,29 % from fruits regional level), 11614 tone in year 2006 (13,21 % from total, 1,94 % from national plums recorded level 4,33 % from fruits of the region) and only 3827 tones in year 2004 (5,11 % from total regional production, 0,74 % from national plumes production 1,15 % from total fruits of the region).

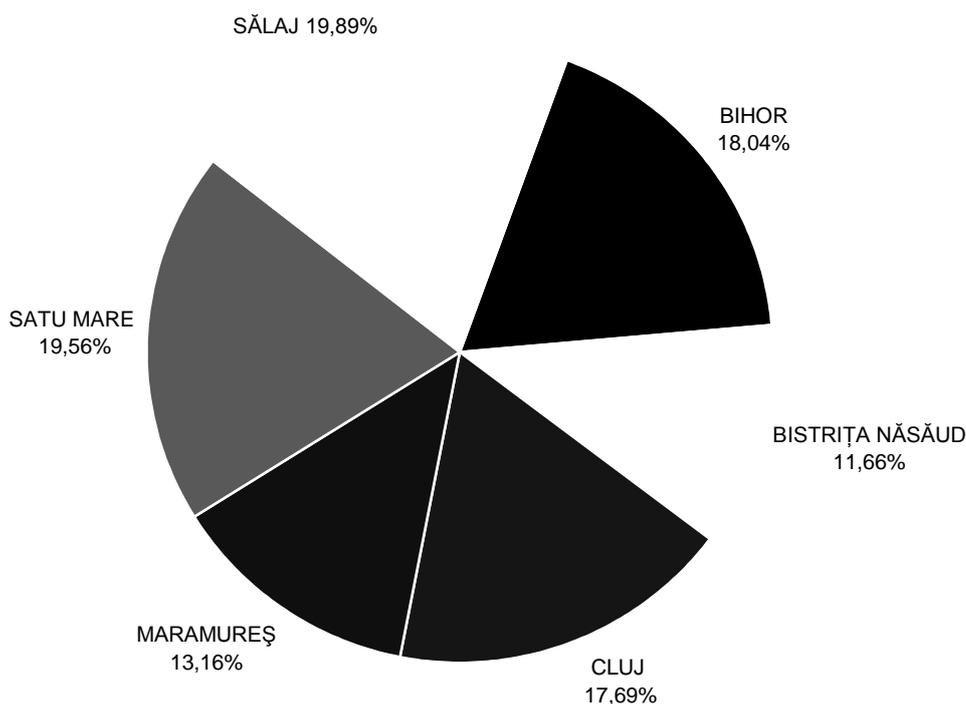
Satu Mare County recorded a maximum production in 2004 year, when the level was 20830 tones of plums (which represent 27,81 % and 4,03 % from area and national plums and 3,27 % from total regional fruits), next year the production decrease at half – 10504 tones (represented 13,88 and 1,69 % from total regional production and national of plums and 4,15 % from total fruits production of the region) followed by an increase up to a level for 2006 year of 15302 tones (17,40 and 5,71 % from regional level and national of plums and 5,71 % from total fruits of the region). Period average was 15545,33 tones plums, which put the county at a level of 19,56 % from total of region and 2,68 % from national plums and 5,46 % from fruit production of the region.

Referring to Sălaj County, we could observe production levels recorded in years 2004 and 2005 – 10195 tones (13,61 % from regional plums production, 1,98 % from national production and 3,07 % from total fruits of the region) and respective 10115 tones (13,37 % from zone total, 1,62 % from national production of plums and 3,99 % from regional fruits production) and a value almost double of production in year 2006 – 27131 tones, the county holding 30,85 % and 4,53 % from regional and national level of plums production and 10,13 % from total fruits production of the region. Period average reach in Sălaj County case a limit of 15813,67 tones, value wherewith the participation share in regional production structure for plums is 19,89 %.

At regional level, the production structure for plums (period average) is presented in figure 1.

Concerning the production dynamics from North – West region, from 2004 to 2006, we could appreciate:

- in year 2005, the biggest values was recorded in Maramureș and Bistrița Năsăud counties, where reporting bases was outruns fro fixed and mobile base index of 4,16 and respective 4 times, supra unitary values being recorded also for Bihor County – 109,58 % (+9,58%) and Sălaj County – 101,03 % (+1,03%). The others counties for the region known sub unitary values in dynamics: 45,61 % for Cluj County (-54,39%), 50,43 % in Satu Mare County (-49,59%), and 99,21 % (-0,79%) Sălaj County.

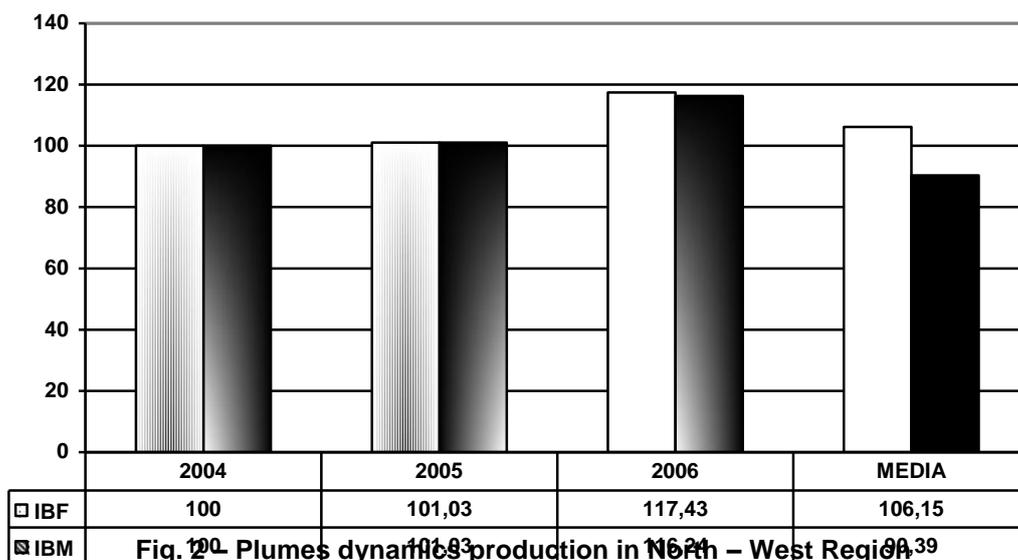


**Fig. 1 - Structura producției de prune – media perioadei  
– Regiunea Nord - Vest**

- for year 2006, fixed base index outruns the reporting base levels by 3,9 times for Bistrița Năsăud County, by 3 times for Maramureș County, by 2,6 times at Sălaj County level an known sub unitary values for Bihor County -30,66 % (69,34 %), Cluj County - 49,54 % (50,46%), and Maramureș County, where recorded value for index was 73,46 % (-26,54%). Regional dynamics situation fro mobile base index at 2006 year level, divide the counties equal: 3 counties outruns the level of reporting bases with 10,63 % for Cluj County (110,63 %), 45,68 % for Satu Mare (145,68 %) and by 2,6 times for Sălaj and three counties had a index level situated under the one recorded for report bases: 63,28 % in Bihor County case (-36,72%), 72,81 % for Maramureș County (-27,19%) and 99,78 % for Bistrița Năsăud County (-0,22 %).

- medium production dynamics knows for fixed base index outruns of report bases by 3 times for Bistrița Năsăud, 2,7 times for Maramureș County and a level of 155,11 % (+55,11 % ) recorded for Sălaj County, also sub unitary levels in Cluj County case 65,36 % (-34,64 %), Satu Mare 74,63 % (-25,37 %) and Bihor 92,98 % (-7,02 %). For mobile based index, the counties have sub unitary values in dynamics – Bistrița Năsăud, Maramureș and Sălaj – of 75,07 % (-24,93 %), 90,10 % (-10,9 %) and respective 58,29 % (-41,71 %) but also values which outruns the report bases – counties Bihor, Cluj and Satu Mare – 134,08 % (+34,08 %), 129,51 % (+29,51 %) and respective 101,59 % (+1,59 %).

Figure 2 show the time evolution for plums production index during analyzed period.



### CONCLUSIONS

1. Concerning the North – West Region plums production, we could see that a total which vary from 74866 tones in 2004 year, to 75656 tones in 2005, and at 2006 year level, the production was 87942 tones, which leads to a period average of 79494,66 tones.

2. From component counties for the region, the most important weights are hold in 2004 year by Cluj county which recorded 28,75 % from total, followed close by Satu Mare with a value of 27,81 % and Bihor with 20,60 %, the rest of the counties recording smaller weights. For the following years it's observe some changes in production repatriation like: in 2005, the biggest weight was holded by Bihor county – 22,35 %, followed by Maramureş county with 21,08 %, and 2006 Sălaj county holding 30 % from total region production (30,85%).

3. It is notice the fact that, at period average level the county plums production are balanced, with values situated between 11,66 % for Bistriţa Năsăud county and 19,89 % for Sălaj, we could appreciate that territorial repartition of plum plantation from region North – West is well balanced.

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# ASPECTE PRIVIND EVOLUȚIA OFERTEI DE LEGUME ÎN ROMÂNIA ÎN PERIOADA 2001 – 2006

## ASPECTS REGARDING THE EVOLUTION OF VEGETABLE MARKET IN ROMANIA, DURING 2001-2006

*Elena Peș, Corina Rușeț, Anda Milin*

**Key words:** supply, cultivated area, mean yield, total yield

### **ABSTRACT**

*Prin dimensiunile sale economice și sociale și prin funcțiile sale ecologice, sectorul horticol constituie o importantă avuție națională a României. Sub aspect economic, sectorul horticol reprezintă o importantă sursă de venituri pentru bugetul statului și oferă posibilitatea completării rezervelor valutare ale țării prin intermediul activităților de export. El oferă pe de altă parte materia primă necesară dezvoltării unei activități de prelucrare și valorificare ce poate fi realizată în unități mici și mijlocii, ușor de integrat în comunitățile rurale.*

*Due to its economic and social dimensions and to its ecologic functions, the vegetable-growing sector represents an important national wealth in Romania. From an economic viewpoint, it represents an important source of incomes for the state budget and offers the possibility to complete the currency reserves of our country, through export activities. On the other hand, this sector provides the raw matter necessary for the development of the processing and capitalization activities, which could be performed in small and middle units that can be easily integrated in the rural communities.*

### **INTRODUCTION**

In Romania, there are very favorable agri-pedo-climatic conditions for legumiculture development, for the increase of its participation to the creation of national wealth, for the satisfaction of population's requirements for vital food and for export increase.

### **METHODOLOGY OF RESEARCH RESULTS AND DISCUSSIONS**

The vegetable supply, in terms of volume and structure, must be concordant especially with the Romanian consumers' demand. The vegetable supply of our country is determined by the area cultivated with vegetables and by the mean yields/hectare.

The evolution of the areas cultivated with vegetables, main crops, during 2001-2006 is presented in table 1.

The analysis of the data recorded in this table reveals the following aspects:

- the area cultivated in Romania has been reduced during the analyzed period with 1021.0 thousand ha, representing a 12% reduction. The year 2006 represents the year with the smallest surface cultivated – 7884.0 thousand ha. The percentage of private sector in the total area cultivated increased from 91.0%, in 2001, to 97.8%, in 2006;

- the area cultivated with vegetables increased from 269.9 thousand ha, in 2001, to 280.1 thousand ha, in 2006. The biggest area cultivated with vegetables, 308.2 thousand ha, was recorded in 2004. The areas cultivated in the private sector developed from 262.5 thousand ha, in 2001, to 280.1 thousand ha, in 2006, meaning a 103% growth. Under such conditions, the private vegetable sector attained the percentage of 98.3% in 2006;

- regarding tomatoes as main vegetable crop, they represent a percentage of 18.10% in the entire area cultivated with vegetables in 2006. The areas cultivated

remained relatively constant, because tomatoes have been and they still are the most required vegetables. The private sector represented, in 2004, 97.4%;

- regarding onion, we may notice a reduction of the area cultivated. If in 2002 the area cultivated with onion was 38.0 thousand ha, in 2006 it was 33.8 thousand ha. The percentage representing the private sector in the case of onion is 98%;

- we may notice a reduction of the area cultivated with garlic from 14.7 thousand ha in 2001 to 13.1 thousand ha in 2006. The biggest area cultivated with garlic was recorded in 2002 – 15.0 thousand ha. The private sector represents 100% of the area cultivated with garlic;

**Table 1**

**Evolution of areas cultivated with vegetables – main crops, during 2001-2006**

- thousand ha -

	Specification	Years						Differences % 2006- 2001
		2001	2002	2003	2004	2005	2006	
1	Total area cultivated, of which:	8905.0	9001.6	8880.6	8527.8	8467.9	7884.0	-11.47
	in private sector	8109.4	8607.9	8640.7	8208.6	8267.7	7716.6	-4.84
	% of total	91.0	95.6	97.2	96.25	97.6	97.8	7.47
2	Area cultivated with vegetables	269.9	282.0	286.9	308.2	266.7	280.1	3.78
	in private sector	262.5	278.9	284.7	305.9	257.5	275.4	4.91
	% of total vegetables	97.2	98.9	99.2	99.0	96.5	98.3	1.13
3	Tomatoes, of which:	46.1	48.4	49.5	58.5	47.1	50.7	9.98
	in private sector	44.8	48.0	49.1	58.3	45.9	49.4	10.27
4	Onion, of which:	37.1	38.0	36.9	28.3	35.7	33.8	-8.89
	in private sector	36.4	37.7	36.7	27.8	34.6	33.4	-8.24
5	Garlic, of which:	14.7	15.0	14.8	8.7	12.4	13.1	-10.88
	in private sector	14.6	15.0	14.8	8.7	11.6	13.1	-10.27
6	Cabbage, of which:	39.9	40.5	42.2	42.1	54.8	45.7	14.54
	in private sector	39.4	40.2	42.0	41.8	53.4	44.6	13.20
7	Pepper, of which:	17.9	19.2	20.0	18.1	19.0	23.0	28.49
	in private sector	17.7	19.2	20.0	18.0	18.7	22.5	27.12
8	Water and sweet melons, of which:	38.9	43.8	42.2	37.8	37.2	34.7	-10.80
	in private sector	37.5	42.6	42.0	37.6	36.6	34.6	-7.73

Source: Statistical Annuary of Romania, 2007

- cabbage records, during the period studied, an increase of the area cultivated from 39.9 thousand ha to 45.7 thousand ha. The biggest area cultivated with cabbage, 54.8 thousand ha, was recorded in 2005. The private sector represents 97.5% of the total area cultivated;

- in the case of pepper, although the production technology is more difficult, we may notice an increase of the areas cultivated. In 2001, the area cultivated with pepper was 17.9 thousand ha, and it turned to 23.0 thousand ha in 2006. In the case of this crop, too, the biggest percentage belongs to the private sector, with 98.0% of the total area cultivated with pepper;

- regarding water and sweet melons, after a slight increase of the areas cultivated (in 2002, 2003), we may observe a reduction, so that in 2006 the areas cultivated represented 34.7 thousand ha.

The evolution of the mean yields per hectare in the main vegetable crops is presented in table 2.

Table 2

## Evolution of mean yields in main vegetable crops, during the period 2001-2006

- kg/ha -

	Specification	Years						Differences % 2006- 2001
		2001	2002	2003	2004	2005	2006	
1	Tomatoes	14141	13599	16535	22743	13302	16468	16.46
	in private sector	13950	13501	16422	22634	13297	16559	18.70
2	Onion	10686	8979	9495	11771	10198	11554	8.12
	in private sector	10674	8982	9501	11724	10189	11572	8.41
3	Garlic	5658	4824	5172	7532	5506	4893	-13.52
	in private sector	5661	4824	5172	7531	5456	4892	-13.58
4	Cabbage	20550	20303	24130	21831	18406	24227	17.89
	in private sector	20597	20320	24177	21852	18577	24271	17.84
5	Pepper	10318	10264	12426	13106	10736	12135	17.61
	in private sector	10317	10271	12448	13102	10666	12200	18.25
6	Water and sweet melons	14150	14870	18120	20240	18602	18519	30.88
	in private sector	14470	15230	18150	20290	18748	18524	28.02

Source: Statistical Annuary of Romania, 2007

From the data recorded in this table, we concluded the following characteristics:

- mean yield/ha in tomatoes increased from 14,141 kg/ha in 2001 to 16,468 kg/ha in 2006, respectively with 16.46%. The biggest mean yield/ha was recorded in 2004, 22.743 kg/ha. In the private sector, the mean yields/ha oscillated between 13.297 kg/ha (2005) and 22.634 kg/ha, in 2004;

- in onion, we may notice a mean yield decrease to 8979 kg/ha in 2002; after that, the yield started to increase, attaining in 2006 the value of 11,554 kg/ha;

- in garlic, mean yields/ha oscillated between 4828 kg/ha in 2002 and 7531 kg/ha in 2004;

- regarding cabbage, we have the biggest yields/ha of all crops studied, attaining, in 2006, a mean yield of 24,227 kg/ha;

- in pepper crop, the mean yields/ha increased from 10,264 kg/ha to 13,106 kg/ha. During the period studied, the mean yield increased with 17.61%;

- mean yields/ha of water and sweet melons increased from 14,150 kg/ha in 2001 to 18,519 kg/ha in 2006, respectively with 30.88%. The biggest mean yield was recorded in 2004, 20,240 kg/ha.

The internal vegetable production represents the main component of the vegetable supply in a country, aiming at the satisfying of the internal demand; it is presented per total vegetables and structured into the main component products, in concordance with table 3.

According to the data recorded in this table, we may conclude the following:

- the total vegetable yield in Romania has had, during the period analyzed (2001-2006), relatively significant fluctuations, beginning with an increase of up to 4773.9 thousand tones in 2004, followed by a decrease to 3624.6 thousand tones in 2005, and then by an increase of up to 4138.9 thousand tones in 2006. During the period studied, the total vegetable yield increased with 7.55%.

The biggest vegetable yield was obtained in the private sector, 98.4% in 2004.

The tomatoes remain the vegetable have represented the biggest percentage in the total production, attaining, in 2006, 20.17%.

The total tomato yield oscillated, during the period studied, between 627.0 thousand tones and 1330.1 thousand tones. Onion recorded a slight reduction during the period analyzed, and garlic as well. The internal cabbage production increased with 286 thousand tones in 2006 compared with 2001. Regarding pepper crop, we may observe a total yield increase from 184.8 thousand tones to 279.1 thousand tones in 2006, respectively with

35.01%. In water and sweet melon crops, the biggest yield was recorded in 2004, 765.1 thousand tones.

**Table 3**

**Evolution of vegetable yields per total and per main crops, during the period 2001-2006 in Romania**

- thousand tones -

	Specification	Years						Differences % 2006- 2001
		2001	2002	2003	2004	2005	2006	
1	Total vegetables, of which:	3848.3	3973.4	4684.5	4773.9	3624.6	4138.9	7.55
	in private sector	3752.5	3921.0	4637.0	4730.2	3523.3	4074.9	8.59
2	Tomatoes, of which:	651.7	658.8	818.9	1330.1	627.0	835.0	28.13
	in private sector	625.6	647.8	806.4	1320.0	609.8	817.3	30.64
3	Onion, of which:	396.5	340.8	350.4	332.8	363.6	390.7	-1.46
	in private sector	388.7	338.7	348.7	325.4	352.3	386.7	-0.51
4	Garlic, of which:	82.9	72.4	76.5	65.9	68.4	64.2	-22.56
	in private sector	82.9	72.4	76.5	65.4	63.4	63.9	-22.92
5	Cabbage, of which:	819.2	821.4	1019.2	919.1	1009.4	1106.0	35.01
	in private sector	812.5	817.4	1015.2	914.5	992.2	1082.6	33.24
6	Pepper, of which:	184.8	197.4	249.1	237.2	203.8	279.1	51.03
	in private sector	182.6	196.8	248.4	236.4	199.4	274.6	50.38
7	Water and sweet melons, of which:	550.6	651.3	764.6	765.1	691.8	641.8	16.56
	in private sector	542.8	648.7	762.3	762.9	685.3	640.4	17.98

Source: Statistical Annuary of Romania, 2007

## CONCLUSIONS

The analysis of the vegetable supply in Romania, we may conclude the following:

- the area cultivated with vegetables increased, during the period analyzed, with 3.78%;
- tomatoes, as main vegetable crop, represent a percentage of 18.10% of the area cultivated with vegetables;
- the total vegetable yield oscillated significantly during the period analyzed;
- the vegetable yields achieved in Romania cover the internal demand during the period May-October, and the products imported cover the sort diversification and the vegetable supply during the cold season.

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# MACHINE FOR APPLYING MANURE FERTILIZERS BY MEANS OF VERTICAL SPREADING APPARATUS

## MAȘINA PENTRU ADMINISTRAT INGRAȘĂMINTE ORGANICE SOLIDE, CU APARAT DE ÎMPRAȘTIERE VERTICAL

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**keywords:** fertilization, spreading machine

### ABSTRACT

*In contextual actual de protejare a stării de sanatate a oamenilor si animalelor, realizarea si implementarea unei tehnologii de fertilizare ecologica constituie un obiectiv major. Pe aceasta tema se inscrie realizarea unei masini destinata administrarii ingrasamintelor organice, masina care inglobeaza solutii constructive la nivel european*

*Within the current context of protecting human and animal health, achieving and implementing an environmental-friendly, fertilizing technology represents a major objective. Therefore, a machine designed to manure fertilizers applying with constructive solutions at European level has been manufactured.*

### INTRODUCTION

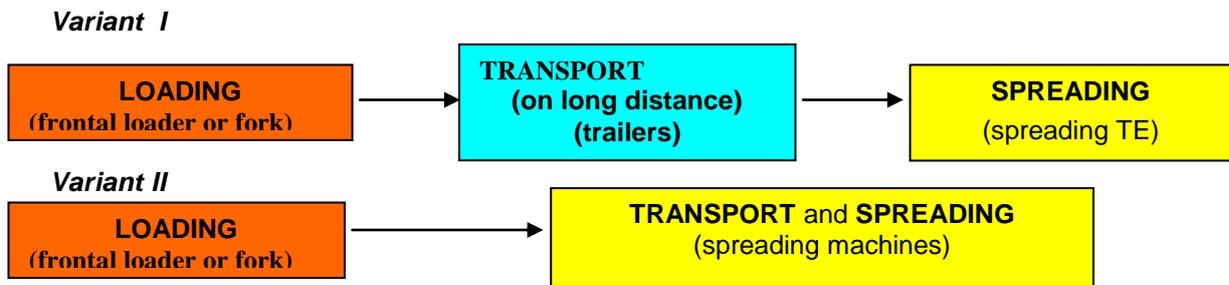
Within the sustainable development of agriculture, food safety takes an important part together with people consumption requirements, quantitatively and speaking, which demand the enforcement of accordance with agricultural policies and with Community acquis, aiming at:

- producing enough food as volume, structure and quality;
- ensuring all people access to necessary food;
- obtaining agro-food product as complex as possible in terms of nutritive value, purity and quality-complying to national standards.

The environmental pollution-as a result of agricultural activities is determined by the accumulation into the soil of nitrates and nitrites, as well as in surface aquatic and phreatic basins, pesticides action upon human beings and animals, air basin pollution, reduction of biodiversity and other negative phenomena which endanger life existence on Earth. The environmental-friendly agriculture has fully demonstrated its technological capacities, benefic role and high economic efficiency, leading to the increment of food nutritive value.

The comparative analysis practice of organic and traditional technologies of plant cultivation, demonstrates that ecological agriculture, instead of intensive agriculture does not influence life conditions of men. At the same time *it preserves the biodiversity.*

The concern of soil organic fertilization frames within these trends. Two main technological variants can be applied:



**Fig.1. Fertilizing technologies**

Within the first variant, the trailers are loaded from a platform by means of a front loader, afterwards being performed the transport to crop and spreading with technical spreading equipment which can be carried or trailed. This variant applies when the distance between the farm and the field having to be fertilized are big.

In the second case, when the platform is established near the parcel, the transport and spreading operations are achieved by the same machine.

### **ROMANIAN RESEARCHES FOR DEVELOPING THE ORGANIC FERTILIZING TECHNOLOGY**

Within the context of the facts previously presented INMA Bucharest has designed and manufactured the experimental model of a fertilizing machine with organic solid fertilizers, having a mass of 5 t. and MG 5 symbol.



**Fig.2. Machine for applying manure fertilizers, MG5 (front view)**



**Fig.3. Machine for applying manure fertilizers, MG5 (back view)**

The machine comprises the following principal subassemblies:

- chassis ..... 1 pcs;
- bin ..... 1 pcs;
- running train ..... 1 pcs;
- conveyor ..... 1 pcs;
- transmission ..... 1 pcs;
- conveyor driving ..... 1 pcs;
- service brake ..... 1 pcs;
- parking brake ..... 1 pcs;
- spreading apparatus ..... 1 pcs;
- front additional shutter ..... 1 pcs;
- signaling installation ..... 1 pcs;
- supporting leg ..... 1 pcs;
- driving pump ..... 1 pcs;
- wheel track ..... 2 pcs.

MG5 is designed to transport and spreading of organic solid fertilizers an 9° sloped fields to be cultivated with cereals, technical plants or vegetables.

The tests under exploitation conditions of machine, for applying organic solid fertilizers MG-5 have been performed on experimental field belonging to National Institute of Research-Development for Machines and Installations designed to Agriculture and Food Industry-INMA Bucharest, as well as on the field of Experimental Farm within The Institute of Research of Vaccine - "Ion Cantacuzino".

There have been performed:

- **laboratory tests** (external dimensions; mass and mass center coordinates determination; determination of transversal stability on sloped roads; determination of transversal stability during the braking parameters; checking the lighting and bright signaling system; determining the handling possibility; determining the quality indexes of transport works; determining the rotations of spreading apparatus and conveying belt's feed; determining the applied manure rate flow) ;
- **working (fields) tests:** (spreading width; degree of manure; spreading uniformity; inconstancy of spreading flow; working capacity);

- **energetic indexes** ( the pressing force on the coupling eye; required trailing force; torque resistant at spreading rolls driving; power necessary for the machine trailing; power necessary spreading rolls; effective speed of displacement during the work; fuel consumption per hour).



**Fig.4. Test view on stubble field**



**Fig.5. Unfertilized field**



**Fig.6. Fertilized field**



**Fig.7. View of fertilizers spreading field, on ploughed and disked field (near plane)**



**Fig.8. Ploughed and disc washed fertilized (far plane) and unfertilized (near plane)**

### TECHNICAL CHARACTERISTICS:

- Machine type ..... semi-mounted
- Tractor in aggregate, HP..... min. 65
- External dimensions, mm
  - length..... 5800
  - width ..... 2110
  - height..... 2300
- Loading mass, t ..... 5
- Own mass, kg ..... 3460
- Conveyor .....with seraphs disposed on chain
- Conveyor's driving ..... mechanical/hydrostatic
- Spreading device .....with vertical rolls
- Spreading width, m ..... approx.8
- Spreading device driving ..... mechanical
- Running track..... monoaxle
- Wheel track, mm ..... 1600

- Wheel base, mm ..... 4040
- Service brake ..... pneumatic
- Stationary brake..... mechanical,  
on rear axle wheels
- Speed limit, km/h
  - during transport .....15
  - during the work ..... 7

We shall present only a few of indexes determined during the machine’s tests – the ones considered to be the most important..

**1) The quality of transportwork** is expressed by the coefficient of loading capacity, which represents the ratio between the mass of loaded fertilizer and the machine loading mass, considering the body fully loaded.

Depending on the fertilizer’s characteristics, the machine can be loaded within 1350...4050 kg up to the upper of shutters, corresponding to transport capacity coefficient of approx. 0.81.

In fact, the manure is loaded over the body’s upper limit, having at its upper part a parabolic shape. This way the obtained value surpasses the values calculated in table 1, reaching a loading maximum admissible mass of 5000 kg, case in which the transport capacity coefficient will be over 1.00.

**Determination of indexes of transport works’ quality**

**Table 1**

t. No.	Transported product	Specific mass (kg/m <sup>3</sup> )	Common shutters body	
			Loading capacity (kg)	Loading capacity coefficient
1.	Non-fermented loosened manure	300...400	1350...1800	0.27...0.36
2.	Fermented compacted manure	500...600	2250...2700	0.45...0.54
3.	Semi-fermented manure	700...800	3150...3600	0.63...0.72
4.	Fermented manure	800...900	3600...4050	0.72...0.81

**2) The effective working width** determined following the tests was of  $L_{max} =$  approx.10m , during the fermented manure spreading, with a product mass of  $\gamma = 810$  kg/m<sup>3</sup> , but the uniformity of distribution has been constant for a spreading width of  $L_{effect}=8m$ .



**Fig.9. Aspect of the process regarding the determination of distribution width**

We can notice that this machine – equipped with vertical rollers in comparison with similar machines endowed with two rollers horizontally located performs a greater spreading width, approximately 2.5 times bigger.

This represents an important advantage because the power consumption necessary for fertilizing per unit area is diminished and the effective working capacity is increased.

### 2) Mincing degree

The manure mincing gives the working qualitative index, which shows the distributed percentage of manure particles less than 6 cm in comparison with the whole manure quality which has to be spread.

The mincing degree of manure (manure particles smaller than 6 cm\)) achieved by MG5 machine is comprised between 65.11 % and 87.73%, the average value being of 80.84%, performed when the fermented manure is spread.

**3) The distribution uniformity** is the working qualitative index which shows the manner in which the manure is spread by machine per working and movement direction.

The distribution uniformity for a mass of manure of 510 kg/m<sup>3</sup> has varied between 75.2...85.5% and for a mass of manure of 814kg/m<sup>3</sup> has varied between 78.3...87.9%.

### 4) Distributed manure flow

The rate of manure per hectare which can be distributed by the machine MG-5 varies along with the aggregate rate of travel, the speed of conveyor (which determines the flow of distributed manure) and the respective manure characteristics.

The machine MG5 can be manufactured in two constructive variants of conveyor belt driving: *mechanical* or *hydrostatic*.

In case of **mechanical driving** of conveyor, fig 10, depending on the tractor's rotative speed APP there is possible to adjust the conveying belt in four steps, by means of a jack (click) mechanism, the registered values being shown in table 2. Therefore there have been achieved spreading ratios in proportion to conveying belt feed rate.



Fig.10. Conveyor's mechanical driving



a)



b)

Fig.11. Conveyor's hydrostatic driving  
(a - discharge regulator; b- hydraulic engine + reductor )

In case of **hydrostatic driving**, fig.11, the input rotation speed of reductor is adjusted by means of flow controller (discharge regulator) and hydraulic engine; therefore the feed rate of conveyor with scrapers and implicitly the manure ratio per unit area are modified.

**DISTRIBUTED MANURE FLOW (mechanical variant) Table 2**

Crt. No.	The rotation speed of PTO (rot/min)	CONVEYING BELT FEEDING [mm/s]		AVERAGE VALUES OF DISTRIBUTION FLOW [kg/s]			
		540	1000	540	1000	540	1000
				Fermented manure 1000 kg/m <sup>3</sup>		Nonfermented manure 300 kg/m <sup>3</sup>	
1	- Step 1 - Step 2 - Step 3 - Step 4	40 25 17 7.4	74 46 32 14	56 35 24 11	102 65 45 21	17 11 7 3	32 20 13 6

**DISTRIBUTED MANURE FLOW (hydraulic variant) Table 3**

Position at discharge regulator	Rate of speed of conveyor with scrapers (hydrostatic driving) [m/min]	AVERAGE VALUE OF DISRIBUTION FLOW, Q [kg/s]		
		Nonfermented manure $\gamma=300...500$ kg/m <sup>3</sup>	Semifermented manure $\gamma=700...800$ kg/m <sup>3</sup>	Fermented manure $\gamma=800...900$ kg/m <sup>3</sup>
1	0.14	0.8...1.33	1.87...2.13	2.13...2.4
4	0.24	1.4...2.33	3.27...3.73	3.73...4.2
10	0.86	5.1...8.5	11.9...13.6	13.6...15.3

Following the data included in this table, it results that, during the exploitation tests, the machine MG-5, driven from tractor U-650 M at 540 rot/min rotation speed of PTO, have been achieved distribution flows of 3...17 kg/s for spreading fermented manure in correlation with conveyor's rate of travel.

#### 5) The manure ratio to be distributed per hectare

Following the data comprised in table 4 the conclusions are: when the manure is spread as 814 kg/m<sup>3</sup> product mass by the machine MG-5, the spread quantities vary between 2.94 t/ha and 40.18 t/ha, depending on the rate of travel during the work; on the effective spreading width and on the scraper conveyor's speed.

When the manure is spread as product whose mass is of 510 kg/m<sup>3</sup>, the quantities distributed by MG-5 vary between 1.47 t/ha and 25.11 t/ha.

**MANURE RATIO PER HECTARE Table 4**

Crt. No.	Rate of travel during the work (effective)	AVERAGE VALUES OF MANURE RATIO [t/ha]					
		Product mass for manure [t/m <sup>3</sup> ]					
		$\gamma=0,510$			$\gamma=0,814$		
		Conveyor speed, m/min (regulator's adjusting step)					
Speed step [km/h]	0.14 (tr.1)	0.24 (tr.4)	0.86 (tr.10)	0.14 (tr.1)	0.24 (tr.4)	0.86 (tr.10)	
1	2.64 (I L)	4.08	7.01	<b>25.11</b>	6.52	11.18	<b>40.18</b>
2	4.24 (II R)	2.55	4.36	15.62	4.06	6.95	25.01
3	5.87 (III L)	<b>1.47</b>	3.15	11.3	<b>2.94</b>	5.02	18.06

### 6) Necessary trailing force

During the manure spreading operation when the machine is loaded at maximum admissible net mass of 5 tons of manure, on stubble, the trailer force required for trailing the machine MG-5, is comprised between 4.31 and 592 daN and during the machine's trailing on spring discing this force is between 786 and 1118 daN.

When the machine starts to operate, due to overload coefficient, the trailer force reaches 2570...2600 daN.

### 7) Machine's hitch pressure on towing device of tractor

The load transferred in steady state on tractor's coupling device by the machine MG-5 loaded with 5 tones of manure mass is of 1330 daN.

During the work, when the fertilizer is spread on ploughed and disced field having 420 kg/m<sup>3</sup> product mass, the machine's body being loaded with 2560 kg mass of product, there have been registered values of pressure force on coupling device comprised between 85 and 230 daN. The pressing force has maximum values when the operation begins – of 620 daN, diminishing during the operation development along with the manure discharging.

### 8) Moment of resistance at spreading drums driving

The moment of resistance has been registered by means of a dynamometer mounted on PTO's shaft according to figure 12 and 13 in three distinct cases:

- at spreading rollers unloaded start;
- - at no-load operation;
- - at full load operation.



Fig.12. Dynamometer's mounting on tractor's PTO



Fig.13. Machine connected to tractor's PTO. Mounting for registering the moment of resistance at PTO

For 5000 kg load, transported by the conveyor with scrapers, at different speeds of conveying belt, depending on the flow controller's position (meaningly the conveyor's speed), the moment of resistance at tractor's PTO, by extrapolation will have the values shown in table 6.

**RESISTANT TORQUE AT TRACTOR'S PTO'S SHAFT (LOADED MACHINE)**

**Table 6**

	RESISTANT TORQUE AT TRACTOR PTO'S SHAFT [daN.m] At a net mass of 5000 kg; $V_{conveyor} = 0.14...0.86$ m/min; $p=55$ bar									
Flow controller position	0.14 (tr.1)	0.22 (tr.2)	0.30 (tr.3)	0.38 (tr.4)	0.46 (tr.5)	0.54 (tr.6)	0.62 (tr.7)	0.70 (tr.8)	0.78 (tr.9)	0.86 (tr.10)
Loaded operating	11.22	17.63	24.04	30.45	36.86	43.27	49.68	56.09	62.50	<b>68.91</b>

It has been found that the value of maximum resistant torque is of 68.91 daN.m.

When the spreading device starts to operate, the PTO's torsion moment can reach  $M_{\max \text{ start}}=290 \text{ daN.m}$ .

## CONCLUSION

The elaboration and application of environmental-friendly fertilizing technologies and implicitly, the achievement of TE appropriate to ecological technology applying will have favorable effects upon environment protection and regeneration of biological sources for agricultural products obtaining.

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# ROLUL AGROTURISMULUI ÎN RELANSAREA ECONOMICĂ A SPAȚIULUI RURAL

## THE IMPORTANCE OF AGROTOURISM IN THE ECONOMIC RELAUNCH OF THE RURAL AREA

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**Key words :** long-term development, agriculture, agrotourism, economical relaunch, rural space, tourism.

**Cuvinte cheie :** dezvoltare durabilă, agricultură, agroturism, relansare economică, spațiu rural, turism

### SUMMARY:

*Înscrierea pe coordonate europene a României, impune o dezvoltare economică continuă. Realizarea acestui deziderat, implică utilizarea la parametri optimi a mijloacelor existente și punerea în valoare a oportunităților ivite. În acest sens, optimizarea rezultatelor economice apărute ca urmare a practicării unei agriculturi bio (realizarea de produse naturale în medii neatinse de efectele distructive ale poluării și valorificarea optimă a acestora) precum și valorificarea cu maxim profesionalism a potențialului turistic, cu toate formele sale de exprimare, vor conduce la o eficiență economică sigură.*

*Serviciile turistice se extind și diversifică, funcție de mutațiile socio-economice și arealul propice dezvoltării lor. Apariția noțiunilor de „turism rural” și „agroturism” îmbogățesc cuprinsul noțiunii de „turism”, diversificându-i formele de exprimare.*

*Romania's entry on the european coordinates imposes a continue economical development. The achievement of this target implies the use of the existing methods and the capitalization of all opportunities at best parameters. In this way, optimizing the economical results which appeared as a result of the practice of a bio agriculture (the attainment of natural products in environments untouched by the destructive effects of pollution) and also the professionalistic capitalization of the touristic potential, in all its forms, will lead to a certain economical efficiency.*

*Touristic services extent and diversify according to the socio-economical changes and their favourable area of development. The appearance of the „rural tourism” and „agrotourism” terms enriches the whole notion of „tourism” by diversifying it's forms of expression.*

### INTRODUCTION

Humankind started to be more preoccupied by vacation destinations, especially after the 60's, when tourism became one of the most important economical activities in the world. Peoples begun to manifest their wish to spend their vacations in the nature, in rural space/environment. They wanted to satisfy their curiosity about the traditional villages world (agrotourism), to enrich their cultural knowledges (cultural/monastic/religious tourism) etc. This intention proved to be a good start for the economical relaunch of the rural space because: are solicited berthing spaces with a reduced confort, supplementary income sources for rural population, refreshing folk traditions, the wish to perpetuate tradional handicrafts, improvement of living level in the areas utilated as material basis of tourism, releasing the extracrowded touristical areas, valuing the rich rural potential.

So, we are much concerned about the longterm development, defined as the development „that corresponds to the present needs, without affecting the capacity of next generations”. Concerns about long-term development are the complex result of problems

that constitute the object of whole humankind: environment damaging, uncontrolled extension of urbanisation, poverty etc.

## MATERIAL AND METHODE

This notion includes two important issues: how long can be achieved an economical increase without negative results for the planet life and environment protection.

Both issues must be solved in order not to affect the life of next generations. Long-term development notion must be approached from three points of view:

- temporal dimension
- equity notion
- environment

*Temporal dimension* imposes some limits for development, determined especially by ecological elements. Are stressed the resources depletion, the irreversibility of some damage processes etc.

*Equity notion* refers to the interest for next generations without sacrificing the present generation. From this desideratum, the economical development must be achieved without damaging and depleting environment resources.

The *environment* is the most fragile, nevralgic and human power independent problem, this is why long-term development conditions are based on the capacity to care the environment and it's resources.

From the five agents that influence development (population, environment, food, industrial development and pollution) the long-term development strategy must find out the possibility to optimize the needs-resources rapport.

Long-term development concept starts from the idea that nature is the only life source and this is why it must be protected, both for present and future. Never by now a civilisation have destroyed so much it's life environment, never by now have been threatened with destruction oceans, plants species and animal races, the strate of ozone was never so affected as now and the pollution was never so threatening. When all this are analysed the blame belongs to the powerfull industrialization. This opinion is regarded as a mistake by the specialists: it is not the industrialization which bears the guilt for the ecological disaster, it is man's guilt because of it's greed, inattention, ignorance, neglect, indifference. And it is man's fault because it didn't select and didn't apply corectly science and technique discoveries, because it didn't act in order to lead to nature development and protection and not to nature degradation. The man is the one who should discern and manifest responsibility when he acts so he should take into consideration the natural laws and to assure ecological equilibrium. From all the actions that determined environment destruction, pollution has the greatest impact both on nature and human. Air, water and soil pollution transformed the bounteous and friendly nature into a more hostile and dangerous one.

The most dangerous form of pollution is probably the one provoked by practising an intensive and industrialized agriculture. This happens because agiculture pollution supposes first of all, soil damaging. On soil can not be practically applied no epuration treatment, it's depolluation being possible only by slow action of natural agents. Agriculture includes, in distinction of industry, large areas, which makes the consequences be more severe. Agriculture pollution attains directly the man by nourishment; man cannot protect himself and so the action develops directly on the human body. It seems a paradox that as far as he develops and proudly takes credit for the epocal discoveries, the man becomes practically more destructiv and even autodestructiv. This is why the issues of economical development and increase cannot be separated in the present by the ecological issues.

Propelling the ecological issue in the plan of universal concerns from last decades resulted into an unprecedent mobilisation of public opinion regarding this problem. Public opinion sensibility proved that humankind was already counsient of the negative impact of

development on its own lives and especially on the near future. As a result of this concerns the concept of long-term development was imposed. It was recommended by the UNO General Assembly by the Resolution no. 42/187 as the main principle of national strategies in economical development domain and environment protection.

In the following years took place two universal conferences with a theme regarding economical development in the conditions of environment protection. First conference took place at Stockholm and the second at Rio de Janeiro, both in 1992. Both conferences had a strong echo in what public opinion is concerned. Favourable opinions begin to show up regarding environment protection which materialized in „green parties” appearance which sustain development in the conditions of environment protection, including fauna and flora. In the last decade, in developed countries were set up administrative structures specialised in environment protection. In the same time, public opinion forced the setting up of some nongovernmental institutions that follow the way in which responsible agents accomplish their prerogatives, supervising this activity’s evolution. Western Europe developed countries adopted some conventions by which they follow to improve simultaneously the activity in some more sensitive activity domains. This is how was adopted „The frame convention regarding climateric changes that cares for reducing the carbon dioxyd from the atmosphere and also to improve considerably the quality of the atmospherical air above Europe” and „The frame convention regarding biodiversity” which proposes protecting life on the european areal, assuring an ecological equilibrium and keeping it so that the natural european potential be saved for the use of this generation and also for the next one. Another adopted document is „Agenda 21” which includes a vast programm of actions that must be applied to preserve and exploit the environment in the 21 century perspective. An ultimate adopted document is „The declaration of priciples regarding ecologicaly administration, preservation and viable exploitation of all kind of forests”.

Western Europe plans a series of actions in order to improve the ecological equilibrium and to impose the concept of long-term development on the continent. Other states from Central Europe and East Europe are willing to adhere at this actions also:

-for environment protection in big cities and to improve life conditions of people, who are the first that endure the consequences of air and noise pollution is taken into consideration that public transport in Europe becomes preponderant, especially on long distances. Public transport must be organised in a way that totally assure the increasing needs in this domain and also it’s adequate development at the end of 22 century. There is an intense and frequent publicity for using the bike on short distances, which is considered to be the most ecologicaly and efficient way of transportation. In the same time with making the publicity, European Union assures conditions for practising this kind of transportation, by setting up bike tracks on the streets, special parking spaces for bikes, rest places in ascendent areas etc. Whole european system made efforts for adapting traffic at the unmotorized systems and the intense use of public transport. For the beginning was imposed the interdiction of circulating with motorized ways in the ecologicaly vulnerable areas (parcs, reservations, mountains, stations, other recreation spaces). Those who still use autovehicles are obliged to pay some subtantial taxes as a compensation for the damages brought to the environment by practising this action.

-regarding the same aspect, all citizens who want to adapt to this life style made considerable efforts and a great propaganda with the inauguration of a bike highway in 1994, between Zurich and Vienna. A second portion of highway, continouing the first one, will be finished soon, from Vienna to Budapest. Following the events and appropriating them, Bulgaria expressed it’s will to be included at the european plan network that will be build.

-increase the interest of big metropolises for setting up green spaces, parks, gardens, lakes, reservations by which is tried to set up for the inhabitants some areas of quiet, calm, relaxation and rest.

-industrial areas are supervised, the investments that are done for preventing pollution being rather expensive. Are taken into consideration both aspects regarding air and water pollution, present legislation being extremely severe and efficient.

-increased the interest for practising green tourism, rural tourism and agrotourism, urban environment inhabitants manifesting tendency to spend their free time in nature. This interest for nature released the appearance of „durable tourism” notion that follows to preserve natural environment and to develop touristic activity without damaging and endanger touristic areas. From all modernization strategies of agricultural structures, agrotourism is on the first places in Austria, Switzerland, France, Germany, Spain. Rural European space is in the attention of European Union being considered an important force of the entire continental area, its development being used by the union. This environment is on the specialist attention as the strong campaign for environment protection showed the indestructible connection between them. To achieve harmony and equilibrium for the rural environment means also an adequate protection of all environment. Now, the rural environment is thought to be the most important reserve of human life and culture.

Chance of becoming active partners of European Union is found also, among others, in the material and human potential of the rural environment, in the big unevaluated reserves that are on the Romanian ground. At the beginning of this new millennium this environment seems to be long behind urban environment, with serious differences between the life style of the inhabitants from the two environments. Organized extension of agrotourism, which is the most efficient way for a superior value of human and material resources it's an opportunity for rural environment development.

First of all it assures working places and obtaining some reasonable incomes for the people in rural areas which now is in a difficult financial situation because of the recede registered in the economical activity.

Then, it allows refreshment of all complementary activities that may extend proportionally with agrotourism development, becoming a source of incomes for other categories from the active population: guides, instructors, small artisans, tradesmen.

Agrotourism assures superior valorification of surplus from the farms, that most of the time degrades by non-usage. This is very important especially because the alimentary products are natural, made without using pesticides, so they are of best quality. Taking into consideration that Romania's western area has the adonix flora of such an extraordinary value, unique in the country, competing with that from Bucovina's Obcina (Vatra Dornei), alimentary product taste very good and are very appreciated abroad. This increases products quality and implicitly the demands for such products.

Ethnic composition of Banat population formed by Slovaks, Serbians, Hungarians, Czechs, Bulgarians, allowed the development of a cult for alimentations and habits specific for their origin areas.

The practice of agrotourism is beneficial also for autochthonous population who wants to spend the vacations in different places than in the usual ones, but who doesn't afford expensive trips. High prices in agrotourism are more accessible than those from the classic tourism, favoring development of a mass tourism.

This activity development could allow the knowledge of the country's western area, agrotourism could become in this conditions an invisible ambassador, facilitating investors attraction for tourism industry, integrated tourism, interethnic tourism or other economy branches.

Extremely diverse rural landscape, largely well preserved, life at the country with its traditional components, agricultural and forest potential of Romania and specific architecture for rural environment are agents that encourage rural tourism. Rural tourism

must be „difuse”, imperceptible from the point of view of habitual competency. It must be based on natural, folk, architectural and gastronomical patrimonium specific to agrotouristic areas. Today, although there are positive signals of agrotourism extension, there are a few restrictive agents that block rural tourism enlargement at the capacity offered by the landscape and traditional culture.

Restrictive agents are: substructure (roadways, railways, fast and sure banking, postal and telephonical services), modest living conditions or even unacceptable conditions even for modest tourists, offered by most of peasant houses, insufficient instruction of farmers (minimal knowledges in tourism domain, not knowing a foreign language) and security (tourists personal security etc).

Agrotourism has the function of economical strengthening of farms capacities due to its specificity of internal agroalimentary consumption in the farm. In what foreign tourists are concerned, agrotourism represents a form of „internal” export of agroalimentary products. The fact that most of the aliments consumed in agrotouristical activity come from personal production determines the increase of the rentability resulted from the agrotouristical activity. It also determines the fact that the prices for agrotouristical services be under the level of organized tourism. From the calculations made by the specialized touristical services it comes out that the price of an agrotouristic meal is lower with 40-50% everytime, comparing with a meal served in a restaurant from the touristic hotels network. The explanation for this price difference is very simple. The price of the agricultural product consumed in the agrotouristic farm has no commercial addition, VAT (value added tax), excise taxes, transportation, storage, etc, expenses. The meat, the eggs, the cheese, the milk, the butter are brought directly on the consumers tables. Also, touristical services (berthing, services etc) don't come with additional, indirect expenses, or management and commissions etc which keeps the price of the agrotouristic product incomparable smaller. In this conditions, agrotouristic policies must protect rural tourism advantages. This means remission of taxes, reducing the fiscal pressure that would lead to prices equalisation and the lost of traditional clients (townsmen with modest incomes, foreigners willing to know rural areas traditions, citizens who come back to their homeland to remember the pleasant times in their lives – childhood, or children from the urban areas etc).

Services evolution in developed countries has a strong, ascendent and constant past. The so called invisible activity gain a lot, in USA, only one person from 15 works now in a pure material activity. Services share in the total amount of some national economies overcomes 2/3 in some states and it's in a continuous increase.

In USA, Canada, Netherlands over 73% of the working population works in services, in the other developed countries the share of this services being comprised between 55% (Portugal) and 72% (Great Britain).

Analysing the evolution of the third sector at the universal scale we see the continuous and constant movement of work force to the branches of this activity. This means permanent development of agrotourism. Economists analyse in this way a country development level also according to how much the services share participates at the increase of GDP (gross domestic product (USA 73,2%, Denmark 72,9%, Netherlands 67,6%, Canada 65,9%, Great Britain 64%). Only in underdeveloped or insufficiently developed economies and in the underdeveloped or going to development countries, services shares in work and GDP are smaller. Necessity to increase the carrying out of agrotouristical services, complementary to tourism and promoting the interethnic tourism may lead to increasing the services share in GDP.

From all activities that complete services sphaera, tourism has an important percentage that increases as long as population free time increases too. It's thought that is more developed as it's paying more attention to its individuals, to the increase of their spiritual and material wealth; this is how reduction of working time (on behalf of working productivity) became a slogan in the electoral campaigns, and free time is an indicator that

reflects the level living of a population increase. In the countries that are going to develop, this sector development is necessary too. In this way, the third sector development is asked to counterwork some underdevelopment phenomenas. First of all is emphasized the issue of surviving services regarding subnutrition and covering the minimum life necessities, alimentary services, assuring working places and minimum incomes for subsistence. In this context tourism diversified and grown enclosing both spatially and temporally the entire world. This development was also favoured by its beneficial effects, because it's an extremely rentable activity representing an important source of incomes for some countries. Emphasizing a region's natural, social and especially cultural particularities in a constant and sustained activity, tourism may contribute to its development and modernization, representing an extremely attractive alternative for valuing the existent resources. This is how the tourism share increased in the last decade from 28,3% to 31,3%, being strongly stressed the internal tourism, where the annual returns average is of 7,4%. Tourism registered increasing numbers both at universal and regions level. Every country tries, with an adequate policy, to increase its turnover in tourism, which comes to constitute an important source of incomes for equilibrating the balance of payments.

Agrotouristic and interethnic regional activities lead to balancing mass tourism and implicitly at the increase of services share.

Terminological specifications:

In the international tourism is observed a constant increase both of the tourists number and also of the returns that come from touristic activity. Although the percentages show little increases, those are constant, proving continuous diversification and development of this economical sector.

On the areas, the most intense touristic activity is registered in Europe, followed by North America and Asia. Interethnic euro-agrotourism lead to increase of the universal tourism share services.

In Europe, we discover that most of the tourists are from the continent, so they prefer to go rather in bordering or close countries. Between 1985-1991, tourism average rhythm of annual increase in Europe was 12,09% in Belgium and 10,92% in Spain. Annual average increase of american tourists visiting Europe is 8,49%.

In what is concerned the number of foreign visitors from the European Union countries, the biggest share in 2003 is that of german tourists, whose number grew up from 203.000 in 1994 to 380.000 in 2003 with a continuous increase. We also see an increase of the number of tourists from Europe, as those from Hungary and Moldavian Republic and we can observe a decrease of the number of tourists who come in Romania from Russian Federation. The total increase was in 1994 of 43.0000 and in 2003 of 85.0000.

Also, we can notice that most of the tourists come from Europe which means that they limit to spend their vacations in Romania just because it's a close country or their homeland.

At the same time with touristic activity development and its explosive extension was also emphasized a tourism diversification, according to tourists wishes, relief particularities, services complexity.

There are two important general tourism categories: sun tourism (motivated by natural agents) also called „sunlust” and knowledge tourism, called „wunderlust”.

In the knowledge tourism there are many characteristic types. These are: business tourism, cultural-scientific tourism, medical tourism, recovery tourism, opening or transit tourism, tourism of TIR type, rural tourism, agrotourism, interethnic agrotourism.

A huge breaking up from this complex branch of tourism that took place two decades ago is represented by the rural tourism. Special attention of political and administrative agents for this area (rural), that is ought to be protected and also

modernized, imposed as a real development possibility for this rural tourism activity. On the other hand, urban population tendency to spend its free time in nature, in quiet, far from all that urban means, including pollution, it's a guarantee of the development possibility of this activity in the interethnic environment and agrotourism. Often, it's made an identification of these terms, between if it's true that there are many common points, overlappings, but certainly there are some differences that differentiate the terms and implicitly, the activities.

In this way, the most frequent confusion it's made between rural tourism and green tourism. At a more complete analysis we can distinguish that green tourism supposes some routes in nature, geographical border being extremely important in touristic decision. For instance, a trip to Niagara falls, climbing a mountain etc, are different from rural tourism which assumes a touristic activity in a rural area. It's true that, in most of the cases, this area belongs to an exceptional natural place, which fulfills and completes tourists feelings, giving them complete satisfaction. Still, there is, at least theoretically, the possibility of doing such an activity without this criterion of natural. For instance, to visit a farm in a didactical purpose, with preschool children.

Analysing phenomena's evolution, any approach must answer to a series of issues, such as: if agrotourism can assure enough working places, incomes and capital flux in order to contribute to a long-term rural development; whether all rural areas can be adjusted; if there are certain risks by country development and by what is distinguished rural tourism from other forms of tourism. Nowadays are many people who see agrotourism as an important element of the local/regional development strategy going from the economical advantages which it generates: creating national income, valutory contributions at payments balance, developing working market, local use of work force disponibilities, developing some rural areas etc.

Beyond the positive effects that agrotourism generates, we must carry out that it is more than an economical activity; actually it's an interaction of population masses which needs a large range of services, facilities and inputs that transform themselves in opportunities and challenges for the host economical agents. Radu Rey thought that „agrotourism is not only an agent of economical equilibrium that engages a lot of adjacent agents and reproductible resources. It also becomes a cultural-educational ambassador, a constant instrument and not very expensive, of social progress”, shortly paraphrasing this we can say that this is were the notion of interethnic tourism fits in. The notion of interethnic tourism it's understood as a continuous message of peace and understanding between ethnicities, nations and peoples.

Multilateral character of tourism, in generally and agrotourism in particular, doesn't allow to be described as „an industry” in a technical sense because this sector doesn't have just one characteristic production or well defined operational parameters. It's economical dimension can not be known without the intervention of some exogenetic/endogenetic economical, social, cultural and ambiental agents. So, we deal with a large, varied and complex character of the touristic phenomena which requires a much attentive analysis. From the agrotourism issues that come out by their negative impact, we enumerate:

- the threaten against the environment, touristic circulation intensity in certain cases can be a social and ecological problem for the rural area;
- socio-cultural threaten, natural world perturbation de-balances the small socio-cultural universe of rural community;
- problems about planning, local control, public participation and possible partnerships.

Expressly individual answers given to agrotouristic problems are not a policy for this sector; this kind of answers can only give short time solutions for long-term problems.

Agrotourism success depends especially of the region capacity to be an appropriate host for rural tourism, of its capacity to plan and put into practice development projects

with all the changes that are brought by this form of tourism in the region, in general, and in farm, in particular. It also depends of the existence of a contest field of ethnical representation between different agrotouristical units on ethnogeographic areas, leading to a european finality in the spirit of coloboration and interethnical understanding.

Economical science is concerned by achieving an optimal utilisation of limited resources, many of them being rare or unique. This principle functions for an individual request that aims psychological benefits from a journey or a business that proposes as a purpose to cash profit, by providing substantial goods and services for the tourists. It also functions for a host community which regards tourism in the terms of economical benefit and the represented area's prosperity.

According to its content and in correlation with the whole national economy, tourism acts like stimulative agent of the global economical system. Touristic journey development suppose a request and a consume of specific goods and services, which leads to an increase of their production. At the same time, touristical request determines an offert adaptation seen in the development of this sector technical-material basis and, indirectly, in the stimulation of producing the branches that participate at the construction and equipment of berthing and alimentation spaces, in roads network modernization and getting conveyance and agremental instalations.

By tourism development it's achieved a significant production rise. Still, tourism contribution to GDP it's very different in world's states according to development and structure of those countries economy.

Tourism is not only a GDP creator, but it also has an important contribution in achieving value added taxes. By its specific – services activity, large consum of living work, intelgence and creativity – tourism takes part at creating the value added tax in a share superior to close branches from the point of view of development level.

Tourism also has an important pulling in effect of stimulating the production in other domain, a result of its branch of interference and syntesis character. Elaborated studies shown that some branches activity is largely determined by tourism needs.

Connected with development and economy modernization of a country, tourism acts as a method to diversify the economy. This way, the adaptation at tourist requests favorises, on one hand, the appearence of specific branches (activities) : leisure industry, wire transport, travel agencies, artcraft production and, on the other hand, it gives new dimensions to some of already existent branches : agriculture, food industry, constructions, transport, cultural services.

Tourism also represents a way of valuing all resources categories and especially the natural ones, other than the traditional and/or those of small dimensions. Elements like landscape's beauty, mineral or thermal water curative qualities, climateric conditions, cultural-artistical events, art monuments, historycal vestiges, folk tradition find in tourism their best valorification, even the only one in some situations.

Natural consequence of this effects, tourism can induce shiftings in teritorial developments ; from this angle, it is seen as an attenuation arm of interregional disequilibriums regarded at national or universal scale as « a solution for defavorized areas development, a remedy for de-industrialized places ».

Tourism economical effects have also other forms of manifestation ; from all this we have to mention its contribution to assuring an equilibrated money circulation realised by the inter and international tourism.

Tourism became one of the major socio-economical sectors. It registered a constant expansion in time, with an anual increasing rate of 4-5 percentages in the last half of the 22 century. Joyning intern and international tourism is understood now as the largest universal industry. International tourism is one of the major components of international economical activities.

According to World Tourism Organization (WTO) the number of tourists, at the universal scale will double in 2010 comparing to 1990. The main touristical destination is Europe, wich is registered with the smallest rithm of increase.

Tourism doesn't mean just an increase of tourists number. It has shown that it transforms itself in a divers and complex economical activity. Although mass torurism is predominant, came out other activities linked to culture, environment, affairs, education, health, religion etc. This forms of tourism reflect, among other things, preferences for environment quality and a much more energic form of recreation. Sky, hike, cyclism, are more pleasent than anytime, satisfying the need of being closer to nature, moving, exploring and learning. This new activities have also a great responsability to environment management because those who practise this activities are seldom scattered in areas without any adequate developed substructure or without the capacity to administrate touristical activities.

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# THE IMPACT OF OFF- FARM EMPLOYMENT ON THE PROCESS OF COMMERCIALIZATION OF AGRICULTURE IN ROMANIA-IMPACT OF STRUCTURAL AND COHESION FUNDS

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**Keywords:** Transition economies, Romania, agricultural commercialization, off-farm Employment, structural funds.

## **ABSTRACT**

*Acest articol analizeaza impactul ocuparii fortei de munca la nivelul de off-farm asupra procesului de comercializare a agriculturii in Romania. Analiza descriptiva dezvaluie existenta unei importante relatii intre piata de munca la nivelul de off-farm si vanzarile din agricultura. Numarul mare de locuri de munca este corelat cu numarul mic de gospodari care vand produse agricole si cu o suma mare obtinuta din vanzari pe fiecare gospodarie, sugerand specializarea si comercializarea fermelor in regiuni cu off-farm employment.*

*Piata de munca non-agrara are un impact indirect asupra vanzarilor, prin cresterea productivitatii muncii in agricultura si prin crearea unui acces usor la credite. Oricum fermele comerciale au inceput sa investeasca in agricultura si datorita viitoarei comercializari.*

*Datorita intrarii Romaniei in Uniunea Europeana in Ianuarie 2007, economia a inceput sa se dezvolte. Multe sectoare au inregistrat cresteri vizibile, iar investitiile straine directe sunt inca solide. Romania va primii 20 milioane euro, sub forma de fonduri structurale si de coeziune in primii sapte ani de la adeziune, bani care vor ajuta tara sa pastreze un trend ascendent al economiei.*

*Romania si Bulgaria detin aproape 50% din fermele inregistrate in EU. Majoritatea fermelor romanesti sunt ferme mici, folosite pentru castigarea existentei, problema insa intervine in numarul fermelor, aproximativ 5%, care au fost parasite din lipsa de fonduri, inca din 2001. Piata unica europeana si politica comuna agricola, vor avea un impact imediat asupra agriculturii romanesti.*

*This article analyses the impact of off-farm employment on the process of commercialization of agriculture in Romania. The descriptive and correlation analysis reveals the existence of an important relationship between off-farm employment and agricultural sales. High off-farm employment is correlated with low number of households selling agricultural products and with high amount sold per household, suggesting specialization and commercial farming in the regions with off-farm employment. Non-agricultural employment has an indirect impact on agricultural sales as well, through increased labor productivity in agriculture and through easing access to credit. Moreover, commercial farms undertake substantial investments in agriculture, thus furthering commercialization.*

*Following Romania's accession to the EU in January 2007, the country's economy has continued to expand at a steady rate. Many sectors are performing well and foreign direct investment remains solid. Romania will receive 20bn euros in the form of EU structural and cohesion funds in the first seven years of its EU membership, which will help the country's goal of staying on track for constant economic growth.*

*Romania and Bulgaria account for 50% of the registered farmland in the EU. The majority of Romania's claims are small land holdings used for subsistence farming, but cooperatives are making headway as the number of agricultural land holdings dropped 5% from 2001. The EU's single market and common agricultural policy will have the greatest immediate impact on Romanian agriculture.*

## INTRODUCTION

During the transition towards a market economy in Romania most enterprises established at the time of industrialization and urbanization project of the communist period reduced or stopped their activity and many employees lost their jobs. A reverse migration from urban to rural areas took place, thus contributing to the increase in employment and underemployment in agriculture —the main occupation in the rural areas. The emerging farmers without necessary production factors, know-how and confronted with inadequate input and output markets decreased their agricultural sales and purchase of agricultural goods, while increasing self consumption in the household. The interaction between unemployment, the increase of employment in agriculture and consequently in self-consumption in the household shows a reverse evolution as compared to the commercialization process of agriculture. Therefore, the paper analyzes how the differences in the off-farm employment opportunities in the different regions reverse the process towards subsistence farming and promote agricultural commercialization.

The commercialization of agriculture occurs both on the demand and supply side (Pingali, 2006) and off-farm employment plays an important role in the process of commercialization (Timmer, 2007; Timmer, 2006; Pingali, 2006). On the demand side, off-farm employment leads to increased cash income, which is spent in large part on food, thus contributing to an increased demand of marketed agricultural products (von Braun et al., 2005).

On the supply side, income from off-farm employment increases access to credit, investments in agriculture and agricultural labor productivity. Increased production allows a higher share left for sales after satisfying self-consumption.

In order to analyze the interaction between off-farm employment and the commercialization of agriculture the paper uses descriptive as well as correlation analysis. The descriptive analysis based on national statistics reveals the general trends and the regional differences in off-farm employment and agricultural production patterns. Moreover, the regional differences in sales, income, credits and investment are illustrated using household level evidence. The descriptive part offers an insight into the relationships between off-farm employment, income, credits and investment as well as agricultural sales. Moreover the correlation analysis presents empirical proof of the influence of off-farm employment on the sales of agricultural products. The data sources for the analysis are secondary data from the National Institute for Statistics (NIS), previously National Commission of Statistics (NCS) and household level data is offered by the Rural Euro Barometer Survey of the Open Society Foundation (OSF) (OSF, 2007).

### **AGRICULTURAL PRODUCTION, SALES AND EMPLOYMENT IN ROMANIA IN THE TRANSITION**

Since 1989, Romania has gone through a continuous transition process from the command to the market economy. The social costs of the changes were high. The inefficient economic sectors contracted leading to mass unemployment. In parallel, in agriculture the privatization of land and the downsizing of the agricultural production units occurred. The rural sector – with agriculture as the main driving force – was a significant factor that absorbed the economic and social shocks (Tesliuc, 2007a; OECD, 2007).

The decline in industrial activities determined the urban population to return to the rural areas, most of them finding occupation in agriculture. As a result, the share of the population employed in agriculture increased from 28% in 1990 to 41% in 2003 decreasing to 36% in 2007. At the same time the contribution of agriculture to GDP declined. Given

that the agricultural output was more or less constant throughout the transition, it indicates that the labor productivity of agriculture decreased.

The lack of increase in agricultural production parallel to the increase in agricultural employment is related to several factors. The farmers lacked the necessary factors of production and due to the specificity of land restitution the lands became small and fragmented. and fragmentation increased the cost of mechanical work per unit of area (IAE and CURS, 2007; Tudor, 2006).

Low input use, high costs of mechanical cultivation and land fragmentation all lead to the reduction of agricultural yields. The farmers decreased their reliance on the markets and increased self-consumption, which together with low agricultural yields meant that very low surplus production, could be marketed (Tudor, 2006; Tudor, 2007; Tesliuc, 2007a). In addition, the households had low cash incomes (NIS, 2007c), therefore only a limited number of rural households practiced investments, another important factor in increasing production (OSF, 2007).

A chance to increase market orientation would be the general economic development creating off-farm employment beneficial on agricultural sales on both the demand and supply side. From 2001 an increase in the rural off-farm employment rate was registered and the urban-rural migration flow stopped and even reversed due to the increase in the number of private companies as it was mentioned before.

## **OFF-FARM EMPLOYMENT AND AGRICULTURAL PRODUCTION PATTERNS IN THE DEVELOPMENT REGIONS – STRUCTURAL FUNDS**

Important territorial disparities exist in Romania, as suggested by the PHARE program elaborating a study on regional development policy for Romania during 1994-1997. Based on the proposals of the PHARE study the Law 151 from 1998 defines eight development regions for Romania, consisting of counties with similar economic and social profiles (Antonescu, 2006).

The development regions are North-East (NE), South-East (SE), South (S), South-West (SW), West (W), North-West (NW), Center and Bucharest. As the GDP per capita indicates, the most developed region is Bucharest with close to 5000 Euro GDP per capita, followed by the W and Center regions with close to 2500 Euro GDP per capita, the rest of the regions having a rather low GDP per capita.

The employed population structure as well as the rural employed population structure in the different sectors of the economy in the development regions is concordant with the economic development level of the regions. This pattern mirrors the interaction between per-capita income and share of agriculture in employment shown in Syrquin and Chenery 1989. Indeed, the regions composed of counties with low and very low development level – NE, SE, S, SW and NW – had over 40% of population employed in agriculture in 2005 and a low share of population in services. Center and W had around 30% of population employed in agriculture while the most developed region of Bucharest had an urban occupational pattern, with 6% of the population employed in agriculture in 2002 (NIS, 2007).

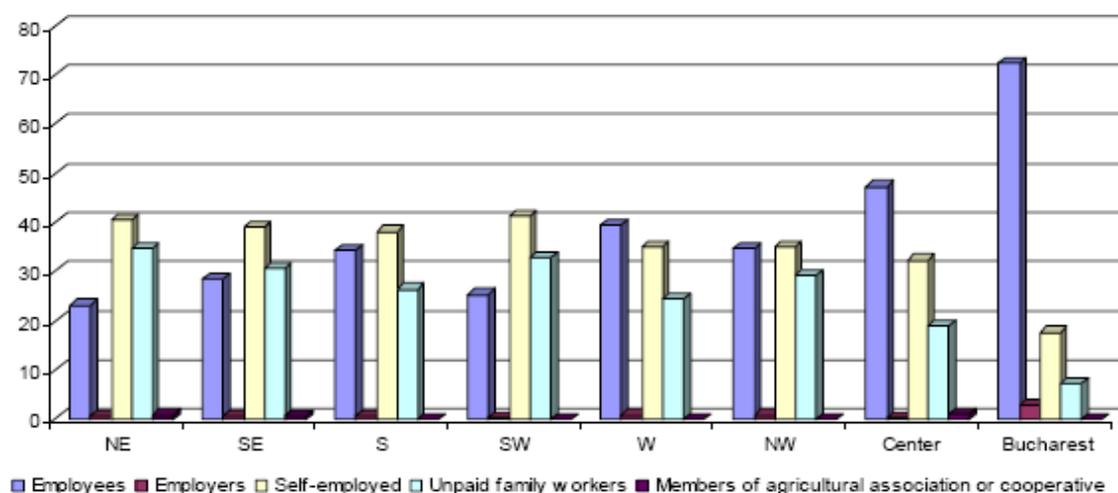
The interregional disparities are even larger when the employment patterns in the rural areas are examined. In the rural areas of Romania industry or the third sector are absent in some localities and employment in agriculture accounts for 80-100% of total employment (Chirca and Tesliuc, 2006).

Again, the share of rural employment in agriculture is inversely related to the economic development level of the regions. The more developed regions, Bucharest and the regions from the province of Transylvania – W, NW and Center – have a lower share of agriculture in rural employment than the other regions. Specifically, the rural area of the municipality of Bucharest has a different occupational structure than the rest of the

regions, as the strong economic and social influence of the capital city leads to a balanced structure of the employed population between the three sectors of the economy. The region Center provides an occupational contrast as well, with the second lowest share of agriculture in rural employment after Bucharest.

Graph 1 presents the distribution of the rural employed population according to the professional status. In the regions with predominant agricultural sector – NE, SE, S and SW the self-employed and unpaid family workers account for about 70% or more of the employed population. The W and NW regions have a lower share of self-employed and family workers and close to 40% of employees. The Center has an even higher share of employees, close to 50%, while the region Bucharest is the closest to the urban pattern with 72% of employees and 3% employers in the rural employed population.

**Graph 1. Regional socio-professional structure of the rural population in 2007**



Source: NIS, 2007b

The distribution of farm household members according to their professional status shows a similar structure. The most developed regions from an economic point of view also have the greatest shares of members performing non-agricultural activities as employees, employers and self-employed in non-agricultural activities. Thus, in Bucharest and Center regions 10% of the household members work off-farm, in the W and NW regions up to 7% and in the NE, SE, S and SW regions the shares of off-farm employed members range up to 5%. At the same time the lowest share of members performing agricultural activities as farmers and unpaid family workers is found in the Center and Bucharest regions (NIS, 2007c).

The share of the dependent members (unemployed, pensioners, pupils and other dependent people) in the household is another important indicator determining the division of agricultural production between household consumption and sale. The subsistence of dependent members is ensured mainly by the activity of the other household members working either inside or outside the household. In Bucharest, 50% of members of farm households are dependent members. The smallest share of dependent members – under 40% – is found in the predominantly agricultural regions NE, NW and SW with low off-farm employment (NIS 2007c). In general, high and constant off-farm incomes allow supporting more dependent members at household level, without obliging them (for example the pensioners) to work in agriculture.

The opportunities for off-farm employment across the regions are indicated by the regional disparities in underemployment as well. Underemployment rates, approximated by the number of 8 hour working days per person in the farming sector in 2007 had the highest share in the regions with low economic development and high agricultural sector

share in both total and rural employment. Thus, the regions NE and SW are characterized by the highest underemployment with the persons employed in agriculture working less than half a year. Other two agrarian regions, S and SE, had the second largest underemployment with 56% and 61% of the yearly working time used. They are followed by the Transylvanian regions and finally by the Bucharest region with 380 eight hour days per person worked (NIS, 2007).

The overview of the regional disparities shows that the regions Bucharest, Center and West are the most developed, with lowest shares of total and rural agricultural employment, highest shares of off-farm employment and greatest share of employees and employers in the rural occupational structure. As a sign of better off-farm employment opportunities in the Bucharest, Center and West regions, underemployment affects less the active population than in the rest of the regions.

Parallel with the regional disparities in off-farm employment, agricultural production patterns are examined through indicators like the utilized agricultural area per farm, the labor productivity of agriculture or the share of agriculture in GDP.

The average farm size features significant disparities by regions, the SW and W regions having a higher average farm size than the rest. The lower the farm size, the lower the agricultural output and the higher the farm subsistence level, given that a larger share of production is destined for consumption.

Even if the average farm size is not importantly higher in the economically developed Transylvanian and Bucharest regions than in the rest of the regions the labor productivity of agriculture follows the development patterns of the regions. Indeed, the agricultural output value one person employed in agriculture is the highest in the Transylvanian regions. This fact suggests a more important influence of the off-farm employment opportunities on labor productivity than of the average farm-size in the Transylvanian region. At the same time, Bucharest has the lowest labor productivity from all regions.

In concordance with the work of Chenery and Syrquin 2006 the share of agriculture in GDP decreases from the developed to the less developed regions. Indeed, agriculture has the lowest share of GDP in Bucharest and Transylvania. The average farm output value is also lowest in Bucharest and SW regions, however the rest of the Transylvanian regions do not show a distinctive character as compared to the outer Carpathian regions (NIS 2007).

The high labor productivity in the W region, indicating more developed agricultural and non-agricultural sectors as compared to the rest of the regions has several explanations. The Transylvanian, and especially the W region, is influenced to a larger extent by the developed West Europe than the rest of Romania. Moreover, Transylvania had a different historical path of development as compared to other parts of Romania (Bachman, 2006).

In conclusion the differences in the agricultural production patterns in the regions parallel the employment characteristics of the regions. In the regions with many possibilities for off-farm employment and low share of agriculture in employment – Bucharest and Transylvania – the share of agriculture in GDP is low. Moreover the regions Center and West have the highest agricultural output value per one person employed in agriculture, not so much the Bucharest region.

## **CONCLUSIONS**

The paper aimed at analyzing the relation between off-farm employment and agricultural sales. For this purpose the regional disparities in the evolution and current situation of off-farm employment, agricultural production, agricultural sales, incomes, investments and credits were analyzed at the regional level.

The regions with high development level, the Bucharest, Center and West regions have a relatively low share of agriculture in total and rural employment. These regions also exhibit a larger share of employees and employers in the rural occupational structure and the largest off-farm employment of the farm households. In these regions a low share of underemployment in agriculture suggests better off-farm employment opportunities than in the outer Carpathian regions with low development levels.

Concomitantly, in the regions with many off-farm employment possibilities, Bucharest and Transylvania, the share of GDP in agriculture is low compared to the rest of the regions. The Center and West regions exhibit the highest labor productivity of agriculture, not so much the Bucharest region. The differences between the regions follow similar pattern with respect to market participation and market orientation as well. Market participation with more than a quarter of production is the highest in the Transylvanian regions, just like the share of completely market oriented households selling most of their production. The average agricultural cash incomes of the farm households in the regions is in turn inversely correlated to the share of sellers, suggesting that the large share of market participation is not a sign of commercial farming but the proof of urgent cash needs determining farmers to sell some products.

Investments in agriculture occur mostly in the regions with high off-farm employment, however they are not correlated with the off-farm income but with the agricultural cash incomes.

This suggests that investments are primarily effectuated by households who develop commercial farms. Credit constraints are relaxed by the amount of off-farm income the household possesses thus enabling more investments.

The better off-farm employment opportunities lead to two evolutions, some households, especially those without significant agricultural activities exit farming, while the remaining households with higher agricultural incomes effectuate agricultural investments, become more specialized, increase their production and commercialize a large share of their production.

The important impact of off-farm employment on the commercialization of agriculture in a regional context underlines that economic development and the creation of non-agricultural jobs will all increase the commercialization of agriculture. At the same time the increase in off-farm employment will ease the burden of poverty the population is facing mainly in the rural areas by offering the chance to exit subsistence farming and pick up non-agricultural activities or become a commercial farmer.

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# MANAGEMENTUL CARIEREI PROFESIONALE ÎN ROMÂNIA

## PROFESSIONAL CAREER MANAGEMENT IN ROMANIA

*Corina Rușeț, Elena Peț,*

**Key words:** management, professional career, human resources

### **ABSTRACT**

*Aceasta lucrare prezintă o deosebită importanță deoarece, managementul carierei se referă la planificarea , proiectarea și aplicarea strategiilor și planurilor care permit organizației să-și satisfacă nevoile resurselor umane. Conceptul de carieră profesională nu trebuie asociat doar persoanelor care aspiră la funcții din ce în ce mai înalte; cariera angajaților reprezintă un obiectiv de care organizațiile sunt preocupate pentru fiecare dintre aceștia.*

*This paper work has a special importance because career management is related to planning, designing and application of the strategies and plans allowing the organization to satisfy its human resources needs. The concept of professional career must not be associated only to individuals who aim at higher and higher positions; employees` career represents an objective subject to organizations, for each of their employees.*

### **INTRODUCTION**

Career represents a very important aspect in a man's life, due to the fact that it gets materialized into a continuous fight to attain the aims and objectives proposed. Most employees are eager for having and developing a career, considering their personal needs and the family ones, as well (life quality).

In Romania and not only, the designing of the human resources career requires a reflection upon the assembly of activities of the human resources management.

Career management's main objectives are:

- promotion of a policy of development adequate to the career, in concordance with the nature of the activity performed, and also with the individual and organizational needs and possibilities;
- integration of the individual needs and aspirations into the organizational needs and objectives;
- satisfaction of the organization's needs for development and amplification of its positive images through the recognition of its employees' needs for training and development;
- identification and maintenance of the best employees or of those with certain professional perspectives by satisfying their professional needs and short- and long-term personal aspirations;
- elaboration of some career plans or the introduction of some special promotion schemes for the competent employees who do not have adequate positions;
- guiding and supporting the competitive employees to attain the personal objectives in concordance with their potential, needs and aspirations, and also with their contribution in the organization;
- supporting employees in the identification of qualifications and qualities necessary for the current positions, and also for the future ones;
- assurance of the training and development necessary for employees, in order to allow them to face any responsibility level, on the condition that they have the potential or capacity to attain this level;

- development of new career ways for the orientation of individuals in as many directions as possible;
- revivification of employees presenting stagnation or restriction in their career;
- achievement for organization and also for its employees of some reciprocal advantages.

### METHODOLOGY OF RESEARCH

To carry out our researches, we performed questionnaire-based sociological investigations.

The human resources investigated must identify their aspirations and capacities, and the companies must identify their needs and opportunities, to plan their staff and to provide the necessary information and the adequate training for their employees, meaning that the organizational needs cannot be satisfied if the individual needs are neglected.

### RESULTS AND DISCUSSIONS

In companies from Romania, career management takes into consideration the process of career planning, and also the performance of some programs for human resources development.

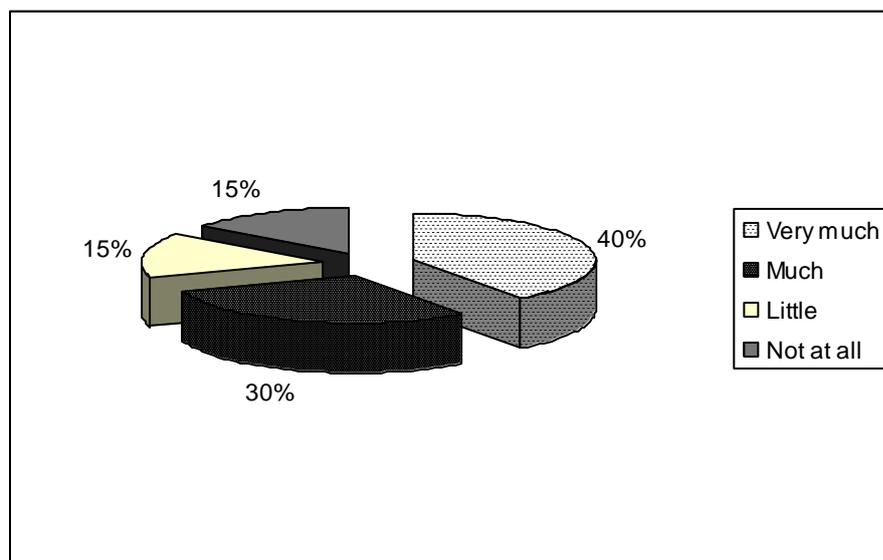
The process of career planning involves individual responsibility, and also the organizational responsibility.

The employees investigated, especially the young ones, require a bigger independence in choosing their career, a wider spectrum for the individual option, considering that what they perform is for their interest and they are less concentrated on the organizational necessities.

The human resources from an agri-food company from Timișoara were asked to answer to the following questions:

Do you feel that your position will help you to accomplish your life (from material and professional viewpoints)?

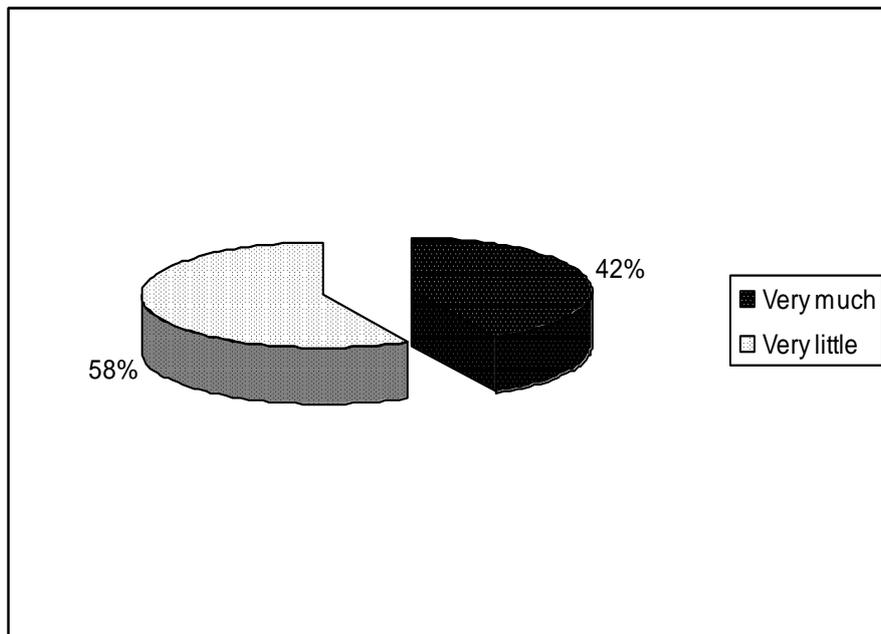
The company employees said, in a proportion of 40% very much, 30% much, 15% said little and 15% said the their position do not help them at all to accomplish their lives.



**Fig. 1. Percentages of human resources accomplishment**

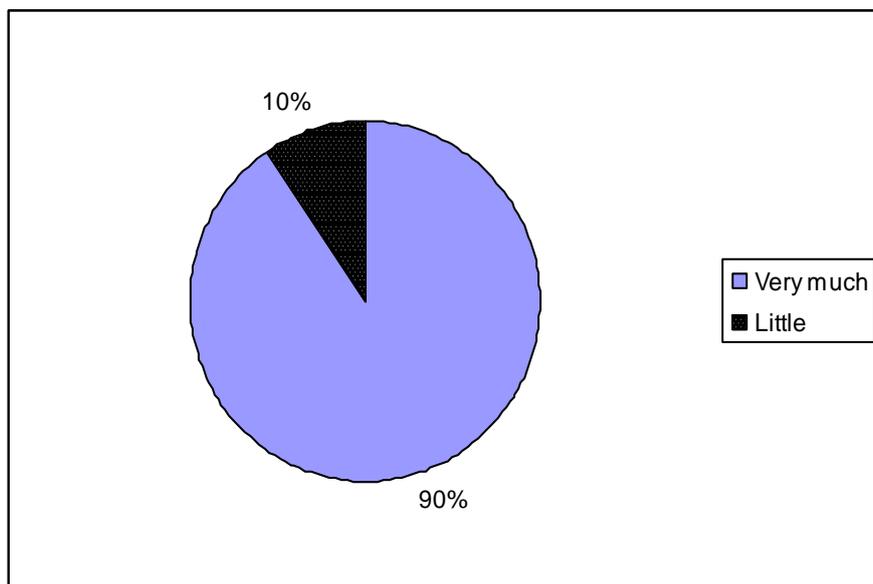
Another question was: Do you think that your work will help you to develop as personality along time?

The company employees answered in a proportion of 45% very much, and 55% declared that their work help them very little to develop as personality.



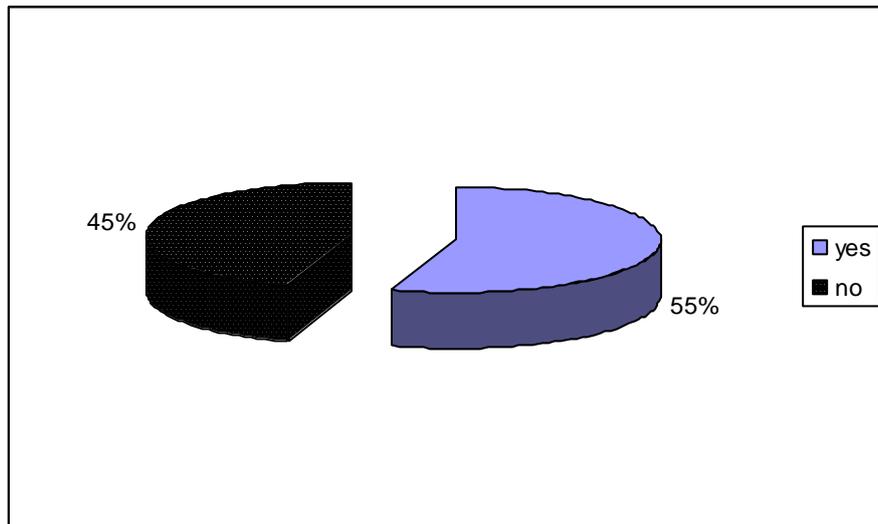
**Fig. 2. Work influence on personality**

The next question in the questionnaire was: Does your job offer responsibility to you?  
 The subjects investigated said in a proportion of 95% very much, and 10% said little.



**Fig. 3. Job responsibility**

At the question: Do you feel that your work will offer a perseverance fulfilment to you, too? 55% said yes, and 45% said no.



**Fig. 4. Percentage of perseverance fulfilment**

Due to the increase of job task complexity, employees must be better and better informed, educated and qualified. In this way, many of the companies from Romania elaborate programs of professional training for employees. The application of such programs is advantageous for employers and also for employees, who become more attached to company interests.

### **CONCLUSIONS**

The professional career is related to the entire individual life, to the achievements or lack of achievements in the personal life and in the professional life as well.

Career management plans and adapts the evolution of a company in concordance with the individual needs, potential, results and desires of its employees.

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# CONSIDERATII CU PRIVIRE LA RESURSELE UMANE DIN PENSIUNILE TURISTICE RURALE

## CONSIDERATIONS REGARDING THE HUMAN RESOURCES IN RURAL TOURISM PENSIONS

*Corina Rușeț, Elena Peț, Anda Milin*

Key words: human resources, rural tourism, pensions

### ABSTRACT

*Lucrarea prezintă o deosebită importanță deoarece principalul obstacol în dezvoltarea turismului rural îl constituie lipsa resurselor umane calificate. În pensiunile turistice rurale din România, personalul este asigurat în special de către membrii familiei, rude, vecini și cunoștințe. Prin intermediul resursei umane se comercializează și se consumă produsul turistic, iar calitatea forței de muncă utilizată reprezintă un factor determinant al calității produsului turistic în ansamblu.*

*This work has a special importance because the main obstacle in the development of rural tourism is represented by the lack of qualified human resources. In Romanian tourism pensions, the staff is provided especially by family members, relatives, neighbors and acquaintances. The tourism product is commercialized and consumed with the help of the human resources, and the quality of labor force represents a decisive factor for the quality of tourism product on the whole.*

### INTRODUCTION

Rural tourism is considered to be an alternative activity that has had impact and will continue to develop within the rural area due to its beautiful landscapes, to a substantial part of the territory that is maintained in its demi-natural condition, to the hospitality of population in the rural area, and to the continuation and maintenance of some important traditions and customs that have disappeared or have not existed within the urban area. The practice of rural tourism contributes to rural economic life through: perspectives for village long-term development in tight relationship with agriculture, infrastructure, environmental protection; possibility to become support for new business and jobs that should determine local development; increase of incomes for the inhabitants in rural areas by capitalizing the local resources.

The labor force effectuating services for tourists, beside experience and professionalism, must be able to work, to be in a good health condition, so that it will not cause diseases to tourists, to be able to cook good diversified food, to keep the cleaning at the proper hygiene-sanitary level, to provide a pleasant, happy and attractive work climate, to be able to combine all its qualities in order to create a good framework for all activities.

### METHODOLOGY OF RESEARCH

Our researches were performed in the region Poiana Mărului, county Caraș – Severin. This region is located 25 km far from the town Oțelul Roșu, on the banks of Bistra Mărului, this perimeter being also crossed by some of its effluents (Scorila, Șucu). Muntele Mic, Nedeia and Vâful Pietrii dominate the resort with their forest slopes, and the crests of the mountains Retezat and Turcu may be seen afar. The objective of this work was to present the potential of the human resources that practice rural tourism in the region Poiana Mărului, and in our researches we performed sociological investigations.

When doing this work, we focused on the presentation of the agrotouristic potential of the region Poiana Mărului, and we performed sociological questionnaires in order to carry out the studies. One of the reasons which determined us to apply to sociology is that, in its substance, agrotourism is organically associated to human behavior, and the second

reason is that the achievement of sociological knowledge is indispensable for the elaboration of projects made to be applied practically. We distributed 250 questionnaires in this region, and the subjects investigated did not have to mention their identity. The questionnaire was destined for tourists that visited the region Poiana Mărului.

### RESULTS AND DISCUSSIONS

The results of the questionnaire applied in the region Poiana Mărului are presented below in a synthesis. At the question „Have you ever visited this region?“, the tourists investigated said, in a proportion of 61%, yes, we have visited this region, and 39% said no.

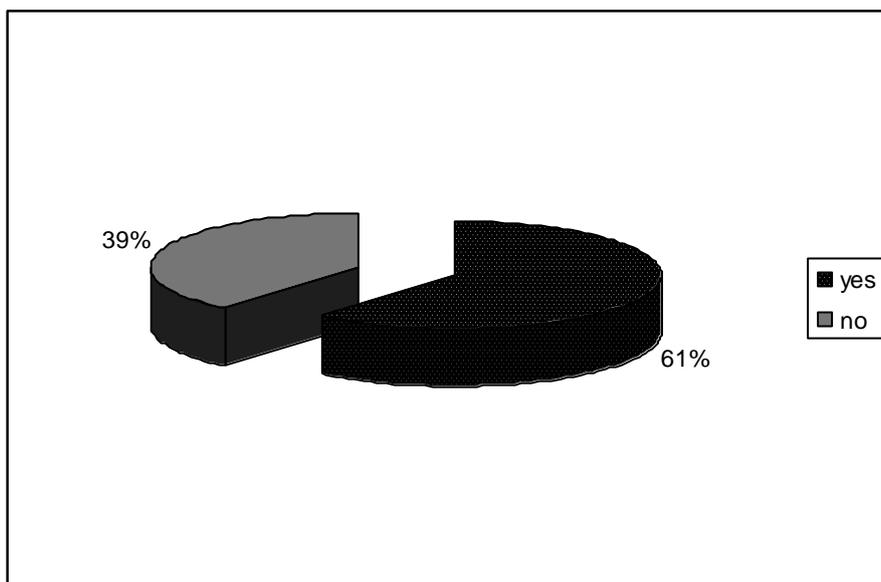


Fig. 1 Degree of tourism visits in this area

The second question put to the tourists visiting Poiana Mărului was: “Are you satisfied with the organization of human resources in the pension you live in?”. According to the questionnaires, 60% of the subjects were very satisfied with human staff organization, 25% were satisfied and only 15% were unsatisfied. Human resources practicing tourism must adapt themselves to the requirements of the tourism market and to make their pensions fit the quality standards required by travelers. The traditional good-quality treatment is an indispensable characteristic of the rural tourism, being one of the advantages of this form of activity.

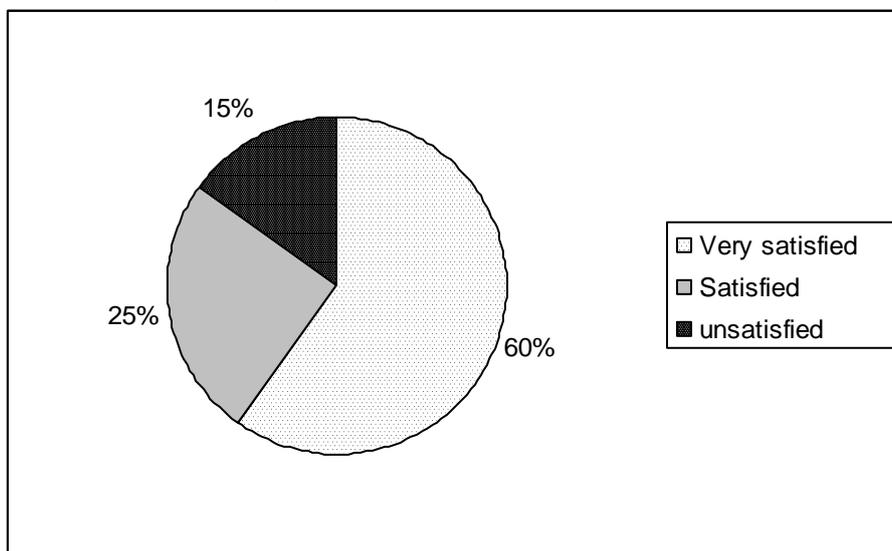
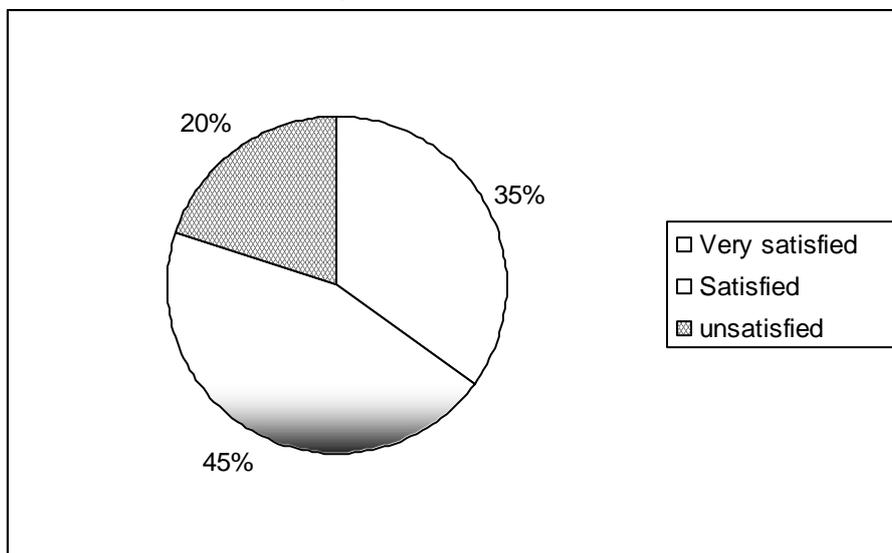


Fig.2 Satisfaction degree of tourists regarding organization

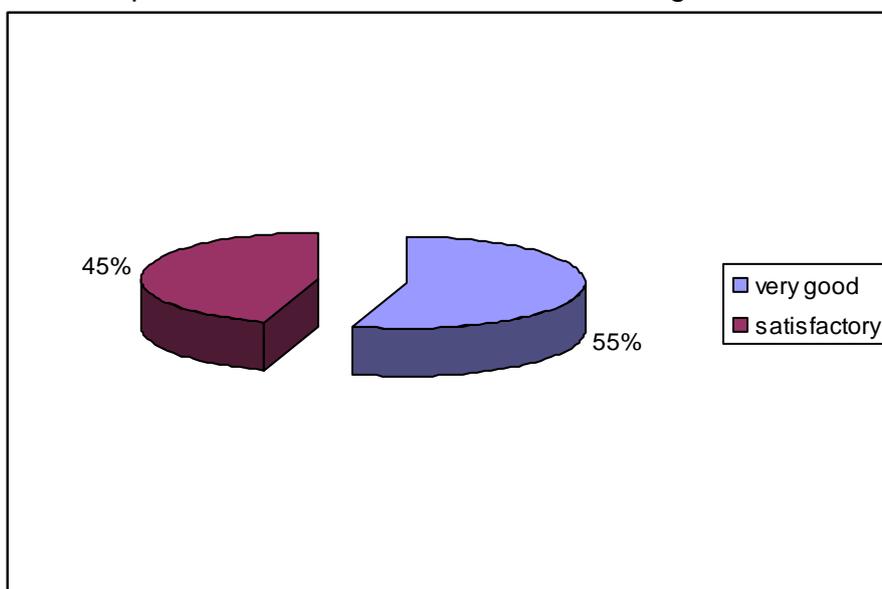
At the question „Please mark the satisfaction degree regarding food preparation and serving”, the persons investigated were very satisfied by the food consumed in a proportion of 35%, 45% satisfied, and 20% were unsatisfied, wanting kitchen meals, too. Food serving represents in most cases a complementary activity beside accommodation and it contributes to make the clientage faithful.



**Fig.3 Satisfaction degree of tourists regarding food supply**

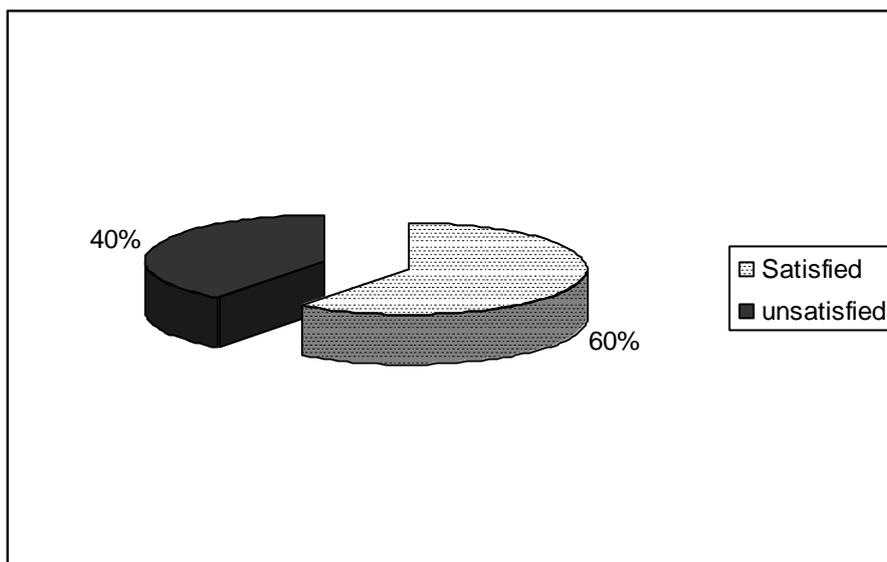
Another question met in the questionnaire is: “How do you appreciate the relationships with pension staff?”.

Tourists had in a proportion of 55% very good relationships with pension employees, and 45% had satisfactory relationships. Beside food requirements, human resources must be hospitable and allow a close contact with guests.



**Fig. 4. Relationships of tourists with pensions' employees**

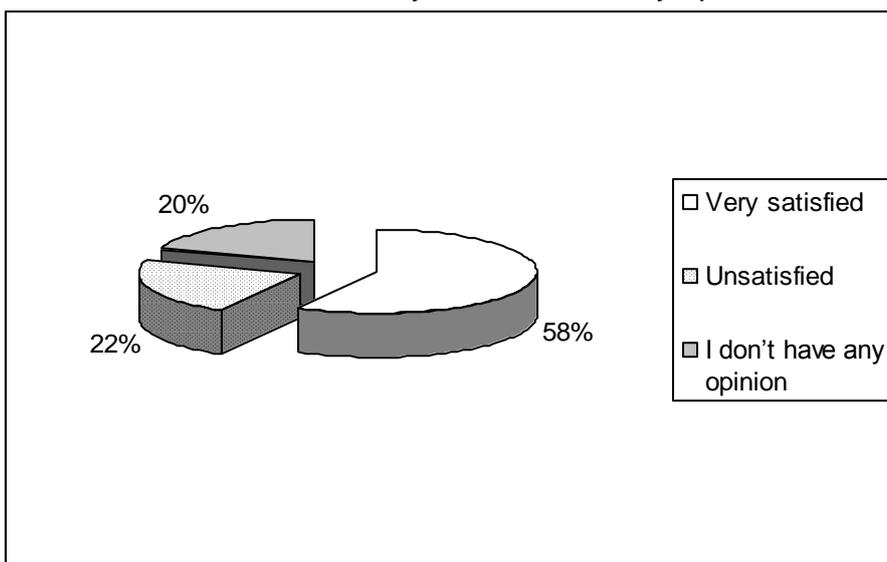
Another question is related to tourists’ degree of satisfaction regarding accommodation. 60% of the tourists accommodated in the pensions from Poiana Mărului are satisfied with the accommodation places, and 40% were unsatisfied, declaring that it could be better.



**Fig. 5. Accommodation supply**

Thereafter, tourists were asked to mark the satisfaction degree with regards to the special endowments available for children.

The persons who visited this area declared they were very satisfied in a proportion of 58%, 22% unsatisfied and 20% said they did not have any opinion.



**Fig.6. Special endowments in pensions with playgrounds for children**

### CONCLUSIONS

Human resources practicing tourism must adapt themselves to the requirements of the tourism market and to make their pensions fit the quality standards required by travelers.

Beside food requirements, human resources must be hospitable and allow a close contact with guests.

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# ESTABLISHING WORK INDEX PARAMETERS OF AGRICULTURAL MACHINES AND REDUCTION OF FUEL CONSUMPTION

## STABILIREA PARAMETRILOR DE LUCRU A MAȘINILOR AGRICOLE ȘI REDUCEREA CONSUMULUI DE COMBUSTIBIL

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**KEYWORDS:** agricultural machines, pressure sensor, penetration resistance, revolution regime.

### ABSTRACT

*The experimental studies have underliend the benaviour of the soil at challenges in horizontal and vertical plane, as a result of the rolling system of the agricultural machines on the soil. The intensity of the treading of the soil is influenced by the internal and the factors external the internal ones being characterized by the resistance at the penetration of the soil.*

*At the same time iincreasing Diesel fuel price, used as fuel for the functioning of the agricultural machines engines, obliges to take an action to reduce the quantities of consummated fuel respective the reduction of the price of the agricultural works. One of the method of using the correct revolution regime of the engine and using the full power of it, in the zone in that the fuel consumption is minimum or almost minimum.*

*În lucrare se prezintă studii și cercetări privind parametrii de lucru ai agregatelor agricole, influența proprietăților fizice și mecanice ale solurilor asupra acestora și determinarea rezistenței la penetrare a solului în plan vertical și mai ales în plan orizontal.*

*Creșterea prețului motorinei, ne obligă să acționăm în vederea reducerii cantității de combustibil consumat pe unitatea de suprafață, respectiv reducerea prețului de cost a lucrărilor agricole. În afara metodelor tehnice care conduc la reducerea consumului de combustibil sau a posibilităților de folosire a biocombustibililor ca înlocuitori ai motorinei, se poate spune că cea mai simplă, eficientă și la îndemâna oricărui utilizator este metoda folosirii corecte a regimului de turație a motorului și folosirea completă a puterii acestuia, în zona în care consumul de combustibil este minim sau aproape de minim.*

### INTRODUCTION

Through the using during the work of the traction force and also the action from the power plug or hydraulic action can be used also the small and very small speeds, the load of the engine is maximum , the revolution regime of the minimum specific consumption of fuel.

This thing imposes to form complex agricultural aggregates that in the same time with a few work capacities lead to the decrease of the agricultural work period, at the decrease of shifts number on soil and also the decrease of fuel consumption.

When it can't realized a maximum load of the engine, the engine must be exploited at 60% from the maximum revolution in the minimum specific consumption zones.

Traction force depend of the soil, of the settle degree, of the humidity but also of the moving speed that influence the traction force revolution of the engine and the motor moment.

At high speed of moving the fuel consumption is decreasing motor moment is getting bigger values as 1100-1200.

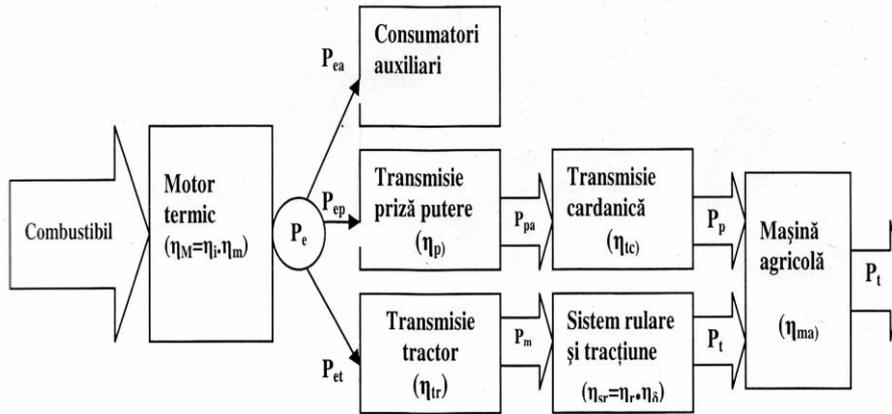


Figure 1. Used engines power for effectuation works in station regime and force regime

At small speeds the fuel consumption is increasing the traction force is growing because of the adherence absence. At small and very small speeds must compensate through a few work properties, big width of work, complex aggregates for obtaining a full load of the engine and his using in the regime of maximum revolutions but heaping the limit of skidding.

## THE MATERIAL AND RESEARCH METHOD

Under the action of the external forces, in the soil appear reactions which acts on the soil, mainly at compression in the vertical plane, and at tangent forces in the horizontal plane. The result of these actions could be movement of the soil on a limited section, leading to a break up of the soil (figure 2).

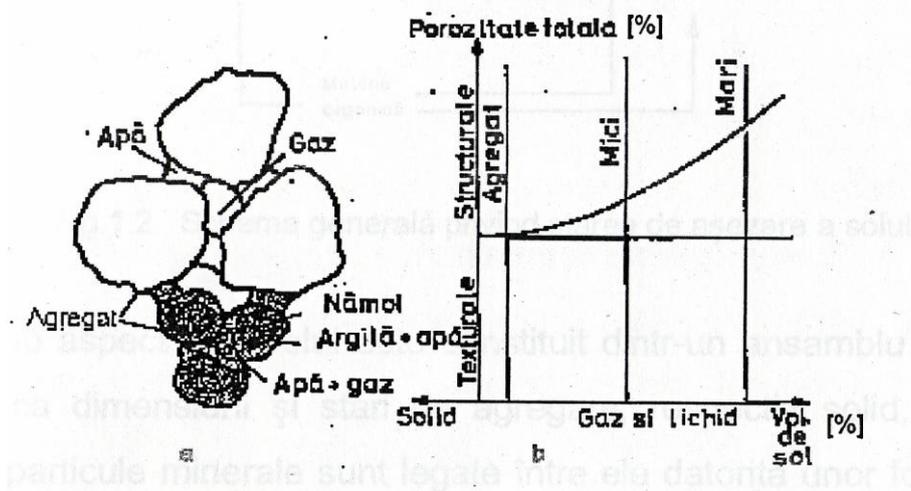


Figure 2. Physics constitution of soil (a) and fizic aspects (b)

The effect of the pressure on the soil

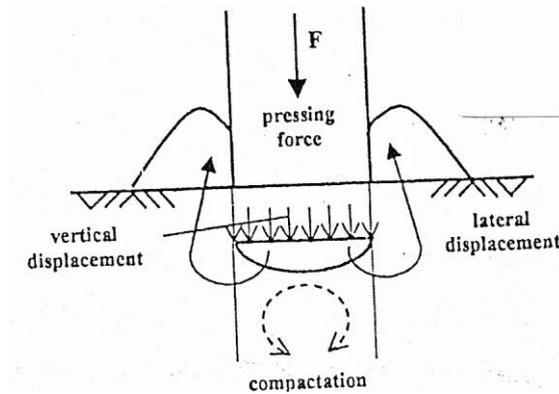


Figure 3. The effect of the pressure on the soil

The intensity of the treading of the soil is influenced by the internal and the factors external the internal ones being characterized by the resistance at the penetration of the soil.

### RESULTS AND DEBATES

In order to determine the resistance at penetration of the soil in horizontal plane, a deformation of the soil takes place, in the vertical plane, till a certain depth. And this deformation is considered to be almost equal to the deformation of the soil, in the process of compacting of this-one, with a force equal to the resistance at penetration of the soil, applied to a penetration cone surface, used during the determination of the resistance at penetration, in horizontal plane.

Table 1

Average values of penetration resistance [KPa]

Measuring depth [m]	Penetrometer position	
	Vertical	Horizontal
0,1	50,30	2,10
0,2	10,20	4,02
0,3	12,50	5,00
0,4	17,60	7,10
0,5	25,00	9,98

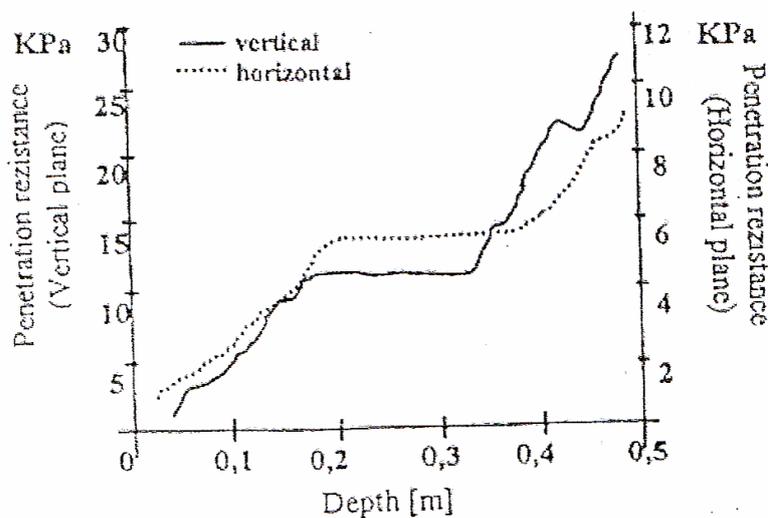


Figure 4. Soil resistance penetration in vertical and horizontal plane

At the same time values of the thermal engine revolution regime and using mode of the engine power that the used power to be almost in today (85-90%) from the full power.

The characteristic curves that were drawn in figure 1 are possibly only geometrical. In reality, the engine doesn't work normal at revolutions smaller than (0.6-0.8/nm) or bigger than (1.1-1.2/nm). The paper power curve and the moment are determined experimentally between the two limited values [1].

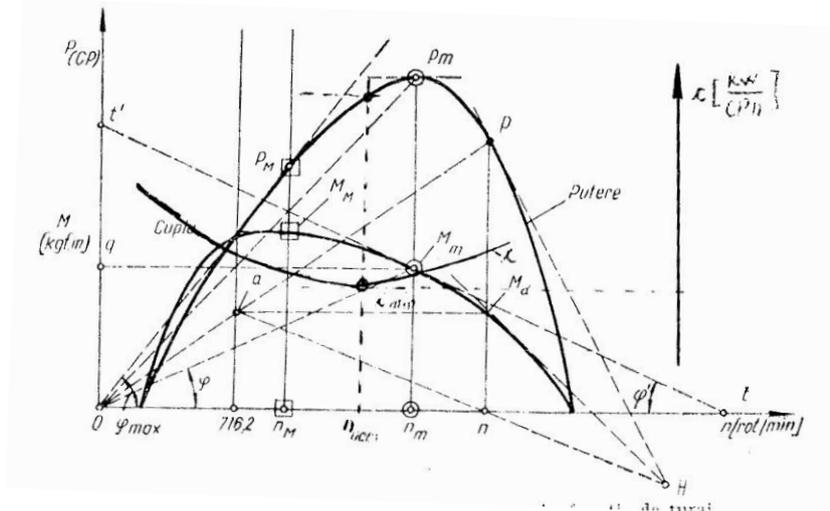


Figure 5. Curves power, moment and consumption for the thermal engines

Some, it must be known that between the two values, the specific fuel consumption decreases to a minimum value after it starts to grow again.

### CONCLUSIONS:

- Soil penetration resistance decrease with increasing of humidity and also increase with clay content.
- It is recommended to the workers that use thermal engines that equip the motor vehicle, to use revolution regime that leads to values determining, in the same time with the obtaining of the full power of the engine and using more of it.
- Between the values of soil penetration resistance of electrometer cone in vertical and horizontal plane exist a ratio estimated of 1:2, 7.
- Therefore the specialists must recommend to the workers that use thermal engines that equip the motor vehicle, to use revolution regime that leads to values determining, in the same time with the obtaining of the full power of the engine and using more of it.

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# HYDRAULIC DEVICE FOR AUTOMATIC ADJUSTING OF AGRICULTURAL MACHINES POSITION WORK

## INSTALAȚIA HIDRAULICĂ PENTRU REGLAREA AUTOMATĂ A POZIȚIEI DE LUCRU A MAȘINILOR AGRICOLE

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**Keywords:** mechanism, hydrostatic system of position, agricultural machines.

### ABSTRACT

*Action adjourning mechanisms which equipped agricultural tractors is ma de from a hydrostatic system. Some hydraulic system are endowed with the possibly to achieve automatic adjusting of force and position.*

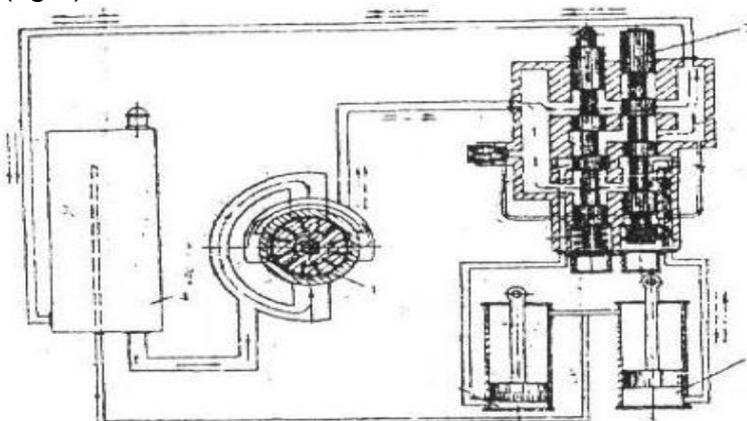
*Other had manual sue of equalizer and function of the command achieve for work position of adjourning system. With a view to modifying the mechanism and ensure a fixed position given the tractor or soil of agricultural machines. It has been achieved a simple distributor system which is mounted between the equalizer with axial piston and the double effect cylinder of adjourning mechanism.*

### INTRODUCERE

*Sistemele hidraulice care echipează unele tractoare agricole, pot realiza reglarea poziției mașinii agricole față de sol sau tractor numai prin acțiunea manuală a utilizatorului. Instalația prezentată oferă posibilitatea modificării tehnice a instalațiilor cu comandă manuală în instalații hidraulice cu comandă automată prin înlocuirea unor elemente componente, adică înlocuirea cilindrului hidraulic cu dublu efect cu un cilindru hidraulic cu simplu efect.*

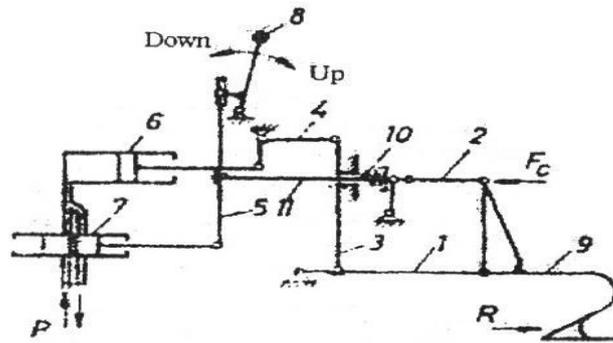
### GENERALITY:

The agricultural tractor team with hydraulic system was made in and of easier creates of difference agricultural aggregates, of stability of one position of work of these and she maintains during the work. Indifferent of tractor type a hydraulic installation has in her few principal elements (fig.1).



**Fig.1.** The principal components of one hydraulic installation. 1- hydraulic pump; 2-distributor; 3- geometrical hydraulic engine; 4- hydraulic tense.

A few hydraulic installation has in their composition, functional elements that's assure the obtain of a few automatic adjusting of power and the position of the elements present in fig.2.



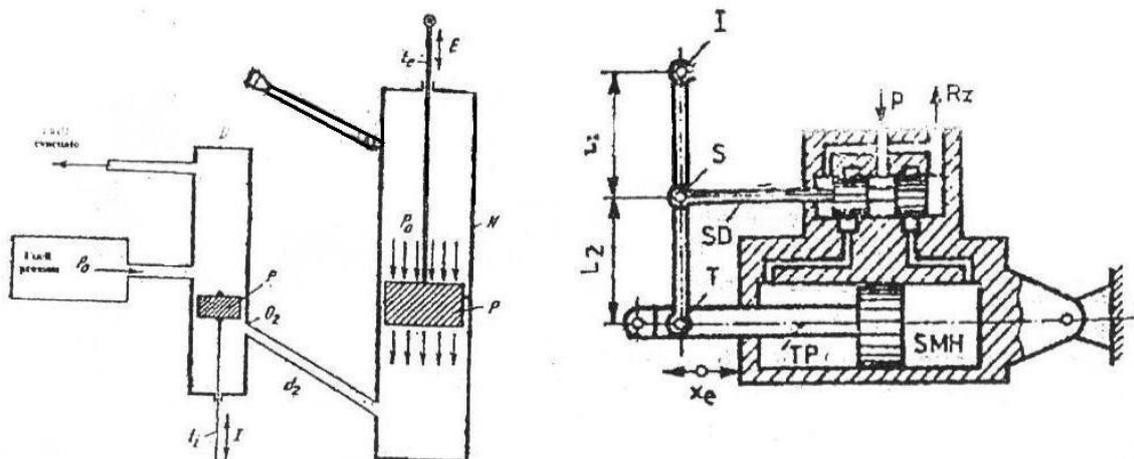
**Fig.2. Hydraulic installation with automatic adjusting: 1 Agricultural car; 2 Lateral, 3 functions arms; 4- Central; 5 Selection handle; 6- hydraulic Engine; 7 Rotate Hydraulic engine; 8- Command handle; 9- Agricultural work element; 10- powered position traducers; 11 Road.**

This hydraulic installation ashore the maintaining of the one reference position established between the part of tractor and the agricultural car. In this way of the 8 handle is pulling up on the position up, on the 5 command lever the rotation, the distributor 7 drawer. Like beginning the hydraulic oil from the installation comes in the 6 engine that lift up the agricultural car.

On the same time the rotation of 4 arms is rotating and the 10 a traction of position who prowess on 11 rod and rotate the hydraulic distributor drawer the neuter position. In time when the handle of command 8 is turn off the lift up process is turn on to obtain the position of reference of agricultural car in function of the tractor. The automatic adjusting circuited doing direct so at the relative position modification of the agricultural car function with the tractor corp.

### THEORETIC STUDY

In the aimed of piston of some disadvantage of hydraulic installation with separate elements and their transformation in hydraulic installation with automatic adjusting of position it was tacking in study the doings of a simple hydraulic distributor axial like an other of geometrical hydraulic engine that can be maintain between the axial distributor and the hydraulic engine with double installation turn it in cylinder with simple effect of this rod is put function with command lever of the distributor. The components are presents in fig. 3.



**Fig.3. Distributor for automatic adjusting of position of hydraulic installation with separate element: t1 came in rod of hydraulic engine; p1 distributor piston; d1 and d2 functions tubs with hydraulic cylinder and with axial distributor of hydraulic installation**

Mounted between the tubes of hydraulic cylinder who do the connection between the axial distributor of tractor and the hydraulic engine with double effect of the distributor present in fig. 3 assure two functions positions of some hydraulic installation one when the oil go though the tube d1, to the inferior room of the hydraulic engine doing the piston lift up, the piston when the oil of the axial distributor of tractor is recycled to the tank though the tube d2. The come in rod when is mounted to the piston p1, is in function with the command handle of axial distributor and with the arms of the lift up mechanism.

To obtain a reference position of the agricultural car in function with the tractor is moved the command handle of the axial equalizer and after is realized the functional relation between the rods  $t_1$  and  $t_c$ .

Servo mechanism mechanic-hydraulic, present in this work, get a signal that is in a move  $x_i$  transmit at the servo system on his connection the point between the two rods of connection geometrical engine on axial distributor. This signal do a movement of drawer who control the liquid under pressure debited of the hydraulic pump to the hydraulic engine room moved command lever for power amplification, doing the lift up of the agricultural car when this come up to the initial position of neuter it close so the engine liquid and finishing the work cycle. The tense distributor, the pressure and the debit standing send liquid to the hydraulic engine with the position of the position of the debits damages and the necessary power of the command. The evaluation of the characteristics (feature)  $Q(y)$  and  $D_p(y)$  is made by the gradient  $Q/Q_{max}$ ,  $P/P_{max}$  with constant value in math equations, The usual domain of equalizer is limited to the linear parts of the equation.

The debit  $Q$  is sensitive affected of the value  $y_0$  that represent of fact the difference between the piston  $L_p$  dimension and the command the hydraulic engine  $L_c$  with who is creating the engine resistance of the circuit. This resistance  $R$  represent the derivate the fowling down of the pressure with the circuit debit:

$$R = d(D_p/dQ) \quad [Ns/m^5] \quad (1)$$

The debit  $Q_0$  transmitted by the pump and hydraulic resistance  $R_0$  create at the opening  $y_0$  are relating dates:

$$Q_0 = Y_0 B \sqrt{P_0} \quad (2)$$

$$R_0 = P_0 / Q_0 \quad (3)$$

The debit and the resistance tense are explicated through the relations:

$$Q = (y_0 + y) B \sqrt{P_0} \quad (4)$$

$$R = P/Q \quad (5)$$

$$B = C_p \pi \sqrt{2}/Q \quad (6)$$

## CONCLUSIONS

[1].The distributor assures the fast modification element in hydraulic installation with automatic adjusting of position.

[2].The mounting and his action doesn't necessity domain specialization.

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# STUDII PRIVIND SISTEMELE DE AGRICULTURĂ PENTRU CONSERVAREA SOLULUI ȘI MĂSURI PENTRU PROTECȚIA MEDIULUI ÎNCONJURĂTOR

## STUDYES ABOUT AGRICULTURAL SYSTEMS AND SOIL CONSERVATION WITH REGARD TO AGRI- ENVIROMENTAL MEASURES

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**Keywords:** enviromental, development, arable lands, production systems, market economy.

### **ABSTRACT**

*In Romania, the agricultural production systems are passing through profound and dramatic changes providing distinct features and dimensions of the sustainability issue. Although, the degree of soil quality deterioration is significant, an interesting environmental opportunity emerged due to the sharp drop in fertilizers and pesticides consumption in agriculture. The benefit from the EU co-financing the implementation of agri-environmental measures, provides a chance to agriculture and its integration in the environmental aspects.*

*În România, sistemul agricol de producție este influențat profund și dramatic de schimbările asupra formelor și dimensiunilor unor rezultate sustenabile. Deasemenea au loc schimbări importante în ceea ce privește viitorul și oportunitatea aplicării fertilizanților și pesticidelor în agricultură. Măsurile de finanțare și implementare a unor rezultate aduse de UE, conduc la schimbări în agricultură și integrarea în agricultura viitorului.*

### **INFORMATION**

Major changes occurred during the decade in the UE agricultural policies, underlying the environmental objectives in a more integrated approach. The recent reforms of CAP (Common Agriculture Policy), as part of the Agenda 2000, established that agri-environment measures could provide both environmental and socio-economic benefits and should be supported within the framework of an „integrated rural development „policy.

As a result, agri-environment schemes were included in the new Rural Development Regulation-Council Regulation, EC,1257/1999, as the only compulsory element. Special attention has been given in this respect to the accession of the Central and East European countries. Programs and projects have been developed during the last years, to contribute to the integration of the environmental issues in to the development planning in the UE candidate countries and to assist the UE acquis communautaire implementation. The most important one recently implemented in Romania, is devoted to stimulate agriculture production methods design to protect the environment and to maintain the countryside. In Romania, the agricultural production systems are passing through profound and dramatic changes providing distinct features and dimensions of the sustainability issue.

Although, the degree of soil quality deterioration is significant, an interesting environmental opportunity emerged due to the sharp drop in fertilizers and pesticides consumption in agriculture. The benefit from the UE co-financing the implementation of agri-environmental measures, provides a chance to agriculture and its integration in the environmental aspects.

## CONSERVATION MANAGEMENT OF SOIL RESOURCES

The largest threat to soil quality in Romania is erosion, which affects almost 7 mil. Ha is becoming an increasing problem due to the deforestation and destruction of buffer strips in vulnerable regions. Most of the mountain and hilly-side farming communities have little prospect to economical development. This leads sometimes to an unsustainable exploitation of natural resources. Therefore, a proposed National Agri-environmental horizontal scheme to be applied at pilot level in the framework of SAPARD, currently comprising management packages for soil erosion control.

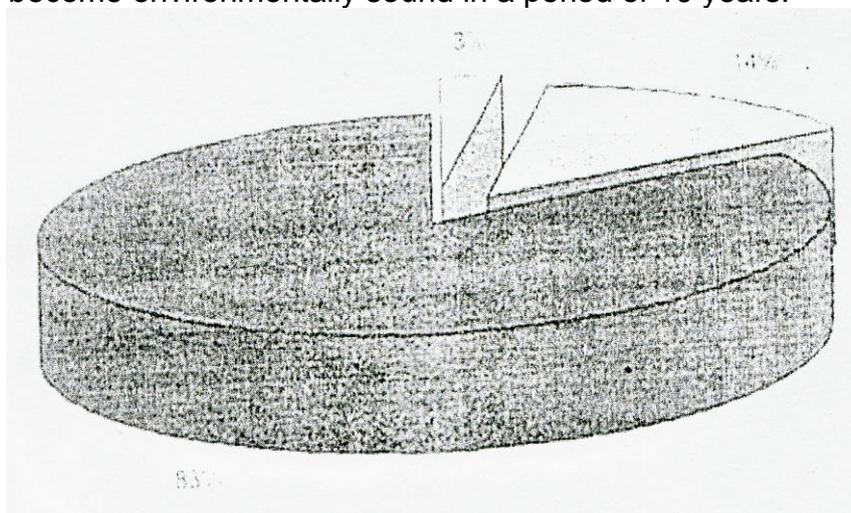
The prescriptions include a reduction of the farm acreage with high risk erosion exposing and an increase of the cover crops. The farmers should plan and perform changes of land use structure of the farm from arable land to hayfield and manual mowing is preferred due to socio-environmental reasons.

Grassland strips are to be sown in order to avoid soil erosion in the sloped arable lands; the strips will never be grazed but always mowed. Introduction of perennial crops and grasslands is recommended along water streams in strips of 10 m wide on each side of the river. The prescriptions also stimulate the association and aggregation of the fields located in the slope area in such way that mechanized soil tillage is performed along the level line. This has a paramount importance since the present situation of land property and low land aggregation in Romania, with small sized split parcels scattered on the agricultural land, impairs a proper land management. Basically, the payments for farmers undertaking the measures are made for the income forgone calculated on the basis of the difference between the most profitable local arable crops and the replacing ones, as well as the need for an incentive.

### ORGANIC AGRICULTURE

Organic farming can be of benefit to the environment, creating habitats in which biodiversity is enhanced by management practices. The area under organic farming in EU countries is continuously increasing. It now covers 2,5% of the EU agricultural land expected to increase to 5-10% in 2005.

In Romania, along the transition to market economy, the agricultural intensification and production growth significantly decreased due to the opening of internal markets for imported products, the loss of external markets, poor land aggregation, reduction of the subsidies, lack of production means of the land owners, poverty a.o. various aspects of the economic decline and social features of the transition period have contributed to an overall improvement of the environment in the agricultural areas and the decrease of the agricultural pollution from point and non-point sources. Based on the existing situation regarding farming systems extent (figure 1), resources and assumption trends towards achieving sustainability in agriculture, a scenario developed by a national agricultural production can become environmentally sound in a period of 10 years.



**Figure 1. Share of agricultural systems in Romania, % of the arable land.**

Roughly 12 mil. of agricultural land in Romania, are affected by one or more limitations. Over 7 mil. ha, with low and very low organic matter content are reported, despite the fact that a significant share of the soils are taxonomically ranked as fertile. But most of the productive capacity limiting factors can be buffered by the systematic use of organic farming techniques.

The poor performance and extent of the survival agriculture system provides a wide room for implementing low input environmentally sound practices as well as organic ones, including organic-by-neglect land management capable to replace the lack of manure where scarce livestock is available. In the SAPARD context, organic agriculture might be seen as a supplementary measure of the conservation of soil resources taking into account the potential for unfair competitive advantages which may be gained by the pilot areas benefiting from SAPARD funds.

Even if a significant share of the SAPARD budget is available for this purpose, clarifications between ED and the national authorities in question are still needed. However, beyond SAPARD circumstances, organic agriculture has a considerable potential in Romania in terms of exporting organically products.

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# RESEARCH REGARDING THE ESTABLISHMENT OF THE PRESERVATIVE TECHNOLOGIES FOR SOIL WORKS MECHANIZATION AT WHEAT CROP, FOR THE SOILS' SPECIFIC CONDITIONS IN THE N-E AREA OF ROMANIA

## CERCETĂRI PRIVIND STABILIREA TEHNOLOGIILOR CONSERVATIVE DE MECANIZARE A LUCRĂRILOR SOLULUI LA CULTURA DE GRÂU, PENTRU CONDIȚIILE SPECIFICE DE SOL DIN REGIUNEA N-E A ROMÂNIEI

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**Key words:**sustainable agriculture, agricultural units, soil preservation.

**Cuvinte cheie:** agricultură durabilă, agregate agricole, conservare sol.

### ABSTRACT

*In the paper are presented the results obtained by the research team for establishing the optimal solutions of preservative technologies for settling up wheat crop on specific soils in the N-E area of Romania. Research tracked, for different variants of agricultural units the evolution of soils' physical features, the determination of exploitation indexes of the units and crop yields. In connection with the obtained results the authors recommend optimal variants for settling up wheat crop, for soils' conditions from N-E of Romania.*

*În cadrul lucrării sunt prezentate rezultatele colectivului de cercetare prin care s-au stabilit soluții optime de tehnologii conservative pentru înființarea culturii de grâu pe soluri specifice zonei de N-E a României. Cercetările efectuate au urmărit, pentru diferite variante de agregate agricole evoluția caracteristicilor fizice ale solurilor, determinarea parametrilor de exploatare ai agregatelor și producția de cereale. Ca urmare a rezultatelor obținute autorii recomandă variantele optime de tehnologii conservative pentru înființarea culturii de grâu, în condiții de sol din N-E României.*

*To establish the preservative technologies for soil works mechanization at wheat crop and the adequate machine system, aligned at the concept of sustainable agriculture, it is necessary to be effectuated proper experimental researches. The mechanization technologies and the proposed units (design by research team or already existed) must be tested, in laboratory and field conditions, to establish if are in according with the imposed demands.*

*For solving these problems the research team proposed more variants of technologies for soil works mechanization and sowing at wheat. These technologies were test to establish which of them are suitable in the higher degree to the concept of sustainable agriculture and assures, mainly, protection, preservation and improvement of the agricultural fields. For this, each variant of mechanization technologies which includes un-conventional, preservative, soil works, done with adequate aggregates, will be compare with a control variant where is applied the classic technology, conventional, of soil works, but also the comparison will be made also with the others variants.*

*Each variant of mechanization technology include soil works for wheat crop and the aggregates which are involved in this activity. Here is included soil basic work, superficial works for maintenance of early ploughing and germination bed prepare. Sometimes soil works are reduced till the total disappears of them, who it is in the case of direct sowing (in stubble-field, in un-prepared soil, un-ploughed).*

*Due to the fact that majority of the tested technologies include combined, complex, working units which have in their structure also sowing equipments, was establish that*

sowing work to be presented at all technologies, so that these ones to be compared between them.

### MATERIAL AND METHOD

Experiments regarding technologies for soil works mechanization at wheat took place in years 2006, 2007 and 2008. Because at the experience settled up at the beginning of September 2006 we considered that the results were influenced by the draught (in September...December 2006 and April...July 2007 rain falls quantities were lower than the multiannual monthly averages), in September 2007 was started up a new experience with technologies for mechanization of soil works at wheat; and this time the experiment took place in normal conditions regarding rain falls quantities recorded during vegetation period.

The soil where tests were made is a mezocalcaric cambic chernozem type to baticaric, with a clay-loamy texture and medium values of the apparently density and humidity. The average longitudinal slope of the field is 2 degrees. The precursory plant was sun-flower.

At all the technologies for mechanization of soil works and sowing, applied at wheat, before them the vegetal mass was chopped with a SR 250 machine, so in this way were created the normal conditions for soil works and sowing.

In the researches were tested six variants of technologies for mechanization of soil works and sowing. The six variants of technologies are presented in *table 1*.

Table 1

Used aggregates	Variants of technology
<ul style="list-style-type: none"> <li>• Valtra T-190 tractor + Opal 140 reversible mouldboard plough</li> <li>• U-650 tractor + GD-3.2 easy disk harrow + 2 GCR-1.7 tooth harrow (3 passes)</li> <li>• U-650 tractor + SUP-29 universal sowing machine</li> </ul>	V <sub>1</sub> (control)
<ul style="list-style-type: none"> <li>• Valtra T-190 tractor + Opal 140 reversible mouldboard plough</li> <li>• Valtra T-190 tractor + AGPS-24 complex unit (FRB-3 rotary hoe + SUP-24 DR sowing machine), 540 rot/min at tractors' power plug</li> </ul>	V <sub>2</sub>
<ul style="list-style-type: none"> <li>• Valtra T-190 tractor + GD-4.2 heavy disk harrow</li> <li>• Valtra T-190 tractor + AGPS-24 complex unit (FRB-3 rotary hoe + SUP-24 DR sowing machine), 540 rot/min at tractors' power plug</li> </ul>	V <sub>3</sub>
<ul style="list-style-type: none"> <li>• U-650 tractor + PC-7 chisel</li> <li>• Valtra T-190 tractor + AGPS-24 complex unit (FRB-3 rotary hoe + SUP-24 DR sowing machine), 540 rot/min at tractors' power plug</li> </ul>	V <sub>4</sub>
<ul style="list-style-type: none"> <li>• Valtra T-190 tractor + soil loosening organs mounted on AGPS-24 complex unit (540 rot/min at tractors' power plug)</li> </ul>	V <sub>5</sub>
<ul style="list-style-type: none"> <li>• Valtra T-190 tractor + MCR-2.5 combined machine for soil processing in rows and sowing (direct sowing in un-ploughed soil), 1000 rot/min at tractors' power plug</li> </ul>	V <sub>6</sub>

Variant V<sub>1</sub> was considered control (standard) variant, because represents the technology for mechanization of soil works and sowing which is generally applied in field conditions; it is the classical one, the conventional technology of soil processing.

At each technology for mechanization of soil works and for each working unit (machine or tool) were determine the quality indexes of the effectuated work; also at each

variant were determine the energetic and exploitation indexes for every each unit. The obtained results were compared with the limits imposed by the agro-technical demands, to see if the results are suitable or not. Also on the base of the indexes values, each technology was compared with control technology and with the other ones, to be able to establish the best technology.

For selecting the technology for mechanization of soil works, at each of them was determine, after wheat sowing, soils' penetration resistance and stability of soils' structural elements. We consider that those indexes, soils' penetration resistance and especially stability of soils' structural elements (expressed by balanced average diameter of soils' structural elements and hydric stability of those elements), are very important, because on their basis could be establish the manner in which each technology for mechanization of soil works contributes to its degradation.

Also for choosing the best technologies for mechanization of soil works were calculated, for each technology, fuel consumption per hectare for a mechanized processing of soil works and sowing.

We also considered that at selection of technologies for mechanization of soil works must be take in account the way in which plants grow and the obtained yields. For that were determining the number of risen plants per square meter, plants' height, and finally were established the seed yields per hectare.

## RESULTS AND DISCUSSIONS

At choosing the technologies for mechanization of soil works which will be recommended to be applied in production will be take in account the following: soils' breaking up degree at germination bed prepare, soils' penetration resistance, balanced average diameter of soils' structural elements, hydric stability of those elements, fuel consumption per hectare for soil works and sowing, number of risen plants on 1 m<sup>2</sup> and their height, seeds yield per hectare.

We consider that for the working indexes the most important one is soils' breaking up degree. The problems which appear at germination bed prepare are mainly caused by the fact that it is not assured a suitable breaking up of soil. The decreasing of soils' breaking up degree at values lower than the minimum limits imposed by the agro-technical demands appears especially at germination bed prepare for crops which are sowed in autumn.

As regarding the energetic and exploitation indexes of the agricultural units, could be mention that the most important one is fuel consumption per square unit.

**Soils' breaking up degree at germination bed prepare** varied function of the applied technology, from 70% to 100% (table 2).

**Table 2**

**Soils' breaking up degree obtained at germination bed prepare for winter wheat**

Variant of technology	Soils' breaking up degree, %
V <sub>1</sub> (control)	70
V <sub>2</sub>	90
V <sub>3</sub>	92
V <sub>4</sub>	93
V <sub>5</sub>	95
V <sub>6</sub>	100

If we have in view the agro-technical demands which impose that soils' breaking up degree at germination bed prepare to be minimum of 90%, variant V<sub>1</sub> (control) could not

be applied (at this variant soils' breaking up degree is not in the imposed limits established by the agro-technical demands).

The others variants have adequate values for soils' breaking up degree. From these ones, variant V<sub>6</sub> is the best one, soils' breaking up degree being, in this case, 100%.

**Soils' penetration resistance** was determining the next day after wheat sowing. In table 3 are presented the obtained results regarding soils' penetration resistance, for different applied technologies.

**Table 3**

**Soils' penetration resistance obtained at different technologies for mechanization of soil works and sowing (winter wheat)**

Variants of technologies	Depth (cm)					
	5	10	15	20	25	30
	Soils' penetration resistance, daN/cm <sup>2</sup>					
V <sub>1</sub> (control)	1.3	1.4	1.7	2.4	4.8	8.3
V <sub>2</sub>	2.4	2.9	3.3	3.7	4.6	4.7
V <sub>3</sub>	2.2	6.8	7.3	7.8	9.1	9.5
V <sub>4</sub>	1.5	1.5	1.9	2.5	5.1	8.6
V <sub>5</sub>	2.3	4.2	7.6	8.0	8.5	8.8
V <sub>6</sub>	7.5	7.7	9.1	9.3	11.1	10.2

The agro-technical demands establish many value classes for soils' penetration resistance: very low = under 11 daN/cm<sup>2</sup>, low = 11 – 25 daN/cm<sup>2</sup>, medium = 26 – 50 daN/cm<sup>2</sup> etc. If these demands are compared with the obtained results, could be observed that soils' penetration resistance is "very low" at all variants. With other words, soils' penetration resistance is very good at all variants.

For the 0 – 20 cm depth soils' penetration resistance varies function of the applied variant of technology, between 1.3 daN/cm<sup>2</sup> and 9.3 daN/cm<sup>2</sup>. The lowest values of the index were recorded at variant V<sub>1</sub>, and the higher ones, at variant V<sub>6</sub>.

We consider that for a correct understanding of the obtained results must be take in consideration the deep at which worked the active organs of the units. The highest deep for soil processing was recorded at mouldboard plough. In this case working depth doesn't pass 20 cm. That means that soils' penetration resistance at 25 cm and 30 cm depth, even if has higher values, wasn't influenced by plough. In the case of direct sowing (variant V<sub>6</sub>), working depth of the horizontal rotary hoe was of 8 cm, and the soil was processed only on third part of the surface; means that soils' penetration resistance of 9.1...11.1 daN/cm<sup>2</sup>, recorded at the depth of 15...30 cm, isn't influenced by MCR-2.5 combined machine.

Must also be taken in account the working conditions, the precursory plant, the moment at which the soils' penetration resistance was determine. The moment at which soils' penetration resistance was determine is very important, because during vegetation period of the crop, is recorded a certain increasing of this index value. Also, when precursory plant is a weeding one, soil, till a certain depth, has a penetration resistance quite reduced, due to weeding works which were been made.

The very low values of the soils' penetration resistance are due to the fact that soil had an adequate humidity, because of the rain falls which overpasses the multiannual monthly averages; also, soil was loosening at the surface due to the weeding works effectuated at the precursory plant (sunflower), and the determination of soils' penetration resistance was made in the next day from sowing.

Also the agro-technical demands establish that at a soil penetration resistance till 25 daN/cm<sup>2</sup> the roots of the plant grow normally. If we compare these demands with the

obtained results, we could say that at all variants are conditions for a normal growth of wheat plants' roots.

**Balanced average diameter of soils' structural elements** was determined the next day after sowing, for three depths: 0 – 10 cm, 10 – 20 cm and 20 – 30 cm. In *table 4* are presented the obtained results regarding balanced average diameter of soils' structural elements, for different applied technologies and depths.

**Table 4**

**Balanced average diameter of soils' structural elements, for different applied technologies  
(winter wheat)**

Variants of technologies	Depth (cm)			
	0 - 10	10 – 20	20 - 30	Average
	Balanced average diameter of soils' structural elements, mm			
V <sub>1</sub> (control)	4.86	4.08	5.15	4.70
V <sub>2</sub>	4.45	3.92	5.28	4.55
V <sub>3</sub>	3.52	5.80	5.35	4.89
V <sub>4</sub>	3.79	5.96	5.48	5.08
V <sub>5</sub>	3.63	6.04	5.95	5.21
V <sub>6</sub>	4.28	6.52	6.16	5.65

In the case of balanced average diameter of soils' structural elements, from the agronomical point of view the great interest is focused on the structural elements with a 2 – 5 mm diameter (even over 5 mm). Comparing the obtained results with these demands, we see that balanced average diameter of soils' structural elements is suitable at all variants and depths.

The soil layer at 20- 30 cm depth don't present a great importance because here didn't work the active organs of the agricultural units. In 10 -20 cm soil layer the balanced average diameter of soils' structural elements is adequate, being in the limits establish by agro-technical demands at all technological variants. At this deep, with the exception of the variant where was applied direct sowing (V<sub>6</sub>), worked only active organs of the unit which processed soils' basic work (soil was processed only one time).

In the case of soil layer at 0 – 10 cm depth, with the exception of V<sub>6</sub> variant, soil was processed for many times. For example, at variant V<sub>1</sub> (control) in this layer worked: the active organs of the mouldboard plough, then the active organs of the disk harrow plus the ones of the tooth harrow, the two harrows processing for 3 times the soil. For this reason, with two exceptions, in the 0 – 10 cm soil layer balanced average diameter of soils' structural elements is lower that the one in 10 – 20 cm soil layer; explanation being the one that a repeated processing of soil determine the fragmentation of some soils' structural elements. Exceptions are variants V<sub>1</sub> and V<sub>2</sub> where it is used mouldboard plough, because this one turns upside-down the 0 – 20 cm soil layer, bringing at surface soil with bigger structural elements.

At the group of the variants at which was not used the mouldboard plough; the higher value of this index was recorded at variant V<sub>6</sub>, and the lowest one, at variant V<sub>3</sub>. In the case of variant V<sub>6</sub> balanced average diameter of soils' structural elements is the higher one, due to the fact that soil was little mobilized, fragmentation of structural elements being minimal.

**Hydric stability of soils' structural elements** was determined also in the next day after sowing, for three depths: 0 – 10 cm, 10 – 20 cm and 20 – 30 cm. In *table 5* are presented the obtained results as regarding hydric stability of soils' structural elements, for different technologies and depths.

Agro-technical demands establish that if hydric stability of soils' structural elements is 40 – 60 %, then this index could be classified in “very high” class; when the index overpass 60 %, then it is classified in “extremely high” class. If the obtained results are compared with the imposed agro-technical demands, we could say that hydric stability of soils' structural elements is very good at all variants and depths.

At the variants in which were not used the mouldboard plough, the highest value (the best one) of the index was recorded at variant V<sub>6</sub>, and the lowest value, at variant V<sub>3</sub>; the order of the variants, starting with the best one, is: V<sub>6</sub>, V<sub>5</sub>, V<sub>4</sub>, V<sub>3</sub>.

Table 5

**Hydric stability of soils' structural elements, for different applied technologies (winter wheat)**

Variants of technologies	Depth (cm)			
	0 - 10	10 – 20	20 - 30	Average
	Hydric stability of soils' structural elements, %			
V <sub>1</sub> (control)	78.6	75.5	85.1	79.7
V <sub>2</sub>	77.9	75.7	84.8	79.4
V <sub>3</sub>	74.4	82.6	85.8	80.9
V <sub>4</sub>	75.7	82.8	86.1	81.5
V <sub>5</sub>	76.4	83.0	86.7	82.0
V <sub>6</sub>	78.0	84.7	87.2	83.3

The highest value of hydric stability of soils' structural elements obtained at variant V<sub>6</sub> (direct sowing) could be explain by the fact that soil was less mobilized, so fragmentation of the structural elements was reduced.

In the case of 20 – 30 cm soil layer, which was not processed by agricultural units, hydric stability of soils' structural elements is higher at all the technological variants. For 10 – 20 cm soil layer, which, with the exception of variant V<sub>6</sub>, was only one time processed, hydric stability of soils' structural elements is lower because were affected more soil aggregates. In the soil layer of 0 – 10 cm, which was processed many times (with the exception of variant V<sub>6</sub>), the value of the index was the lowest one because soil was repeated processed fact that leads to an amplification of fragmentation process of structural elements. Variants V<sub>1</sub> and V<sub>2</sub> are exceptions, because here the mouldboard plough turned upside-down the 0 – 20 cm soil layer, bringing at surface soil with greater hydric stability of soils' structural elements.

**Fuel consumption per hectare.** We consider that this index has a great importance in selection of the tested technologies for mechanization of soil works and sowing. The index could be obtained by summing the diesel quantities consumed for mechanization of soil works and sowing per hectare, with other words the works requested at each technological variant. In *table 6* are presented the fuel consumption per hectare for all the six technological variants.

Table 6

**Fuel consumption per hectare for soil works and sowing (winter wheat)**

Variants of technologies	Fuel consumption per hectare for soil works and sowing, l/ha
V <sub>1</sub> (control)	33.670
V <sub>2</sub>	25.800
V <sub>3</sub>	16.350
V <sub>4</sub>	16.870

V <sub>5</sub>	11.160
V <sub>6</sub>	7.697

We consider that at the tested technological variants the fuel consumption per hectare at soil works and sowing is suitable. The higher consumption was recorded at variant V<sub>1</sub>, and the lowest one, at variant V<sub>6</sub>.

Analysing the obtained consumptions could be observe the fact that, practically, took place a continuous decreasing of them from variant V<sub>1</sub> (control) to variant V<sub>6</sub>.

If we compare variants V<sub>1</sub> and V<sub>6</sub>, could be observed that it is recorded a very great decreasing of fuel consumption per hectare: at variant V<sub>6</sub> fuel consumption is 4.4 times lower that the one from variant V<sub>1</sub>. A great difference is recorded between variants V<sub>1</sub> and V<sub>5</sub>: so, at variant V<sub>5</sub> fuel consumption per hectare for soil works and sowing is 3.2 times lower that the one obtained at variant V<sub>1</sub>. This great difference regarding fuel consumption is recorded, first of all, due to the number of passes of the agricultural units: five passes at variant V<sub>1</sub> and only one pass at variants V<sub>5</sub> and V<sub>6</sub>.

It is necessary to establish a very important thing: which of the variants V<sub>3</sub> and V<sub>4</sub> is the best one. At a first sight could say that the best one is variant V<sub>3</sub> because fuel consumption is lower with 0.520 l/ha that the one obtained at variant V<sub>4</sub>. But when we consider also the other indexes, things are changing. Working depth is almost 20 cm at chisel (variant V<sub>4</sub>) and only 10 cm at heavy disk harrow (variant V<sub>3</sub>); in the chisel case soil is loosening on a higher depth, creating in this way better conditions for growth of plants' roots. The soils' breaking up degree is higher at variant V<sub>4</sub> face to the one recorded at variant V<sub>3</sub>. Also, at variant V<sub>4</sub> soils' penetration resistance is lower, and balanced average diameter of soils' structural elements and hydric stability of those elements are higher, in comparison with the values obtained at variant V<sub>3</sub>. More of, as could be seen, variant at which chisel was used (V<sub>4</sub>) have better results that the one at which was used heavy disk harrow, as regarding plants' growth and also seed yields per hectare. Having in view the obtained results for all these indexes, could be appreciate that variant V<sub>4</sub> is better than variant V<sub>3</sub>, even if the difference between fuel consumption is around 0.520 l/ha in favour of variant V<sub>3</sub>.

**Plants' growth and development.** Studies regarding the growth of wheat plants were effectuated at 41 days from sowing. In *table 7* are presented the obtained results regarding the number of raised plants per 1 m<sup>2</sup> and their height, at all six variants of technologies.

Table 7

Number of raised plants per 1 m<sup>2</sup> and their height (winter wheat)

Variants of technologies	Number of raised plants per 1 m <sup>2</sup>	Plants' height, cm
V <sub>1</sub> (control)	295	9.0
V <sub>2</sub>	309	9.2
V <sub>3</sub>	318	9.6
V <sub>4</sub>	324	9.9
V <sub>5</sub>	364	11.3
V <sub>6</sub>	416	12.7

Analysing the obtained results could be observed that both the number of raised plants per 1 m<sup>2</sup> and both plants' height recorded a continuous increase (the smallest values of the two indexes were recorded at variant V<sub>1</sub>, and the higher ones, at variant V<sub>6</sub>).

The best results regarding wheat plants' growth was obtained at variants V<sub>3</sub>...V<sub>6</sub>, at which were used preservative systems for soil work, and mouldboard plough was not used.

**Obtained seed yields.** This one depends of many factors, from which we mention also the soil working system which was applied. In *table 8* are presented the results regarding seed yields obtained at different technologies for mechanization of soil works.

The yield of wheat seeds varied, function of the applied variant of technology, from 4602 kg/ha to 5515 kg/ha.

The highest wheat seed yield was obtained at variant V<sub>6</sub>, at which direct sowing was applied, and the lowest one, at variant V<sub>1</sub> (tillage with mouldboard plough, after that germination bed prepare with GD-3.2 disk harrow, three passes, and sowing with SUP-29 sowing machine).

Table 8

Obtained seed yields at different variants of technologies

Variants of technologies	Seed yields	
	kg/ha	in comparison with control variant (classic), %
V <sub>1</sub> (control)	4602	100.00
V <sub>2</sub>	4650	101.04
V <sub>3</sub>	4692	101.95
V <sub>4</sub>	5171	112.36
V <sub>5</sub>	5452	118.47
V <sub>6</sub>	5515	119.84

When are used the un-conventional systems for soil works, in which the mouldboard plough was not used, was established, that the order of the variants, starting with the best one (having in view only seed yields), is: V<sub>6</sub>, V<sub>5</sub>, V<sub>4</sub>, V<sub>3</sub>.

To put in light the differences face to variant V<sub>1</sub> (control) of the variants V<sub>2</sub>...V<sub>6</sub>, regarding seed yields, the yields are presented as percentages, considering that yield of variant V<sub>1</sub> is 100 %. So could be observed the fact that at variant V<sub>2</sub> wheat seed yield increases face the one of the control variant with 1.04 %. At variant V<sub>3</sub> yield increase with 1.95 % face to variant V<sub>1</sub>. In the case of variants V<sub>4</sub>, V<sub>5</sub> and V<sub>6</sub> could be seen that seed yields increase significantly face to the one from control variant, increases being of 12.63 % - 19.84 %.

**Variants of technologies which will be applied.** Till now all the variants of technologies for mechanization of soil works were separate analyzed, at each index. For establishing the technologies which will be applied and their order we have in view more indexes: soils' breaking up degree at germination bed prepare, balanced average diameter of soils' structural elements, hydric stability of those elements, fuel consumption per hectare for soil works and sowing, number of raised plants per 1 m<sup>2</sup> and their height, seed yields per hectare.

At each index was established which are the variants which could be applied, the variants with the worst results, the order of the variants starting with the best one. Now is the moment to establish the variants which could be applied and their order, variants which are not recommended to be used, taking in account, simultaneously, all the above mentioned indexes.

Must be mentioned from the beginning the fact that it is necessary to be use, as much as it is possible, the preservatives, un-conventional systems for soil work, without turning upside-down the mobilized soil layer, so to be avoided the usage of mouldboard plough.

In the case in which are favourable conditions for using the preservative systems for soil works, without using mouldboard plough, we consider that the variants which could be applied, starting with the best one, are:  $V_6$ ,  $V_5$  and  $V_4$ . If it is not possible to use variant  $V_6$ , will be used variant  $V_5$ ; in the case in which variant  $V_5$  could also not be used, will be applied variant  $V_4$ .

When are not conditions for applying un-conventional systems (preservation ones) for soil works or it is recommended that tillage to be made with turning upside-down of soil layer (so in the cases were must be used mouldboard plough), will be applied variant  $V_2$ . Variant  $V_1$  (control) it is not recommended to be applied, because fuel consumption per hectare for soil works and sowing is too high, and soils' breaking up degree at germination bed prepare is not adequate, being situated lower under the minimum limit impose by agro-technical demands.

### CONCLUSIONS

1. At technological variants  $V_2...V_5$  soils' breaking up degree at germination bed prepare is adequate. In the case of variant  $V_1$  soils' breaking up degree is not, even far away, between the limits imposed by agro-technical demands.

2. It is obvious that soils' penetration resistance is "very low" (very good) at all six variants of technologies which were tested. The lower values were recorded at variant  $V_4$ , and the higher ones at variant  $V_6$ . We could consider that at all technological variants are conditions for a normal grow of plants' roots.

3. Balanced average diameter of soils' structural elements is suitable at all six variants and for all three soil layers. In the case of the variants at which was not used mouldboard plough, the highest value (the best one) of the index was recorded at variant  $V_6$ , and the lowest one, at variant  $V_3$  (explained by the fact that at variant  $V_6$  soil was less mobilized).

4. Hydric stability of soils' structural elements is very good at all technological variants. From the group of variants at which was not used mouldboard plough, the highest value (the best one) of the index was recorded at variant  $V_6$ , and the lowest one, at variant  $V_3$ .

5. Fuel consumption per hectare for soil works and sowing, determinate at the six experimental variants of technologies for wheat, is suitable. The higher fuel consumption was recorded at variant  $V_1$  (control), and the lowest one, at variant  $V_6$ . At variant  $V_6$  fuel consumption per hectare is 4.4 times lower that the one obtained at variant  $V_1$ .

6. The lowest values of the raised plants number per 1 m<sup>2</sup> and plants' height were recorded at variant  $V_4$ , and the highest ones, at variant  $V_6$ . The values of those two indexes are greater in the case of the variants at which mouldboard plough was not used.

7. The highest seed yield was obtained at variant  $V_6$ , at which direct sowing was applied, and the lowest one, at variant  $V_1$  where was used the classical system for soil works, the one applied nowadays in production. At variants  $V_4$ ,  $V_5$  and  $V_6$  seed yields increased face to control variant with 12.36 %- 19.84 %.

8. In the case in which are favourable conditions for using the preservative systems for soil works (without using mouldboard plough), we consider that the variants which could be applied, starting with the best one, are:  $V_6$ ,  $V_5$  and  $V_4$ . If it is not possible to use variant  $V_6$ , will be used variant  $V_5$ ; in the case in which variant  $V_5$  could also not be used, will be applied variant  $V_4$ .

9. When are not conditions for applying un-conventional systems (preservation ones) for soil works or it is recommended that tillage to be made with turning upside-down

of soil layer (when mouldboard plough must be used), will be applied variant  $V_2$ . Variant  $V_1$  (control) must not be applied, because fuel consumption per hectare is too high, and soils' breaking up degree at germination bed prepare is not suitable, being situated lower under the minimum limit imposed by agro-technical demands.

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## THE AUTOMATIZATION OF RESULTS CONTROL AND THE IMPROVEMENT OF MAKING DECISIONS USING THE PALISADE APPLICATION

## AUTOMATIZAREA CONTROLULUI REZULTATELOR ȘI ÎMBUNĂTĂȚIREA ADOPTĂRII DECIZIILOR PRIN UTILIZAREA APLICAȚIEI PALISADE

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**Keywords:** Palisade, process, information, risk factors, analysis, decision  
**Cuvinte cheie:** Palisade, proces, informație, factori de risc, analiză, decizie

## ABSTRACT

*As we know very good at this moment, an very important problem for any domain is the automatization of the activities. This paper proposed a study about the usage of the Palisade program pack in the process of substantiation and adoption of decisions.*

*In the actual society of knowledge, the impact of the new informational technologies was extended even in an important domain of human activity: the adoption of decisions.*

*The necessity of objecting at the selection process of the most favorable decision lead to the extension of the usage of information technology also in the conceptual phase. The decision tools suite (DTS) and the expert systems have the answer for the computer science workers at the needs of the deciders, used especially in the case of the decisions adopted in conditions of risk or uncertainty.*

*The PALISADE package of programmers is a support system of decisions, which overlaps the processor tables, increasing the possibility of usage, especially for simulation problems, calculating the risk, building decision trees etc.*

*După cum se știe destul de bine, o problemă foarte importantă din orice domeniu este reprezentată de procesul de automatizare a activităților. Acest articol propune un studiu despre utilizarea pachetului de programe Palisade în procesul de fundamentare și adoptare a deciziilor.*

*În actuala societate a cunoașterii, impactul noilor tehnologii informaționale s-a extins și într-un important domeniu al activității umane: **adoptarea deciziilor**.*

*Necesitatea obiectivizării procesului de selecție a celei mai favorabile decizii a dus la extinderea folosirii tehnologiei informației și în faza conceptuală. Sistemele suport de decizie și sistemele expert au fost răspunsul informaticienilor la cerințele decidenților, utilizabile mai ales în cazul deciziilor adoptate în condiții de risc sau de incertitudine.*

*Pachetul de programe PALISADE este un sistem suport de decizii, care se suprapune peste un procesor de tabele, sporindu-i acestuia posibilitățile de utilizare, mai ales pentru probleme de simulare, de calcul al riscului, construirea arborilor de decizii etc.*

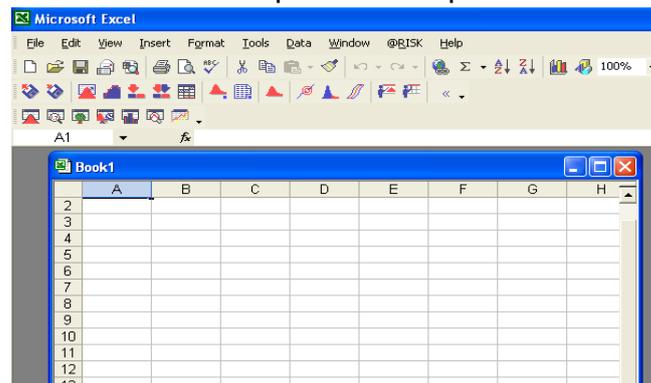
The computer utilization is very profitable in any domain of activity, because it permits the facilitation of intellectual work, relieved in this way the specialist or the researcher for a series of activities very difficult in the absence of this technology of computing. Also, the computer permits the work with a very large volume of information in a very small period of time, in this way it determined an increase of the work speed. In the last years, at the rank of companies, usually the informatisation included the routine, the calculus and the editing activities, etc. In consequence, in preparing the decision the information technology was used especially for obtaining and for systematization of the information necessary for the substantiation process of the decisions, the adoption decisions process remaining just a manager attribute and depending in a big part of experience, of intuition and of other human qualities of this. [Splivalo David, 2006]

The Decision Tools Suite PALISADE is a pack of programs which was designed to work with Microsoft Excel application (the Excel programs bare of commands completes itself, with peculiar commands after installing PALISADE pack), so it can admit the prosecution of complexes analyses and, than, to allow taking optimal decisions on the base of these prosecution analyses.

Palisade Systems Inc., founded in 1996, propose this package of soft programs named The Decision Tools Suite (DTS), who brings together the following components: @RISK, TopRank, Precision Tree, Risk Optimizer, Best Fit, Risk Accelerator.

These modules from DTS they were designed so that it can work together and to be activated from a bare of commands available in the superior menu of Microsoft Excel application. All those modules mentioned have interface, menus and compatible buttons bares Microsoft Excel (fig 1).

Each component from the DTS pack can realized an analyze of a certain type of data and exist information in a Excel page, by combining those analyses it can take very precise decisions connected whit the process or phenomenal studied at that moment.



[Schwanebeck Allison, 2008]

**Fig. 1**

Further we will try to present few details about the most important work modules which form the DTS pack. [Parish Wendy, 2007]

**The module @RISK**

It admits the analysis of the risks which can appear in a phenomena and a studied process according to the already existing information in a ".xls" file, so it helps us to identify the new opportunities of work, or to avoid the possible errors and traps which can appear during the progress of this process or phenomena. For this it is filled in the available dates in the Excel document that have attached even the module @RISK with the adequate functions, it is used the information considered sure for selecting a certain type of function which will be used to evaluate the risk, then to activate the module of simulation of the calculation risk and in the end it can be used the options of graphic presentation with the aim of presenting more clear the obtained results.

**The TopRank module**

It permits the quick determination of the risk factors (the critical factors) from the studied process by taking into account of the all available dates in the current sheet of the Excel document. So the TopRank module allows the crossing of the all dates introduced by the operator in the sheet and according to these allows the identification of that cells which affects the most wished evolution of the studied process and phenomena and then classifies and places these elements of risk in distinct statitic reports of different forms or in easy understanding and interpreting graphics for the beneficiarys.

**Precision Tree module**

This module form DTS pack allows the user, that according to the accomplished analyses with the dates and information available in the sheet, to display as a tree of decisions what it is wanted to be done in that process or phenomena and why. So we can say that the tree of decisions allows the visualisation of some midsequent of events in function of the decision that will be adopted by the user.

After how we see, the DTS modules pack permits the calculation and the simulation of the risks by the support of the Microsoft Excel application. We can to distinguish here that the Decision Tools Suite is compatible with Excel versions 2000 through 2007. The @RISK simulations are calculated 100% within Excel, supported by Palisade sampling and statistics proven in over twenty years of use. Palisade does not attempt to rewrite Excel in an external recalculation to gain speed. Palisade harnesses the power of multiple CPUs and multi-core processors to give you the fastest calculations.

Further we will try to present in detail how work the @RISK module.

**Utilization of the @RISK module**

The execution and examination of the available data and information with the support of the @RISK module from the DTS package presume the crossing of the following stages:

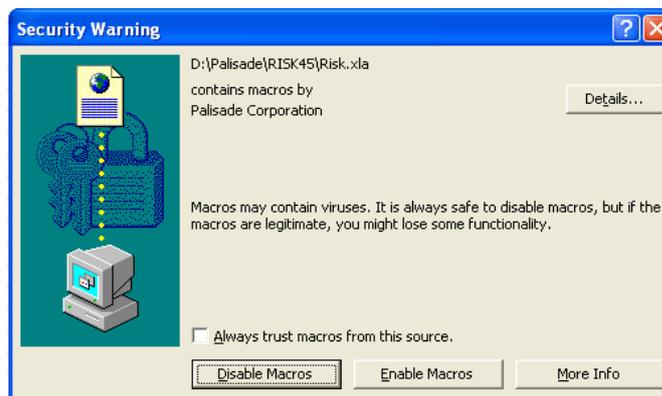
1) the insertion of data and initial information in the Excel calculation page, corresponding the process or phenomenon that will be studied ( figure 2). The following exemplification has make at a students group, by starting of the obtaining previous results

	A	B	C	D	E	F	G	H
1		Ionescu	Popescu	Tudor	Costache	Iancu		
2	Matematica	7	6	8	5	9		
3	Ec. Politica	9	5	7	9	5		
4	Contabilitate	6	6	5	7	6		
5	Doctrine	8	5	8	7	7		
6	Statistica	7	6	5	6	5		
7	Media stud.	7.4	5.6	6.6	6.8	6.4		
8	Media grupa	6.56						
9								

we can to try what results will be obtain in the follow session.

**Fig. 2**

2) there will be defined the inputs and outputs that will come under the computation process of the risk and which will be further/ulterior analyzed inside of this application. It s activated the option „Start @RISK” if this module wasn’t already activated from the vertical menu which is display by pressing “Start”, and from the displayed window we activate



„Enable Macros” button (figure 3).

**Fig. 3**

The definition for the entries of the corresponding data of the process or of the studied phenomenon is made like this:

a) we select the suitable cell of that value which will be studied as an entry size for that process. This value will be that value which will affect in a certain way the exit which correspond to that process or phenomenon we have studied. For the example presented, we shall considerate the cells corresponding to the students’ marks to be sizes of entry. For example, we shall select the B2 cell;

b) we activate “Define Distributions” (figure 4);

	A	B	C	D	E	F	G	H
1		Ionescu	Popescu	Tudor	Costache	Iancu		
2	Matematica	7	6	8	5	9		
3	Ec. Politica	9	5	7	9	5		
4	Contabilitate	6	6	5	7	6		
5	Doctrine	8	5	8	7	7		
6	Statistica	7	6	5	6	5		
7	Media stud.	7.4	5.6	6.6	6.8	6.4		
8	Media grupa	6.56						
9								

**Fig. 4**

c) in the displayed window there are chosen different properties of the distribution of the respective size of entry (the type of the distribution, the central or medium value, the distribution base etc.) as in figure 5;

**Fig. 5**

d) we activate “Apply”.

Through outputs we understand that size from the process which we want to follow because it represents a final result, to which the values corresponding to inputs participate. We define the outputs like this:

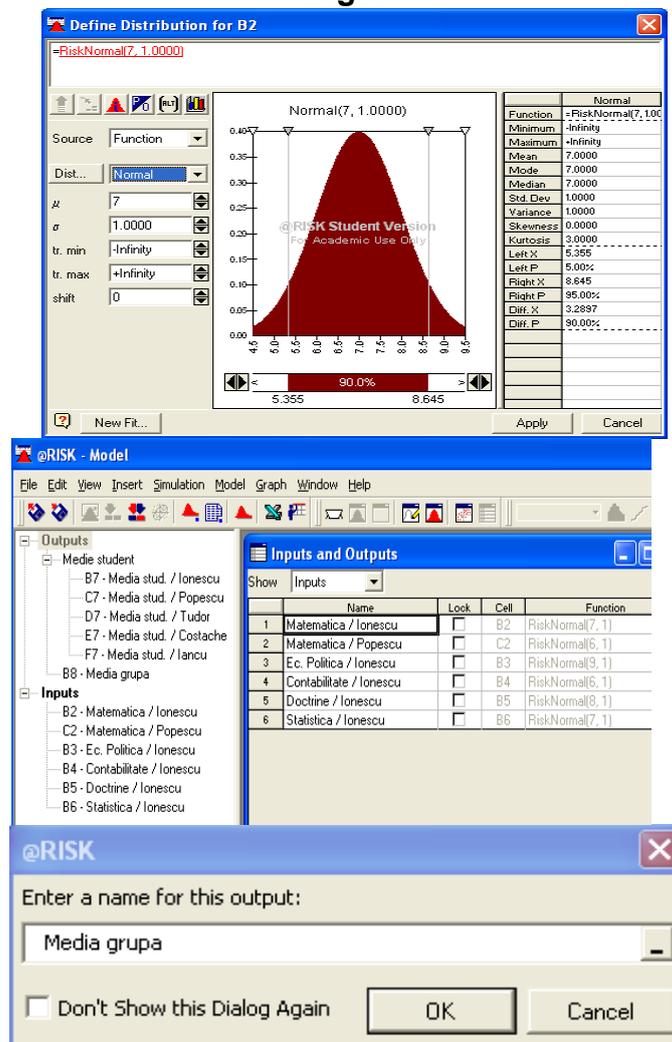
a) we select the cell that contains the value which will be studied as size of output from that phenomenon or process. For example we can considerate size of output the means of every student, and also the general mean of the students from that group. For example we will chose as size of output the value from the cell B8.

b) we activate the button „Add Output” (fig. 6).

**Fig. 6**

c) if only one cell was selected then we will name that output, and if a group of cells was selected we will name that domain of output from the displayed window and through a click we activate the button “OK”(fig. 7)

**Fig. 7**



The display of a list of outputs and inputs previously defined for that process or phenomenon is made through the button „Display List of Outputs and Inputs” (fig. 8).

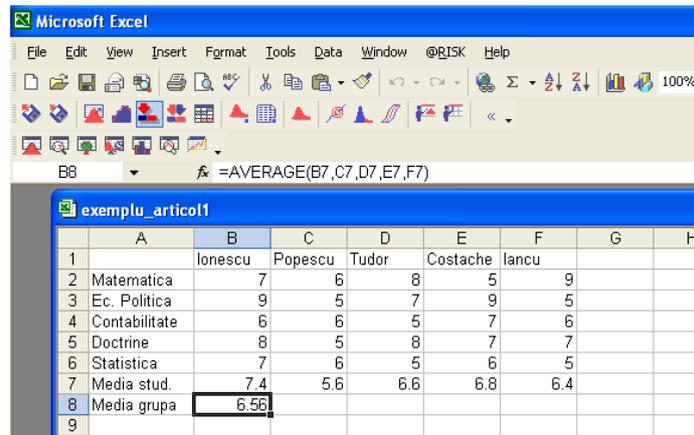


Fig. 8

3) The activation of simulation operation.

To choose the desired options in the phase of simulating a calculus the button “Simulation Setting” is pressed. Then we press “Start Simulation” to effectuate the calculus of simulating the desired process or operation.

From this moment on the modulus @RISK recalculate the data from the given model, every time the program indicates it. Every time @RISK takes randomly the values from the entry defined sizes, attaches them to the model that is being studied and registers

	Name	Cell	Minimum	Mean	Maximum	x1	p1	x2	p2	x2-x1	p2-p1	Errors
Output 1	Media stud. / Ionescu	B7	6.407907	7.400676	8.369941	6.606851	5%	8.010102	95%	1.403251	90%	0
Output 2	Media stud. / Popescu	C7	5.053394	5.598903	6.093046	5.263119	5%	5.912511	95%	0.6493926	90%	0
Output 3	Media stud. / Tudor	D7	6.6	6.6	6.6	6.6	5%	6.6	95%	0	90%	0
Output 4	Media stud. / Costache	E7	6.8	6.8	6.8	6.8	5%	6.8	95%	0	90%	0
Output 5	Media stud. / Iancu	F7	6.4	6.4	6.4	6.4	5%	6.4	95%	0	90%	0
Output 6	Media grupa	B8	6.306386	6.559916	6.743547	6.385834	5%	6.698184	95%	0.3123503	90%	0
Input 1	Matematica / Ionescu	B2	4.661205	7.000511	9.662683	5.308453	5%	8.560107	95%	3.251654	90%	0
Input 2	Matematica / Popescu	C2	3.266972	5.994514	8.465228	4.315593	5%	7.562556	95%	3.246963	90%	0
Input 3	Ec. Politica / Ionescu	B3	6.04233	8.994802	11.36006	7.295619	5%	10.58266	95%	3.28704	90%	0
Input 4	Contabilitate / Ionescu	B4	2.950482	5.997441	8.416716	4.292249	5%	7.608167	95%	3.315918	90%	0
Input 5	Doctrine / Ionescu	B5	5.53184	8.000391	10.57217	6.251241	5%	9.603556	95%	3.352314	90%	0
Input 6	Statistica / Ionescu	B6	4.595755	7.010237	10.36018	5.261524	5%	8.559042	95%	3.297518	90%	0

the output results. (figure 9)

Fig. 9

4) The interpretation of the achieved results and the study of possible risks.

The result of the simulation is an image of the whole possible results, including the variants found at random when simulating the calculus.

According to the attached graphics of these calculated results which can be of different types, we can observe the evolution tendencies of output sizes. Following these observations we can take certain decisions.

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## **MODERN TOOLS AND COMPLEX SYSTEMS FOR FOOD PREPARATION IN INDUSTRIAL FARMING**

### **UTILAJE MODERNE ȘI SISTEME COMPLEXE PENTRU PREPARAREA HRANEI ANIMALELOR DIN FERMELE ZOOTEHNICE**

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**Keywords:** feed, farms livestock, silos, feed mill, mixers, computers, equipments.

**Cuvinte cheie:** hrană, ferme zootehnice, siloz, moară, amestecătoare, computere, echipamente.

#### **ABSTRACT**

*In this paper is proposed a on the way the fodder kitchens are constructed and used, ,in order to ameliorate the process of feeding fodder to animals from zootechnical farms. These complex fittings, who containing feed mills, mixers or proportioning devices, have the role of mixing and homogenization of the raw material used in obtaining certain fodder recipes.*

*The electronic equipments and process computers have a vital importance for these fodder kitchens , all this allowing the automatisation of the activities, in order to keep the production going inspite the presence of a human operator. Another advantage implied by the use of computers in fodder production is the fact that the correct obtaining process of several fodder recipes used by farms, can be monitorised.*

*În cadrul acestui articol se propune un studiu despre modul de construire și de utilizare a bucătăriilor furajere, în vederea îmbunătățirii procesului de alimentare cu furaje a animalelor din cadrul fermelor zootehnice. Aceste instalații complexe, ce au în*

componentă mori, amestecătoare sau dozatoare, au drept scop amestecarea și omogenizarea materiilor prime ce sunt utilizate la obținerea unei anumite rețete furajere.

Un rol important pentru aceste bucătării furajere îl au echipamentele electronice și calculatoarele de proces, acestea permițând automatizarea activităților, astfel încât acestea se pot desfășura și fără prezența operatorului uman. Un alt avantaj al utilizării computerelor este faptul că astfel se poate urmări și controla obținerea corectă a uneia sau mai multor rețete furajere utilizate în fermele agricole.

**Fodder kitchens, Mixed Fodders and micro Mixed Fodders** are complex systems used in preparing feed for zootechnical farms livestock. According to their productivity, they contain the following main elements: **raw material silos; finite product silos; feed mills; mixers; premixes dispensers; oil dispensers; tools for raw materials and finite products transfer; process computers and accessories; electrical equipment and accessories.**

We may say that every such system is unique as it is designed for specific needs to serve various species, e.g.: pigs, poultry, cattle, sheep, fish etc., it will have a construction scheme of its own, it will be installed in an existent building, either adapted to the new function or newly built, and it will mainly function for one, two or more recipes.

**The raw material silos**, generally built from galvanized ondulated tin, may have an infinity of type dimensions, resulting either in slim buildings (tall and with a small diameter) or shorter and with larger diameters, depending on the local conditions (surfaces, obstacles, owner's preferences).



The silos which have a plate base or a tronconic cylinder shaped base are metal made silos which can be used especially for storing raw materials (maiz, barley, wheat, sunflower groats, soy groats, peas etc.), but also for the finite product (combined fodder prepared from a recipe decided within the Fodder kitchen, mixed and micro-mixed fodders). Their storing capacities can vary from 50 to 850 m<sup>3</sup> i.e. approx. 40 - 650 tones for raw materials and 6 - 48 m<sup>3</sup>, approx. 4 - 30 tones/cell for the finite products.

The internal metal silos are normally used for cereals and oil and protein plants and can have capacities from 5 to 240 m<sup>3</sup>, i.e. approx. 4 - 180 t.

The glass fiber silos are generally used for finite products, usually having a tronconic cylinder shape with emptying angles up to 67 ° for facilitating floors flow. They can have capacities from 4 to 31 m<sup>3</sup>, i.e. approx. 2,5 – 18,5 t/cell. This type of silos are frequently attached to stables in order to ensure the necessary few-days-stock of finite product for the internal feeding lines.

The sack type silos ("Trevira") which have good water-tight qualities are being used more and more frequently as a buffer stock from a finite product (a particular recipe). The usual capacities for these types of silos are from 3 to 26 m<sup>3</sup>, i.e. 2 - 17 t/silo.



**Feed Mills** from the simple ones (with pentrough – feeding basket, with classical horizontal axis, for beacns, with aspiration - recommended for fodder kitchens of up to 1,5 t/h), to the hily productive ones with vertical axis, can reach various levels of productivity, depending on the engine they use, number of hammers, active surface of the mill (gauze) and size of gauze’s holes.

**Aspiration mills** have the advantage of being able to adapt to cheaper feeding solutions (aspiration wells or funnels, flux deviators with manual or servo-engined lid). Thus, one aspiration well + one two ways servo-engine deviator + necessary aspiration and release tubes + command unit and protection can cost between 700 - 1.000 Euros for serving one silo or one macro-component.



Type of mill	MB 7,5	MB 11	MB 15	MB 18	MB 22	MB 37
<b>Maximum productivity in t/h</b>	<b>0,7</b>	<b>1</b>	<b>1,5</b>	<b>1,7</b>	<b>2,1</b>	<b>3</b>
<b>Electric engine power (kW)</b>	<b>7,5</b>	<b>11</b>	<b>15</b>	<b>18</b>	<b>22</b>	<b>37</b>

### Vertical axis

**mills**, served by inclined snail transporters are 300-600 Euros more expensive per unit as compared to the aspiration mills (with variations depending on the length of the snail, the distance from the silo to the mill and the type of the engine). The latter ones can be powered by tri-phase engines of 5,5 - 55 kW, with productivity levels between 750 - 6.000 kg/h (productivity determinations for cereals with 14 % humidity, ground through a gauze of Ø 4 mm). They can ensure production of micro mixed fodders with productivity levels of 2 - 4 t/h for finite products, and if two mills batteries are used the productivity reached could be between 5 - 10 t / h.



Type of mill	HS 75	HS 100	HS 150	HS 250	HS 300	HS 400	HS 500	HS 750
<b>Maximum productivity in t/h</b>	<b>1,5</b>	<b>2</b>	<b>2,4</b>	<b>2,8</b>	<b>3,2</b>	<b>4</b>	<b>4,5</b>	<b>6</b>
<b>Electric engine power (kW)</b>	<b>5,5</b>	<b>7,5</b>	<b>11</b>	<b>18,5</b>	<b>22</b>	<b>30</b>	<b>37</b>	<b>55</b>

**The mixers** perform the mixing and homogenization of macro and micro-components of a fodder recipe and can be vertical or horizontal. The vertical ones are used in all types of Fodder Kitchens, mixed fodders or micro mixed fodders and can produce feed for all breeds.



Even though they can reach homogeneity grades of 1:100.000 they are considered as less difficult to use, their structure is simple and they come with a low price. Their only disadvantage is the mixing time, which is usually double than the one offered by the horizontal mixers. The horizontal mixers are more frequently used in the preparation of poultry feed or in units which offer third-party services. Being able to produce higher grades of homogeneity, with shorter mixing times, they still have the disadvantage of being more complex constructions made with higher exploitation costs due to their superior power systems.

The horizontal mixers allow the inclusion of liquid fats in recipes, of up to 10 %.

	VERTICAL					HORIZONTAL			
Type of mix	A F M 7 5 0	A F M 1 5 0	F M 1 8 0	F M 2 5 0	F M 3 0 0	H O M 3	A O 5 0 0	A O 1 0 0 0	H O M 2 0
<b>Utilized mass capacity (kg)</b>	<b>7 5 0</b>	<b>1 5 0 0</b>	<b>1 8 0 0</b>	<b>2 5 0 0</b>	<b>3 0 0 0</b>	<b>3 0 0</b>	<b>5 0 0</b>	<b>1 0 0 0</b>	<b>2 0 0 0</b>
<b>Electric engine power (kW)</b>	<b>2, 2</b>	<b>4</b>	<b>5, 5</b>	<b>5, 5</b>	<b>7, 5</b>	<b>2, 2</b>	<b>5, 5</b>	<b>7, 5</b>	<b>1 5</b>
<b>Mixing time(s)</b>			<b>5-15</b>					<b>3-7</b>	

The house-made way of preparing some simple fodder recipes, but which imply a lot of manual work, can be obtained by combining a mill with a mixer as independent tools which are connected to necessary accessories or even to a compact machine with a shared chassis on which is installed a low capacity mill (700 – 2.000 kg/h), with a 5,5 - 7,5 kW engine, a transfer snail, a 500 - 1.000 kg capacity mixer and maybe a time relay for regulating the mixing time. The Kompacktmischer can be a starting solution even if it must be completed with 2 - 3 feeding snail transporters, an emptying transporter and 1-2 sacks of finite product, possibly with a weighing system and a display for quantity control. *For a 200 - 300 stronghold pig farm, 50 - 100 milk cows and bulls and even for 5.000-20.000 poultry farms such a machine could represent a solution, especially if there is enough manpower for manipulating the raw materials and the finite products.*



In what the dosage of premixes is concerned this can be done with **spyre dispensers** of de Ø 75 – 125 mm **(a)**, with productivities of 600 - 4.000 kg / h or with low productivity snail transporter. Dispensing the oil or other liquid fats can be done with **dispensing installations with oil pumps (b)**, while dispensing the preserving substances can be done with **special dispensers for preserving substances (c)**.



The pneumatic transporters, snail transporters, horizontal transporters and elevators are recommended for transporting and manipulating raw materials inside barns, but also inside fodders kitchen, for seed cereals, but also for vegetables, soy and sunflower groats.

The **pneumatic transporters (a)** can be used to unload products from transportation means and to transfer them on distances of 10 - 25 m (sometimes longer), having a productivity of 12 to 28 t / h, depending on the distance and the number of curves in the route. Endowed with a constructive utility, based on aspiration and and release, this transporter can transfer (load and unload) either flexibly or in bulk, reaching a productivity of 4 - 14 t / h, which is also dependent on the number of curves (2 - 3) and the distance (10-25 m).



The direct transportation on the vertical line can be made with the **paddled elevator (b)** or **cup elevator (c)**, with variable productivities between 18 t / h – 60 t / h. The paddled elevator are cheaper to buy but are more expensive to be used because they need more powerful engines.

In what **snail transporters (a and b)** are concerned they are the most frequently used, being very versatile and covering productivities from 3 to 50 t / h, depending on the snail diameter, the angle under which it works, the type and properties of the transported material.

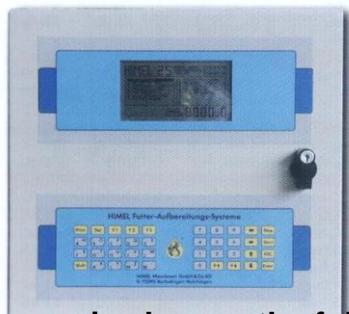
**The horizontal transporter (c)** are variants of the more elaborated snail or paddled transporters.



**The process computers** represent the key factors of a Fodder kitchen, mixed-fodders or micro mixed fodders, as elements which allow the technological advance and can transform a difficult and toiling process into an automatized process of feed production, able to work without the presence of an operator.

The computer manages and commands the whole grinding process, dosage and mixing, as well as the transport of materials between the machines in the fodder kitchen, all the times (grinding, mixing, emptying etc.), as well as the sincronization and de-phasing are thoroughly controlled and ordered by the computer. The computer receives signals from the tensometric cartriges on which the mixer is mounted, and the commands from the computer to any engine are given through the protection and command units from inside the electric table.

The work precision of the scales is of 100 g of the mix. The programming can be made in [kg ] or [%]



**If the main Starter menu is chosen, the following table will appear:**

<p><b>1 Starter</b></p> <p>2 Recipe information</p> <p>3 Component data</p> <p>4 Process data</p> <p>5 Installation data</p> <p>6 Helping p</p> <p>7 Text inse</p>	<p>1 Single mix</p> <p>2 Multiple mixes</p> <p>3 Autostart</p> <p>4 Signals</p> <p>5 SPS Program</p> <p>6 Single night start</p>
<p>Progr. H X..XX</p>	<p><b>0000.0</b></p>

**Here a choice can be made among more starting possibilities for preparation.**

Such a computer allows the producing of even 40 recipes or mixes, with maximum 30 components each.

A single functional connection the machines presented in summary above can form in various ways a valid module of a fodders kitchen. If the machines are multiplied by 3, 4 or more times, depending on the number of macrocomponents, or buffer silos, a real fodder kitchen can be obtained.



The macro-components (maize maiz, barley, wheat, sunflower groats, soy groats) are aspired from the silo which is allocated to each one through the pentthrough corresponding to the flux branch which is commanded by the computer by the flux deviators with servo-engines and the command and protection unit from the electric table.

The products which are ground by the mill reach into the mixer which is disposed with a filtering battery with seven sacks for eliminating dust. Through the cyclonet on which these dust removing filters are mounted (with a filtering surface of over 15 m<sup>2</sup>) the fine powders of ground product are recovered in the mixer. The medium concentrations of medium powders in suspension (the ones with diameters smaller than 20 µm) in 24 hours do not overpass the maximum admitted concentration MAC (0,15 mg/m<sup>3</sup>).

The premixes are being distributed with the spyre dispenser, after which the homogenization process can be started followed by the emptying process and the transfer

into the sack for the commanded recipe. The number of charges necessary for the production of the required quantity of a recipe and then the succession of recipes or the Stop command are monitored by the process computer.

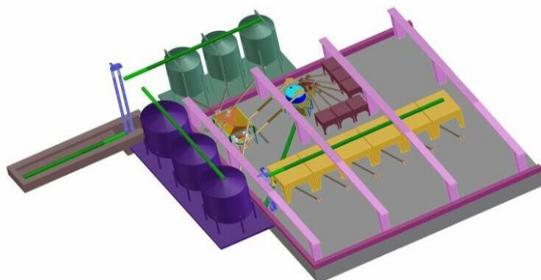
The grinding process can be obtained during the night, in an autonomous way, when the electric energy is cheaper. The constructive solution for the fodder kitchen fed with aspiration pentthroughs can achieve productivities of up to 1,5 t/h and can serve a pig farm of up to 3.000 animals, a cattle farm with up to 1.500 heads or a poultry farm of up to 80.000 heads, if it is used in full shifts.

The specific price for such a fodder kitchen can vary between 15.000 and 40.000 Euro / t / h of production capacity, depending on the options of the beneficiary and its structure because „**the details make the price**”.

If the feeding solution is modified with snail transporters and high productivity mills the level of 3 t / h of finite product can be reached. Obviously, in this way the needs of some farms as those mentioned above can be covered, and the surplus of production can be delivered to third parts which can seriously decrease the amortization time.

The specific price decreases as the capacity increases, thus for productivities of 3 t / h, it can vary between 20.000 - 35.000 Euro / t / h for production capacity.

A mixed or micro mixed fodder, depending on its capacity can be done from the following elements: a reception hole, more external and internal silos, a mill or a battery of mills, a high capacity mixer, silos and dispensers for premixes, snail transporters, elevators, horizontal transporters, redlers, silos for finite products, one or two process computers, with more interfaces and relay.



The specific price of a complex system with a 10 t / h productivity (which can be called mixed fodder), as the one presented in the image above and which is built and has been functioning for more than 3 years in Romania, in Alba – Iulia, with German technology, being served by a Romanian company, gets even lower varying between 20.000 – 30.000 / t / h of productin capacity.

Among the companies which produce such machines there are: TEHNOFAVORIT Bonțida – Cluj - România, HIMEL – Germany, LAW - Spain, Riela - Germany, etc.

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# THE DETERMINATION OF ENERGETIC AND QUALITATIVE INDICES OF SOIL WORKS, FOR THE NEW AGGREGATES CATEGORIES TRACTOR - AGRICULTURAL MACHINE

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**Key words:** tractor, soil, machine, qualitative, agricultural

## **ABSTRACT**

*Lucrarea prezintă rezultatele experimentărilor în câmp cu diferite agregate tractor-mașină agricolă, în unități agricole din diferite zone ale țării, cu diferite tipuri de sol, referitor la realizarea indicilor calitativi de lucru și cei energetici ai solului, respectiv tractorului.*

*The paper presents the fields experimentation results with different tractor - agricultural machine aggregates, in agricultural units from different country areas, with different soil types, referring to realization of the soil's, respective tractor's working qualitative and energetic indices.*

## **INTRODUCTION**

Once with the Romania's adherence to EU beginning from year 2007, in agriculture, as in all the activity sectors, it has to be improved continuum the qualitative level and the efficiency of the performed activities, and the results to respect the requirements and the regulations valid in EU.

The soil works quality represents the key element for making more efficient from the economical-financial point of view the agricultural exploitations.

For being able to positively intervene on the factors and elements which influence the soil working process, it was realized a theme which proposed itself the research and

experimentation of a determination methodology for soil works quality, for agricultural exploitations, and it had in view the following:

- the scientific substantiation and the qualitative indices identification at soil works;
- the elaboration of a determination methodology of soil works quality according to the agricultural-technical requirements and respecting the EU's environmental norms;
- realization of complex tests for methodology verification;
- realization of a reference book with appliance in the small and medium farms.

Development of a performing agriculture and at the same time durable which to allow obtaining of some healthy and increased productions, cannot be achieved unless the crops' foundation and maintaining works are executed at a high qualitative level. The realization of this desiderate presumes the appreciation of the soil works quality in function of some qualitative and energetic indices, identified and determined by different methods.

For establishing some quality appreciation criteria for work effectuated by soil works machines, they were performed experimentations with different machines types, with different working organs, at different speeds and depths on representative soil types, being determined the admissible values of work qualitative and energetic indices, respective the geometric and gravitational elements of the worked soil. The appreciation of the works quality in function of the limit admissible values for the work qualitative and energetic indices, determined with the help of some geometric and gravitational elements, represents an important step in what concerns the limit which has to be achieved in the construction of machines for soil works.

The main purpose is to find the optimal constructive and energetic solutions, for obtaining values considered admissible of work qualitative indices, with simple machines which to have a reduced energetic consume and an economic efficiency as higher as possible, both in fabrication and in the agricultural exploitations.

## **MATERIAL AND METHOD**

Because the soil works have an essential influence on the physical-chemical and biological soil's features, these constitutes agricultural-technical measures of great importance, because of the complex effects which they have on the soil's physical, chemical and biological features.

Through soil works it has to be assured:

- the accumulation and storage in soil of the entire water quantity originated from rainfalls during the summer and autumn;
- the accumulation in soil of a nitrates quantity as larger by intensifying the nitrification processes;
- obtaining of a aerated soil layer, but in the same time laid-down, for assuring a good plants rootedness and for avoiding the tear-up process;
- obtaining of a germinating layer, without boulders, so that the seed could take contact as intimate with the soil, as to spring in a shorter time ;
- the weeds, diseases and pests combating, which bring high prejudices to the agricultural productions.

The soil works influence the soil's water regime too. Through different systems and soil working methods there are created favorable conditions for accumulating in soil of some as large as possible water quantities in the dry regions, and in the wet regions there is assured a good water draining at higher depths, so that doesn't appear an humidity excess in the arable soil layer.

The soil works' influence on the apparent density (volume weight), is materialized by meaning that an aerated soil creates better conditions for plants growing, because the roots are developing better and get easier into soil, especially in the first vegetation stages.

The different degree of soil's aeration or compaction, realized by agricultural works, is maintained only a certain period of time. Because of this cause, the influence of the initial aeration on the production is closely related to plants requirements towards a certain degree of soil aeration.

The soil porosity is a very important feature and influenced decisive by a good work of soil, because only between certain limits of the aeration porosity and of the capillary porosity, the plants and microorganisms could find good life conditions. The radicular plants system can develop itself in good conditions when the total porosity is comprised between 48 and 60%, from which capillary porosity 30-36%, and the aeration porosity 18-24%.

The soil's working methods can influence positive the formation of new structural aggregates. The diameter of the hydro-stable aggregates constitutes a clue of soil's aeration, respective of soil's biochemical processes intensity.

Not in the last row, the soil works quality can put its print on the microorganisms and biochemical processes activity.

The soil's principals agricultural-technical works for crops foundation are:

- ◆ base work of soil with furrow overthrow (ploughing);
- ◆ base work of soil without furrow overthrow (cizelatul);
- ◆ preparation of the germinating bed with discs harrows, or with the combiner, for seeding purposes;
- ◆ soil work for crops maintenance in the vegetation period.

They were followed this way:

- realization of productions closed to the ones obtained in conventional technology;
- reduction of production costs;
- increment of productions stability;
- profit's increment;
- increment of water quantities from rainfalls accumulated in soil in the cold season;
- maintaining of physical, chemical and biological features in the limits of normal activity of plants and microorganisms' radicular system.

Indicators regarding the exploitation parameters and the energetic consume:

- work's quality indices;
- energetic indices.

Following the obtained results at tests in field-laboratory conditions, were determined or calculated according to the vigor procedures the next indices:

a) qualitative indices of work:

- working depth, in cm;
- working width, in cm;
- soil's crumbling degree ( $G_{ms}$ ), in %;
- the vegetal waste covering degree ( $G_v$ ), in %;

b) energetic indices:

- effective working speed ( $V_e$ ), in km/h;
- skidding ( $\delta$ ), in %
- fuel consumption at hectare ( $Q$ ), in l/ha;

Nr. crt.	Soil caracteristique	INCDA FUNDULEA	SCDA DRĂGĂNEȘTI VLAȘCA	SCDA ȘIMNIC	MATACHAND SRL AMARA	USAMV TIMIȘOARA	SCDA VALUL lui TRAIAN
1.	Soil type	brown reddish of wood	brown reddish luvic	brown reddish of wood	black earth	alkaline black earth	black earth
2.	Anterior crop	black earth	barley	pease	wheat	wheat	wheat
3.	Height of the vegetal waste	7-14 cm	9-16 cm	10-18 cm	12-32 cm	8-12 cm	10-28 cm
4.	Weight of the vegetal waste	0,315 kg/m <sup>2</sup>	0,433 kg/m <sup>2</sup>	0,351 kg/m <sup>2</sup>	0,281 kg/m <sup>2</sup>	0,316 kg/m <sup>2</sup>	0,432 kg/m <sup>2</sup>
	Soil humidity:						
5.	▪ 0-5 cm	8.75%	1.97%	13.22%	7.43%	19.14%	3.97%
	▪ 5-10 cm	11.24%	3.29%	12.02%	8.56%	18.13%	4.76%
	▪ 10-20 cm						

▪ 20-30 cm	15.16%	3.52%	11.76%	9.67%	18.44%	5.55%
	17.23%	4.30%	11.28%	10.22%	17.74%	6.28%



Determination of the soil's crumbling degree



Determination of the soil's aerating degree



Determination of the covering degree with vegetal waste



Determination of the vegetal waste destruction degree

### 3. EXPERIMENTATIONS RESULTS

*The obtained results on the experimental fields inside the project*

**Table 2**

Base works denomination	Agricultural gear denomination in aggregate with U 650 tractor	Anterior work	Experimental field	Qualitative indices of work						
				Working depth (cm)	Working width (cm)	Crumbling degree (%)				Vegetal waste covering degree (%)
						> 100	50-100	20-50	10-20	
PLOUGHING	PP-3	Harvesting	USAMV Timișoara	25,2	89,5	27,5	18,2	23,9	30,4	91,3
		Harvesting	SCDA Valul lui Traian	24,4	88,7	21,5	22,0	22,7	33,7	93,3
		Harvesting	SCDA Șimnic	24,9	90,6	24,8	21,6	24,7	28,8	92,8
		Harvesting	SCDA Drăgănești- Vlașca	24,6	89,8	26,9	18,8	27,5	26,8	90,1
		Harvesting	MATHACHAND Amara	25,1	89,7	12,4	18,4	39,5	29,8	95,2
	GD-3,2	Harvesting	USAMV Timișoara	6,8	327,1	1,7	3,9	7,5	86,9	94,6
		Harvesting	SCDA Valul lui Traian	6,5	332,9	1,2	3,6	9,2	85,2	94,8
		Harvesting	MATHACHAND Amara	6,5	331,5	1,7	4,0	8,5	85,8	95,1
CIZEL	PC-7	Harvesting	SCDADrăgănești-Vlașca	15,1	417,5	-				-
		Harvesting	INCDA Fundulea	18,1	416,2	-				-
PREPARED IN NARROW BANDS	MBI-4	Harvesting	SCDA Valul lui Traian	16,3	281,6	-				-
		Harvesting	SCDA Drăgănești- Vlașca	15,3	283,5	-				-
		Harvesting	INCDA Fundulea	15,4	281,6	-				-
SEEDING	SUP-29	Harvesting	USAMV Timișoara	6,1	353,4	-				-
		Harvesting	SCDA Șimnic	6,0	353,3	-				-
VIBROMIX	VIBROMIX	Harvesting	SCDA Șimnic	15,7	322,5	-				-
		Harvesting	INCDA Fundulea	16,0	323,0	-				-



Carried plough PP-3



Cizel plough PC-7



Discs harrow GD 3,2



Combiner VBM

Base works denomination	Agricultural gear denomination in aggregate with U 650 tractor	Anterior work	Experimental field	Energetic indices					
				Speed (Km/h)		Skidding (%)		Fuel consumption (l/ha)	
				IR	IIR	IR	IIR	IR	IIR
PLOUGHING	PP-3	Harvesting	USAMV Timișoara	3,75	5,86	14,28	11,48	31,26	28,22
		Harvesting	SCDA Valul lui Traian	3,73	5,29	11,48	14,40	33,55	30,60
		Harvesting	SCDA Șimnic	3,93	5,86	10,83	13,71	29,49	27,49
		Harvesting	SCDA Drăgănești-Vlașca	3,30	5,66	14,75	13,58	36,06	32,28
		Harvesting	Mathachand Amara	4,12	6,43	14,40	12,80	26,51	23,84
	GD-3,2	Harvesting	USAMV Timișoara	5,57	8,49	13,60	12,29	6,73	6,11
		Harvesting	SCDA Valul lui Traian	5,10	8,33	13,00	10,83	7,10	6,27
		Harvesting	SCDA Șimnic	5,63	8,26	12,30	11,57	6,17	4,98
		Harvesting	Mathachand Amara	5,75	8,29	15,08	12,90	5,67	4,98
						IIR	IIIR	IIR	IIIR
CIZELAT	PC-7	Harvesting	SCDA Drăgănești-Vlașca	3,38	5,07	11,76	11,51	10,70	9,41
		Harvesting	INCDA Fundulea	3,44	4,92	10,60	7,69	10,90	9,40
						IR	IIR	IR	IIR
PREPARED IN NARROW BANDS	MBI-4	Harvesting	SCDA Valul lui Traian	4,48	7,47	12,30	10,83	9,54	7,85
		Harvesting	SCDA Drăgănești-Vlașca	3,53	5,70	13,00	10,10	10,06	8,61
		Harvesting	INCDA Fundulea	4,00	6,76	14,40	10,83	9,97	8,23
						IR	IIR	IR	IIR
SEEDING	SUP-29	Harvesting	USAMV Timișoara	4,27	6,04	13,00	11,47	6,57	5,71
		Harvesting	SCDA Șimnic	4,39	6,25	11,57	10,00	5,58	4,53

INDICI DE LUCRU CALITATIVI PPS

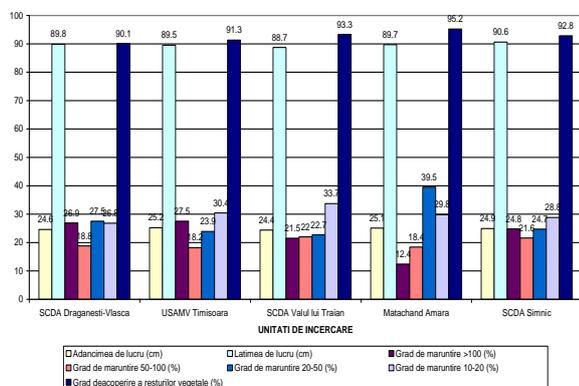


Fig. 1

INDICI DE LUCRU CALITATIVI GD 3,2

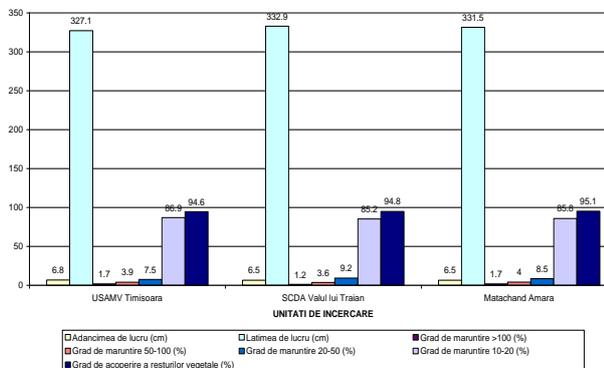


Fig. 2

INDICI DE LUCRU CALITATIVI PC 7

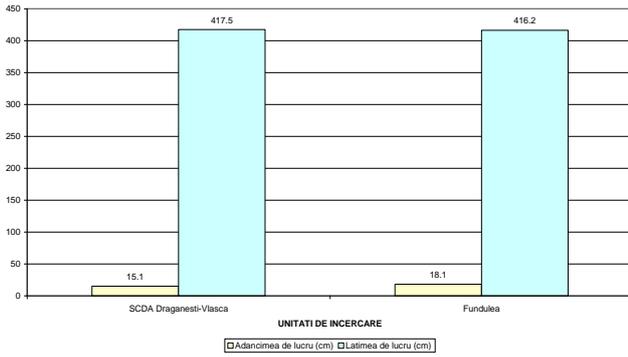


Fig. 3

INDICI DE LUCRU CALITATIVI MBI 4

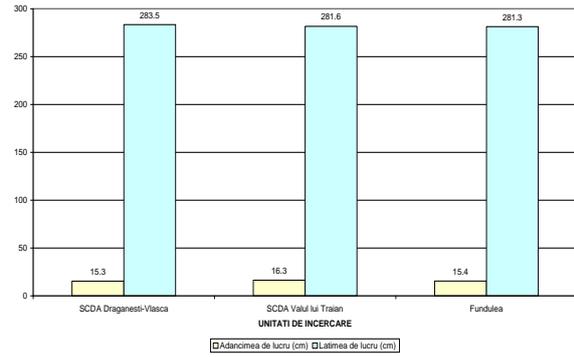


Fig. 4

INDICI CALITATIVI DE LUCRU SUP 29

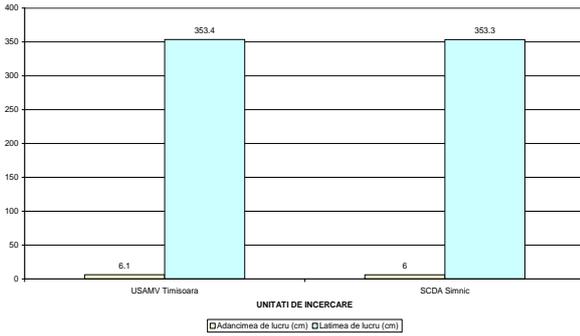


Fig. 5

INDICI DE LUCRU CALITATIVI VIBROMIX

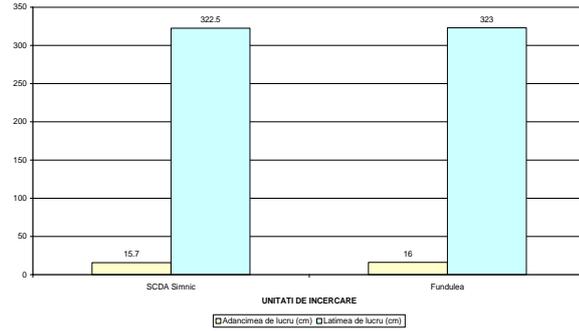


Fig. 6

INDICI ENERGETICI PP3  
VITEZA I R

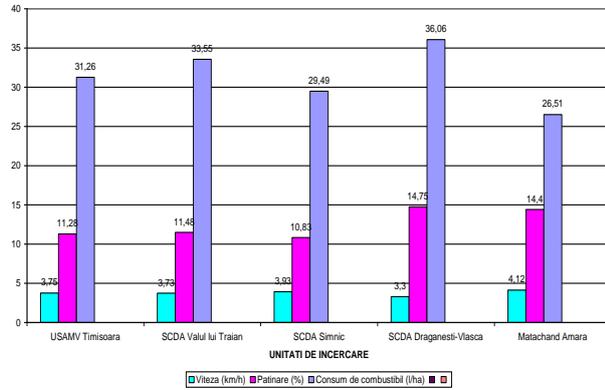


Fig. 7

INDICI ENERGETICI PP3  
VITEZA II R

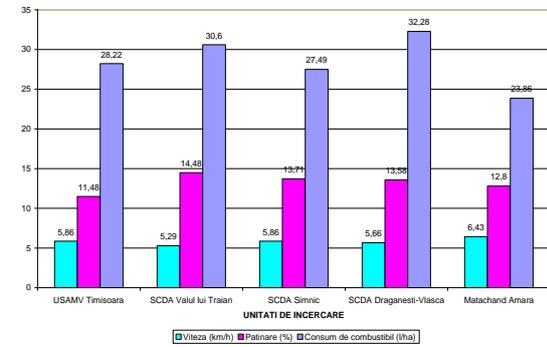


Fig. 8

INDICI ENERGETICI GD 3,2  
VITEZA II R

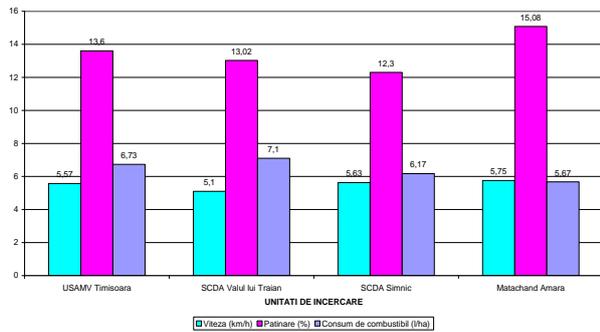


Fig. 9

INDICI ENERGETICI GD 3,2  
VITEZA III R

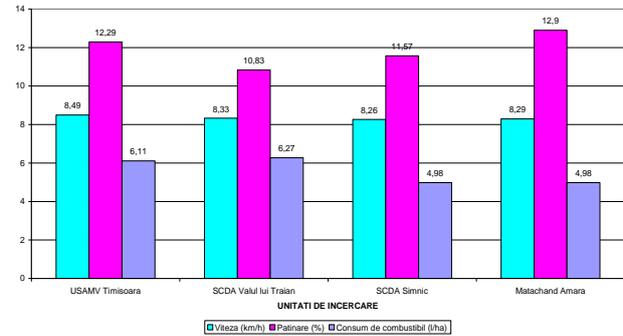


Fig. 10

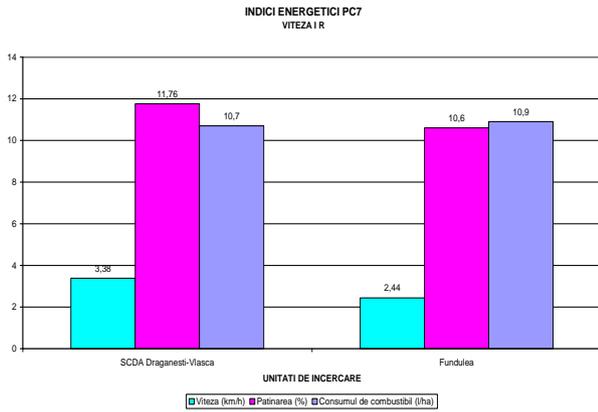


Fig. 11

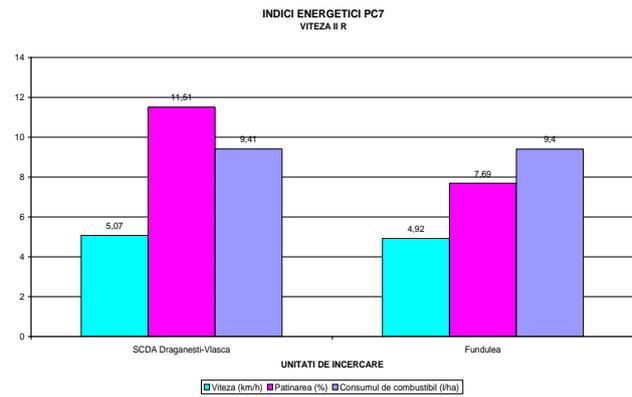


Fig. 12

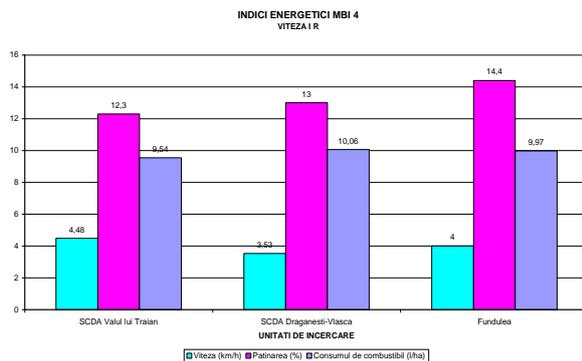


Fig. 13

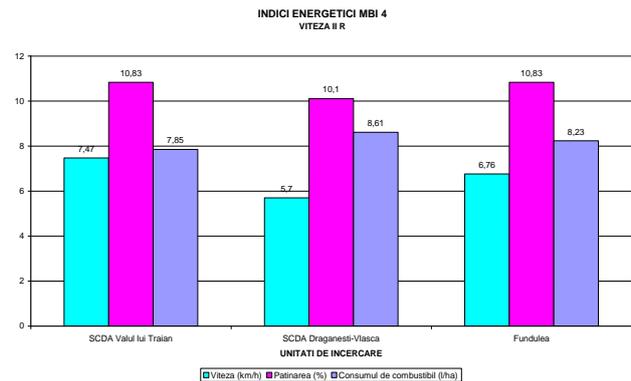


Fig. 14

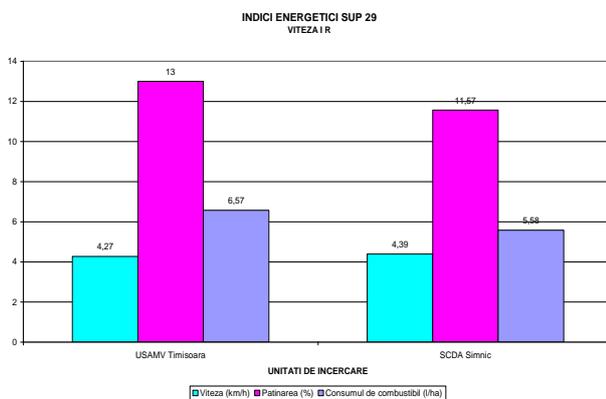


Fig. 15

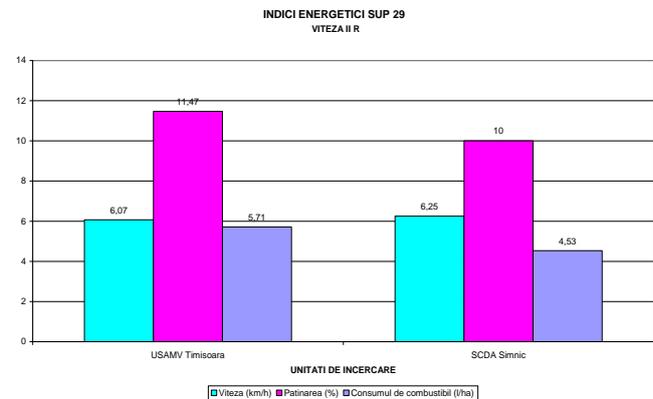


Fig. 16

## CONCLUSIONS

The field-laboratory experimentations of aggregates for soil works, in different variants of working it, were effectuated in September-October 2008 period (optimal period for field works in each area), on the experimental fields of INCDA Fundulea, SCDA Șimnic, USAMV Timișoara, SCDA Drăgănești-Vlașca, SCDA Valul lui Traian and MATAHAND Amara.

The experimentations were performed in 6 distinct areas of the country, in function of the soil's type: black earth, brown reddish of wood soil (luvosoil), candic black earth, alkaline black earth and of the aggregates tractor - gear, specific to soil's works, existent in the endowment of the agricultural unit from above and have comprised the destination domains, the composition and the technical characteristics of the agricultural gear with which there were effectuated the tests, the methodic, the equipments and the measure

and control apparatus used during tests, as also the formulas and the calculus method of energetic and qualitative indices of work. The obtained data during tests were processed and presented below;

By analyzing the presented data, it results that at the maximum working depth:

- *plough PP-3 (fig. 1, 7, 8)*, has realized the next indices:
  - working depth of 24,4÷25,2 cm;
  - working width of 88,7÷90,6 cm;
  - vegetal waste covering degree of 90,1÷95,2 %;
  - crumbling degree of 12,4-39,8 %;
  - working speed of 3,30-4,12 km/h, in first gear Rapid and 5,29-6,43 km/h, in second gear rapid;
  - skidding of 10,83-14,40 % , in first gear rapid and 11,48÷4,40%, in second gear rapid;
  - fuel consumption of 26,51-36,06 l/ha, in first gear rapid and 23,84÷2,28 l/ha, in second gear rapid;
- *discs harrow GD-3,2(fig.2,9,10)*, has realized the next indices:
  - working depth of 6,5÷6,8 cm;
  - working width of 327,1÷332,9 cm;
  - vegetal waste covering degree of 94,6÷95,1%;
  - crumbling degree of 1,2÷86,9 %;
  - working speed of 3,30÷4,12 km/h, in second gear rapid and 5,29÷6,43 km/h, in third gear rapid;
  - skidding of 10,83÷14,40 % , in second gear rapid and 11,48-14,40 % , in third gear rapid;
  - fuel consumption of 26,51-36,06 l/ha, in second gear rapid and 23,84÷32,28 l/ha, in third gear rapid;
- *the cizel plough PC-7(fig.3, 11, 12)*, has realized the next indices:
  - working depth of 6,5÷,8 cm;
  - working width of 416,2÷417,5 cm;
  - working speed of 3,30÷4,12 km/h, in first gear rapid and 5,29÷6,43 km/h, in second gear rapid;
  - skidding of 10,83÷14,40, in first gear rapid and 11,48-14,40, in second gear rapid;
  - fuel consumption of 26,51÷36,06 l/ha, in first gear rapid and 23,84÷32,28 l/ha, in second gear rapid;
- *the modernized combiner VIBROMIX VBM(fig.6)*, has realized the next indices:
  - working depth of 15,7÷16,0 cm;
  - working width of 322,5÷323,0 cm;
  - working speed of 3,30÷4,12 km/h, in first gear rapid and 5,29÷6,43 km/h, in second gear rapid;
  - skidding of 10,83÷14,40%, in first gear rapid and 11,48-14,40%, in second gear rapid;
  - fuel consumption of 26,51÷36,06 l/ha, in first gear rapid and 23,84÷32,28 l/hain second gear rapid;
- *seeding machine SUP-29(fig.5, 15, 16)*, has realized the next indices:
  - working depth of 6,0÷6,1 cm;
  - working width of 353,3÷353,4;
  - working speed of 3,30÷4,12 km/h, in first gear rapid and 5,29÷6,43 km/h, in second gear rapid;
  - skidding of 10,83÷14,40 % , in first gear rapid and 11,48÷14,40 % , in second gear rapid;
  - fuel consumption of 26,51÷36,06 l/ha, in first gear rapid and 23,84÷32,28 l/ha, in second gear rapid;

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