

## OBSERVATIONS ON THE INVENTORY OF PHYTOPHAGOUS ARTHROPODS AND PHYTOPATHOGENIC AGENTS FROM MEADOWS SITUATED IN NORTH-EASTERN MOLDAVIA

Nela TĂLMACIU\*, M. TĂLMACIU, F.D. LIPȘA

*University of Agricultural Sciences and Veterinary Medicine, Iași*

Received March 22, 2010

**ABSTRACT** – In most of grassland ecosystems used for grazing, a change of flower composition took place, by invading these areas with weeds that diminish their economic value, both quantitatively and qualitatively. One of the strategies of weed control is using natural limitative factors, which are pests and phytopathogenic agents. Observations were carried out in 2009 on two plots: the first plot situated near Iași – Miroslava and the second plot situated near Bârlad – Perieni, 100 km south from Iași. The plots were invaded by *Lepidium draba*. As a result of inventorying phytophagous bodies of invasive plants in the grassland ecosystems of the Central Moldavian Plateau in 2008, we have shown that the species belonged to orders *Coleoptera*, *Heteroptera*, *Homoptera*, *Diptera*, *Lepidoptera* and *Acari*. Among all these species, as potential control agents of *Lepidium draba*, having a high control rate, there were *Ceutorhynchus cardariae* Korotyaev, *Psylliodes wrasei* Leonardi and Arnold., *Aceria draba* Nal. The signalled micromycetes were *Blumeria graminis*, found in Perieni (Vaslui) in common

meadow grass (*Poa pratensis*); *Puccinia coronifera* f. sp. *Lolii* in Miroslava (Iași) in raigrass (*Lolium perenne*); *Puccinia poarum* in Perieni (Vaslui) in *Poa pratensis*; *Alternaria alternata* was signalled in whitetop (*Lepidium draba*), alfalfa (*Trifolium repens*), orchardgrass (*Dactylis glomerata*), raigras (*Lolium perenne*) sampled in Perieni (Vaslui) on June 10, 2009 and *Cladosporium herbarum* found in *Lepidium draba* and raigrass (*Lolium perenne*) in Miroslava (Iași) on July 5, 2009 and in alfalfa (*Medicago sativa*) in Perieni (Vaslui) on July 25, 2009.

**Key words:** natural grassland, invasive plants, phytophagous arthropods, phytopathogenic agents

**REZUMAT** - **Observații privind inventarierea artropodelor fitofage și a agenților fitopatogeni din pajiștile situate în nord-estul Moldovei.** În majoritatea ecosistemelor practice, exploatate prin pășunat, are lor o schimbare a compoziției floristice, adesea prin invadarea acestor suprafețe cu specii de plante, cunoscute sub

---

\* E-mail: ntlmaciu@yahoo.com

numele generic de buruieni, care le depreciază valoarea economică, atât din punct de vedere cantitativ, cât și calitativ. Una dintre strategiile de combatere și menținere a acestor plante în pășuni la un nivel tolerabil este utilizarea factorilor limitativi naturali, reprezentați, în special, prin dăunători și agenți fitopatogeni specifici. Astfel, observațiile au fost efectuate în anul 2009, pe două loturi: primul lot, situat lângă Iași – Miroslava și cel de-al doilea lot, situat lângă orașul Bîrlad – Perieni, la aproape 100 km sud de Iași, loturi invadate de *Lepidium draba*. În urma efectuării cercetărilor de inventariere a organismelor fitofage ale plantelor invazive în ecosistemele practice din zona Podișului Central Moldovenesc, în anul 2008, s-a evidențiat faptul că speciile aparțin ordinelor: *Coleoptera*, *Heteroptera*, *Homoptera*, *Diptera*, *Lepidoptera* și *Acari*. Dintre toate aceste specii, ca potențiali agenți de combatere a speciei *Lepidium draba*, cu o rată înaltă de distrugere a acesteia, sunt *Ceutorhynchus cardariae* Korotyaev, *Psylliodes wrasei* Leonardi și Arnold., *Aceria draba* Nal. Micromicetele semnalate au fost următoarele: *Blumeria graminis* la Perieni (Vaslui) pe firuță (*Poa pratensis*); *Puccinia coronifera* f. sp. *Lolii* la Miroslava (Iași) pe raigras (*Lolium perenne*); *Puccinia poarum* la Perieni (Vaslui) pe firuță (*Poa pratensis*); *Alternaria alternata* a fost semnalată pe urda vacii (*Lepidium draba*), trifoi (*Trifolium repens*), golomăț (*Dactylis glomerata*), raigras (*Lolium perenne*), recoltate la Perieni (Vaslui) pe 10.06 și *Cladosporium herbarum*, semnalată pe urda vacii (*Lepidium draba*) și raigras (*Lolium perenne*) la Miroslava (Iași), pe 5.07.2009, și pe lucernă (*Medicago sativa*) la Perieni (Vaslui), pe 25.07.2009.

**Cuvinte cheie:** pajiști naturale, plante invazive, artropode fitofage, agenți fitopatogeni

## INTRODUCTION

Because of improper usage of grasslands situated in the central area of Moldavia, some plants with low fodder qualities or with the capacity of synthesising toxic substances for animals, weeds multiplied highly, becoming “problem weeds”, as *Lepidium draba*, *Euphorbia cyparissias*, *Artemisia* sp., *Achillea* sp., *Linaria vulgaris*, etc., decreasing the productivity of these ecosystems (Pârnu, 2005; Manoliu *et al.*, 1996).

*Lepidium draba* L. (whiteweed), a species originating in Europe, became a problem plant in many agroecosystems of Romania and in many grassland ecosystems, especially those used for grazing (Cripps *et al.*, 2005).

A high number of diseases and pests that cause every year great losses of green mass, hayfield or seed attacks fodder plants from permanent grasslands and fodder crops within crop rotations. A tight connection was established between the high degradation degree of grasslands and the endemic appearance of pests and pathogenic agents.

## MATERIALS AND METHODS

Observations were carried out in 2009 on two plots. The first plot is situated near Iași – Miroslava (47° 10'N, 27° 27'E) and is invaded by *Lepidium draba*. This field is grazed by cattle of the peasants from the neighbouring village and is found at a high overgrazing stage. The second experimental plot is grazed by

## PHYTOPHAGOUS ARTHROPODS AND PHYTOPATHOGENIC AGENTS FROM MOLDAVIAN MEADOWS

sheep and is found near Bârlad – Perieni (48° 16'N, 27° 38'E), 100 km south from Iași.

Experimental fields have a total area of 5000 square meters, where six experimental areas of 16 x 22 m each, are isolated, separated by an area of 2 m, respectively, 4 m. Inside each experimental area, we have delimited three variants: a control variant with untilled field; a variant with superficial tillage field; a variant with superficial tillage field and oversown with high fodder value of plant mixtures. We have sown the following fodder plants: *Dactylis glomerata*, *Festuca valesiaca*, *Lolium perene*, *Onobrychis viciifolia*, *Medicago sativa*.

Placing experimental areas, working variants and observation zones was done at random. On each of the three variants, four observation zones of 3x3 m were delimited, in total 72 variants. Within each central subplot of 0.5 x 0.5 m, there are 10 plants of *Lepidium draba*, the following characteristics being recorded for each plant: phenological stage, number of shoots per plant, their height and any trace of attack.

For the determination of signalled micromycetes on fodder grasses and legumes, the biological material was collected during May-August from the two places. We have sampled fodder grasses and legumes that showed parasitic symptoms. Plants were sampled and herborized during travels, in order to maintain morphological traits and symptoms of the species. Necromass elements with saprophytism symptoms were sampled and kept until their

determination in paper boxes. All the samples were labelled. Data on sampling place, time, host plant, and fungus were noted.

The analysis of samples was done in laboratory, at the beginning as a preliminary free examination and by binocular magnifying glass and then by microscopic examination. The determination of micromycetes was done according to the functions at the anamorphic stage or in the teleomorphic stage. At micromycetes where fructifications were not formed yet, they were kept in a wet room, in order to hurry up fructification. Afterwards, they were tested periodically.

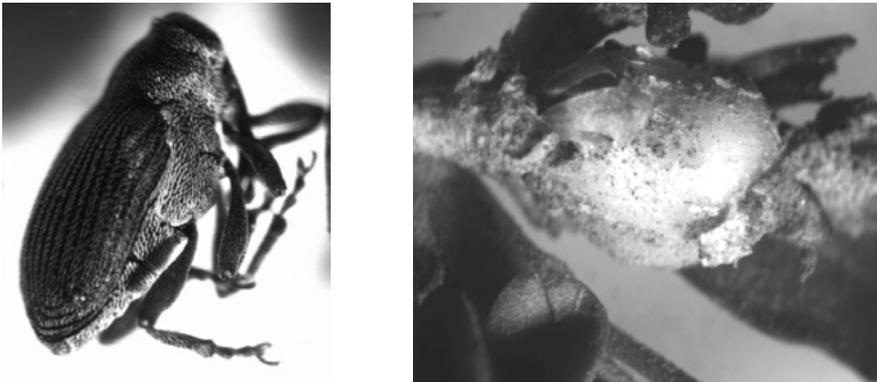
## RESULTS AND DISCUSSION

Observations on the inventory of phytophagous arthropods in *Lepidium draba* L., at Perieni, Vaslui County were carried out taking into account the plant phenology:

- 7.04.2009, plant phenology: plantlets at rosette stage and the stage of first stemlet formation;
- 22.04.2009, plant phenology: plants of 10-15 cm, before flowering
- 8.05.2009, plant phenology: plants of 20-30 cm, flowering 50%
- 25.05.2009, plant phenology: plants of 30-40 cm, shedding 50% (*Table 1*)

**Table 1 – Structure of phytophagous arthropods in *Lepidium draba* L., at Vaslui**

Attacked organ	Stage of the phytophagous	Obtained species	Observations
<b>7.04.2009 – plantlets at the rosette stage and formation of first stemlets</b>			
Root nodules	Young larvae	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	Nodules
Nodules at the basis of young plant stems	Young larvae	<i>Ceutorhynchus cardariae</i>	
		<i>Korotyaev</i>	
		<i>Ceutorhynchus cardariae</i>	
Aerial organs of plantlets	Adults	<i>Korotyaev</i>	
	Adults	<i>Baris semistriata Boheman</i>	
	Adults	<i>Psylliodes wrasei Leonardi &amp; Arnold</i>	
<b>22.04.2009 – plants of 10-15 cm, floral button</b>			
Root nodules	Mature larvae	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	Empty nodules
Nodules at the basis of stems, on stem, on the leaf limb	Young larvae	<i>Ceutorhynchus cardariae</i>	
	Mature larvae	<i>Korotyaev</i>	
Aerial organs of plantlets	Adults	<i>Baris semistriata Boheman</i>	
	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
<b>8.05.2009 – plants of 20-30 cm, flowering 50%</b>			
Root nodules	Mature larvae	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	Empty nodules
Nodules at the basis of young plant stems	Young larvae	<i>Ceutorhynchus cardariae</i>	Empty nodules
	Mature larvae	<i>Korotyaev</i>	
Leaves, flowers	Adults, larvae	<i>Brevicorine brassicae</i> L. <i>Aceria draba</i> Nal.	
Aerial organs of plantlets	Adults	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	First adults
	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Inflorescences	Adults, larvae	<i>Aceria draba</i> Nal.	
Flowers	Adults, larvae	<i>Meligethes</i> spp.	
<b>25.05.2009 – plants of 30-40 cm, shedding 50%</b>			
Nodules on leaf limb	Larvae	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Aerial organs of plantlets	Adults	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	First adults
	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Leaves	Adults, larvae	<i>Colaphellus</i> spp.	
Inflorescences	Adults, larvae	<i>Aceria draba</i> Nal.	
Flowers	Young larvae	<i>Meligethes</i> spp.	
	Mature larvae		
Leaves and flowers	Mature larvae	<i>Plutella xylostella</i> L.	



**Figure 1 - Adult *Ceutorhynchus assimilis* Paykull and root nodule**

In Iași, observations on the inventory of phytophagous arthropods and phytopathogenous agents in *Lepidium draba* L. were carried out taking into account the plant phenology at a certain time (*Table 2*):

- 10.04.2009, plant phenology: plantlets at the stage of rosette and formation of first stemlets
- 25.04.2009, plant phenology: plants of 10-15 cm, before flowering
- 10.05.2009, plant phenology: plants of 20-30 cm, flowering 50%
- 30.05.2009, plant phenology: plants of 30-40 cm, shedding 50%

After carrying out the inventory of phytophagous organisms of invasive plants in grassland ecosystems from Central Moldavian Plateau in 2008, we pointed out that the species belonged to the following orders: *Coleoptera*, *Heteroptera*, *Homoptera*, *Diptera*, *Lepidoptera*, *Acari*.

Among these, cabbage seedpod weevil, *Ceutorhynchus assimilis* Paykull, attacks plant roots at larva stage, forming nodules on roots (*Figure 1, 2*). As adults, they feed with plant aerial organs, especially with leaves. At larva stage, other species eat organs found on soil (*Baris semistriata* Boheman, *Ceutorhynchus cardariae* Korotyaev (*Figure 3*), *Psylliodes wrasei* Leonardi and Arnold), and most of them destroy different plant organs (leaves, stem, flowers and fruits) at larva and adult stage, by direct consumption or by forming nodules with which walls they feed (Chatened du Gaetan, 1990).

Among all these species, as potential agents with a high rate of controlling *Lepidium draba*, are *Ceutorhynchus cardariae* Korotyaev, *Psylliodes wrasei* Leonardi and Arnold. and *Aceria draba* Nal. (Fumanal et al., 2004; Hinz et al., 2007).

**Table 2 – Structure of phytophagous arthropods in *Lepidium draba* L., in Iași**

Attacked organ	Stage of the phytophagous	Obtained species	Observations
<b>10.04.2009 - plantlets at the rosette stage and formation of first stemlets</b>			
Root nodules	Mature larvae	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	Empty nodules
Nodules at the basis of stems, on stem, on the leaf limb	Mature and young larvae	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Aerial organs of plantlets	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
<b>25.04.2009 – plants of 10-15 cm, before flowering</b>			
Root nodules	Mature larvae	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	Empty nodules
Nodules at the basis of stems	Mature and young larvae	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Leaves, flowers	Young larvae	<i>Plutella xylostella</i> L.	
Leaves	Young larvae	<i>Pieris napi</i> L.	
Aerial organs of plantlets	Adults	<i>Ceutorhynchus assimilis</i> <i>Paykull</i>	First adults
	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Flowers	Adults, Young larvae	<i>Meligethes spp.</i> , <i>Thrips spp.</i>	
Leaves, inflorescences	Adults, larvae	<i>Brevicorine brassicae</i> L., <i>Aceria draba</i> Nal.	
<b>10.05.2009 – plants of 20-30 cm, flowering 50%</b>			
Nodules on the leaf limb	Larvae	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	
Leaves	Mature larvae	<i>Pieris brassicae</i> L.	
Leaves	Larvae	<i>Phytomyza atricornis</i> Meigen	
Inflorescences	Adults, larvae	<i>Aceria draba</i> Nal.	
<b>30.05.2009 – plants of 30-40 cm, shedding 50%</b>			
Aerial organs of plantlets	Adults	<i>Ceutorhynchus cardariae</i> <i>Korotyaev</i>	First adults
	Adults	<i>Psylliodes wrasei</i> Leonardi & Arnold	
Inflorescences	Adults, larvae	<i>Aceria draba</i> Nal.	

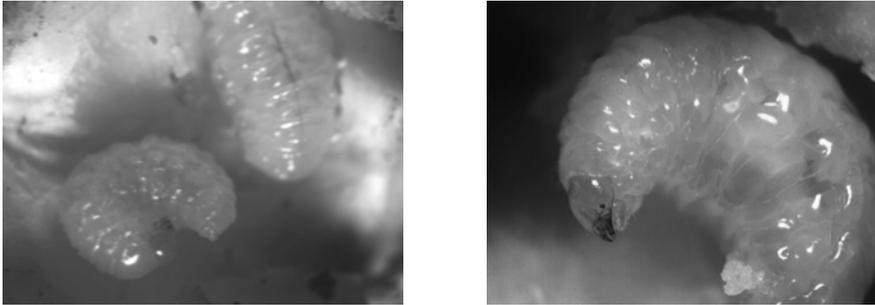


Figure 2 - *Ceutorhynchus assimilis* Paykull larvae in root nodules

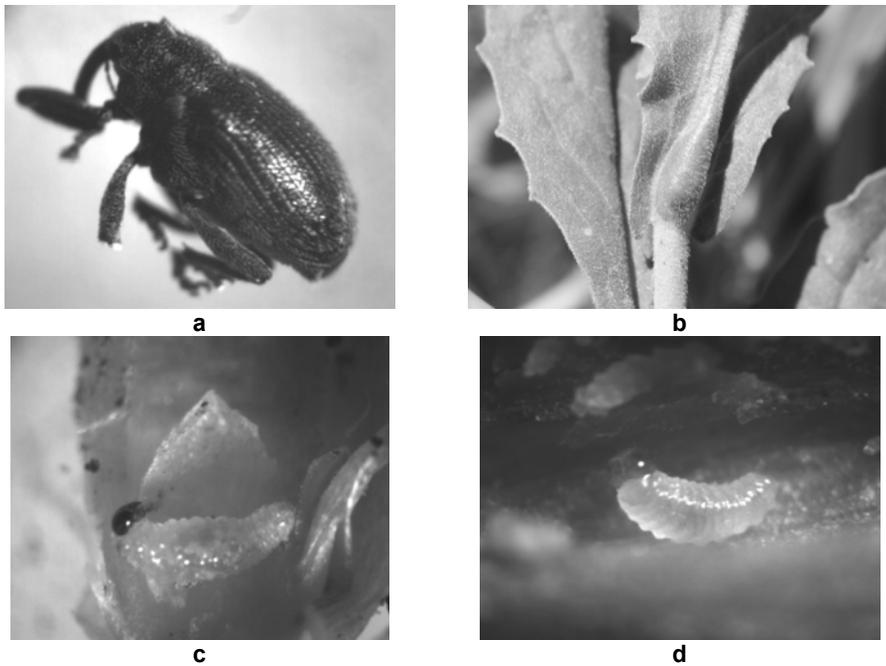


Figure 3 - *Ceutorhynchus cardariae* Korotyaev  
a-adult, b-nodule at the petiole level, c,d-larva inside the nodule

**Micromycetes found on fodder grasses and legumes.** The determination of micromycetes was done according to the most recent literature works at the Chair of Plant Pathology, and for the taxonomic order, we have used the classification

system accepted nowadays by most mycologists (Ulea *et al.*, 2009).

1. *Blumeria graminis* (DC.) Speer. (sin. *Erysiphe graminis*) - Fam. *Erysiphaceae*, Ord. *Erysiphales*, Cl. *Pyrenomyces*, Subclass *Ascomycotina*; f.c. *Oidium* sp. was signaled at Perieni (Vaslui) on

common meadow grass (*Poa pratensis*).

On leaves, stems, and inflorescences, fungus develops an entophyte whitish mycelium. Here, are formed *Oidium* sp. type conidia. Cleistothecia are grouped or spread in vegetative mycelium, have a globular shape, measure 130-260  $\mu\text{m}$  as diameter and have a dark coloured wall with few very short appendices. Ascus contain eight ellipsoidal hyaline or yellowish ascospores with sizes of 20-24 x 10-14  $\mu\text{m}$ .

2. *Puccinia coronifera* f. sp. *lolii* (Niels.) Erikss. (sin. *Puccinia coronata*) - Fam. *Pucciniaceae*, Ord. *Uredinales*, Cl. *Teliomycetes*, Subclass *Basidiomycotina* was found at Miroslava (Iași) on raigrass (*Lolium perenne*).

Spherical, sub epidermal picnidia, 80-100  $\mu\text{m}$  diameter. Aecidia are displayed on yellow-reddish spots, while tissues are swollen, dense, in circular groups or irregularly spread. Amphigenous uredospores, especially on the front face, 15-24 x 12-18  $\mu\text{m}$ . Teleospores are small, 33-55 x 13-20  $\mu\text{m}$ .

3. *Puccinia poarum* Niels. - Fam. *Pucciniaceae*, Ord. *Uredinales*, Cl. *Teliomycetes*, Subclass *Basidiomycotina* - was signalled at Perieni (Vaslui) on common meadow grass (*Poa pratensis*).

Small uredospores, on the front face of *Poa* leaves and, seldom, on stems, circular or ellipsoidal, yellowish-orange or dark, without paraphyses. The size of uredospores is 20-29 x 16-22  $\mu\text{m}$ , no coloured or

yellowish-golden membrane. Teliospores are found especially on the lower side of leaves, circular or lengthened, 35-65 x 17-26  $\mu\text{m}$ .

4. *Alternaria alternata* (Fr.) Keissler (sin. *Alternaria tenuis*) - Fam. *Dematiaceae*, Ord. *Moniliales*, Cl. *Hyphomycetes*, Subclass *Deuteromycotina*.

Fungus forms black or greenish colonies. Conidiophores are simple or branched, isolated or grouped, yellowish-brown coloured and have many brown transversal walls. Their size is 50 x 4-6  $\mu\text{m}$ . Conidia are formed at the end of conidiophores or on lateral branches, are claviform with 6-8 transversal walls and one longitudinal wall. They measure 20-63 x 9-18  $\mu\text{m}$ .

Micromycetes were signalled on *Lepidium draba*, *Trifolium repens*, *Dactylis glomerata*, *Lolium perenne*, sampled at Perieni (Vaslui) on 10.06.2009.

5. *Cladosporium herbarum* (Pers.) Lk. ex S.F. Gray - Fam. *Dematiaceae*, Ord. *Moniliales*, Cl. *Hyphomycetes*, Subclass *Deuteromycotina*.

On dark mycelium, fungus forms cylindrical conidiophores, grouped in yellowish-olive coloured branches; to the end side are formed elliptical or oval, uni- or pluricellular conidia that measure 5-23 x 3-8  $\mu\text{m}$ . Fungus was signalled on whitetop (*Lepidium draba*) and raigrass (*Lolium perenne*) at Miroslava (Iași) on 5.07.2009 and on alfalfa (*Medicago sativa*) at Perieni (Vaslui) on 25.07.2009.

## CONCLUSIONS

After carrying out field observations and identification of gathered material, the following phytophagous organisms were recorded: *Meligethes* sp., *Colaphellus* sp., *Psylliodes wrasei* Leonardi and Arnold, *Baris semistriata* Boheman, *Ceutorhynchus assimilis* Paykull, *Ceutorhynchus cardariae* Korotyaev (ord. Coleoptera); *Phytomyza atricornis* Meigen (ord. Diptera); *Pieris brassicae* L., *Pieris napi* L., *Plutella xylostella* L. (ord. Lepidoptera); *Brevicoryne brassicae* L. (ord. Homoptera); *Aceria draba* Nal. (ord. Acari).

As concerns the signaled micromycetes on fodder legumes and grasses, the biological material was gathered in the steppe area from southern Moldavia, during May-August 2009, in the two places from Iași and Vaslui counties.

The following micromycetes were found: *Blumeria graminis* at Perieni (Vaslui) on *Poa pratensis*, *Puccinia coronifera* f. sp. *lolii* at Miroslava (Iași) on *Lolium perenne*, *Puccinia poarum* at Perieni (Vaslui) on *Poa pratensis*; *Alternaria alternata* was found on *Lepidium draba*, *Trifolium repens*, *Dactylis glomerata*, *Lolium perenne*, sampled at Perieni (Vaslui) on 10.06.2009 and *Cladosporium herbarum* found on *Lepidium draba* and *Lolium perenne* at Miroslava (Iași) on 5.07.2009 and *Medicago sativa* at Perieni (Vaslui) on 25.07.2009.

## Acknowledgments:

Investigations have been financed by CNCSIS –UEFISCSU, Project 191 PNII – IDEI code 680/2007

## REFERENCES

- Chatened du Gaetan, 1990** – *Guide des Coleopteres d'Europe*. Delacrois et Niestlé, Paris
- Cripps M.G., Hinz H.L., McKenney J.L., Harmon B.L., Merickel F.W., Schwarzlaender M., 2005** – *Comparative survey of the phytophagous arthropod faunas associated with Lepidium draba in Europe and the western United States, and the potential for biological weed control*. Biocontrol Science and Technology. 16:1007–1030
- Fumanal B., Martin J., Sobhian R., Blanchet A., Bon M., 2004** – *Host range of Ceutorhynchus assimilis (Coleoptera: Curculionidae), a candidate for biological control of Lepidium draba (Brassicaceae) in the USA*. Biological Control. 30:598–607
- Hinz H.L., Diaconu A., Tălmăciu M., Năstăsă, V., Grecu M., 2007** – *Testing the efficacy of specialist herbivores to control Lepidium draba in combination with different management practices*. Vol. Abst. XII internațional symposium on biological control of weeds, Montpellier, France, 151-152
- Manoliu Al., Zanoschi V., Ștefan N., Șesan Tatiana, 1996** – *Buruienile din culturile agricole și bolile lor (Weeds from crops and their diseases)*. Edit. Ceres, București
- Pârnu C., 2005** – *Enciclopedia plantelor – Plante din flora României (Plant encyclopedia – Plants from Romanian flora)*, Vol.IV, Edit. Tehnică, București

**Samuil C., Vintu V., Saghin Gh., Popovici I.C., 2008** – *Strategies for using organic fertilizers on permanent grasslands in north-eastern Romania*. 22<sup>st</sup> General Meeting of the European Grassland Federation, Uppsala, Sweden, ISBN 978-91-85944-47-9

**Ulea E., Lipșa F.D., Irimia Nicoleta, Balan Gabriela Mihaela, 2009** – *Investigation on the influence of fertilization and of Onobrychis viciifolia Scop. and Bromus inermis Leiss. mixture on soil microflora*. Cercetări agronomice în Moldova, vol. XLII, No. 2 (138), 47-54