FAUNA AND ECOLOGY OF THE WEEVILS (COLEOPTERA: CURCULIONIDAE) ASSOCIATED WITH LEGUMINOUS PLANTS IN THE REPUBLIC OF MOLDOVA

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Abstract. An updated study of the weevil species belonging to the family Curculionidae associated with leguminous plants from the Republic of Moldova, their biodiversity, ecological peculiarities and distributions was provided. Altogether, 50 species from 5 genera and 3 subfamilies have been revealed. According to trophic preferences, investigated weevils are led with 21 genera of host plants; the greatest number of species was detected on gg. *Medicago* (27 species), *Trifolium* (23), *Vicia*, and *Melilotus* (20). The geographical diversity analyses revealed 9 zoogeographical groups. The most numerous groups are the Western-Palearctic (15 species) and Holarctic (13).

Keywords: Curculionidae, leguminous plants, fauna, ecology, Republic of Moldova.

Rezumat. Fauna şi ecologia coleopterelor curculionide (Coleoptera: Curculionidae) asociate cu plante fabacee în Republica Moldova. A fost efectuat un studiu actualizat al biodiversităţii, particularităţilor ecologice şi distribuirii speciilor de coleoptere Curculionidae asociate cu plantele fabacee în Republica Moldova. În total, au fost evidenţiate 50 de specii din 5 genuri şi 3 subfamilii. În funcţie de preferinţele trofice speciile de curculionide investigate apartin unui număr de 21 de genuri de plante gazdă; cel mai mare număr de specii a fost gasit pe specii din genurile: *Medicago* (27 specii), *Trifolium* (23), *Vicia* şi *Melilotus* (20). Analiza răspândirii geografice a stabilit că speciile de curculionide cercetate apartin la 9 grupe zoogeografice, predominante fiind cele Vest-Palearctice (15 specii) şi Holarctice (13).

Cuvinte cheie: Curculionidae, plante fabacee, faună, ecologie, Republica Moldova.

INTRODUCTION

Weevils (Curculionoidea) are one of the biggest groups of phytophagous coleopterans, which contains about 60,000 species and 6,000 described genera (THOMPSON, 1992; KUSCHEL, 1995). Currently, on the territory of the Republic of Moldova 683 weevils species have been revealed (POIRAS, 2006). Weevils constituting various taxonomic groups feed on plant roots, stems, leaves, flowers, fruits or seeds. They may be among the first enemies to consume healthy plants or may be specialists on decaying tissues or dead remains of plants felled by other causes (FARRELL et al., 2001; LANTERI et al., 2002). Weevils are known as dangerous pests of agricultural crops, harming the leaves, roots and seeds of bean crops, and consequently, they can cause severe economic damage. Injured seeds are poorly stored, mechanical damage increase respiration process in seeds and therefore water elimination (SOH, 1983). Attacked seeds become wet and heated, facilitating development of microorganisms. Leguminous plants are important not only as valuable food for animals, but also as improvement of soil productivity by creating a high-quality background, essential for the subsequent crops in crop rotation.

At the same time, annual leguminous plants provide with the forage rich in proteins, carbohydrates, mineral salts and vitamins (PETRUHA, 1969; EGOROV, 1979). Losses in agriculture caused by harmful insects are first of all, the result of insufficient data regarding the composition and status of insect complexes, their number and delay of preventive interventions. Currently, in the Republic of Moldova, 42 genera and 150 species of leguminous plants (Fabaceae) are known (GHEIDEMAN, 1986), many of them used in agriculture as crop plants. This causes permanent interest in studying this group of insects.

The first faunistic data about weevils family *C*urculionidae from the researched region have been recorded by MILLER & ZUBOVSKII (1917); later information on the presence of some weevils species from the researched region and adjacent areas of Ukraine have been marked by MEDVEDEV & SAPIRO (1957).

The weevils living on leguminous plants are poorly studied in the Republic of Moldova; only some fragmentary data on this group are available (POIRAS, 1994, 1998, 2001, 2006), and some information about pest species on alfalfa (ANTONOVA, 1977, 1988).

The aim of the present study was to provide updated data of the weevil species associated with leguminous plants belonging to the family Curculionidae from the Republic of Moldova, their biodiversity, ecological peculiarities and distributions.

MATERIALS AND METHODS

The main material was collected from different regions of the Republic of Moldova between 2008 and 2010. Weevils were collected by sweep-net from early April to mid October of each year. Larvae, cocoons and adults of weevils were as well individually collected for the study of their host plants. Also entomological museum collections of the Institute of Zoology, Moldova Academy of Sciences have been used. The world catalogue of ALONSO-ZARAZAGA & LYAL, 1999 was used for taxonomic classification.

RESULTS AND DISCUSSIONS

Altogether, 50 species from the genera *Otiorrhynchus* (1 pecies), *Tanymecus* (1), *Sitona* (19), *Hypera* (11), and *Tychius* (18) included in 3 subfamilies Entiminae, Hyperinae, and Tychiinae have been revealed (Table 1).

According to trophic preferences, the investigated weevils are associated with 21 genera of host plants belonging to the family *Fabaceae.* The greatest numbers of weevil species were detected on the genera *Medicago* (27 species), *Trifolium* (23), *Vicia* (20), *Melilotus* (20), *Onobrychis* (14), *Pisum* (6) and *Astragalus* (6). The plants from the genera *Lathyrus* (4 species), *Cytisus* (4), *Lotus* (4), *Ononis* (3), *Lens* (3), *Robinia* (3), *Genista* (2), *Galega* (2), and *Coronilla* (2) were less populated. Only by one weevil species are specific for the following plants genera: *Lupinus*, *Ornithopus,* and *Dorycnium*. There are no available data about the host plant *Tychius uralensis* PIC.

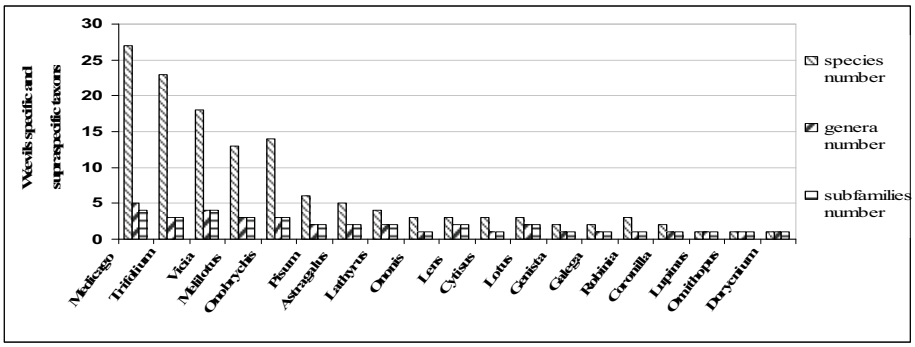

Figure 1. Trophic preferences of the weevils belonging to the family Curculionidae associated with leguminous plants in the Republic of Moldova.
Figura 1. Preferința trofică a coleopterelor Curculionidae asociate cu plantele fabacee în Republica Moldova.

Percentage parity of specific and superspecific taxons of weevils according to their host plants belonging to the family Fabaceae shows that the most preferred, as forage plants, are those from gg. *Medicago*, which are inhabited by 100% generic taxa and 55.1% of species taxa. Also, *Trifolium* and *Vicia* host a large number of genera and species taxa of weevils, 60% and 80%, respectively 46.9% and 40.8%. Sixty percent of the generic taxa and 28.5% of the specific taxa live on *Melilotus*.

These data can be probably explained on the basis of ecological peculiarities and role of these plants in the agricultural system. The genus *Medicago* is widely distributed on the territory of the Republic of Moldova as it is cultivated in agriculture for animal forage. In the case of *Trifolium* and *Vicia* genera their claim can be attributed to increased species richness on the investigated area. Concerning *Melilotus* genus, their species are widespread on the territory of republic, without being weeds (SOH, 1983; GHEIDEMAN, 1986).

It is well known that weevils are ranged from polyphagous to monophagous according to the spectrum of host plants preference. Investigated weevils are represented by three groups: wide polyphagous, which contains only 3 species (*Otiorrhynchus ligustici* L., *Tanymecus dilaticollis* GYLL., and *Hypera cumana* PETRI), wide oligophagous with 27 species and narrow oligophagous 19 (Table 1). The given group of weevils associated with leguminous plants in the Republic of Moldova does not include narrow polyphagous and monophagous species. The classification was made according to EMELIANOV (1964) conception.

Table 1. List of weevils (Coleoptera: Curculionidae) associated with leguminous plants in the Republic of Moldova.
Tabel 1. Lista speciilor de coleoptere Curculionidae asociate cu plantele fabacee în Republica Moldova.

No.	Species	Trophic specialization			Types of areas
		Wide polyphagous	Wide oligophagous	Narrow oligophagous	
	CURCULIONIDAE Family LATREILLE 1802 **ENTIMINAE** Subfamily SCHOENHERR 1823 **Otiorhynchini** Tribe SCHOENHERR 1826 ***Otiorrhynchus*** Genus GERMAR 1824				
1.	*O. (Cryphiphorus) ligustici* L.	+			Holarctic
	Tanymecini Tribe LACORDAIRE 1863 ***Tanymecus*** Genus GERMAR 1817				
2.	*T. dilaticollis* GYLL.	+			Eastern-Mediterranean
	Sitonini Tribe GISTEL 1856 ***Sitona*** Genus GERMAR 1817				
3.	*S. griseus* FAB.		+		European
4.	*S. tibialis* HBST. (=*striatellus*) GYLL.		+		Western-Palaearctic
5.	*S. lineatus* L.		+		Holarctic
6.	*S. sulcifrons* THUN.		+		Panpalaearctic
7.	*S. flavescens* MARSH. (=*lepidus*) GYLL.		+		Holarctic
8.	*S. crinitus* HBST. (=*macularius*) MARSHAM		+		Trans-Palaearctic

9.	*S. hispidulus* FAB.		+		Holarctic
10.	*S. cylindricollis* FAHR.		+		Holarctic
11.	*S. humeralis* STEPH.		+		Western-Palaearctic
12.	*S. concavirostris* HOC.			+	Eastern-Mediterranean
13.	*S. inops* GYLL.		+		Western-Palaearctic
14.	*S. callosus* GYLL.		+		Western-Palaearctic
15.	*S. lateralis* GYLL. *(=ononidis)* SHARP.		+		European
16.	*S. longulus* GYLL.			+	Western-Palaearctic
17.	*S. languidus* GYLL.		+		European
18.	*S. waterhousei* WALT.			+	European
19.	*S. ambiguus* GYLL.		+		European
20.	*S. suturalis* STEPH.		+		Holarctic
21.	*S. puncticollis* STEPH.			+	Western-Palaearctic
	HYPERINAE Subfamily MARSEUL 1863 **Hyperini** Tribe MARSEUL 1863 ***Hypera*** Genus GERMAR 1817				
22	*H. meles* FAB.		+		Holarctic
23.	*H. nigrirostris* FAB.		+		Holarctic
24.	*H. variabilis* HBST. (= *postica*) GYLL.			+	Holarctic
25.	*H. pedestres* PAYK. (=*suspiciosa*) HERBST		+		Euro-Siberian
26.	*H. contaminata* HERB.			+	European
27.	*H. cumana* PETRI	+			Euro-Siberian
28.	*H. zoilus* SCOP. (= *punctata*) F.			+	Holarctic
29.	*H. plantaginis* DEG.		+		Western-Palaearctic
30.	*H. viciae* GYLL.		+		Trans-Palaearctic
31.	*H. murina* F. (=*fuscocinere*) MARSHAM		+		Holarctic
32.	*H. transsylvanica* PETRI			+	Euro-Siberian
	TYCHIINAE Subfamily PASCOE 1870 **Tychiini** Tribe THOMSON 1859 ***Tychius*** Genus GERMAR 1817				
33	*T. quinquepunctatus* L.		+		Trans-Palaearctic
34.	*T. polylineatus* GERM.			+	Western-Palaearctic
35.	*T. pumilus* CH. BRISOUT			+	Euro-Siberian
36.	*T. aureolus* KIESENWETTER		+		Western-Palaearctic
37.	*T. medicaginis* CH. BRISOUT		+		Western-Palaearctic
38.	*T. junceus* REICH.		+		Western-Palaearctic
39.	*T. flavus* BECKER.			+	Western-Palaearctic
40.	*T. subsulcatus* TOUR.			+	European
41.	*T. trivialis* BOH.			+	Euro-Siberian
42.	*T. caldarai* DIECKMANN			+	Mediterranean
43.	*T. cuprifer* PANZER			+	Western-Palaearctic
44.	*T. uralensis* PIC.	?	?	?	Eastern-Palaearctic
45.	*T. squamulatus* GYLL.			+	Western-Palaearctic
46.	*T. crassirostris* KIRSH.			+	Euro-Siberian
47.	*T. meliloti* STEPH.		+		Western-Palaearctic
48.	*T. breviusculus* DESBR. (=*micaceus*) REY			+	Trans-Palaearctic
49.	*T. stephensi* SCHONH.		+		Holarctic
50.	*T. picirostris* F.			+	Holarctic

According to weevils larvae ability to develop on different part of plants, the following groups can be denoted: the weevils whose larvae prefer to develop on parts of vegetative plants (roots, stems and leaves) and group species whose larvae develop on generative plant organs (flowers and seeds). In the case of investigated weevils species associated with leguminous plants from the Republic of Moldova, plant vegetative organs are the most fitted for larvae development. Over 33 species have trophic specialization on plant roots, stems and leaves, while the number of species feeding on generative parts includes 20 species (Table 2).

Specialization to utilize definite plant organs is not clearly expressed for some weevils. Larvae of *Hypera postica* can simultaneously use plant stems, leaves and flowers. Larvae of *Hypera meles*, *H. nigrirostris*, *H. variabilis*, *H. pedestres*, *H. contaminata*, *H. plantaginis*, *H. viciae*, *H. murina*, *H. transsylvanica* can develop both on plant leaves and flowers. *Tychius stephensi*, *T. picirostris* can be found on flowers and seeds. Information for species *Hypera cumana*, *Tychius pumilus*, *T. subsulcatus*, *T. trivialis*, *T. caldarai*, *T. cuprifer* is not available.

The geographical diversity analyses of the weevils (Coleoptera: Curculionidae) associated with leguminous plants in the Republic of Moldova revealed 9 zoogeographical groups. The most numerous groups are the Western-Palearctic (15 species) and Holarctic (13). Essentially less numbered are European (7), Euro-Siberian (6), Trans-Palearctic (4) and Eastern-Mediterranean (2) groups; only by one weevil species have Panpalearctic (1), Easten-Palearctic (1) and Mediterranean regions.

The study revealed the presence of 50 species belonging to the family Curculionidae, which live on leguminous plants in the Republic of Moldova. The majority of the investigated weevils are oligophagous. The most preferred host plants are *Medicago*, *Trifolium*, *Vicia,* and *Melilotus*.

Table 2. The weevils larvae development on different part of plants. / Tabel 2. Dezvoltarea larvelor pe diferite organe ale plantei.

No.	Weevil Developments on plants	Weevils species	Percentage (%)
1.	**Root**	*Otiorrhynchus ligustici* L., *Tanymecus dilaticollis* GYLL., *Sitona griseus* FAB., *S. tibialis* HBST., *S. lineatus* L., *S. sulcifrons* THUN., *S. flavescens* MARSH., *S. crinitus* HBST., *S. hispidulus* FAB., *S. cylindricollis* FAHR., *S. humeralis* STEPH., *S. concavirostris* HOC., *S. inops* GYLL., *S. callosus* GYLL., *S. lateralis* GYLL., *S. longulus* GYLL., *S. languidus* GYLL., *S. waterhousei* WALT., *S. ambiguus* GYLL., *S. suturalis* STEPH., *S. puncticollis* STEPH.	42
2.	**Leaf**	*Hypera meles* FAB., *H. nigrirostris* FAB., *H. variabilis* HBST., *H. pedestres* PAYK., *H. contaminata* HERB., *H. zoilus* SCOP., *H. plantaginis* DEG., *H. viciae* GYLL., *H. murina* F., *H. transsylvanica* PETRI	20
3.	**Stem**	*Tychius polylineatus* GERM., *T. meliloti* STEPH.	4
4.	**Flower**	*Hypera meles* FAB., *H. nigrirostris* FAB., *H. variabilis* HBST., *H. pedestres* PAYK., *H. contaminata* HERB., *H. plantaginis* DEG., *H. viciae* GYLL., *H. murina* F., *H. transsylvanica* PETRI, *Tychius junceus* REICH., *T. stephensi* SCHONH., *T. picirostris* F.	26
5.	**Seed**	*Tychius quinquepunctatus* L., *T. aureolus* KIESENWETTER, *T. medicaginis* CH. BRISOUT, *T. flavus* BECKER., *T. subsulcatus* TOUR., *T. squamulatus* GYLL., *T. breviusculus* DESBR., *T. stephensi* SCHONH., *T. picirostris* F.	18

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