HETEROPTEROUS INSECTS ON ALFALFA CROPS FROM WESTERN PART OF ROMANIA

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Abstract: *Alfalfa (Medicago sativa) is a perennial plant from Fabaceae family, cultivated as an important forage crop in many countries around the world. During the vegetation period, alfalfa is attacked by a series of pests that can cause significant yield losses that reach up to 40 - 50% (in case of seed crops). Among these pests, heteropterous insects are considered to be the most damaging. In the climatic conditions in the western part of Romania (Hateg: Hunedoara), a significant presence has the heteropterous insects (plant bugs), 23 specie being collected. Specimens were collected from alfalfa crop by hand and using sweep net methods. There were 747 specimens belonging to 23 species, from which 5 species: Deraeocoris serenus, Deraeocoris trifasciatus, Nysius thyme, Alydus calcaratus, Camptopus lateralis are new records for the investigated area. The experiments conducted in Hunedoara County, on alfalfa crop shows that insects from Miridae, Coreidae and Pentatomidae family produces serious damage when they feed on alfalfa plants causing lesions along the main steam, leaf petioles and leaves.*

Keywords*: heteropterous insects, alfalfa, western Romania, feeding habits, host plants*

INTRODUCTION

The heteropterous insects can be characterized as some of the largest groups within the order *Hemiptera*, being easily identified by the repellent substances produced by the metathoracic scent glands (SCHUH AND SLATER, 1995; FORERO, 2008)

This suborder comprises about 40,000 species belonging to 7 infraorders and 44 families (KIS, 1984) or 75 - 89 families (HENRY, 2009; SCHUH & SLATER, 1995). In Romania it is estimated that about 1000 species live, their number being constantly increasing due to the new invasive species that threaten the crops*: Nezara viridula* L, 1758; *Halyomorpha halys* Stal, 1855.

Heteroptera are common insects, with body length ranging from 1 mm to 10 cm, being widespread in terrestrial and aquatic biotopes, but there are some parasitic species in birds and mammals (KIS, 1984; RABITSCH, 2010). They are species of major importance for agricultural practice, most of which are phytophagous species harmful to cultivated plants or polyphagous species having different host plants and some of them are predatory, being used as biological control agents (RABITSCH, 2010; SCHAEFER & PANIZZI, 2000).

Althought the *Heteroptera* fauna has been studied at numerous habitats in central and western Romania (HORVATH, 1897; SCHNEIDER, 1970, 1976; PERJU & SCHNEIDER, 1972; KIS & STĂNESCU, 1995; KIS, 1997; STĂNESCU, 1997; BELDEAN, 2004; TOGĂNEL, 2006), there is still a lack of knowledge about the species of many sites; previous papers on true bugs species in Hunedoara County, on alfalfa crops, are not known, the present paper wishing to be a novelty for the area under study.

This study proposed to expand currently available data on the fauna of heteropterous insect, to identify the species found on alfalfa crops, a brief classification of this species and the plant bug feeding habits and host plants.

MATERIAL AND METHODS

Study site

The investigations were carried out on the lands of a farm located near the city of Hateg, Hunedoara County (45°36'27"N 22°57'0"E).

The city of Hațeg is located in the south-western part of Hunedoara County, at the confluence of rivers Raul Mare with Stei, in the depression with the same name, at an altitude between 310 - 350 m.

The area studied is characterized by annual average temperatures of 10 degrees Celsius and atmospheric precipitation unevenly distributed on an average of 638 mm. The wind blows predominantly from the northwest. The soil on which the research was carried out is a limestone alluviosol, presenting a weak alkaline reaction, content in humus low, content in total nitrogen high, as well as the supply with mobile phosphorus and mobile potassium, high. The degree of saturation in the bases is submezobasic, and the texture is medium clay.

Sampling methods

The biological material was collected during the year 2019 in July, August and September, with a periodicity at every two weeks. Material from alfalfa crop was collected by standard sweep-netting method and some were handpicked. Bugs were narcotized by using killing bottle and brought to the laboratory and preserved by dry preservation method and identified.

To identify the heteropterous species, standard keys were used: KIS, 1984; SCHUH & SLATER, 1995; MOULET, 1995; PERICART, 1998; PROTIC, 1998, 2001.

RESULTS AND DISCUSSIONS

During the investigation on diversity of *Heteroptera* fauna, 747 specimens of heteropterous insects belonging to 23 species, classified into 7 families were collected from Hateg (Hunedoara, Romania) (table 1).

The most species – rich family was *Miridae*, with 11 species and 507 specimens, representing 67.87 percent, followed by the *Pentatomidae* family, with 6 species and a number of 52 specimens (6.96%).

Although only one species of insects belonging to the *Nabidae* family was collected from the alfalfa crop, the number of specimens was very high, 168, representing 22.49%, the family being in second place in terms of the number of specimens collected, regarding to the total number of insects.

Family *Alydidae*, *Coreidae*, *Rhopalidae* and *Lygaidae* had low percentage of participation.

16 species for the total insects species collected from alfalfa crops were identified both in the studied area and in the rest of Romania regions (Kis, 1975, 1984, 2001; Marcu, 1982; Stanescu, 1997; Toganel, 2006), five species: *Deraeocoris serenus, Deraeocoris trifasciatus, Nysius thyme*, *Alydus calcaratus*, *Camptopus lateralis* being new records for the investigated area.

Halyomorpha halys has not been included in the work of Romania fauna, the species being signaled by DE MICHELE & GROZEA (2018) and MACAVEI ET AL. (2015) as invasive species for diverse habitats in large areas of Banat and Transylvania.

Two new species: *Deraeocoris trifasciatus* and *Nysius thymi* have been identified within the fauna of *Heteroptera* in alfalfa crops in Hateg (Hunedoara county), this species being considered rare species for Romanien heterofauna.

Table 1.

Heteroptera species and number of specimens collected from Hateg (Hunedoara), in 2019

Heteroptera species	Collecting date in 2019						
	30.07.	02.08.	14.08.	20.08.	28.08.	06.09.	Total
Family *Miridae* Hahn, 1831							
Adelphocoris lineolatus	6	65	99	60	25	6	261
Adelphocoris seticornis	-	9	7	3	-	-	19
Adelphocoris quadripunctaus	-	-	-	7	-	-	7
Deraeocoris lutescens	-	-	23	-	-	-	23
Deraeocoris serenus	-	-	14	2	-	-	16
Deraeocoris trifasciatus	-	-	65	-	-	-	65
Lygus lineolaris	-	-	4	-	-	-	4
Lygus pratensis	1	17	13	8	-	4	43
Lygus rugulipennis	7	5	6	5	4	1	28
Lygocoris pabulinus	-	-	-	12	5	21	38
Stenodema laevigata	-	-	-	-	3	-	3
Family *Nabidae* Costa, 1852							
Nabis ferus	10	29	64	23	20	22	168
Family *Lygaeidae* Schilling, 1829							
Nysius thymi	-	-	-	-	1	-	1
Family *Alydidae* Amyot & Audinet – Serville, 1843							
Alydus calcaratus	-	-	-	-	6	2	8
Camptopus lateralis	-	-	-	-	2	5	7
Family *Coreidae* Leach, 1815							
Mesocerus marginatus	-	-	-	-	-	2	2
Family *Rhopalidae* Amyot & Audinet – Serville, 1843							
Corizus hyoscyami	-	-	-	-	2	-	2
Family *Pentatomidae* Leach, 1815							
Dolycoris baccarum	-	-	-	-	-	3	3
Eysarcoris aeneus	-	-	2	-	-	-	2
Halyomorpha halys						2	2
Holcostethus vernalis	-	-	-	3	6	4	13
Palomena prasina	3	4	-	2	1	-	10
Zicrona caerulea	-	1	14	3	2	2	22
						Total specimens	747

All *Miridae* species measure aprox. 12 mm in lenght and are notorious agricultural pests, however some species are predatory. In alfalfa cro, in 2019, in Hateg, 8 species were phytophagous pierceing plant tissues, feeding with different agricultural plants and weeds; and 3 species were predatory feeding with aphids (table 2).

Most types of insect prey of nabids (familiy *Nabidae* represented in our study by *Nabis ferus*) are plant-feeding species, but this species sometimes attack predaceous insects, including members of their own.

Table 2.

Feeding habits and host plants of *Heteroptera* species collected from alfalfa crop, in 2019

Hereroptera species	Diet/ Feeding habits	Chorology
Adelphocoris lineolatus	Phytophagous/ variety of crops including alfalfa, bean, cotton, peach	Holopalaearctic
Adelphocoris seticornis	Phytophagous/ plants from *Fabaceae* family	Palaearctic
Adelphocoris quadripunctaus	Phytophagous/ *Urtica* spp	Mediterranean
Deraeocoris lutescens	Zoophagous/ aphids	Euro-Mediterranean
Deraeocoris serenus	Zoophagous/ little insects	Mediterranean
Deraeocoris trifasciatus	Zoophagous/ aphids and moth caterpillars	Holopalaearctic
Lygus lineolaris	Phytophagous/half of all commercially grown crop plants, but favors alfalfa, beans	Palaearctic
Lygus pratensis	Phytophagous/different herbaceous plants	Holopalaearctic
Lygus rugulipennis	Phytophagous/cotton, alfalfa and weeds	Holopalaearctic
Lygocoris pabulinus	Phytophagous/almost all herbaceous and woody plants	Holartic
Stenodema laevigata	Phytophagous/ plants from Poaceae family	Holopalaearctic
Nabis ferus	Zoophagous /adults and larvae insects	N-Anatolian-European
Nysius thymi	Phytophagous/ *Asteraceae, Lamiaceae, Brasicaceae*	Holarctic
Alydus calcaratus	Phytophagous / Different plants from family *Fabaceae*	Palearctic
Camptopus lateralis	Phytophagous/ Polyphagous: *Lotus, Trifolium, Medicago*	Palearctic
Mesocerus marginatus	Phytophagous/ leaves and seeds from shrubs	Palaearctic
Corizus hyoscyami	Phytophagous/ Polyphagous	Palearctic
Dolycoris baccarum	Phytophagous/ Polyphagous	Holartic
Eysarcoris aeneus	Phytophagous/ Lamiaceae	Palaearctic
Halyomorpha halys	Phytophagous/ Polyphagous on dicotyledonous plants	Palearctic
Holcostethus vernalis	Phytophagous/ Asteraceae and Fabaceae species	Palaearctic
Palomena prasina	Phytophagous/ polyphagous on different plants and trees	Palaearctic
Zicrona caerulea	Zoophagous/beetles and moth caterpillars	Eurasiatic

The data collected can be correlated with those from the literature (JESSEP, 1964; PERICART, 1987; LATTIN, 1989), in the experimental field being found near the species *Nabis ferus*, several other predaceous families belonging to *Heteroptera* such as *Miridae*, with predatory species: *Deraeocoris lutescens, Deraeocoris serenus, Deraeocoris trifasciatus* and Pentatomidae: *Zicrona caerulea.*

The family *Lygaeidae* is a group of insects with medium body size, that include *Nysius thymi* – a new species collected from alfalfa crop in Hateg, that is a seed – feeding species on several weeds and crops, being mentionated for the first time on this crop, this species being known only in a few locations in Romania until now.

The two species belonging to the family *Alydidae*, collected from alfalfa, are common phytophagous species, widespread in all regions of our country, presenting numerous populations in agricultural crops.

The presence of the two species: *Mesocerus marginatus* and *Corizus hyoscyami* belonging to the families *Coreidae* and *Rhapalidae* we consider it accidental in the studied culture, the predominantly shrub vegetation in the vicinity of the investigated area presenting a dominant influence in this regard.

With regard to the *Pentatomidae* family, five of the collected species are common species in the perennial leguminous forages crops, being specimens with a diet exclusively phytophagous, one being zoophagous.

One of the collected species, namely *Halyomorpha halys*, is new to the *Heteroptera* fauna from alfalfa crop in Western Romania. This species was caught at the beginning of September. The given species has never been registered in alfalfa crop in Romania or neighboring countries. This is a new invasive species for our country, aspects related to food preferences not being studied yet. The accentuated polyphagism, in the country of origin, explains its presence on alfalfa plants.

The data from the experimental field are similar to those from the studied literature: KIS (1984, 2001) and ROȘCA (1982, 1984), considering the zoogeographic distribution, we can see that most species have a wide spreading habitat, predominant are the Palearctic elements (10 species)and Holopalaearctic elements (5 species), the remaining elements represented by three species, are Holarctic; by two species, are Mediterranean elements and by one species, being: Euro-Mediterranean, N-Anatolian-European, Eurasiatic.

CONCLUSIONS

1. In the studied area we identified 23 species of heteropterous insects belonging to 7 families.
2. Most species identified belong to *Miridae* family (11 species) and 5 *Pentatomidae* family (6 species)
3. 5 heteropterous species: *Deraeocoris serenus*, *Deraeocoris trifasciatus*, *Nysius thyme*, *Alydus calcaratus*, *Camptopus lateralis* are new records for the investigated area.
4. Two rare species (*Deraeocoris trifasciatus* and *Nysius thymi*) were mentioned from the first time in the Heteroptera fauna from alfalfa crop, in Hunedoara County.
5. The invasive brown marmorated stink bug (*Halyomorpha halys* Stål, 1855) species is present for the first time on this crop.
6. From the zoogeographic point of view, in alfalfa habitat predominant are the Palearctic elements and Holopalaearctic elements.
7. The trophic spectrum of the analyzed species of heteropterous insects shows that 18 species are phytophagous on different plants including alfalfa, 4 of them haveing an accentuated polyphagism; 5 species having an zoophagous diet.

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