Available on-line at http://dse.usab-tm.ro/en/bjb.html
Banat's Journal of Biotechnology
2011, II(3),

# STUDIES ON *HETEROPTERA* (*HEMIPTERA*) ORDER IN AGROCENOSIS OF WINTER VETCH (*VICIA VILLOSA* ROTH.) IN PLEVEN REGION

**I. Nikolova[1], N. Georgieva[1]**

[1]*Institute of Forage Crops, Pleven, 89 Gen. Vl. Vazov Street, Bulgaria*
*E-mail: imnikolova@abv.bg*

***Abstract***. During 2007-2010 period was studied the quantitative and qualitative composition of species of *Heteroptera* order in winter vetch agrocenosis in Pleven region, as and the population dynamics of economically the most important species of them in order to proper determine the timing and means of control. Fauna of *Heteroptera* in winter vetch stands was represented by 8 families, 18 genera and 19 species. As dominant pests from family *Pentatomidae* outlined *Piezodorus lituratus* (28.0% of total number), from family *Miridae* - *Lygus rugulipennis* (24.6%), *Adelphocoris lineolatus* (10.3%) and from family *Coreidae* - *Ceraleptus gracilicornis* (9.1%). Useful insects were the species from family *Nabidae* - genus *Nabis* (5.7%) and from family *Anthocoridae* - *Orius niger* (11.1%). The participation of *Heteroptera* order in winter vetch agrocenosis was greatest at the stage of pod formation in the second and third decade of June and in the beginning of July. At this period, in case of need, it should be carried out chemical control. It should be planed 15-20 days before appearance of the imago. The population dynamics of useful species from genus *Nabis* and *Orius niger* followed or corresponded with that of harmful bugs that underlined their important role as bio-agents.

**Key word**: *Vicia villosa*, *Heteroptera* order

## Introduction

Phytophagous stink bugs (*Heteroptera*: *Pentatomidae*) are main and important pests in many crops, as harm and suck juice from buds, flowers, pods but mostly from seeds and immature fruits. During feeding they suck out the cell contents by their stylets. In the result of damage occurs malformations in the seeds and it is possibly to drop. The stink bugs are generally polyphags and they feed on cultivated and wild plants as the wild plants in the role of host plants play an important role for increase of population level of different pest species. These plants are important food resources for nymph development and reproduction of adults. As the bugs are multivoltine their development from nymphs to adults influenced by the quality of corresponding host plant. Although the stink bugs are polyphags the local populations of many pentatomid species (family *Pentatomidae*) it might show specific feeding habits, which is associated with restricting of the diversity of different hosts to a few number plant species [PANIZZI, 1997].

One of the most common harmful species are Lygus lineolaris and others from genus *Lygus* (family *Miridae*), which cause serious damages in a great number various field crops and wild plants [DIMITROV, 2008; DAVIDSON and LYON, 1987; FLEISCHER and GAYLOR, 1987; FLEISCHER et al., 1989; GNUS, P., 1982; KHATTAT and STEWART, 1980; TINGEY and LAMONT, 1988]. *Lygus* spp. and *Calocoris* might be observed in extremely high density in cold loved crops such as *Phacelia* (*Phacelia tanacetifolia*), *Medicago polymorpha* and vetch, especially common vetch (*Vicia sativa*). Common and other species vetch have pollen that attracts the bugs and nymphs of species from genus Lygus, which may meet in extremely high numbers in these plants [BUGG *et al*., 1990a; BUGG *et al*., 1990b].

*Polymerus cognatus* is other species polyphag, which causes serious damages to legumes including vetch (http://www agroatlas). As often spread species in vetch crops was reported *Plagiognathus chrysanthemi* [KULLENBERG, 1946]. From the useful species predominated *Orius insidiosus* [BUGG *et al*., 1990].

Winter vetch is one of the important and perspective crops in Bulgaria, especially in recent years in relation to climate changes. This requires enrichment and updating of knowledge for the species diversity and population density of the species of Heteroptera order and their predators in winter vetch stands.

The main purpose of this study was to establish the quantitative and qualitative

composition of species from *Heteroptera* order in winter vetch agrocenosis in Pleven region and the population dynamics of economically the most important species of them in order to properly determine the timing and means of control.

## Materials and methods

The studies to establish the species composition and quantitative participation of the species fro *Heteroptera* order in winter vetch agrocenosis of variety Asko 1 were conducted during 2007-2010 period in the experimental field of Institute of Forage Crops. The field trials was carried out after predecessor spring oats and sown with small seeder for precision seed sowing in line spacing 11.5 cm and depth 3-5 cm. For realization of the objective in germination of plants was used method of sampling sites and in vegetation - the method of mowing with an entomological net. During the vegetation was not held chemical control. Samples were taken once a week during the growing period. As a result of the applied methodology was caught 1256 number heteroptery total for three years. The determination of species was realized by collection determined by Dr. Nikolai Simov (National Museum of Natural History, Sofia).

## Results and discussion

Fauna of *Heteroptera* in winter vetch stands was represented by 8 families, 18 genera and 19 species *(Table 1)* as during the study were caught total 1256 individuals (imago and larvae).

**Table 1.**

Species composition and abundance of entomofauna of *Heteroptera* order

| Видове | 2008 | 2009 | 2010 | Общо | % |
|---|---|---|---|---|---|
| **Сем. *Alydidae*** | | | | | |
| Camptopus lateralis Germar | 0.0 | 0.7 | 0.0 | 0.7 | 0.2 |
| **Сем.*Anthocoridae*** | | | | | |
| *Orius niger* Wolff | 8.5 | 35.7 | 8.0 | 52.2 | 11.1 |
| **Сем.*Coreidae*** | | | | | |
| *Ceraleptus gracilicornis* Herrich- Shäffer | 0.2 | 28.6 | 14.0 | 42.8 | 9.1 |
| *Coreus marginatus* Linnaeus | 0.0 | 0.7 | 0.0 | 0.7 | 0.2 |
| **Сем.*Lygaedae*** | | | | | |
| *Geocoris ( Piocoris) erythrocephalus* Lep.&Serv. | 0.2 | 2.1 | 1.0 | 3.3 | 0.7 |
| *Heterogaster urticae* (Fabricius) | 0.0 | 0.0 | 1.0 | 1.0 | 0.2 |
| *Nysius senecionis* Schilling | 0.0 | 2.1 | 2.0 | 4.1 | 0.9 |
| *Nysius niger* Baker | 0.0 | 1.4 | 0.0 | 1.4 | 0.3 |
| *Lygaeus simulans* (Deckert. 1985) | 0.0 | 1.4 | 0.0 | 1.4 | 0.3 |
| **Сем.*Miridae*** | | | | | |
| *Adelphocoris lineolatus* Goeze | 1.5 | 40.0 | 7.0 | 48.5 | 10.3 |
| *Camplylomma verbasci* Meyer-Dür | 1.4 | 13.6 | 1.0 | 16.0 | 3.4 |
| *Deraeocoris ( Camptobrochis ) serenus* D.&Sc. | 1.6 | 4.3 | 5.0 | 10.9 | 2.3 |
| *Lygus rugulipennis* Poppius | 14.5 | 56.4 | 45.0 | 115.9 | 24.6 |
| *Polymerus cognatus* Fieber | 0.9 | 1.4 | 0.0 | 2.3 | 0.5 |
| *Polymerus vulneratus* Panter | 0.0 | 0.7 | 0.0 | 0.7 | 0.2 |
| **Сем.*Nabidae*** | | | | | |
| *Nabis sp.(N.pseudoferus pseudoferus;N. punctatus punctatus*) | 3.7 | 7.9 | 15.5 | 27.1 | 5.7 |
| **Сем. *Nepidae*** | | | | | |
| *Ranatra linearis* (Linnaeus) | 0.0 | 0.7 | 0.0 | 0.7 | 0.2 |
| **Сем.*Pentatomidae*** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| *Dolycoris baccarum* Linnaeus | 0.3 | 1.4 | 2.0 | 3.7 | 0.8 |
| *Eurydema ventralis* Kolenati | 0.0 | 0.7 | 2.0 | 2.7 | 0.6 |
| *Piezodorus literatus* Fabricius | 1.2 | 97.9 | 33.0 | 132.1 | 28.0 |
| Неизвестни дървеници | 0.0 | 2.3 | 1.0 | 3.3 | 0.7 |
| **Всичко** | 34.0 | 300.1 | 137.5 | 471.6 | 100.0 |

The richest of genera, respectively the species was family *Miridae* (6 species - 41.2% of the total identified species). With high participation were family *Pentatomidae* (3 species - 29.4%), family *Coreidae* (2 species - 9.3%) and family *Nabidae* (5.7%). Family *Anthocoridae*, *Lygaeidae*, *Alydidae* and *Nabidae* had low percentage of participation.

The total numbers of *Heteroptera* varied by years. In 2009 it was the greatest, which was explained with the higher average daily air temperature and lower sums of rainfall *(Figure 1)*, which favored the development and multiplication of bugs. In support of the last was the fact that they appeared in greater numbers in May when the temperature was permanently higher by 1.2 and 1.0 $^0$C to 2008 and 2010, respectively.

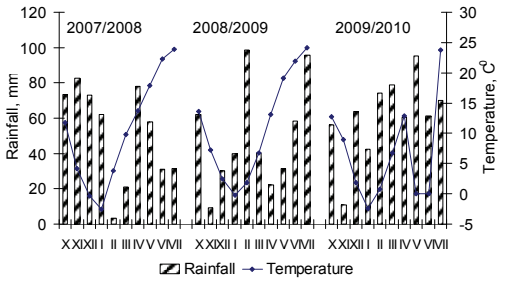



*Figure 1*. Meteorological characteristics of Pleven region

In Bulgaria some of the established species have two or more generations as in the beginning of June usually appeared the second generation. This suggests that these bivoltine and polyvoltine species developed and first generation in winter vetch stands. Depending on meteorological conditions and cycle of development of individual species, they harm from flowering and early podformation to maturing of seed if it is possible.

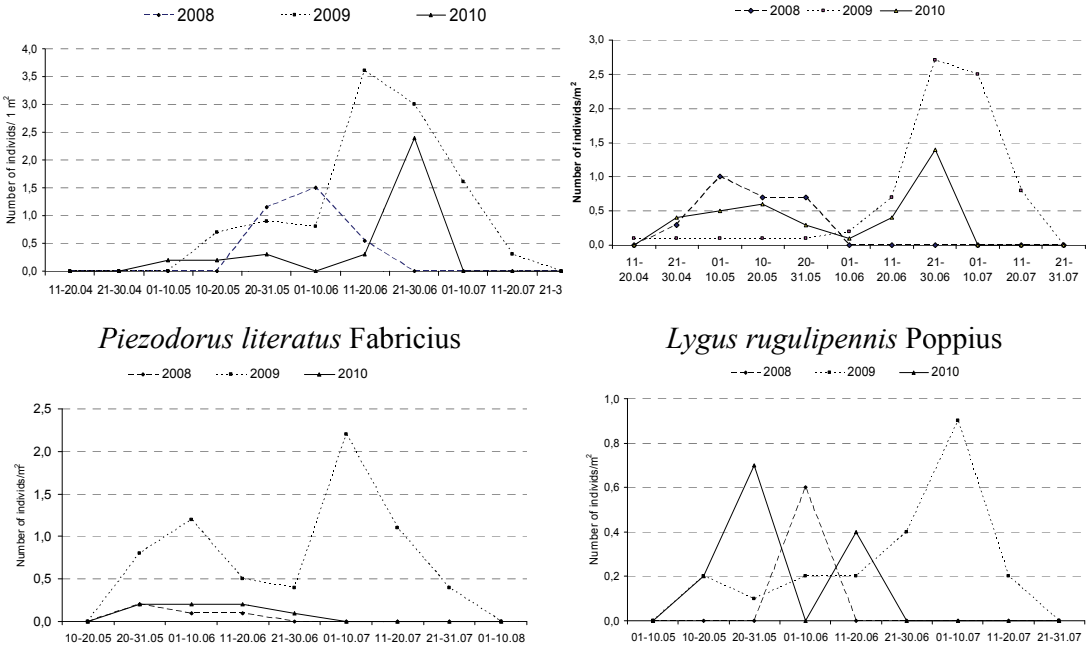
As dominant pests in winter vetch from family *Pentatomidae* outlined *Piezodorus lituratus* (28.0% of total caught exemplars), from family of *Miridae* - *Lygus rugulipennis* (24.6%), *Adelphocoris lineolatus* (10.3%), *Camplylomma verbasci* (3.4%), and from family *Coreidae* - *Ceraleptus gracilicornis* (9.1%). The useful insects were the species from family *Nabidae* - genus *Nabis* (5.7%) and from family *Anthocoridae* - *Orius niger* (11.1%) - *Table 1.* These are predators that feed with different insects and play essential role as bio-agents.

It was followed the population dynamics of dominant species by years and total for 2007-2010 period with purpose to determine the proper time for control in reaching the economic threshold of harmfulness.

In autumn with oncoming of cold periods and after rain *Piezodorus lituratus* migrated in wilderness areas or other places to winter as imago in the soil under fallen leaves or foliage. According Javahery (1967) the species developed one full generation in the year with obligatory diapause. Kondorosy (2001) found that in forage legumes in Hungary, including vetch one of common species is *Piezodorus lituratus*. The bug was a dominant species in winter vetch and occupied with 3.5, 32.6 and 24.0% of total number heteroptery for 2008, 2009 and 2010 respectively. The species appeared in the crops in the beginning of May as reached its maximum at pod formation stage in the second and third decade of June. It meeted by the end of July *(Figure 2)*.

*Lygus rugulipennis* is one of the most common and widespread pests in cereal, legumes, forage legumes and other crops [DIMITROV, 2008; NIKOLOVA, 2010; VARZINSKA, 1977; PRIEDITIS, 1985; KONDOROSY, 2001]. His hosts are about 500 plants from 57 families [HOLOPAINEN and VARIS, 1991], but it prefered mostly *Trifolium pratense* L., *Medicago sativa* L., *Vicia sativa* L. and *Chenopodium album* L. [VARZINSKA, 1977]. The species develops two generations per year [STEWART, 1969] as the main damage in winter vetch fulfilled second generation. In winter vetch crops it appeared in the second decade

of April as the density of bugs gradually increased and peaked during the third decade of June at the stage of pod formation when it caused the most significant damages on generative organs of plants. In the next stage their number decreased as they presented in crops to the end of July. *Lygus rugulipennis* was dominant species from family *Miridae* and occupied 42.6, 18.8 and 32.7% of total number of Heteroptera order for 2008, 2009 and 2010 respectively.




*Piezodorus literatus* Fabricius

*Lygus rugulipennis* Poppius

*Adelphocoris lineolatus* Goeze

*Ceraleptus gracilicornis* Herrich-Shäffer

*Figure 2.* Number dynamics of dominant harmful species in winter vetch

*Adelphocoris lineolatus* was another major species of this family. The species is well known as one of the important pests in alfalfa, but it is also common in other legume and non legume crops [VARZINSKA, 1977; PETROVA et al., 2010]. The insect pest occupied 4.4. 13.3 and 5.1% of the determined number of bugs respectively for 2008, 2009 and 2010 and appeared relatively late in the crops (the and of May). Damage caused the individuals of second generation. Maximum numbers of was observed the second decade of June in 2009, when the bugs were established in the highest density.

*Ceraleptus gracilicornis* is representative of family *Coreidae* and then species predominated in forage legumes [DIMITROV, 2008; CRAVEDI and MAZZONI, 2004; KONDOROSY, 2001]. The results of this study confirmed this assertion as the insect participated with 0.6, 9.5 and 10.2% from total found heteropter for 2008, 2009 and 2010 respectively. The bugs were found from the beginning of May to the end of July as in higher density were observed in the end of May–the beginning of June and July during the study period.

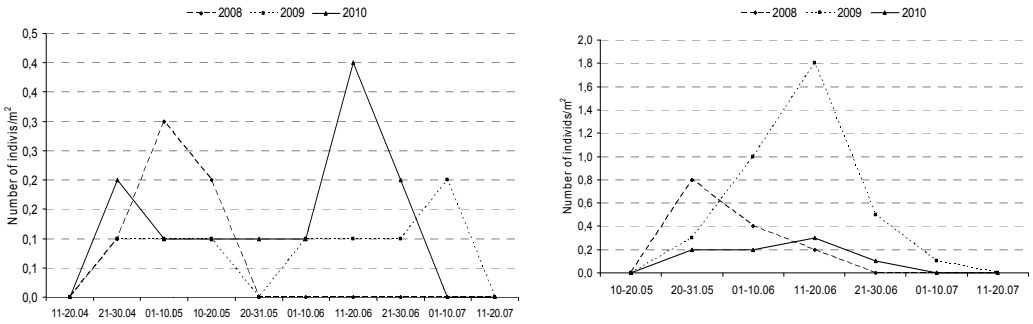
The studies showed the most suitable times for conducting chemical control in case of strong infestation of harmful species.

The predatory species of genus *Nabis* ate the larvae of order *Heteroptera* and others pests in winter vetch. Their numerical dynamics followed or corresponded with that of harmful species that underlined their exclusive role as bioregulator of the population density of insects. Predatory bugs participated by 10.9, 2.6 and 11.3% of the total population density of Heteroptera order in 2008, 2009 and 2010 and were established in crops from the end of April to beginning of

Available on-line at http://dse.usab-tm.ro/en/bjb.html
Banat's Journal of Biotechnology
2011, II(3),

July with higher numbers in the beginning of May and the middle of June *(Figure 3).*

Species from genus *Orius* widely multiplication in stands of pea, vetch and alfalfa [Bokina, 2008]. Adult bugs and larvae are predatory polyphages which feed on aphids, mites, thrips, owlet moth eggs, eggs and larvae of phytophagous bugs, small caterpillars, and beetle larvae. An essential component of bugs' diet is plant pollen without which the females does not oviposit [CHELNOKOVA, 1977]. Moreover, with combined diet including insects and plant pollen the life duration of bugs increases considerably [SIDLYAREVICH, 1968]. The results of this study indicated that the numbers of *Orius niger* was relatively high in winter vetch crops. Probably the favorable conditions during the flowering (longer duration) as and the presence of aphids, cicads and other heterogeneous species of harmful insects favored the development of biological agent and helped for its higher numbers in comparison with other predatory species. *Orius niger* appeared the third decade of May and attended to the end of June as at relatively high population density occured from the end of May to the middle of June *(Figure 3).*




род *Nabis* *Orius niger* Wolff

*Figure 3.* Number dynamics of dominant predatory species in winter vetch

## Conclusions

Fauna of *Heteroptera* order in winter vetch stands was represented by 8 families, 18 genera and 19 species. As dominant pests in winter vetch from family *Pentatomidae* outlined *Piezodorus lituratus* (28.0% of total number), from family *Miridae* - *Lygus rugulipennis* (24.6%), *Adelphocoris lineolatus* (10.3%) and from family *Coreidae* - *Ceraleptus gracilicornis* (9.1%). Useful insects were the species of family *Nabidae* - genus *Nabis* (5.7%) and family *Anthocoridae* - *Orius niger* (11.1%).

Participation of Heteroptera order in winter vetch agrocenosis was the greatest at the stage of pod formation in the second and third decade of June and the beginning of July. In this period in case of need it should be carried out chemical control. It should be planed 15-20 days before appearance of the imago.

The population dynamics of useful species from genus *Nabis* and *Orius niger* followed or corresponded with that of harmful bugs that underlined their important role as bio-agents.

## References

1. **Димитров Д**. 2008. Вредна и полезна ентомофауна при някои зърнено-бобови култури. Дисертация за придобиване на образователна и научна степен „Доктор", Ген. Тошево, стр. 166.
2. **Николова И**. 2010. Проучване на ентомофауната при пролетен фуражен грах (*Pisum sativum* L.) в Плевенски район. Юбилейна научна конференция "България и българите в чужбина"**,**17 октомври 2009, 539-548.
3. **Bokina I. G**. 2008**.** On the Biology of Anthocorid Bugs (Heteroptera. Anthocoridae). Predators of Grass Aphids in the Forest-Steppe Zone of West Siberia. Entomological Review, Vol. 88, No. 9, pp. 1060–1063.
4. **Bugg R. L., S. C. Phatak, J. D. Dutcher**. 1990a. Insects associated with cool-season cover crops in southern Georgia: Implications for pest control in the truck-jbrm andpecan

agroecosystems. Biol. A@. Hort. 7: 17-45.
5. **Bugg. R. L., F. L. Wackers, K. E. Bnmson, S. C. Phatak, J. D. Dutcher**. 1990b. Tarnished plant bug *(Hemiptera: Miridae*) on selected coolseason leguminous cover crops. J. Entomol. Sci., 25: 463-474.
6. **Chelnokova T. A**. 1977. Biology of the Predatory Bug *Orius niger* (Wolff.) of the Family Anthocoridae (Hemiptera–Heteroptera) in the Middle Volga. Nauch. Trudy Kuibysh. Gos. Ped. Inst., No. 199, 81–87.
7. **Cravedi P., E. Mazzoni**. 2004. Working Group "Integrated plant protection in stone fruit " Proceedings of the Meeting. Bulletin OILB srop Vol. 27 (5).
8. **Davidson R.H., W. F. Lyon**. 1987. Insectpests offarm. garden. and orchard. John Wiley and Sons**,** New York, N.Y.
9. **Fleischer S. J., M. J. Gaylor**. 1987. Seasonal abundance of *Lygus lineolaris (Heteroptera: Miridae)* and selectedpredators in early season uncultivated hosts: Implications for managing movement into cotton. Environ. Entomol, 16: 379-389.
10. **Fleischer S. J., M. J. Gaylor, R. Dickens, D. L. Turner**. 1989. Roadside management of annualfleabane (*Erigeron annuus***)** and wild carrot (*Daucus carota*). Weed Tech, 372-75.
11. **Gnus P.** 1982. Hits andmisses. The ecological approach topest control in orchards. Entomologia Experimentalis Et Applicata 31: 70-87.
12. **Javahery M.** 1967. The biology of some Pentatomidae and their egg parasites. In Schaefer. C. W. & Panizzi. A.R. 2000 (eds.). Heteroptera of economic importance. CRC Press. Boca Raton. Florida.
13. **Holopainen J. K., Varis A. L.** 1991. Host plants preference of the European tarnished plant bug. *Lygus rugulipennis* Poppius (Het.. Miridae). *J. Appl. Entomol.* 111: 484–498.
14. **Khattat A. R., R. K. Stewart**. 1980. Population fluctuations and interplant movements of *Lygus lineolaris*. Annals. Entomol. SOC. Am., 73: 282-287.
15. **Kondorosy E**. 2001. A pillangos viragu takarmanynovenyek poloskafaunajarol. Novenyvedelem 37 (11): 531-538.
16. **Kullenberg B**. 1946. Studien fiber die Biologie der Capsiden. Zool. Bidrag fran Uppsala 23 (1944), 522 pp.
17. **Panizzi A. R**. 1997. Wild hosts of Pentatomids. Ecological Significance and Role in Their Pest Status on Crops. Annual Review of Entomology, Vol. 42: 99-122.
18. **Petrova V., I. Samsone, L. Jankevica.** 2010. True bug community on strawberry fields of Latvia. Environmental and Experimental Biology (2010) 8: 71–74.
19. **Prieditis A. P**. 1985. Studies of the bugs of family Anthocoridae in the apple agrocenoses of Latvia. In: Proceedings of the Conference Plant Protection in the Baltic countries and Belarus, Tallinn 2: 36–37.
20. **Sidlyarevich V. I**. 1968. Predatory Bugs Anthocoridae and Miridae. Their Biology and Beneficial Activity in Gardens of Byelorussia. In Proc. VNIIZR. Biological Method of Plant Protection, No. 31, pp. 256–266.
21. **Stewart R. K**. 1969. The biology of *Lygus rugulipennis* Poppius (Hemiptera: Miridae) in Scotland. Transactions of the Royal Entomological Society of London, Volume 120, Issue 20, pages 437–453.
22. **Tingey W. M., W. J. Lamont**. 1988. Insect abundance infield beans altered by intercropping. Bull. Entomol. Res., 78: 527-535.
23. **Varzinska R**. 1977. Faunistic materials on Miridae of open habitats in the central part of Latvia. Latvijas Entomologs, 20: 33–45.
24. http://www.agroatlas.ru/pests/Polymerus_cognatus_en.htmPests

*Received: March 23, 2011*
*Accepted: April 30, 2011*