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HARMFUL HEMIPTERA OF *LYGUS GENUS* (MIRIDAE, HEMIPTERA) ON ALFALFA (*MEDICAGO SATIVA* L.) IN HAMEDAN PROVINCE (WESTERN IRAN)

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Abstract: The research on the occurrence of herbivorous heteroptera of *Lygus* genus on alfalfa (*Medicago sativa* L.) was carried out over 2005–2006 in the Hamedan province (Western Iran). The analysis of the faunistic material collected from Hemiptera showed the occurrence of 4 species where dominant Heteroptera were represented by: *Lygus rugulipennis* Poppius, *L. pratensis* L., *L. gemellatus* H.-S. and *L. punctatus* Z. The maximum abundance of these species coincided with full flowering alfalfa. Among *Lygus* species, *L. rugulipennis* P. was the most highly abundant in alfalfa's the main species in these fields.

Key words: Alfalfa, Miridae, Heteroptera, *Lygus rugulipennis* P., *Lygus pratensis* L., *Lygus gemellatus* H.-S., *Lygus punctatus* Z., Hamedan, Iran

INTRODUCTION

Alfalfa (*Medicago sativa* L.) is highly valued legume forage, extensively cultivated in warm temperate and cool subtropical regions. It has been heralded as having the highest feeding value of all commonly grown hay crops, producing more protein per ha than any other crop for livestock (Metcalf and Luckmann 1982). The alfalfa due to its specific floristic and faunestic status has provided particular microclimate that because it is the habitat of the insects and arthropods.

Heteroptera, known as true bugs, is a very large and diverse order. They are found all over the world; there are few habitats without a Heteroptera adapted to living there. There are 80,000 described species in 37 families (Slater and Baranowski 1987; Borror *et al*. 1989; Henry and Froeschner 1988). It is attacked in the West of Iran

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by the mirid bugs *Lygus* species, thus establishing novel insect–plant associations. Although all of these insects have piercing-sucking mouthparts that normally confine their feeding to liquids (plant and animal) (a few Lygaeidae excepted) they are remarkably diverse in habit and in habitat occupied (Weber 1930; Dolling 1991). The majority of species are phytophagous, feeding on virtually every type of plant from mosses (Tingidae: *Acalypra*) to legumes (Miridae: *Lygus*) to conifers (Pentatomidae: *Dendrocoris*) (Lattin *et al*. 1992).

Family Miridae is one of the most populated families in Hemiptera order with more than 10,000 species in 1,400 genera in all over the world (Schuh 1995). The members of this family in spite of various morphologic differences specially having coneus and 1 or 2 cells on the base of membrane are identifiable from all the close families (Ross *et al*. 1982; Wheeler 2001). Members of this family are similar to Anthocoridae family. In having cuneus, tarsal formula (3-3-3) and number of antennal segments. However it differs from the later family by the generally head is devoid of simple eyes (Bei-Beinko *et al*. 1955; Slater and Baranowski 1978). The species in this family have extensive range of host, so that some of them are phytophagous and some others are predator (Slater and Baranowski 1978; Alford 1984; McGavin 1992).

The *Lygus* bugs of Miridae are tremendously scattered and they are of injurious pests in field crops. Feeding by *Lygus* bugs damages the apical meristem, with consequent development of secondary stems and leaf tattering. *Lygus* bugs are small, oval-shaped insects that feed on a variety of crops and weeds. Several species infest alfalfa. Adult *Lygus* bugs are about 3 mm wide and 6 mm long. They vary from pale green to reddish brown to black and from fairly uniform color to mottled. *Lygus* bugs share characteristics with all, true bugs, these include the distinctive, triangular or 'V'-shaped marking in the upper centre of their backs and membranous wingtips. Adults are active and fly readily when approached. Immature *Lygus* bugs (nymphs) are light green and wingless. Several black spots, usually five, become noticeable on the backs of nymphs as they mature through five instars (growth stages). Wing buds are evident in the fourth and fifth instar (Slater and Baranowski 1987; Schuh and Slater 1995; Dolling 1991; Kelton 1975). In Northern America *L. lineolaris* (Palisot) and *L. hesperus* Knight are the key pests (Kelton 1975) and the other species such as *L. borealis* (Kelton), *L. elisus* (Van Duzee), *L. keltoni* Schwartz and *L. shulli* Knight are secondary pests in some districts. These bugs are main pests in flowering stage of alfalfa and they lead to seed fall and decline of thousand seed's weight (Khanjani 2005). Conti and Bin (2001) *L. rugulipennis* and *L. pratensis* have been reported as important pest of kenaf, *Hibiscus cannabinus* in Italy. Carvalho (1955) reviewed published a comprehensive content of the bugs in this family in the world, and therefore he has reviewed the keys of this family genera Eyles and Carvalho (1975) have reviewed the key of Stenodemini genera in the world. Schuh and Slater (1995) have also published the Heteroptera classification in the world and their life. The literature available offers few reports on Heteroptera infesting alfalfa. Therefore, the aim of the present research was to define the species composition of herbivorous Heteroptera of *Lygus* genus of alfalfa.

MATERIALS AND METHODS

Population samples of the true bugs species were collected from several different sites in Hamedan province (33 59 N: 47 44 E) including Famenin, Ghahavand, Asad-Abad, and Kabutarahang, which is located at western Iran. A total sampling, were

performed in about 30000 ha area in this province, period of 2005–2006. The material was collected with a standard sweeping net and a hand-held aspirator. The sampling twice per week and each time there were taken 2 nets in different hours per day and also the samplings were taken 3 times in each period by the motion in 2 diameters of the field. The specimens of the net were poured in to the packet and there were written all the attribution following date, the place and plant phonology and there were sent to Entomology laboratory in Bu-Ali Sina University to discrimination. The specimen were discriminated and then detected in lab.

RESULTS AND DISCUSSION

The analysis of the faunistic material collected on alfalfa showed the occurrence of 4 species of Heteroptera of *Lygus* genus (Miridae): *Lygus rugulipennis* Poppius, *Lygus pratensis* L., *Lygus gemellatus* H.-S. and *Lygus punctatus* Z. Among *Lygus* species, *L. rugulipennis* was the most highly abundant in alfalfa which is the main species in these fields (Fig. 1).

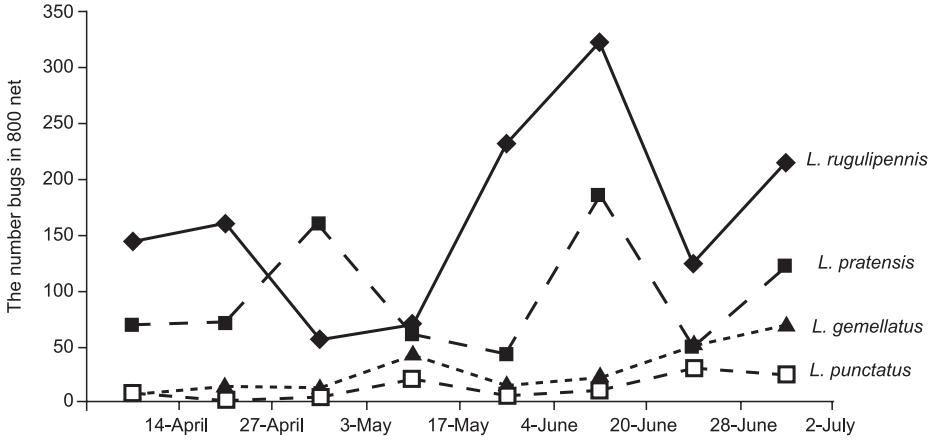

Fig. 1. The comprise of *Lygus* spp. population in various sampling month (2006) in Hamedan province

The Miridae family infesting alfalfa, besides *Lygus* genus Heteroptera, was also represented by other species of the following genera: *Adelphocoris and Stenodema*, which was mostly accessory species (except for *Adelphocoris lineolatus*) (Mirab-balou 2007).

***Lygus rugulipennis* Poppius**

Alfalfa tarnished plant bug; *Lygus rugulipennis* attacks a wide variety of economically important herbaceous plants, vegetable crops, commercial flower plants, fruit trees, and nursery stock (Kelton 1975; Wheeler 2001; Khanjani 2005; Conti and Bin 2001). This polyphagous bug is reported to attack more than 400 species of plants and is a dangerous pest to numerous vegetables (Khanjani 2007). This species is one of the most important pests in alfalfa fields in most parts of Iran. This bug had a key role

in flower shattering, drying green terminal buds, and shrinkage and weight loss of seeds in alfalfa seeds production (Khanjani 2005, 2007). In this species, hemelytra appearing more or less dull because of the dense and long silvery pubescence. Genitalia as in figure 2. Base or right paramere with markedly projecting tubercle. Specula not thickened apically, 1.5 times as long as small lobe of aedeagus. Grayish green, brown or blakish, pattern of scutellum forming a bifid stripe or W-shaped (Bei-Bienko and Baghdanov 1955). Length of male 4.5–6.1 mm, width 2–2.5 mm (Fig. 3) and female length 6–6.7 mm, width 2.2–2.7 mm. The maximum abundance of *L. rugulipennis* was recorded in the second and third decade of June, namely at full flowering (Fig. 1). The highest number of plant bugs was collected in 2006 at Famenin. The lowest number of those phytophagous insects was recorded in 2006 at Bahar (Fig. 4).

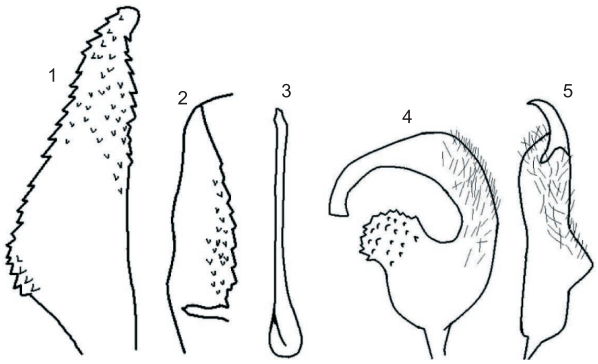

Fig. 2. *L. rugulipennis*: 1–2. lobe of aedeagus, 3. spicula, 4–5. right and left paramere

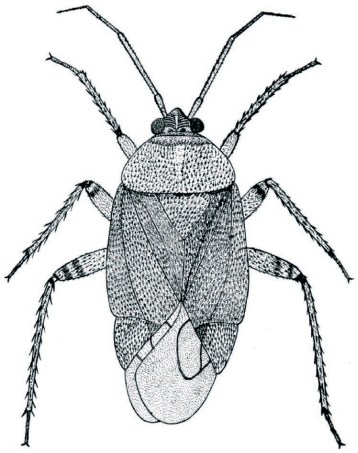

Fig. 3. Adult male of *L. rugulipennis* Popp.

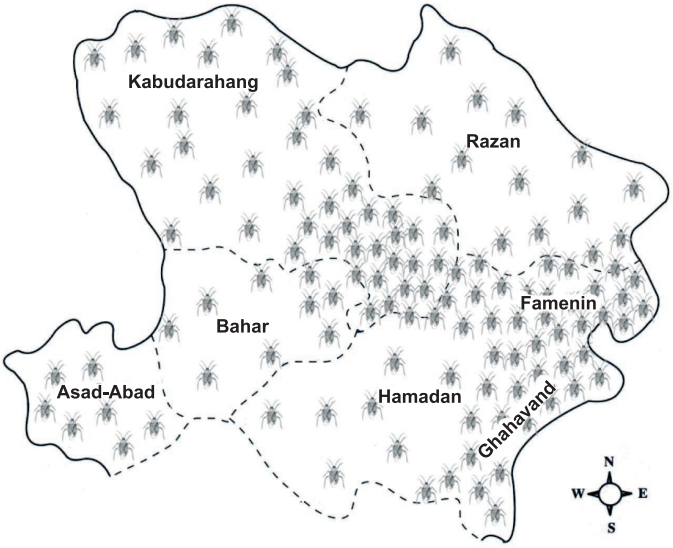

Fig. 4. The distribution *L. rugulipennis* Popp. in alfalfa fields of Hamedan Province

***Lygus pratensis* Linnaeus, 1758**

Genitalia as in figure 5. Spicula of aedeagus apically thickened, twice as long as small lobe; small lobe of aedeagus with only isolated denticles. Black spot at base of scutellum not bifid or only slightly notched apically. Color varying, often with reddish spots. Length of male 4.35–5.36 (Fig. 6) and female 4.55–5.38 mm. The greatest number of representatives of this species was caught in 2006 at Famenin (Fig. 7).

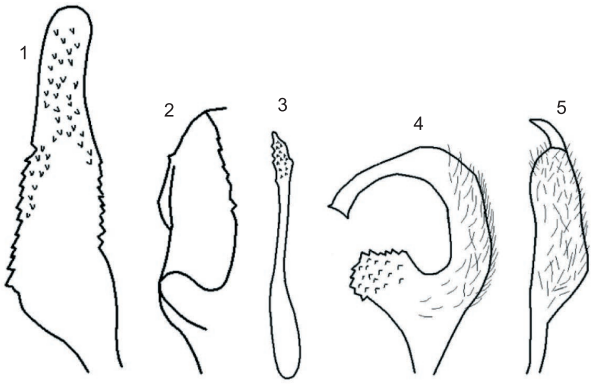

Fig. 5. *L. pratensis*: 1–2. 1–2. lobe of aedeagus, 3. spicula, 4–5. right and left paramere

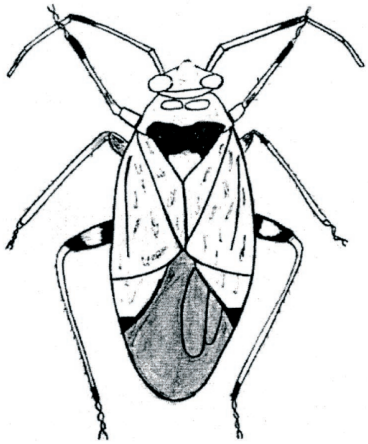

Fig. 6. Adult male of *L. pratensis*

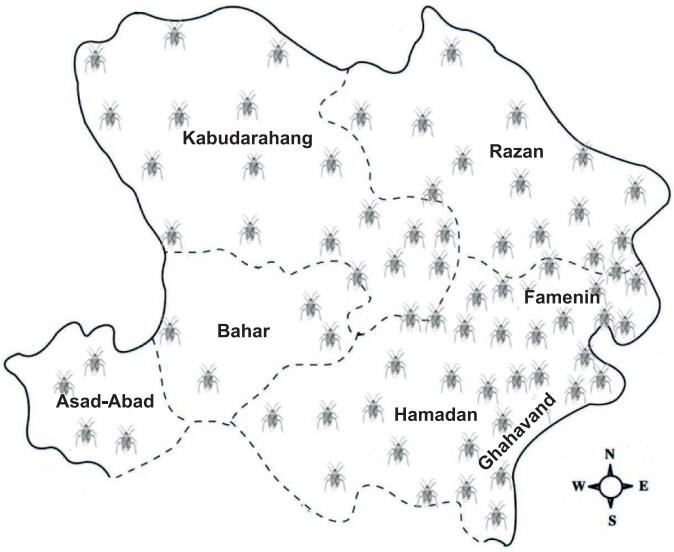

Fig. 7. The distribution *L. pratensis* in alfalfa fields of Hamedan Province

***Lygus punctatus* Zetterstedt**

Genitalia as in figure 8. In this species color with more or less distinct reddish, tinge, often orange-red or brownish red. Middle of corium less densely and less coarsely punctate than other parts of hemelytra. The greatest number of representatives of this species was caught in 2006 at Hamedan (Fig. 9).

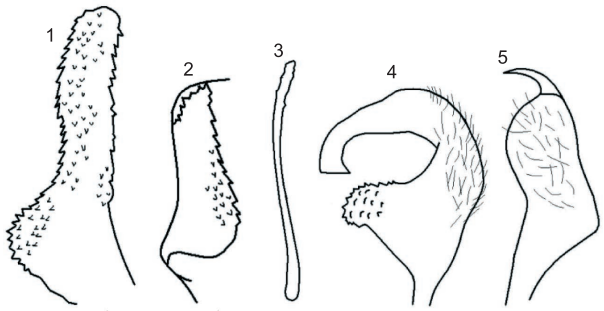

Fig. 8. *L. punctatus*: 1–2. lobe of aedeagus, 3. spicula, 4–5. right and left paramere

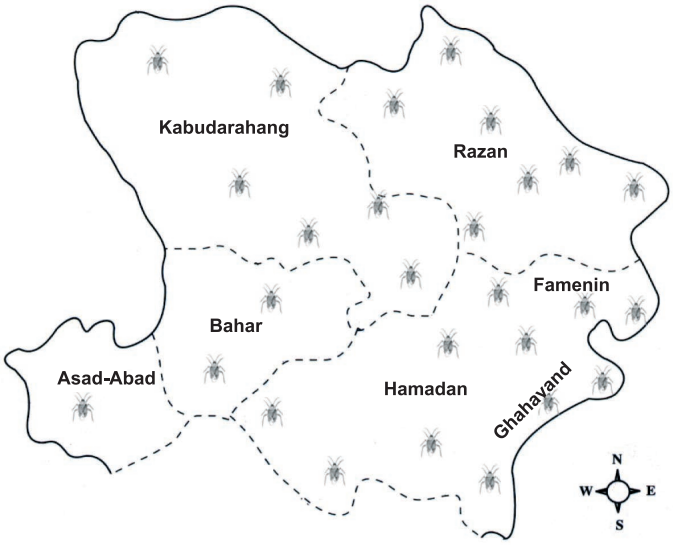

Fig. 9. The distribution *L. punctatus* in alfalfa fields of Hamedan Province

***Lygus gemellatus* Herrich-Schaffer**

Genitalia as in figure 10. Spicula tapering apically, very small, not longer than small lobe; small lobe with numerous denticles. Black spot on scutellum usually bifid apically. Pale grayish green, rarely with brownish or reddish tinge. The greatest number of representatives of this species was caught in 2006 at Hamedan (Fig. 11).

All species of *Lygus* are mainly plant feeders and thrive on a very wide range of host plants including many commercially-grown flowers, fruit trees, garden, forage, and field crops, small fruits, forest tree nurseries, and weeds. *Lygus* bugs have a particular preference for young developing tissue and as such, their damage in alfalfa is often manifested by development of multiple shoots and distortion of flowers and shedding of floral buds. Genus of *Lygus* are the main pests of the seed alfalfa

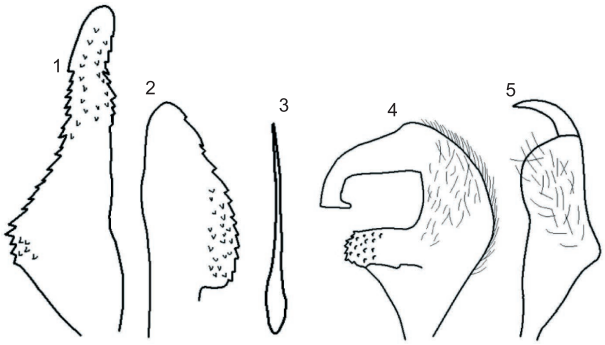

Fig. 10. *L. gemellatus*: 1–2. lobe of aedeagus, 3. spicula, 4–5. right and left paramere

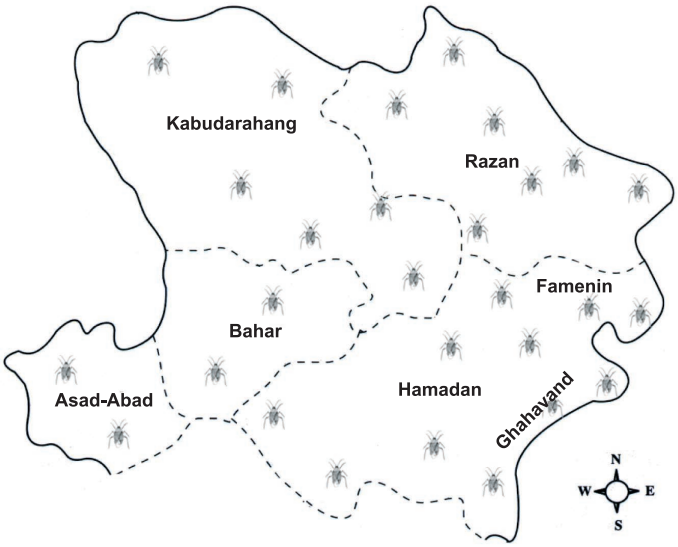

Fig. 11. The distribution *L. gemellatus* in alfalfa fields of Hamedan Province

that with the nutrition of the flower stage led to the most damage on the second and the third cuts on the seed alfalfa. Alfalfa tarnished plant bug, *Lygus rugulipennis* Poppius is one of the most important pest in alfalfa fields in most parts of Iran. This bug had a key role in flower shattering, drying green terminal buds, and shrinkage and weight loss of seeds in alfalfa seeds production. This insect is highly polyphagous, and its preferred host under Hamedan conditions is alfalfa in flower stage and its main damage is flower shattering. It overwinters in dead plant material or under tree bark as adults. Over wintered adults leave the shelters as temperature rises in spring and the female deposits eggs inside the plant stems. The first generation appears in June. It usually migrates after the first harvesting of alfalfa to unharvested fields or

alfalfa seed farms. The second generation appears on the second and third cut and the adults appear in September and have an incomplete generation. This insect has two complete generations every year in this area (Khanjani 2005). Among *Lygus* species, *L. rugulipennis* was the most highly abundant in alfalfa which is the main species in this field (Mirab-balou 2007). Also, *L. rugulipennis* was one of native and important pest in Kenaf, *Hibiscus cannabinus* fields in Italy (Conti & Bin 2001). *Lygus* bug damage may occur in all major apple districts and sometimes is severe. *Lygus* attack is more frequent in orchards that have a permanent cover crop and in orchards adjacent to crops or vegetation that host *Lygus*. *Lygus* bugs may feed on developing flower buds early in spring, causing the buds to exude gum and shrivel up. Usually this damage is not serious unless a very heavy infestation is present. *Lygus* cause their most serious damage by feeding directly on fruit (Anonymous 2007). Damage caused by *Lygus* bugs in cucumbers could include destruction of the growing point of young seedlings and ragging of leaves which appear crinkled and may have several holes (Ferguson 2005).

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POLISH SUMMARY

SZKODLIWE PLUSKWIAKI RÓŻNOSKRZYDŁE (HETEROPTERA) Z RODZAJU *LYGUS* (MIRIDAE, HEMIPTERA) WYSTĘPUJĄCE NA ROŚLINACH LUCERNY SIEWNEJ (*MEDICAGO SATIVA* L.) W PROWINCJI HAMADAN (ZACHODNI IRAN)

W prowincji Hamadan (zachodni Iran), w latach 2005 i 2006 przeprowadzono badania nad występowaniem roślinożernych pluskwiaków różnoskrzydłych z rodzaju *Lygus* na lucernie siewnej (*Medicago sativa* L.). Analiza zebranego materiału faunistycznego należącego do rządu Hemiptera wykazała występowanie czterech gatunków. Dominującymi pluskwiakami były: *Lygus rugulipennis* Poppius, *L. pratensis* L., *L. gamellatus H.-S.* i *L. punctatus* Z. Największa obfitość tych gatunków była zbieżna z pełnym kwitnięciem lucerny. *Lygus rugulipennis* był najliczniejszy spośród gatunków z rodzaju *Lygus* na lucernie, głównym gatunku na tych polach.