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BIOECOLOGICAL CHARACTERISTICS AND TROPHIC RELATIONS BUGS MIRIDAE FAMILY IN UZBEKISTAN

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ABSTRACT
This article demonstrates the results of study on biology, ecology and species composition of Miridae bugs and reveals their dominant species, level of their injuriousness under the Tashkent oasis conditions. It is shown that Miridae bugs are trophically related to 20 species of plant belonging to 9 families.

KEYWORDS: Lucerne, cotton, pest, Miridae bugs, ecology, biology, insect, phytophages, injuriousness, biological and ecological features.

1. INTRODUCTION

Miridae subfamily holds a specific place among Hemiptera, it ecologically relates to various biotopes and takes an enormous importance in biocenosises and agrocenosises. Dominant species of this subfamily being phytophages are critical pest of cotton, rotation forage grasses, vegetables and other crops, medicinal herbs and hardy-shrub species. Some species transmit dangerous viral and bacterial plant diseases. In addition, there are zoophages and zoophytophages among them regulating the number of various small invertebrates – crop pest.[1]

It is known that among cotton damaging bugs only three species with dominating number are of practical importance – two species – tarnished plant and alfalfa plant bug. In addition, more than 20 species of bugs related to zoophages, zoophytophages and saprophages by types of feeding are met in this crop. Asignificant number of predaceous species from orius and campylomma genus among them is of great importance in control of red spiders and aphids.[2]

Bugs damage all herbs, especially cotton balls.[3] Accordingly, bugs damage many species of agricultural crops, including lucerne and cotton. It is apparent from the literature that species composition, population dynamics, biological features, injuriousness of injurious and beneficial species of bugs in the cotton agrocenosises are poorly known.

Caps id bugs are widespread in the most diverse biotopes occurring on grassland, shrub and tree vegetation, mostly in the middle and top stories of plants.

Currently, there is noted an explosion of population of seemingly secondary pests such as Miridae bugs, especially tarnished plant and alfalfa plant bugs, poisoned activity of which on the cotton was underestimated because it was deemed that in the small number of cotton feeding bugs the damage caused to crop might be insignificant. However, the analysis of data on their feeding on cotton generative organs (buds, ovaries, flowers, balls) in a period of few years (2005-2010) has enabled researchers to reconsider an assessment of damages caused by bugs leading to loss of cotton crop during these years up to 60%. It shows that the damage caused by them was appreciably underestimated and in many cases, it managed to be determined only after a long period after the pest disappearance.

In spite of the fact that distribution of bugs (especially alfalfa plant) in the cotton fields of Uzbekistan caused an alarm for a long time.[4,5,6,2] many authors repeatedly specified that it was the serious cotton pest.[7,8] Therefore, it should be noted that the damage caused by bugs was significantly underestimated at all times. Because of insufficient information concerning their bioenvironmental featuresin many case it was determined only after a long time period after the pest disappearance because the variety of forms of damage display substantially is not known to a wide range of experts and injuriousness may be determined only after yield depression.

In Uzbekistan, due to the fact that the cotton was historically the leading economic crop, the main research have permanently been aimed to study cotton pests,

therefore, the data on cotton and crop rotation-related lucerne capsid bugs are known for a long time[7] in contrast to the other crops (wheat, beet, corn, umbellate) seed material of which is exposed to damage in many cases. There are lots of species among plant-eating bugs which in the cotton agrobiocenosis are active predators of many pests. Importance of predaceous bugs in the cotton biocenosis of Uzbekistan, as well as their biology was not studied earlier, though useful activity was noted by many researchers at all times. Relative pantophagy and abundance of predaceous bugs, according to a number of authors, defines their important barrier function preventing invasion of injurious species to a cotton field.[9] At the same time, the species composition, distribution, ecology, food chains, their importance in the separate agrobiocenosises remain almost unstudied in the republic. Therefore, the identification of species composition and population control mechanisms are proposed, that will contribute to Miridae number control using environmentally acceptable methods based on survival of communities in the biocenosises.

2. MATERIALS AND METHODS

Materials for identification of species composition of natural population of Miridae bugs were studied in the cotton and lucerne agrobiocenosises of Tashkent region.

Miridae bugs were studied according to the methods recommended by.[10]

Miridae bugs were collected during the route surveys and on the stationary sites. Miridae bugs recording has been started from the time of reaching by the plants of 10-20 cm height and was kept weekly throughout the whole vegetation period.

Miridae bugs of the lucerne and cotton agrobiocenosises were studied in Tashkent region in Urtachirchik, Bekabad and Zangiata districts in the stationary fields at the farm enterprises “Mekhnatnur” (55 ha), “Rustamagro” (35 ha), “Ittifok”, “ Ittifok -Turopobod” ,“Sayfulla ota” (35 ha) on the lucerne, cotton, agrestal surrounding by method of collection using an entomologic sweep net. Tarnished plant bugs were collected during the route surveys and on the stationary sites. Sweep net cutting method was applied in collection as well as soil and litter layer under the plants, especially, under the trailing shrubs that were examined carefully. Single record consisted of obtaining each reference point in samples of 10-fold repeatability (25 pair seep net movements).

Cotton Miridae bugs were censured every 7-10 days from april to october. The search was careful and comprehensive; bugs leaving the plant during approach to them were recorded. 20 samples (5 plants in each sample) were collected on each site according to a diagonal pattern. Plant ovaries, buds, flowers and balls were considered under the conditions of determination of degree of bug damage to cotton fruit elements. A number of damaged and healthy fruit elements was counted up in analyzing on a regular basis for 100 plant of each field on average.[11]

Sweep net cutting only in warm and insolation weather was executed for census of Miridae bugs on the wild plants around cotton and lucerne fields. Such weeds as winter cress, sorrel, caseweed, orach, etc., were reviewed in order to identify spring areas of normal abundance of tarnished plant bug prior to its transfer to agrocenosis. Primary damages of tarnished plant bug consist of pricks in the form of brown spots. Black spots occur at the sites of cotton fruit element injury. In the case of several punctures in close vicinity these spots are joined. Cotton fruit organs damage was determined based on the signs above. The site description, the time of agro-technical measures and a record date, the weather data during studies, plant development phase and state were logged in the field log.[12]

In Uzbekistan, both pests, tarnished plant and alfalfa plant bugs, are of great importance for industrial, forage, oil-bearing, medicinal, etc. crops. There is only limited literature regarding biology and ecology of tarnished plant bugs being the most serious pests of lucerne, cotton and many other crops. Injuriousness and bioenvironmental features of alfalfa plant bugs (*Adelphocoris lineolatus* G. and *A. jakovlevi* R.) in Uzbekistan are studied by a number of research workers.[8]

Accordingly, we conducted special surveys with respect to alfalfa plant and tarnished plant bugs from *Adelphocoris* and *Lygus genus*.

3. RESULTS AND DISCUSSION

Following the results of processing of material collected in the lucerne and cotton agrobiocenosis of Tashkent oasis, 8 species of Miridae bugs related to 4 families were identified.

Taxonomic composition of Miridae bugs of the cotton agrocenosis of Tashkent oasis:
Order –Hemiptera
Family –Miridae
Genus – *Adelphocoris* Reut, 1896
1 Adelphocoris lineolatus Goeze, 1778
2 Adelphocoris jakovlevi Reut, 1896
Genus – *Lygus.* Hahn. 1833
3 Lygus pratensis L. 1758
4.Lygus gemellatus H.-S. 1836
5.Lygus rugulipennis. Popp.
Genus – *Campylomma*. Reut. 1878
6.Campylomma verbasci Mey-D. 1843
7.Campylomma diversicornis Reut. 1878
Genus – *Camptobrochis.* Fieb 1858
8.Camptobrochis punctulatus Fall. 1807

4 species from detected species of capsid bugs (*Adelphocoris lineolatus* G. and tarnished plant bugs:

Lygus pratensis L., *Lygus gemellatus* H.-S., *Lygus rugulipennis* P.) relate to polyphages detected on many crops (lucerne, cotton, cabbage, beet, corn, soya, peanut, crucials – especially winter cress) but being serious pests they are commonly encountered in the cotton and lucerne agrobiocenosises of Uzbekistan. From them *Adelphocoris lineolatus* G. and *Lygus pratensis* P. are distributed everywhere with a high density. *Campylomma verbasci* M. and *Campylomma diversicornis* R. are predators – zoophytophages exterminating lucerne and cotton red spiders, green fly, tobacco thrip, eggs and caterpillars of junior little owls.

Adelphocoris lineolatus Goeze, *Lygus pratensis* L. in the lucerne agrobiocenosis of Tashkent region, *Lygus pratensis* L, *Campylomma verbasci* M., *Campylomma diversicornis* R. in the cotton fields are dominant species. *Adelphocoris lineolatus* Goeze, 1778 and *Lygus pratensis* L. 1758 and *Lygus gemellatus* H. -S., 1836 (Fig. 1, 2) are dominant amongall the species.

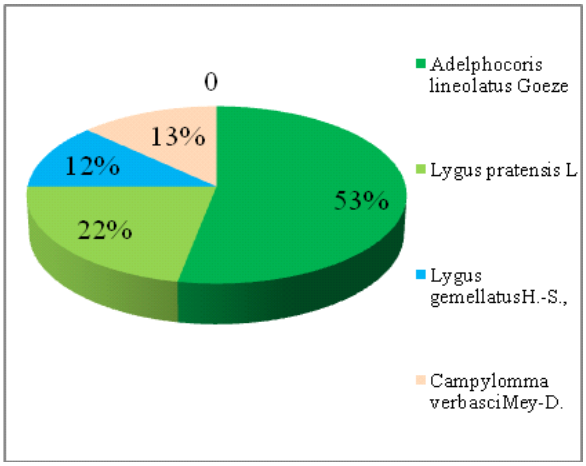
1. *Adelphocoris lineolatus* Goeze, 1778-(alfalfa plant bug) – is a generally recognized paramount pest of seed lucerne practically across the cultivation area. Except lucerne, alfalfa plant bug larvae and imago damage considerably the clover, melliot plantings, more rarely cheakpea and some other seed cultivated leguminous crops. Larvae start breaking the hibernate eggshell in the second decade of April. Alfalfa plant bug damage consists in that with anappearance on the lucerne (April) until wintering (November) in different phases it sucks the juices from the young plants, buds, flowers and young beans, that is why their development firstly delays, and then stops entirely. Damaged parts completely dry, flowers fall, lucerne body becomes thin. It is found that alfalfa plant bug sucking causes cotton ball falling, blossom and ovary fading, leafs appear yellow and fade. Cotton bug infection rate causes considerable loss of crop, reduction of fiber quality, falling of the young fruit elements and seed destruction.

2. *Lygus pratensis* L., 1758 - (tarnished plant bug) – is a wide polyphage. It strongly damages fruits, cereal, leguminous and orchard crops, especially lucerne, beet, corn, as well as cotton, pumpkin, potato, sunflower, cucumbers and other plants. It is the normal component of grassland vegetation of desert zone. Germinating ability of seeds damaged by this pest decreases to 30-50%. Regarding the nature of bug damage, the surveys have shown that cotton plantings that were strongly infected with bugs are noted by a great number of dry but not fallen ovaries and young balls. Buds damaged by bugs are fallen irrespective of age, pricks are fatal for them. Damaged ovaries cause reduction in size, weight, their partial or complete death. Weight of ball, raw cotton properties, length and yield of fibers are changed depending on age when the ovary is damaged. The fiber development stops. In addition, one of the consequences of cotton *L. pratensis* damage is an increase in degree of falling of reproductive organs (buds, flowers, ovaries and balls) in comparison with the natural level.

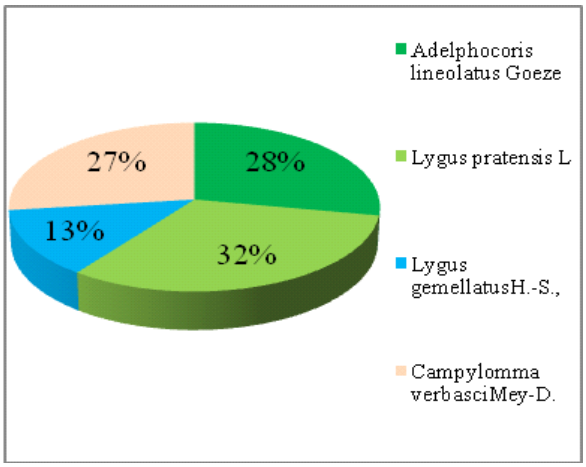
Tarnished plant bug winters in the adult phase. Hibernated individuals of tarnished plant bugs are concentrated in the early April, mainly, on the caseweed, winter cress, sorrel, partially on the orach, etc. Tarnished plant bug egg laying occurs on the weeds above, where they fed additionally, next hatches of 2-3 generation of tarnished plant bug occur on the cotton, lucerne and cultivated plants, and last is related to wormwood, water pepper, etc. It is treated as the most dominant and detrimental species from *Lygus genus* on the cultivated crops.

3. *Lygus gemellatus* H.-S., 1836 - (*Lygus gemellatus*) – is a widespread species in Uzbekistan and particularly in Tashkent region. It develops on a large scale on agricultural crops during the years with the torrid spring when the majority of forage plants spindles and quickly become coarse. It damages the cereal and leguminous crops (especially the lucerne) everywhere. When absinthial bug feeds cotton, the results of the caused damages are most noticeable in formation and developments of buds, flowers and balls. Bug winters in the imago phase. Hibernated individuals outcrop start was noticed in the early april. *Lygus gemellatus* is worse than tarnished plant bug by frequency of occurrence. Bug egg-to-egg cycle on the cotton (from egg to imago) lasts 31 days. *Lygus gemellatus* in the Central Asia develops intensively on the lucerne.[6]

4. *Campylomma verbasci* M. - D., 1843-(Feltwort capsid bug) –a body color is light, brownish yellow, abody length is 2.6-3.1 mm. Phytozoophage. It is noted in the agrocenosisas predator, eats lucerne, melon and more rarely large cotton aphids, red spider and tobacco thrip. *Campylomma verbasci* develops in two generations. Eggs winter. Bug lays them to bark of young branches of apple-tree. The duration of larval stage is about 30 days, 5 ages each by 3-18 days pass depending on the temperature. In case of cold they hide in the bud scales, coiled leaves, etc. Both, larvae and imago are comparatively inactive. Bug eats many small arthropods, prefers plant-eating ticks. Animal food is required for normal development of insects. This species is perspective for ticks control. The maximum number of feltwort bug on the cotton is noted in july-august up to 450 individuals on the 100 cotton plants. A number of bugs on the lucerne and weeds did not exceed 15-20 individuals per 50 pair movements with sweep net. It winters in the egg phase, wintering terminates in april causing necessity of intensive control.[13]



1. Lucerne



2. Cotton

Fig. 1 & 2: Bug Occurrence on the lucerne (1) and cotton (2)

Miridae bug food chains

Miridae bugs have food chains with 20 species of plants belonging to 9 families:

Compositae family: 1. Artemisia scoporia Welk., 2. Matricaria inkanilata Dgi., 3. Acroptilon repens (L) DC.4. Heliathu sannus L.

Leguminosae family: 1. Medicago sativa L., 2. Arachis hypogaea L., 3. Alhagi adans, 4. Glycyirrihza glabra L.

Linaceae family: 1. Linum L.

Malvaceae family: 1. Althaea L., 2. Gossypium hirsutum, 3. Gossypium barbadense, 4. Hibiscus trionum L.

Solanaceae family: 1. Solanum nigrum L., 2. Nicotiana tabacum L.

Polygonaseae family: 1. Polygonum hudropiper L., 2. P.aviculare L.

Umbelliferae family: 1. Ferula foetida L.

Chenopodiaceae family:1. Chenopodium glaucum L.

Cruciferae family: 1. Capsella bursa-pastoris L.

Caseweed and sorrel are favored from wild vegetation. More than 80% of noticed bugs fall to their share in the spring time. Miridae bugs in the lucerne fields are food chained with bean family.

Damage of seeds Miridae bugs causes dying of damaged seeds in early development phases become warped in flannel cake. But if damage is caused in the phase of the end of milky ripeness and later, so the seeds can remain live though their size appears less than normal, energy of germination decreases and they are wrinkled to a greater or lesser extent. The period of maximum increase of number of adult bugs and their larvae coincides with the period of flowering and formation of balls. Therefore, the result of caused damages is mostly noticed during the formation and development of buds, flowers and balls. Damage caused by tarnished plant bugs depends not only on their number, but also on a plant development phase.

However, during the mowing period, due to strong insolation and lack of forage they shall fly to nearby, mainly, cotton fields. They are trophically bound exclusively with lucerne and other leguminous, however, some authors do not refer it to cotton pests. Cotton and sugar beet nevertheless cannot be referred to bug forage plants. There is another point of view noticing that a permanent food chain of Miridae bugs with cotton could not affect the adaptation of their development on the cotton. According to[13], bug prefers to lay eggs on young stalks of cotton leaves.

Damages caused by Miridae bugs were mostly noticed during the formation and development of buds, flowers and cotton balls.

Cotton plants that were strongly infected with Miridae bugs have been differed by a great number of dried, but not fallen ovaries and young balls. Yellow drops of juice drying and blackening in the air appear at the points of buds, ovaries and balls prick causing black spots to occur. In case of several pricks in close vicinity the spots join, become oversized and get an incorrect profile.

In case of damage of recently formed ovaries they do not develop and dry. The buds damaged by bugs fall are irrespective of age. Damaged ovaries reduce in size and weight and sometimes there is partial or complete their dying.

Our surveys confirm that the food chains of tarnished plant bug with the cotton have zonal features. This is proved not only by record of number of adult individuals and larvae of the given species, but also detection of egg laying on the fruit stalks of buds, flowers and young cotton balls.

Cotton trophic specificity can be inferred by degree of preference of one plant organ or another for their feeding and egg laying to be assessed by percentage of bugs or eggs laid thereon. It has been established that it prefers to eat and lay eggs at the top of cotton shrub.

So, tarnished plant bugs prefer to eat on those organs where active sap flow occurs and on those sites which are readily available for phytophage feeding.

Surveys of Miridae bugs of Tashkent oasis agrocenosis enable the author to get the best idea of these insects within the specific region to study frequency of occurrence and to identify their ecological features.

It is identified that Miridae bugs use forage plants consistently. During a season the bug accumulates in the rathe plants, then they migrate to agrocenosises in the process of formation of cultivated plant fruit organs (Table 1).

Table 1: Miridae bug food chains

Forage Plant Family, Genus and Specie	Bug occurrence and imago	Bug lays its eggs, but larvae develop partially	Larvae develop normally until imago flight
Compositae family			
1. Artemisia scoporia Welk.	+	+	+
2.Matricaria inkanilata Dgi.	+	+	+
3.Acroptilon repens (L) DC.	+	+	+
4. Heliathu sannus L.	+	+	+
Leguminosae family			
5. Medicago sativa L.	+	+	+
6. Arachis hypogaea L.	+	+	+
7. Alhagi adans	+	-	+
8. Glycyirrihza glabra L	+	-	+
Linaceae family			
9. Linum L.	+	+	+
Malvaceae family			
10. Althaea L.	+	+	+
11. Gossypium hirsutum	+	+	+
12. Gossypium barbadense	+	+	+
13. Hibiscus trionum L.	+	+	+
Solanaceae family			
14. Solanum nigrum L.	+	-	-
15. Nicotiana tabacum L.	+	+	+
Polygonaseae family			
16. Polygonum hudropiper L.	+	+	+
17. P. aviculare L.	+	-	+
Umbelliferae family			
18. Ferula foetida L.	+	-	-
Chenopodiaceae family			
19. Chenopodium glaucum L.	+	+	+
Cruciferae family			
20. Capsella bursa-pastoris L.	+	+	+

4. CONCLUSIONS

1. As a result of the collected material, 8 species of Miridae bugs were identified in the lucerne and cotton agrobiocenosises of Tashkent oasis related to 4 generations.

Order–Hemiptera, Family–Miridae, Genus – Adelphocoris, species: Adelphocoris lineolatus Goeze, Adelphocoris jakovlevi Reut. Genus – Lygus, species: Lygus pratensis L., Lygus gemellatus, Lygus rugulipennis. Genus – Campylomma, species: Campylomma verbasci, Campylomma diversicornis. Genus – Camptobrochis,species: Camptobrochis punctulatus Fall.

2. It has been established that Adelphocoris lineolatus and A jakovlevi and Lygus pratensis, L. gemellatus cause significant damage to crop annually and are dominant on the cotton and lucerne.

3. It has been identified that Miridae bugs have food chains with 20 species of plants referring to 9 families in Tashkent region.

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