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Some Features Bioecological Miridae Bugs Tashkent Region

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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. And optimum amount of effective temperatures for single generation of bugs is studied.***

Keywords: Miridae bugs, cotton, pest, lucerne, 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 [6].

Bugs damage all herbs, especially cotton balls [7]. 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 [6; 8] many authors repeatedly specified that it was the serious cotton pest [9; 2]. 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 [9] 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 [5].

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. Material 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 [3].

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", "Sayfulla ota" (20 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 [4].

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 [10].

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[2].
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, 3 species of Miridae bugs related to 2 families were identified.
Order –Hemiptera
Family –Miridae
Genus – *Adelphocoris* Reut, 1896
1 Adelphocoris lineolatus Goeze, 1778
Genus – *Lygus.* Hahn. 1833
2 Lygus pratensis L. 1758

4 species from detected species of capsid bugs (*Adelphocoris lineolatus* G.*,* and tarnished plant bugs: *Lygus pratensis* L.*, Lygus gemellatus* H.-S. 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.

Adelphocoris lineolatus Goeze, *Lygus pratensis* L. in the lucerne agrobiocenosis of Tashkent region, *Lygus pratensis* L, 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.

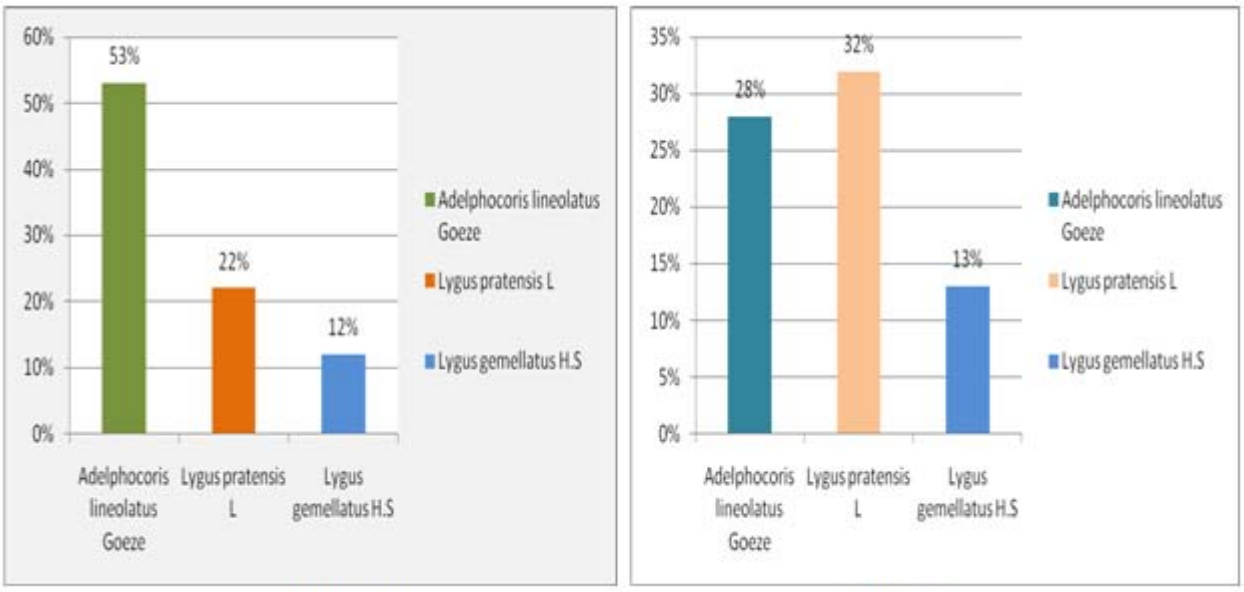
1. *Adelphocoris lineolatus* Goeze, 1778-(alfalfa plant bug) – is a generally recognized paramount pest of seed lucerne practically across the cultivation area. Except lucerne, alfalfa plant bug larvae and imago damage considerably the clover, melliot plantings, more rarely cheakpea and some other seed 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 [8].



1. Luceme 2. Cotton

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

Determination of amount of bug development effective temperatures

Duration of bug development strongly depends on ambient conditions.

The results of our surveys for Tashkent region have shown that the first bug generation has completed the development in 3 decade of May at daily mean temperature of 25^0 effective daily mean temperatures - 372^0 (30 days). 2 bug generations are detected by the end of 3 decades of June and a development period has made 28 days. In the second decade of July, a number of bugs has increased and reached the maximum in august. In september there was a decrease in number.

A change in number of bugs occurs due to development and reproduction according to development of plants in that phase which is favorable for it. The obtained data shows that during a vegetative season increase of number of bugs was fallen on the cotton at the stage of flower-bud formation, flowering and fruit element formation.

In different terms of the vegetative period duration of bug development has made 25-37 days. When comparing these terms with average decade temperatures, the amount of effective temperatures and low development threshold has been established (Fig. 3).

Duration of tarnished plant bug development strongly depends on ambient conditions. The amount of effective temperatures 630^0 (with 10 threshold) is required for a single generation development cycle.

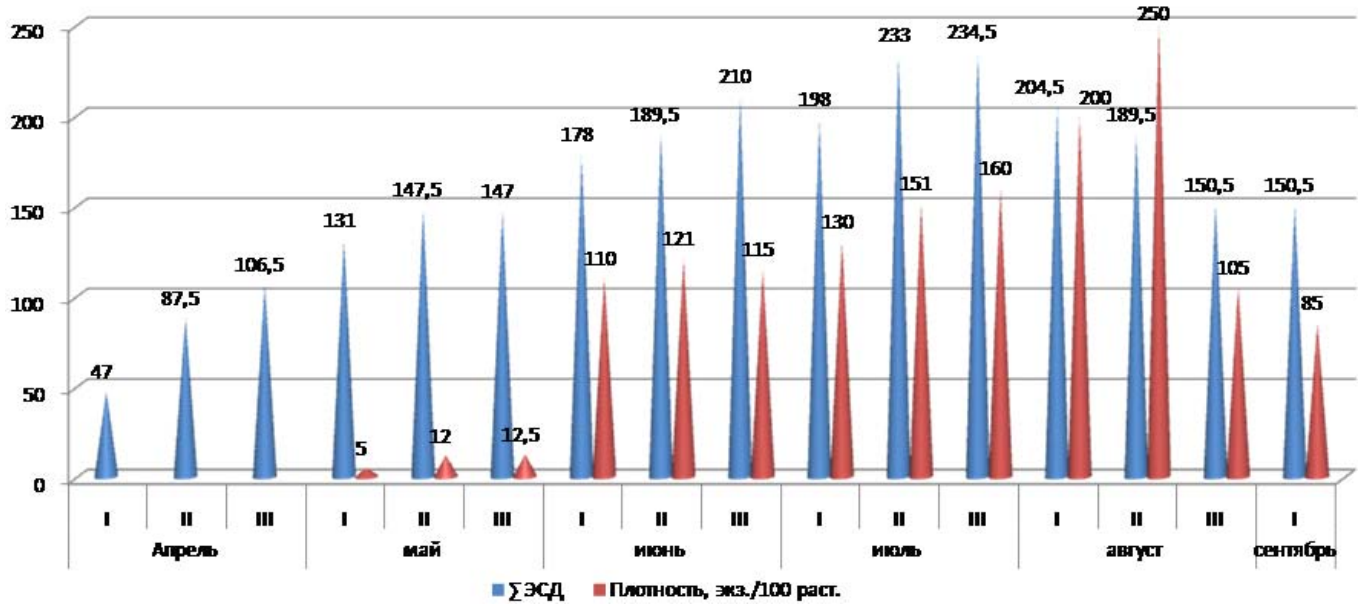


Figure 3: Amount of effective temperatures in the Miridae bug development

4. Conclusions

1) As a result of the collected material, 3 species of Miridae bugs were identified in the lucerne and cotton agrobiocenosises of Tashkent oasis related to 2 generations.
2) Order–Hemiptera, Family–Miridae, Genus – Adelphocoris, species: *Adelphocoris lineolatus* Goeze, Lygus, species: *Lygus pratensis* L., *Lygus gemellatus*
3) It has been established that Adelphocoris lineolatus and Lygus pratensis, L. gemellatus cause significant damage to crop annually and are dominant on the cotton and lucerne.
4) It has been established that the amount of effective temperatures 630^{o} (with 10 ^{o} threshold) is required for a single generation development cycle.

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