



Bioecological Characteristics Of Entomophages Of Dendrophilous Coccids In The Conditions Of Eastern Fergana

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<i>Abstract</i>	
CC License CC-BY-NC-SA 4.0	In the conditions of Eastern Fergana 18 types of coccids are found in orchards, and they cause serious damage to horticulture. As a result of preliminary studies, 3 species of coccidial entomophages (14 species in total) are predatory, 9 are parasitic, and 2 are superparasites. Predatory entomophages feed on the body, larva, ovary or egg sac of a female insect, while parasitic entomophages damage 5 types of female coccidial body, 6 types of larval body, a type of egg sac, and 2 types of larvae and fungi of primary centipedes. “Parasite-host” and “predator-prey” relationship systems have been formed according to the feeding characteristics of entomophages with coccids in the garden ecosystem. This phenomenon led to the formation of a secondary food chain in the producer-consumer-reducer system.

Introduction.

According to the world experience that the negative impact of coccides on trees and shrubs, and the economic damage to horticulture and forestry are increasing (10, 15) year by year. A number of scientists say that it is necessary to identify the entomophages that live in their bodies gratuitously and carnivorously in the development of effective measures against harmful insects, it is great scientific and practical importance to analyze the life processes of connecting them with their hosts, especially this process through the system of “parasite-host” and “predator-prey” relationships. (7, 15, 18, 19, 21).

Scientific sources contain a number of information on the species composition, distribution and bioecology of coccids of orchards that found in Uzbekistan (2, 11, 15). In Fergana Valley 18 types of coccids are found in orchards and they cause serious damage to horticulture (11, 15). However, their entomophagy has not yet been analyzed and the sphere of scientific evidence about them is limited. The available data also belong to the last century (4, 10).

Special attention was paid to large-scale research of entomophages of coccids based on this. This article presents the results of research on harmful coccids and some of their entomophages found in orchards of Eastern Fergana regions.

Materials and methods of the research.

The research was carried out on the basis of individual and complex faunistic expeditions in the plains, hills, foothills, mid-mountain regions, cultural and natural landscapes of Eastern Ferghana during 2018-2020. Commonly accepted coccidological methods (3, 5) were used for collecting and storing coccids, as well as an insect detector and a number of scientific sources for identifying entomophages (1, 3, 5, 6, 8, 9, 10, 13, 16, 17). Acacia scurvy (*Parthenolecanium corni* Bouche), false scurvy (*Eulecanium rugulosum* Arch.), purple scurvy (*Parlatoria oleae* (Colvee), red giant worm (*Drosicha turkestanica* Arch.), apple mealybug (*Phenacoccus mespili* Sign.), plum false shield (*Sphaerolecanium prunastri* Fonsc.) and pistachio pillow worm (*Anapulvinaria pistaciae* Bodenh.) entomophages, mainly in fruit orchards, were regularly monitored and parasites and predators found in them were taken into account in nature and in laboratory conditions.

Results.

As a result of the research, it was found that coccids are damaged by entomophages belonging to the class of insects, such as hardwings, hymenoptera and dipterans. Information about the entomophages of some coccids found in the region of Eastern Fergana is given below.

1. *Cryptochaetum* sp. – (cotton parasite) is a member of the *Cryptochetidae* family.

Lifestyle: parasitic.

Main host: red giant worm (*D.turkestanica*).

Place of localization: female coccidial body.

Fodder plants of the *D.turkestanica* species: willow, poplar, quince and juniper.

The identified location: Altinkol, Asaka, Andijan, Khojaabad districts of Andijan region, and the cities of Andijan and Khanabad.

Biology. Entomophages of the red giant worm in the conditions of Northern Fergana are found to be *Cryptochaetum* sp. from the *Cryptoshaetiidae* family. *Cryptochetum* species is representative of a fly genus that feeds on the eggs of the red giant worm, and its larvae have been recorded to feed on the eggs laid by the giant worm. The female fly laid her eggs on the body of the female giant worm in the first ten days of June. It was observed that the bodies of infected red giant worms were covered with thick white dust (14-17.VI.2019, Andijan, Oltinkol). It was found that adult imagoes fly out of the worm body in the last decade of June (24-28.VI.2019, Andijan, Buloqboshi).

2. *Microterys* sp. – microteris is a member of the *Encyrtidae* family of hymenoptera.

Lifestyle: parasitic.

Main host: Pistachio pinworm (*A.pistaciae*) and other adulterants.

Place of localization: egg sac of the worm.

Food plants of the species *A.pistaciae*: pistachios

The identified place: Bogishamol, Andijan district, Andijan city.

Biology. Its larvae feed on the eggs of the pistachio pillow worm (*A.pistaciae*). It was found that several representatives of *Microteris* emerged from the pillow worm egg sac in June 2018 (16-21.VI.2018, Andijan). *Microteris* - noted in many counterfeiteres. It was observed that its larvae feed on the laid eggs and do not significantly reduce the number of pistachio pinworms.

3. *Leucopis annulipes* Ztt. – leukopis. A representative of the *Chamaemyiidae* family.

Lifestyle: predatory.

Main prey: pistachio pillow worm (*A. pistaciae*) egg sac; apple mealworm (*P. mespili*); body and ovaries of female Acacia false shield (*P.corni*).

Food plants of the species *A. pistaciae*: pistachios

Food plants of the species *P.mespili*: trees with seeds and fruits.

Food plants of *P.corni* species: polyphagous - fruit and ornamental trees and shrubs.

Place of detection: *A.pistaciae* – Bogishamol Park, Andijan District; *P. corni* - Andijan city, Khojaabad, Korgontepa, Khanabad city; *P. mespili* – Khojaabad district

Biology. Pistachio is a serious predator of the pinworm. *Leucopis* eggs were observed to be laid in the egg sac of the pinworm, and the host was found to develop inside the egg sac. The larvae feed on the eggs inside the egg

sac. Then they turn to be cocooned. According to the observations of I.A. Rubtsov, one larva of leukopis eats all (up to 600-1200) eggs in the ovisaka during the development process (14). The development of the larva from egg to pupation took 11-12 days. It was observed that *Leukopis pistachio* has a significant effect on the reduction of the number of pillow-shaped false shields in our observations in Andijan (1-5.V.2018-2020, Andijan). Parasite activity increased during the oviposition period of the pistachio pinworm.

Leukopis flying into the egg sac of the pillow worm was observed in 2-3 decades of May 2018. The effectiveness of *leukopis* is between 10-30% in the conditions of the Crimea (14). Its efficiency was much higher in our observations (20-45%).

Leucopis annulipes Ztt. fly was previously considered a mealybug predator (12). Our research revealed that *Leucopis* is a predator of mealworms as well as many other counterfeiters.

Leucopis larvae develop in ovaries on the body of the female pseudopod, which feeds on the eggs laid by her host. The flight of *Leucopis* from the body of the host began with the arrival of moderately in warm months. According to the obtained results, the number of eggs laid by *leukopis* on the body of one female of acacia false shield (*P.corni*) reached 10-15.

It was recorded in late April and early May in the larvae of *Leucopis* acacia false shields among the eggs laid by *P. corni* coccidis in the conditions of the Fergana Valley. *Leucopis* feeds on the eggs of acacia false shields and develops for about a month. Usually 1-2, sometimes up to 4 larvae are found in the body of the female of the host, and then they turn into a false cocoon. One of them turns into a cocoon in most cases. Larvae isolated under laboratory conditions are given to continue to feed on the eggs of the shams. Also, *leukopis* larvae, which are turning into cocoons, were observed in the soil and tree bark.

The role of *leukopis* larvae is important in reducing the number of eggs of *Acacia* false shields. It was found that they show 25-30% biological efficiency in valley conditions.

4. *Hyperaspis* sp. – a representative of the Coccinellidae family.

Lifestyle: predatory

The main prey: the ovaries of the pistachio pinworm (*A.pistaciae*).

Food plants of the species *A. pistaciae*: pistachios

The identified place: Bogishamol Park, Andijan District, Andijan Region.

Biology. An entomophagous predator of coccids, aphids and other insects, mature *hyperaspis* beetles appear in the second half of April and in May in the conditions of the Fergana Valley. After mating, female pinworms (*A.pistaciae*) lay one egg in their ovaries. The first-instar larvae feed on the eggs of the pinworm. They eat the eggs inside one ovary, and other new eggs are transferred into the egg sacs. Up to 50 ovaries are needed for a pinworm to complete the development of one larva. Adult larvae of *hyperaspis* were also recorded in the body of the pillow worm in the second decade of June. It was found that one *Hyperaspis* larva can eat all the eggs in one egg sac of pistachio pinworm within a day in laboratory conditions. The larvae, which have completed their feeding, pupate inside the ovaries of pseudopods in the third decade of June. The emergence of adult beetles from the mushroom was recorded in June 2019 (19-23.VI.2019, Andijan).

5. *Chilocorus bipustulatus* (Linnaeus, 1758) – a representative of the Coccinellidae family.

Lifestyle: predatory.

Primary host: Larvae and females of *Acacia* leafhopper (*P.corni*).

Food plants of *P.corni* species: polyphagous - fruit and ornamental trees and shrubs.

Place of identification: Khojaabad, Kurgantepa districts of Andijan region, Andijan and Khanabad cities.

Biology. *Hylocorus* was recorded in the colony of larvae of the pistachio pillow worm of the second age in August 2019 (14-21.VIII.2019, Andijan, Oltinkol).

Hylocorus feeds on larvae and females of many coccid species. It hibernates in the beetle stage in bark cracks and in places hidden from view.

The feeding on the larvae of the false acacia (*P.corni*) becomes active in March and April. The contribution of this parasite to the reduction of acacia false shields is not high in the conditions of Andijan, because it mainly feeds on shields and their larvae.

6. *Coccophagus lycimnia* (Walk.) – a representative of the Aphelinidae family.

Lifestyle: parasitic.

Main host: plum beetle (*S. prunastri*); non-swelling false shield (*E. rugulosum*); acacia false shields (*P.corni*).

Place of localization: body of larvae and females.

Food plants of *S. prunastri* species: pome fruit trees - peach, cherry, plum, cherry, wild cherry;

Food plants of *E. rugulosum* species: hawthorn, poplar, willow;

Food plants of *P. corni* species: polyphagous - fruit and ornamental trees and shrubs.

Place of identification: *S. prunastri* - Khojaabad district, cities of Khanabad and Andijan; *E. rugulosum* - Andijan city, Ulughnor district; *P. corni* - Andijan and Izboskan districts.

Biology. It is a free-eater of the plum false shields (larvae and females of the second age). Larvae overwinter in the larval body of the coccophagous host. Larvae emerge from wintering and turn into cocoons. Infected larvae of plum beetles are distinguished from uninfected ones by their dark color (April 27-29, 2018, Andijan, Ulugh'nor). The mummified larvae of coccophagus begin to appear from the second half of April, and the adults begin to fly out of the false body at the end of the second decade of April in the conditions of Eastern Ferghana. Coccophagus infection of counterfeiters was 10%, sometimes 30-35%. The fledglings harm the young and adult females of the forgeries.

Acacia false shields (*P. corni*) are also hosts for this species (coccophagus). The parasite hibernates in the body of the second-year larvae of the shield. Coccophagus-infested larvae of Acacia false shields do not differ in appearance from uninfested ones in early spring. But with the development of parasite larvae, they become mummified and become black and shiny (4-7.V.2018-2020, Khojaabad, Khanabad). The coccophagus infects the second young larvae and giving 3 or 4 generations of young females of the false acacia in the conditions of the valley.

Coccophagus does not play a significant role in the decline in the number of false acacia. It infects its host about 5-10% of second instar larvae.

The species *Coccophagus lycimnia* (Walk.) also parasitizes the second-year immature false shield (*E. rugulosum*). Its larvae overwinter in the body of the host larvae. Their development accelerates as the days get warmer in the spring. After finishing feeding, they turn into a mushroom inside the larva of the pest. They hatch from 2-year-old larvae and fly out in the second decade of April in the conditions of the Fergana Valley.

7. *Metaphicus melonostomatus* (Timb.) – a representative of the Encyrtidae family.

Lifestyle: parasitic.

Main host: plum beetle (*S. prunastri*); non-swelling false shield (*E. rugulosum*); acacia false shields (*P. corni*).

Place of localization: body of the larva.

Food plants of shields: trees and shrubs with fruits and seeds, ornamental trees.

Food plants of *P. corni* species: polyphagous - fruit and ornamental trees and shrubs.

Place of identification: *S. prunastri* - Khojaabad district, cities of Khanabad and Andijan; *E. rugulosum* - Andijan city and Ulughnor district; *P. corni* - Andijan and Khanabad cities, Khojaabad and Kurgantepa districts.

Biology. The second instar is the primary free feeder of plum false shield larvae. *Metaphicus* spends its second instar larval stage inside the host larval body. The flight of *Metaphicus* from the body of the host was observed at the end of April and the first ten days of May. Usually, *metaphycus* females fly out with developed gonads and have been known to start infesting the falcons as soon as they leave the host's body.

8. *Mikroterys hortulanus* (Erd.) – a representative of the Encyrtidae family.

Lifestyle: parasitic.

Main host: plum beetle (*S. prunastri*).

Location: body of an adult female.

Food plants of *S. prunastri* species: pome fruit trees - peach, cherry, plum, cherry, wild cherry;

Place of identification: Khojaabad district, cities of Andijan and Khanabad.

Biology. It parasitizes plum false shields (*S. prunastri*) in the Fergana Valley. When they emerge from their hibernation sites in the spring, it hibernates in the host's body during the adult female stage and move on to additional feeding. Their gonads develop During this time. *Microteris* feeding larvae were observed on the body of a false shield in the third decade of May in the Andijan region (19-23.IV.2019, Khanabad).

The percentage of the pest is affected by *microtheris* varies in the conditions of the valley. It was noted that the biological efficiency of parasite is up to 18-30% in the lowland areas of the valley. But according to observations made in Arslanbob, this figure was 52-84%.

9. *Tetrastichus gallerucae* Fonscolombe. – a representative of the Eulophidae family.

Lifestyle: parasitic.

Main host: secondary parasite of plum false shield (*S. prunastri*).

Place of localization: larvae and sponges of primary carnivores.

Food plants of *S. prunastri* species: pome fruit trees - peach, cherry, plum, cherry, wild cherry;

Place of identification: Khojaabad district, cities of Khanabad and Andijan.

Biology. This species is a secondary parasite of many pseudopods, including the plum pseudopod (*S. prunastri*). The larvae of the parasite develop at the expense of the larvae and fungi of the primary free-eaters, sometimes reducing their numbers by 18-20% or even lower. *Tetrastixus* hibernates in the late larval stage in the mummies of microtheric fungi. The release of microtheris was recorded in laboratory conditions in the second decade of March (13-15.III.2019, Arslanbob) in the colony of plum false shields collected from Arslanbob. It was found that dead larvae of *Microteris* contained *tetrastichus* larvae of the last age in a colony of plum false shields.

10. *Pachineuron solitarum* Hart. – a representative of the Aphelinidae family.

Lifestyle: parasitic.

Main host: metaphycus, coccophagus, etc.

Place of localization: larvae and sponges of primary carnivores.

The identified place: Khojaabad, Ulug'nor, Izboskan districts, Khanabad and Andijan cities.

Biology. Cannibals in the larvae of primary carnivores. It damages larvae and fungi of metaphycus, coccophagus, etc., and can control their number up to 50%.

11. *Aphytis proclia* (Wlk.) – a representative of the Aphelinidae family.

Lifestyle: parasitic.

Primary host: purple sedge (*P. oleae*).

Localization site: female coccyx body.

Food plants of the species *P. oleae*: seed-bearing trees.

Location: Andijan and Izboskan districts.

Biology. Parasitism of the purple shield (*P. oleae* (*Colvee*)) was noted (25-28 V.2020, Izboskan). Its larvae live by sucking the female of the coccid. Adult larvae are lemon-yellow in color, visible. It was known that aphits at different ages larvae overwinter on the back of the female host according to the observations.

12. *Metaphycus* sp. – a representative of the Encyrtidae family.

Lifestyle: parasitic.

Primary host: Acacia false beetle (*P. corni*)

Place of localization: body of the larva.

Food plants of *P. corni* species: polyphagous - fruit and ornamental trees and shrubs.

Location: Khojaabad and Kurgantepa districts, Andijan and Khanabad cities.

Biology. Its larvae overwinter in the larvae of the false acacia beetle (*P. corni*). *Metaphycus* host hatches from larvae to adulthood in mid-May. Mummified larvae of acacia false shields infected with *metaphycus* are distinguished by their yellow-green color (13-17.V.2019-2020, Kurgantepa, Khojaabad).

13. *Metaphycus melonostomatus* (Timb.) – a representative of the Encyrtidae family.

Lifestyle: parasitic.

Main host: non-swelling false shield (*E. rugulosum*).

Place of localization: larvae of the second age and young females.

Food plants of *E. rugulosum* species: hawthorn, poplar, willow.

Place of identification: Ulug'nor district and Andijan city.

Biology. This species infects second-instar larvae and young females of the immature false shield (*Eulecanium rugulosum* Arch.). Its larvae overwinter in the body of an unswollen pseudopod. It was found that parasite flies from the body of the host from the end of April to the middle of May in the Fergana valley. The biological efficiency of the parasite is low (5-8%).

14. *Blastothrix scenographica* (Sugn.) – a representative of the Encyrtidae family.

Lifestyle: parasitic.

Main host: non-swelling false shield (*E. rugulosum*).

Place of localization: larvae of the second age and females.

Food plants of *E. rugulosum* species: hawthorn, poplar, willow

Place of identification: Ulug'nor district and Andijan city.

Biology. *Blastothrix* is an efficient free-eater of the non-swollen false shield (*E. rugulosum*). Its larvae overwinter in their second instar larvae. *Blastothrix* hatching from host larvae was recorded in the second

decade of April. Mass flight is observed in the middle and third decade of April. It turned out that the damage rate of a fake female of this swindler reaches up to 35%.

Conclusion. Entomophages belonging to 14 species of dendrophilous coccids were recorded in the conditions of Eastern Fergana. The feeding characteristics of entomophages with coccids lead to the formation of specific “parasite-host” and “predator-prey” relationships in dendroflor. According to the ecological-faunistic description of coccidial entomophagous agrocenoses of orchards, predatory and parasitic insects show trophic relationships in several directions with plant pests. In particular, 3 types of entomophages are wild (*L.annulipes*, *Hyperaspis* sp., *C.bipustulatus*) according to feeding on their coccids from the species studied in the Eastern Fergana region, 9 types (*Cryptochaetum* sp., *Microterys* sp., *C.lycimnia*, *M.melonostomatus*, *M.hortulanus*, *A.proclia*, *Metaphycus* sp., *M.melonostomatus*, *B.scenographica*) are parasites and 2 species (*P.solitarum*, *T.gallerucae*) are extreme parasites.

If the identified predators feed on the female insect body, larva, ovary or egg sac, 5 types of parasites (*Cryptochaetum* sp., *C.lycimnia*, *M.hortulanus*, *A.proclia*, *M.melonostomatus*, *B.scenographica*) female coccidial body, 6 species (*C.lycimnia*, *M.melonostomatus*, *T.gallerucae*, *Metaphycus* sp., *M.melonostomatus*, *B.scenographica*) larval body, 1 species (*Microterys* sp.) egg sac, as well as 2 species (*P.solitarum*, *T.gallerucae*) damages the larvae and fungi of primary free-eaters.

There is a constant relationship and competition between species in the ecosystem on the basis of the nature of nutrition of harmful and beneficial insects in different directions in the entomocomplex, that is, trophic pairs are formed between organisms in the plant in the order of producer → consumer → reducer. This, in turn, leads to the expansion of the food chain of the same plant ecosystem and the formation of a secondary food chain in the producer-consumer-reducer system.

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