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SOME BIOPHENOLOGICAL CHARACTERISTICS OF BLOSSOM FEEDER *Epicometis hirta* (Poda, 1761) IN SHEKI-ZAGATALA ZONE

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НЕКОТОРЫЕ БИОФЕНОЛОГИЧЕСКИЕ ХАРАКТЕРИСТИКИ МОХНАТОЙ БРОНЗОВКИ *Epicometis hirta* (Poda, 1761) В ШЕКИ-ЗАКАТАЛЬСКОЙ ЗОНЕ

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Abstract. Coleoptera occupies a special place in the class of insects that annually cause great damage to agricultural plants. Of particular agricultural importance among these pests is the shaggy bronze, belonging to the family of Scarabaeidae. The damage caused by this pest to the stone fruit trees of the Sheki-Zagatala zone, the dynamics of development in horticulture, periods of activity in agrocenoses and phenological calendars have not been studied in detail. The article reflects the results of research on the ecology of the shaggy bronze. The study of bioecological and phenological characteristics of stone fruit pests in the Sheki-Zagatala zone was carried out on stationary fields in 2017–2021. The material was collected in agrocenoses and biocenoses during the year. The collection and identification of species, the conduct of experiments, and the mathematical processing of the results were carried out by methods generally accepted in entomology. As a result, it was established that the shaggy bronze develops in one generation in the Sheki-Zagatala zone. Pests go into diapause during the pupation period. Although the seasonal dynamics of the flight of the shaggy bronze is a curve with one peak, the daily dynamics of flight is a curve with two peaks. In spring, there is a one-peak curve, and in summer, a two-peak curve, depending on the weather temperature. The results of the research can be taken into account in the development of integrated pest control measures.

Аннотация. Отряд жесткокрылых (Coleoptera) занимает особое место в классе насекомых, ежегодно наносящих большой ущерб сельскохозяйственным растениям. Особое сельскохозяйственное значение среди этих вредителей имеет мохнатая бронзовка, принадлежащий к семейству скарабеев (Scarabaeidae). Ущерб, наносимый этим вредителем косточковым деревьям Шеки-Закатальской зоны, динамика развития в садоводстве, периоды активности в агроценозах и фенологические календари детально не изучены. В статье отражены результаты исследований экологии мохнатой бронзовки. Изучение биоэкологических и фенологических особенностей вредителей косточковых культур в Шеки-Закатальской зоне проведено на стационарных полях в 2017–2021 гг. Материал собран в агроценозах и биоценозах в течение года. Сбор и определение видов, проведение опытов и математическая обработка результатов осуществлялись общепринятыми в энтомологии методами. В результате установлено, что мохнатая бронзовка развивается в одном поколении в Шеки-Закатальской зоне. Вредители переходят в диапаузу в период окукливания. Хотя сезонная динамика лета мохнатой бронзовки — кривая с одним пиком, суточная динамика полета — кривая с двумя пиками. Весной наблюдается одновершинная кривая, а летом —

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двухвершинная в зависимости от температуры погоды. Результаты исследований могут быть учтены при разработке комплексных мероприятий по борьбе с вредителями.

Keywords: Epicometis hirta, Coleoptera, Sheki-Zagatala zone, bioecology, biophenology.

Ключевые слова: Epicometis hirta, Coleoptera, Шеки-Закатальская зона, биоэкология, биофенология.

It is known that the comprehensive measures plans should be prepared to ensure high productivity in the agriculture [1, 5]. Undoubtedly, one of the most essential issues in such a set of measures is the detection of insects that damage plants, determining the dynamics of seasonal and daily activity of their bio-ecological characteristics. According to the recent literatures, more than 1500 species of insects have been recorded in fruit trees in the CIS, and among these species 140-150 species are the main pests [2, 9, 10] (https://www.zin.ru/; http:www.globalspecies.org).

The beetles (Coleoptera) family has a special place in the class of insects that cause a large amount of damage to the farm plants every year. The blossom feeder belonging to the scarabs (Scarabaeidae) family has a special agricultural importance among these pests. Thus, the damage caused by this pest to stone fruit trees in the Sheki-Zagatala zone, the dynamics of development in horticulture, periods of activity in agrocenosis and phenological calendars have not been studied in detail. The article mainly reflects the results of studies conducted during the settlement of the above mentioned issues.

Material and Method

The study of bio-ecological and phenological characteristics of stone fruit pests in Shaki-Zagatala region has been carried out in stationary fields in 2017-2021. The materials have been collected both from agrocenosis and biocenosis. The observations covered all the seasons during a year. The observations are mainly carried out in plum and greengage gardens. The collection and determination of species, conduction of experiments and mathematical operation of the results have been implemented by methods accepted in entomology [6, 7].

Depending on the growth period, the calculations are made by visual observation of excavations (10 excavations with 0.25 m^2 area, 25-20 cm depth for each hectare), generative and vegetative organs (100-120 plants for each hectare). The individuals collected from nature are mainly used in the laboratory experiments.

Results and Their Analysis

The blossom feeder *Epicometis hirta* Poda., 1761 (*Tropinota hirta* (Poda, 1761)) belongs to Scarabs (Scarabaeidae) family of the beetles and has reddish legs covered with whitish long hairs. Its color is black and the height of its body is about 10-15 mm. It can be observed almost in all regions of Azerbaijan, even in the places above 2000 meters from sea level [5]. This pest can be seen in Hungary, Greece, Italy, France, Ukraine, Kazakhstan, Turkmenistan, Syria, Iran, Southern Russia, and other countries [1-3, 8]. It mainly spreads over the plains and foothills [6, 7].

Both adults and larvae of the species harm the plants. The beetles exited from diapause in March firstly harm the blossoms and buds of wild plants, then domestic plants, so almost all plants of the agrocenosis. The beetles gnaw and decay the corolla, buds and young, green leaves of fruit trees and decrease the productivity. The larvae of pests gnaw and destroy plants especially the young seedlings and roots of sprouts, even underground part of them. The volume of damage caused in new seedlings

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and gardens is higher. It should be noted that the climatic conditions have a great impact on the development and productivity of this pest. Thus, when the average temperature is 16-18℃, and the humidity is between 55-75% , this pest can grow and breed rapidly. However, the low temperature and high humidity affect the pest negatively [3; 4; 8].

The diapause of beetles ended in study areas at the second half of March. As both imagoes and larvae of this pest like sunny and hot weather, they inhabit in the open areas during the winter. Although the color of beetles is bright black, their dense hairs give them grey color. Just for this color, they are also called as "grey flower-eater". As the beetles grow, their hairs fall. It is probably related to their life, and the main cause for it is that they rub on the ground when they enter and exit. This pest is species mostly observed in agrocenosis in late April and May and ended the diapause early in biocenosis among the beetles of Cetoninae subfamily (Table).

Table

PHENOLOGICAL CALENDAR OF BLOSSOM FEEDER IN SHEKI-ZAGATALA REGION

March			April			May			June			July			August			September		
Decades			Decades			Decades			Decades											
1	2	3	1	2	3															
Full Development of generation																				
			pupa; baby beetles																	
			eggs																	
						larvae														
											diapause periods									
												active beetles								

October-February (diapause)

Due to the diapause of the pest, it can be found in sandy and black sandy areas. During the research, sandy-black soils are found in late March near the village of Kish of Sheki district.

Insects feed on the blossoms of various wild and domestic plants after diapause in the spring. First of all, quick-blooming wild plants (dandelion, camellia, blueberry, jasmine, horse chestnut, bitter poplar, cream flower, etc.) and then domestic plants, especially fruit trees (almonds, apricots, plums, cherries, greengage, apples etc.) gnaw their flowers and destroy them.

Copulation and egg-laying of the beetles are observed in stationary areas. The beetles die after 15-16 days from laying eggs. The female individuals usually lay eggs after 4-5 days from copulation. They mainly lay their eggs next to the gardens and fields, uncultivated and sunny areas. Such areas are considered more convenient for nutrition and growth of the larvae exited from the eggs. Females lay their eggs separately or as 2-3 at a depth of 5-7 cm. The color of eggs is whitish, balloon-shaped and a bit longish. Its shape turns into a balloon and its color get darker by the growth of embryo.

The larvae start to exit from eggs at the second half of May. The embryonic growth lasts from 6-10 days (6 day in 25-26^{0}C, 10 days in 220-22^{0}C) depending on the temperature. The larvae have active, 3 pairs of feet covered with light yellowish hairs. The first little larvae can be sometimes observed in the middle of May. Their length is recorded as 15-20 mm in middle of June (15-20. VI), and as 25-28 mm at the end of June. The whole active growth of the larvae ends in 51-57 days.

The old larvae of blossom feeder mainly feed with half-rotten roots and underground parts of some plants at a depth of 10-15 cm. The larvae migrate to the various layers of soil depending on the temperature. Thus, when the weather is cold and humid, they go into deeper layers such as 20-25 cm, and sometimes 30-35 cm (in December-February). However, when the heat get higher and the

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humidity get lower, they migrate to the upper layers of the soil. It should be mentioned that the larvae mainly prefer to inhabit plowed, loam soils rich with various kind of roots. The larvae inhabit in different depth of soil depending on the seasons.

Normally, the larvae are curve-shaped, but when they are picked up they bend like a ball and pretend to be dead. The larvae begin to become pupas from the second half of June. The pupation period continue until the end of August. The larvae stick the parts of soil by their saliva and create the cradle (cocoon) and turn into pupas inside.

After 2–3 days of making the cradle of soil, the larvae change their shell for the last time and turn into pupas. Although the cradle made by blossom feeder has thin wall, it plays a role as very strong and reliable shelter not damaged during the excavation, with length of 14–15 mm and width of 9–10 mm. It looks like an earthworm. The first cocoons can be observed in the first ten days of July (2–5. VII). However, the last larvae that are not pupas are recorded between 9–11 August (Figure 1).

The larvae went in pupation turn into beetles about two weeks later. It should be indicated that beetles are formed inside these cradles, but they don't exit from there and go to the diapause.

The beetles in the cradles for a long period (6–7 months) and in the diapause cause a huge damage to the fruit gardens in spring when they become active.

Also, it should be noted that 80–85% of the beetles exit from pupas, hibernate inside the cradles, but other 10–15% go to the diapause until the next year's spring in the pupation period.

Seasonal and daily flying dynamics of blossom feeders have been clarified by visual observation in stationary field, in 2017–2021.

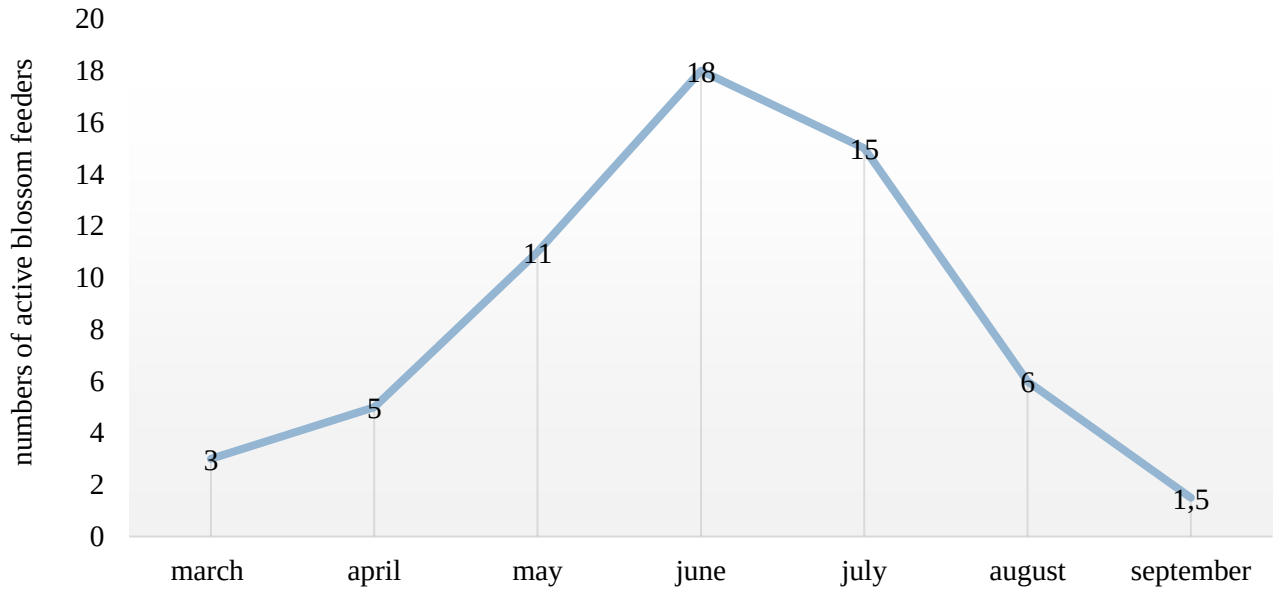

Figure 1. Seasonal flying dynamics of blossom feeder in agrocenosis

The results are visually viewed in the first and second charts. As mentioned in the first chart, the flying of beetles lasts from late March to the first ten-days of August. The maximum flying is observed in May and first ten-days of June. In this period, 0,21-0,32 beetles can be observed on each plant. It should be also mentioned that this number can change depending on the climate. During the observation of daily flying dynamics of beetles, 2 different flying dynamics are defined in them. For example, the flying of beetles last from 930-1000 to 16.30—17.00 in spring (from March to early

June). However, in summer (July-August) their maximum daily flying is observed 2 times. The first flying lasts from 8^{30} to 11^{30} (Figure 2), then the beetles go into soil, wood hollows, under the leaves, shady, cool places, and rest, the second flying lasts from 16^{30} to 19^{30}, sometimes to 20^{00}.

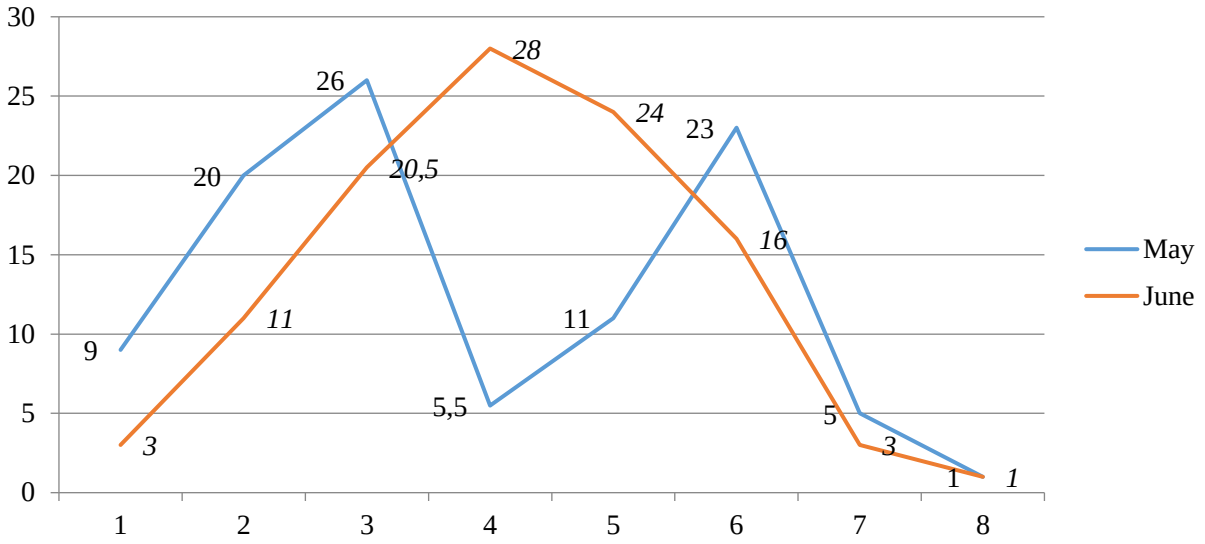

Figure 2. Daily flying dynamics of blossom feeder in agrocenosis. May June

During the observation of the daily behavioral characteristics of beetles, it has been known that some of them spend the night in the depth of 3-5 cm of soil. However, some individuals hide between flowers and leaves of plants until morning. It should also be mentioned that the overnight away from soil prevails mainly in dry and hot weather condition. The beetles prefer to overnight in windy, cold and humid weather in the layers of soil.

When the weather is windy and foggy, the flying of beetles almost minimize. On the contrary, when the weather is suitable their mass flying is observed.

When the temperature is low in March and April, the individuals overnighted over the plants drop into the soil without motion.

Another characteristic belonging to chafers is more striking in these beetles. Thus, when they are taken over, they pretend to be dead, press their feet to their chest or secrete liquid with a yellow strong odor from back. It is probably adaptation formed in them for protection.

Both beetles and larvae of the pest can be observed in stationary fruit gardens during our studies and excavations. The larvae feeding with the roots of wild plants are observed in unplowed areas, at the edges of fruit gardens along with beetles flying separately in early April.

The beetles eat the essential organs of plants: buds, pollens, ovaries, stamen etc. and harm the productivity of the plants. They almost don't touch the flower petal. Their favorite foods are unfertilized flowers and flower buds. When they eat the core of the buds and go inside, only their back legs and the last joint of their abdomen are visible.

As a result of detailed studies, it is determined that the blossom feeder breed one time in Shaki-Zagatala region. The pests go to the diapause in the pupation period inside the cradle made by them, at the same time in the imago period exited from pupa.

Although the seasonal flying dynamics of blossom feeder is one-peak curve, the daily flying dynamics show itself as a chart with two-peak curve. So, one-peak flying is observed in spring, but

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two-peak curve is observed in summer depending on the temperature of weather. The results of the research can be considered in the preparation of the comprehensive pest control measures.

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