Bioecology and Species of Diaspididae in Fruit Gardens

Jurabek Nodirjonovich Yakhyoev
Junior researcher, Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan

Zukhra Yuldashevna Akhmedova
Candidate of Biological Sciences, Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan

Khojimurod Khamrokulovich Kimsanbayev
Doctor of Biological Sciences, Professor, Tashkent State Agrarian University

ABSTRACT

A dangerous pest is widespread in Uzbekistan. Of these is a dangerous coccid. They damage many plants. It damages the apple tree, pear, plum, quince, peach, almonds, hawthorn, elm, poplar and others. Winter diapausing larvae of the first age, covered with a dark gray or black shield. In the spring they are intensively fed, molt and form a shield similar to that of an adult female. After the second moult, adult females are formed. After mating, females spawn larvae-tramps, which creep along branches and leaves, and can also settle on fruits. They give rise to the next generation.

KEYWORDS: *Orchard, population, adult, offspring, larvae, apples, cherries, plums, peaches, purple scale insect, comma scale.*

Introduction. In the world today, special attention is paid to diaspidological research, the study of the faunal composition of different regions by modern methods, the study of their origin on the basis of the evolution of diaspids. Work has been developed on the faunistic composition, biology, ecology, taxonomic composition, trophic relationships and phylogeny of diaspidofauna of ecological zones in different regions. It should be noted that research on the identification of diaspid fauna in fruit and ornamental plants, their morpho-ecological properties, biological characteristics of some common species, adaptation to forage plant habitat and the use of coordinated control methods against them requires research. In this regard, further development of scientific research on the identification of species diversity of diaspids, assessment of the impact of pests on trees and shrubs, the study of the distribution, biology and ecological characteristics of the most serious species is of great scientific and practical importance.

Particular emphasis is placed on conducting research on the bioecology of orchard pests, which play an important role in the sustainable development of the agricultural complex and food security of the world's leading countries. Here, especially in the orchards of our republic, pests of almost all species and widespread California shield fruit trees are mainly apples, pears, plums, cherries, peaches, cherries, apricots, as well as black currants, hawthorn, rose, willow, flowers, red-fruited shrubs cause serious damage to plants.

Research methodology. The study of the biological properties of diaspids began in the spring and was systematically monitored at weekly intervals. Observations were performed using the bioassay

method (once a day) on selected model trees based on the order of diaspids in the plant body, branches and twigs, as well as the order of distribution of diaspids in fruits and leaves. In addition, when taking samples from diaspids, an attempt was made to take the trees on the circular sides of parts of the same height from the ground. Variation in the number of densities of diaspids in modular trees, their life processes, egg-laying, larval emergence, and the emergence of males were also studied.

The morphological and classification characteristics of diaspids have been studied on the basis of a number of identifiers and scientific sources relevant to the field. In particular, it was analyzed in accordance with A.D.Arkhangelskaya, N.S.Borkhsenius, E.M.Dantsig, N.I.Abdrashitova, N.V.Gabrid, I.D.Batiashvili.

The study of the biological properties of diaspids took into account, first of all, the period of their wintering, the emergence of larvae from eggs in spring, the gradual transition of larvae from the first to the second age, shedding, young females or males. In addition, larvae of male insects were isolated and stored in test tubes, and the time of emergence of males in the laboratory was determined. Also, under MBS-9 binoculars, the processes of ovulation of females and the emergence of larvae from eggs were constantly monitored. The development of diaspids found in selected and selected tree trunks was monitored on a regular basis (Tashkent region and Tashkent city).

Samples from plants infested with diaspids were cut, labeled, and studied in the laboratory. Samples taken during the field observations were numbered and recorded in a notebook. During sampling from different ecological zones, 10 control plants were selected from all four sides of the area, and 10 samples were taken from them. The trees under control were conditionally divided into three tiers, and the placement of diaspids along the tiers was determined. The control focused on the number of tufts, the age and composition of the populations. The length of the horns from which the samples were taken was 10 cm. Some of the samples (bark, twigs, leaves, fruits) were cut and placed in a special box lined with cotton wool, and some were soaked in 70% alcohol and fixed in the laboratory to study the composition of the species.

Analysis and results. The fertilized female of the purple shield overwinters in its bark, under the shield of the forage plant. The minimum winter temperature affects the shield, wintering can withstand temperatures for a short time, even if -11–15ºC. But when the temperature is -29ºC, almost everything dies.

In the spring, with the onset of aphids in forage plants, the females continue to feed. At the end of the flowering of the apple begins to lay eggs. The first eggs laid in 2020 were detected on April 24, with an average air temperature of 17.4ºC and a relative humidity of 55%. In 2021, on April 30, the average ten-day temperature was 12.9ºC and the relative humidity was 49%. After 9 to 12 days, the larvae emerge from the eggs, are located on the leaf and fruit bands, and are less common on the leaf surface.

The larvae of the first age appear in the first and second decade of May, May 6, 2020 - May 11, 2021, when the average temperature is 15.4 - 21.5 ºC and relative humidity 48 - 68%.

The second-year larvae were identified on May 24 and 31, and it should be noted that the female larvae develop into adult females after the second ovulation, while the male larvae undergo successive pronymphatic and nymph phases after the second ovulation, and adult males begin to emerge. Female and male mature breeds were identified in late June and early July. The period of first laying of females is determined in the first ten days of July (July 8, 2020 - July 8, 2021).

The sexual productivity of females ranges from 20 to 50 to 70 eggs. The first larvae were detected in mid-July 2020 (16.07), and in 2020 at the end of the second decade of July (19.07), the emergence of

larvae continues until early August (2.08). Representatives of the second generation, significantly more than the first, the larvae clung to the leaf bands, veins, twigs and branches, fruit bands and fruits and asked for juice. One month after the start of feeding, the larvae hatch a second time, and in late August, female and male imagoes appear. After mating, the males die. The females go to winter.

Thus, the purple shield gives twice the generation during the growing season. During the observation period, we found that in the second generation there are many varieties, which are located on the leaves and fruits, which requires us to conduct a special calculation. In these calculations, the ratio between the rocks of the purple flax is determined. To do this, 2 branches were cut from 5 damaged trees, 12 leaves (4 pieces) and 12 fruits (4 pieces) were taken from each side of the tree and the shield of the shield was observed and counted. The color of the female is white or gray, the skin of the second young larva is eccentrically located at one edge of the shield and occupies one third of its area, the length of the shield is 2 - 2.5 mm. The shield of the male shield is elongated, flat, with the skin of the first young larva, the length of the shield is 1.5 mm.

Figure 1. *Parlatoria oleae* Colvee.

Many researchers report that the purple shield also infects: barberry, hawthorn, oak, tobulga, pomegranate, olive, mulberry, laurel, mackerel, catalpa, padub, Semenov maple, white acorn and yellow acacia. Of the 41 species of affected plants, 14 are fruit-berry plants, which are severely damaged by the purple shield. Apples, pears and partially apricots are especially affected.

The first-year and partly second-year larvae and adult females of the California shield overwinter, but two-year-old larvae and adult females die in the winter. Shields hibernate under the branches and shields of trees. In late February, the dormant larva begins to move to the second year. But during the winter 20–50% of the larvae die. The ratio of males to females is on average the same. As the trees begin to turn green, the larvae begin to feed and, by shedding their bark 2 times, become sexually mature females and males.

It wakes up when the air temperature averages + 7.3 ° C, and at + 10 ° C the second peeling begins, the peeling coincides with the emergence of the first buds of the apple. It takes 12 to 16 days from the start of feeding to the third peeling, and the third peeling lasts as long. During this time, the male shield begins to fly, and the female is sexually active. The male shield lives very few hours. It dies after mating with the female. The emergence of female and male shields lasts from late April (early) to May 20 (late), depending on air temperature. It is very important to determine the time of emergence of male insects, so the pheromone traps should be placed at the most optimal time, because the male insects fly only a few days.

Supervision with plant quarantine inspectors

Damaged apple fruit

Injured Apple Horn

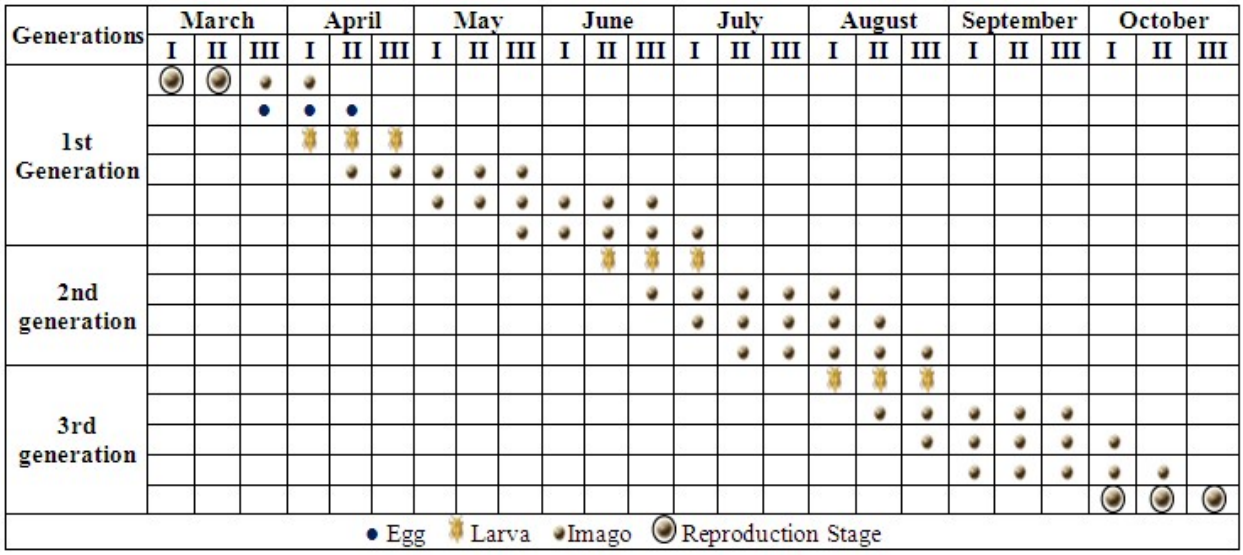
Figure 2. ***Diaspidiotus perniciosus*** **Comst.**

Sometimes the bulk of the male insects fly for two to three days. Female insects live for more than two and a half months. Once the ovaries of the female insect are fertilized, the egg cells develop. This process takes a month. The female of the California shield lays 100-200 larvae (up to 500 in some places in the south). In Uzbekistan, the California shield produces 3-4 generations per season. Some of the larvae of each generation remain for the winter. Finally, the first young larvae of the last generation undergo special training and overwinter under the mother's shield. However, if conditions are available (plants in greenhouses and other homes), the California shield can thrive year-round. California shield can be propagated mainly in seedlings. Infected fruit also has the potential to spread through trade routes.

To study the phenological calendar of the development of the Californian shield insect. The pest in Uzbekistan develops in three generations. Hibernates at the stage of 1st instar larvae under a dense large black shield on the bark of tree trunks and branches. The overwintered larvae wake up in spring at a temperature of ± 10–15°C with the beginning of sap flow in plants. The number of pests is significantly influenced by climatic features. The air temperature of the winter and spring periods is the determining factor in the life cycle of the pest, shifting the timing of the onset of stages in one direction or another within ± 8–12 days. In the conditions of the Tashkent region, the beginning of molting of the 1st instar larvae in the wintering generation begins in the middle of the 2nd decade of March at an average daily air temperature of ± 12–15°C. The bulk of the 2nd instar larvae turn into females at the beginning of the 1st decade of April. They feed heavily, their body increases in size and mate at the beginning of the 2nd decade of April. In the middle of the 3rd decade of April, a massive flight of males takes place. A month after mating, at the beginning of the 2nd decade of May - until the middle of the 1st decade of June, the females give birth to vagrant larvae. By the beginning of the second decade of June, larvae of the 1st instar and single larvae of the 2nd instar are found in nature in nature. The development of the second generation of the shield insect begins in the first

decade of July. At the end of the second decade of July, numerous colonies of 1st instar larvae of the 2nd generation are observed on branches, leaves and fruits (apple, pear and plum). In the third decade of July, the larvae move to the 2nd instar, and at the beginning of August they turn into females. Hatching of larvae of third generation vagrants occurs at the end of the 2nd decade of August and lasts until the end of the 1st decade of September. The beginning of molting of the 1st instar larvae is observed in the 1st decade of September and continues until the middle of the 3rd decade of the month. 2nd instar larvae turn into females at the end of the 2nd decade of September. The flight of males takes place at the beginning of the 3rd decade of September. At the beginning of the 1st decade of October, the females begin hatching of larvae, and it lasts until the end of the 2nd decade of October. At the end of the 1st decade of November, in nature (on the leaves of apple and plum trees), larvae of the 1st and 2nd instars are found in mass, which later go to winter.

Table 1. Phenological calendar of the development of the Californian shield insect (Tashkent region, 2018-2019).



(This table is based on the Tashkent region.) In the southern part of the country, the retreat of the California shield was on the 1st day of February, and the wintering was observed in November.

Thus, the development of the 1st generation of the pest lasts from the 3rd decade of March to the middle of the 1st decade of July, the 2nd generation - from the 2nd decade of June to the 3rd decade of August, the 3rd generation - from the 1st decade of August to the end of the 2nd decade of October. The full developmental cycle of the 1st generation lasts ± 43–53 days, the 2nd generation ± 42–45 days, and the 3rd generation ± 66–82 days. The fecundity of females of the 1st generation is ± 75–95, of the 2nd generation ± 125–155, of the 3rd generation ± 110–130 of vagrant larvae. It should be noted that the 1st and 2nd generations as well as the 2nd and 3rd generations develop in parallel for a long time. Non-simultaneous hatching of larvae leads to the overlap of development dates for different generations. In this regard, in summer, the simultaneous development of all stages of the scale insect is observed. Therefore, during this period, insecticides can be effective, destroying all stages of the pest. The Californian scale insect is distributed mainly with planting and grafting materials. In addition, vagrant larvae can be carried by wind, water, birds, or actively spread through the trees growing nearby.

The body of the plum shield female is noxious or oval in shape, orange in color. There are no hairs on the top of the mustache and there are two tumors at the end. Pygidia with 2–3 pairs of broad fragments. The first pair is bitten on the inner edge, the fragments of the second and third pairs are divided into two, the crowns are hairy. The shield of the female is covered with hairy yellow or

orange worm skins, which protrude from the head of the shield. the posterior part of the shield is broad and moderately swollen, about 1.6 mm long. The nymph shields of the males are elongated, in some almost white, oval in shape. The sectoral part is covered with hairy filaments, the length of the shield is 1-1.2 mm, its worm skin is light yellow.

Figure 3. *Pseudaulacaspis pentagona* Tar.

Infects many species of fruit trees, the females feed on apricot, cherry, plum, almond branches and twigs. Significant damage to cherries and plums. The female of the plum shield overwinters on slender twigs in the form of an imago. Gives offspring twice a year.

The shield attaches to the body, twigs and branches of the cherry, especially by clumping in the leaf veins and absorbing its juice. Strongly damaged trees stunted growth, the leaves begin to fall off early, the yield decreases, the quality of the fruit deteriorates. In the farms where the observations were made, the total damage to fruit trees was 0.96%, cherries were more severely damaged - 1.41%; peaches - 1.14%; apricots - 1.03%. At the same time, the damage to the first score was 0.06%; two balls 0.76%; three points is 0.64%. In terms of spread and damage, it ranks third after the previous two rounds.

In late April, early May, the larvae begin to emerge (larvae). Our observations show that the larvae emerge first from the eggs on the south and west sides of the tree trunk, as these sides are better heated by the sun. In 2020, the first larvae began to appear on April 27 at an average ten-day temperature of 15.8ºC, relative humidity at 69%, and on May 5, 2021 at an average temperature of 21.5ºC, relative humidity at 48%. It should be noted that the emergence of «tramps» larvae coincides with the general flowering period of white acacia.

The larvae that hatch from the eggs emerge from under the mother's shield and crawl through the trunk and branches of the tree in search of food. Finding a convenient place to feed, they pierced the bark with their long hoses and asked for cell sap. Most of the larvae gather under the young twigs, being in the leaf band. But they are almost non-existent in the leaf plate itself.

As the larva feeds, fluffy hairs appear on the surface of its body, the hairs then darken, thicken, and a shield is formed. In larvae, the larval filaments are located on the inside of the shield. In the process of shedding, the larvae lose their eyes, whiskers and legs.

The second-year larvae emerge in the second decade of May (May 18), with an average daily temperature of 18.5ºC in 2020 and a relative humidity of 63%, and an average ten-day temperature of

20.2ºC in the third decade of May (May 27) in 2021. and the relative humidity was 50%. In 2020, the first nymphs of first-generation males appeared in early June (6.VI). Males and adult females were detected at the end of the second decade of June (28.06.2020 y) and at the beginning of the third decade of June (22.06.2020 y). At the end of June (29.06) it was determined that the females of the first generation lay eggs.

Figure 4. ***Lepidosaphes mesasiatica Borch.***

The female lays the egg under her shield, the body of the female bends during the laying of the eggs and slowly moves to the head of the shield. The sexual productivity of a first-generation female is less than that of a second-generation female. The female of the first generation lays an average of 61.8-64.3 eggs, while the second generation lays 84.5-92.3 eggs. It should be noted that some females can lay up to 120 or more eggs. The productivity of females depends on the density of the shield.

During the observations in 2018-2020 in Tashkent region were identified species of shield on fruit trees, among which are very dangerous species. These include Diaspidiotus perniciosus Comst., Parlatoria oleae Colvee, Lepidosaphes ulmi Lin., Tecaspis asiatica Arch., Chlidaspis asiatica Arch., Mytilaspis turanica Arch. and Aulacaspis rosae Bouche. examined.

Parlatoria oleae and Diaspidiotus perniciosus rank high in apple orchards in terms of pest infestation, i.e. 34.4% Parlatoria oleae, 30.2% Diaspidiotus perniciosus, 11.4% Pseudaulacaspis pentagona, 10.9% Lepidosaphes ulmi, 8.9% Ap. , the remaining species accounted for 6.9% (Figure 5).

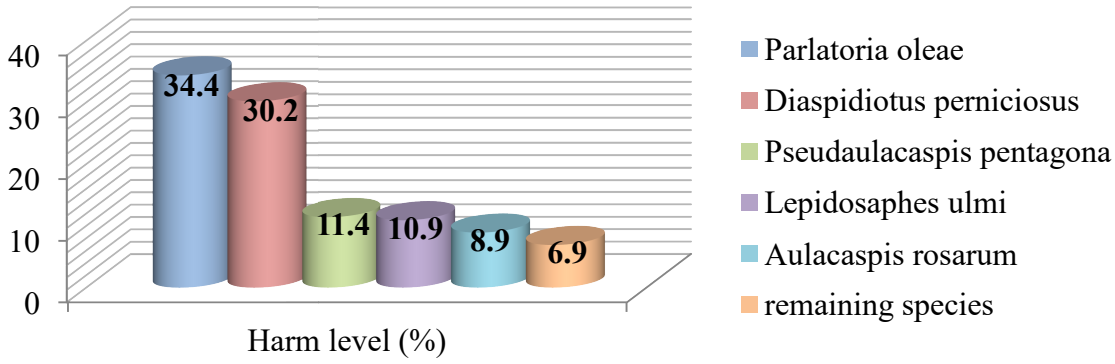


Figure 5. ***Level of damage of shield in apple orchards (Tashkent region, 2018-2020).***

Diaspidiotus perniciosus Comst of fruit trees. 12.8% of pears and apples, 10.1% of plums and apricots, 10.9% of cherries and quinces, 9.7% of peaches and 8.6% of cherries were studied (Fig. 6).

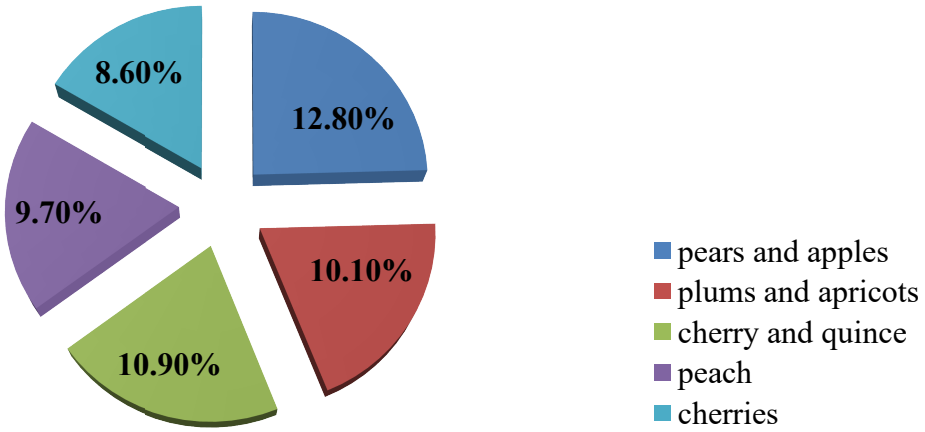


Figure 6. ***Infestation of fruit trees with California shield (Tashkent region, 2018-2020).***

Conclusions and suggestions. In apple orchards, the purple shield and California shield accounted for 34.4% of the various shield damage levels.

California shield infestation of fruit trees affected 12.8% of pears and apples, 10.1% of plums and apricots, 10.9% of cherry and quinces, 9.7% of peaches, and the least 8.6% of cherries.

List of used literature.

1. Кимсанбаев Х.Х., Муродов Б.Э., Ортиков У.Д., Яхёев Ж.Н. Калифорнийская щитовка и карантинные мероприятия / “Ўзбекистон ёшлари: Аграр соҳа ривожида менинг ҳиссам” мавзуидаги II Республика илмий-амалий конференция. – Тошкент. – 2018. – Б. 216-218.
2. Кимсанбаев Х.Х., Муродов Б.Э., Ортиков У.Д., Сулаймонов О.А., Яхёев Ж.Н. Карантинные мероприятия против калифорнийской щитовки (Quadraspidiotus perniciosus Comst) / АГРОЭКОЛОГИЧЕСКИЕ АСПЕКТЫ УСТОЙЧИВОГО РАЗВИТИЯ АПК. – 2019. – С. 91-93.
3. Кимсанбаев Х.Х., Муродов Б.Э., Ортиқов У.Д., Яхёев Ж.Н. Калифорнийская щитовка (quadraspidiotus perniciosus comst) и карантинные мероприятия / International conference. – London, Great Britain. – 2019. – P. 53-55.
4. Kimsanbayev X.X., Murodov B.E., Ortikov U.D., Sulaymonov O.A., Yakhyoyev J.N. Bioecology, crystal pharmaceutical support and efficiency of california shield // International Journal of Research. With impact factor 5.60. – 2019. – № 6. – P. 142-148.
5. Муродов Б.Э., Машарипов У.А., Яхёев Ж.Н. Калифорнийская щитовка – *Quadraspidiotu sperniciosus* Comst // Образование и наука в России и за зарубежом. – 2017. – № 1 (30). –С. 21-23.
6. Муродов Б.Э., Яхёев Ж.Н. Карантинный вредители внутреннего карантина Республики Узбекистан // Образование и наука в России и за зарубежом. – 2017. – № 3 (32). –С. 32-36.
7. Муродов Б.Э., Сулаймонов О.А., Яхёев Ж.Н. Калифорнийская щитовка на яблоне // Образование и наука в России и за зарубежом. – 2017. – № 12 (47). – С. 118-122.
8. Murodov B.E., Ortikov U.D., Yakhyoyev J.N. Bioecology of california shield (Quadraspidiotus perniciosus Comst) in Uzbekistan / Proceedings of International Multidisciplinary Scientific

Conference on Innovative Technology. Organized by Novateur Publications, India. May 25th, – 2020. – P. 104-107.

9. Муродов Б.Э., Ортиков У.Д., Яхёев Ж.Н. Биоэкология и развития калифорнийской щитовки (Quadraspidiotus perniciosus Comst.) в Узбекистане // ЕВРАЗИЙСКИЙ СОЮЗ УЧЕНЫХ (ЕСУ). – 2020. – 5 (74). – С. 39-40.
10. Ортиков У.Д., Яхёев Ж.Н., Пардаев Х.Х. Опасный кокцид. Калифорнийская щитовка (Quadraspidiotus perniciosus Comst) // Образование и наука в России и за зарубежом. – 2018. – № 6 (41). – С. 105-107.
11. Murodov B.E., Yakhyoyev J.N. Quarantine Pests Of Internal Quarantine Of The Republic Of Uzbekistan // Education and science in Russia and abroad. 2017 | Pages: 32-36.
12. Yakhyoyev J.N., Kimsanbayev Kh.Kh., Murodov B.E., Sulaymonov B.A. Bioecology And Phenological Development Of The Californian Shield (Quadraspidiotus Perniciosus Comst.) In Uzbekistan // The American Journal of Agriculture and Biomedical Engineering. With impact factor 5.312. USA. August 02, 2020 | Pages: 124-131.
13. Yakhyoyev J.N., Kimsanbayev Kh.Kh. Bioecology And Species Of Diaspididae In Fruit Gardens // The American Journal of Agriculture and Biomedical Engineering. With impact factor 5.312. USA. November 30, 2020 | Pages: 104-112.
14. Yakhyoev J., Kimsanbayev Kh., Murodov B., Akmedova Z. Taxonomy and bioecology of Hemiptera Diaspididae in fruit and landscape trees // E3S Web of Conferences. 244. – P. 02039.