Xylophagous coin-winged pests of fruit trees and their control

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Abstract. This article examines the biology, ecology, phenology, lifestyle of the main pests that directly affect the growth and development of existing seed and legume orchards in Uzbekistan, according to studies conducted in different regions of the country in 2014-2019, dividing plant pests into three types. These xylophages damage the roots, trunks and branches of trees; phyllophages - infect leaves; as well as carpophagous - scientifically based damage to plant fruits. This article focuses on xylophage pests, the degree of damage caused by root pests of trees mainly in horticulture, *Agrotis segetum* Schiff, *Agrotis exclamationis* and the main pests of trunks, branches and twigs, apple tree and fragrant wood carving worms (*Cossus cossus* L) worms (*Cossus cossus* L) damage the conductive tissues of the plant body by forming paths under the foamy top layer of bark and The results of experiments conducted in different regions of the country on measures to combat their economic damage.

Keywords. Coin-winged pests, xylophagous, phyllophagous, carpophagous, *Agrotis segetum* schiff, *Agrotis exclamationis*, *Sesia myopaeformis* bkh, *Cossus cossus* L, damage rate.

1 Introduction

The growing demand for food in the world is one of the urgent problems of increasing the volume and production of agricultural products, the constant supply of quality food, and the implementation of food security programs based on modern technologies of pest protection in the cultivation of quality fruit [1].

The natural climatic conditions of Uzbekistan have the most favorable conditions for the cultivation of fruit trees and vineyards. Apples, pears, quinces, cherries, cherries, peaches and many other fruit trees are grown in Uzbekistan [2]. In the production of high and high-quality fruit trees, a special place is given to the control of pests of the genus *Lepidoptera*, which are common in orchards. These pests cause serious damage to the crops, vegetative and generative organs of orchards. Up to 80% crop loss is observed in the absence of control measures for a single apple. Even when existing technologies in plant protection are used, the total yield is reduced by 25-30% under the influence of pests [3].

Reduction of the number of pests can be achieved through the introduction of new technologies in pest protection based on the determination of the species composition,

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distribution area, development characteristics, their damage, the amount of pests, found in orchards [4].

Scientific research has been conducted in different regions of the world to study the species composition, distribution, biology, damage and effectiveness of orchid control of orchid pests of orchards [5]. At present, orchards require research to improve the integrated pest protection system in the management of the number of orchard coin wing pests.

The theoretical significance of the results of the study lies in the scientific approach to the species composition, distribution area, damage, biology, biotic chain, symbiotic relationships and pest numbers of pests belonging to the genus Pest in the agrocenosis of orchards [6]. It has also taken a scientific approach to managing pest numbers based on an improved system of scientifically based coordinated control against major species of pests, using a natural population of entomophagous in orchards [7].

Practical significance of the research results is the reduction of the number of root rot, fragrant carnations, green curved leaves, growth of fruit trees, increase in fruit quality, and ultimately, high yields from orchards due to the introduction of an improved system of combating pest management in orchards [8].

Xylophage pests are the largest group of insects in terms of the number of pests, second only after *Coleoptera* and *Hymenoptera*. Coins wing pests are a relatively young but highly formed group of fully evolving insects. The size of butterflies varies greatly: from very small - 3.25 mm when writing on the wing (*Nepticula filipendulae* Wok.), Very large - 24-28 cm - saturnia (*Saturnia atlas*). This category includes a large number of harmful species living in the gardens of Uzbekistan. Their number includes 326 species belonging to about 26 families [9, 10].

In major scientific works devoted to the pests of fruit trees [11]. divided the coin-wing insects that live in orchards into 18 families: wood carvers (*Cossidae*), grooved winged moths (*Plutellidae*), small winged moth living in the mountains (*Argyresthiidae*), real mountain moths (*Yponomeutidae*), glass wings (*Aegeriidae*), dwarf moths (*Stigmellidae*), thin-winged mined moths (*Lyonetiidae*), whirlpools moth (*Cemiostomidae*), sheaths moth (*Coleophoridae*), leaf moths (*Glyphipterygidae*), grooved wing moths (*Gelechiidae*), leaf wrappers (*Tortricidae*), *Geometridae* (*Geometridae*), silkworms (*Lasiocampidae*), wave pests (*Orgyidae*), *Agrotis exclamationis* (*Noctuidae*), bear-butterflies (*Arctidae*), white butterflies (*Pieridae*). During the season, butterflies develop by giving one or more generations. (In Central Asia, some species produce up to six offspring). No more than one in mountainous and foothill areas [12].

Most of Uzbekistan is in the desert and valley areas. The mountains are located in the south and northeast of the republic. In the desert, the most important are the *Noctuidae* (about 200 species) and the butterflies, which include about 180-190 species. In total, more than 700 species live in the desert regions of Uzbekistan, including the southern valleys [13]. According to Azimov and others, more than 900 species of butterflies are currently recorded in Uzbekistan [14].

2 Materials and methods

The research was conducted in 2015-2019 in Tashkent, Fergana and Surkhandarya regions of the Republic of Uzbekistan. The territory of Uzbekistan is located in Central Asia and represents a unique combination of plains and mountainous terrain. Uzbekistan has a common slope from south-east to north-west. Absolute records are highest in the southeast, with altitudes ranging from 1,000–1500 to 3500–4500 m above sea level [15], and in the northwest from 54 to 300 m.

High heat content, sharp continental climate, low annual total precipitation. Winters in the foothills and plains are cold enough, but very unstable compared to the season. The

temperature is not constant and the snow cover does not last long. Spring is rainy, temperature is unstable, and season is short. Summers are long, hot, and dry, with little rainfall; the relative humidity is sharply lower than in spring and winter [16]. Uzbekistan is conventionally divided into 3 geographical regions, where certain varieties with relatively short, medium and long vegetation are grown.

Entomological calculations and observations were performed on the basis of methods adopted in entomology [17] Methodical instructions on the density of pests were carried out [18], while the number of beneficial insects were carried out [19].

Insect damage was determined and agrotoxicological experiments were performed according to the accepted method [20-22]. Biological efficacy in laboratory and field experiments was determined according to the formula [23], which takes into account the control variant. The obtained results were processed mathematically and statistically [24].

3 Results and discussion

The world fauna of cocoon pests includes more than 150,000 species. The species composition of pests living (feeding) on fruit trees is more than 15,000 species in the CIS countries. More than 1,500 species of butterflies are registered in Uzbekistan, including more than 326 species belonging to 37 families of butterflies [25].

The genus Lepidoptera is a fully variable insect that has 2 pairs of wings, the wings of which protrude from each other and are covered with microscopic coins that form a different colored image. The oral apparatus of mature insects is of a sucking type in the form of a spiral-twisted hose (with the exception of the primary moths, their oral apparatus is rodent). The worms are well developed: they have a head, rodent mouth organs, a worm-shaped body, 3 pairs of breasts, and 2 to 5 pairs of abdomen (false) legs. Pupa - is in closed shape [26].

The studies were conducted in Tashkent, Fergana and Surkhandarya regions (2014-2019) to determine the species composition of coin-winged pests of fruit trees in the habitats and route inspections. Determining which species the butterflies belong to was conducted on the basis of the literature. Conducted using leading experts in the field of general and agricultural entomology, as well as "Detectors". As a result, 57 species of coin wings were identified. By the nature of nutrition: 33 species gnawed the leaves, 13 species gnawed the roots and trunks of the seedlings, and 11 species infested the fruits. Summarizing all the above information, the following conclusions can be drawn.

1. A total of 57 species of moths associated with the food chain were found and identified in the three regions of the country during the initial stages of their development and active fruiting of fruit trees. Of these: leafhoppers - 20, *Agrotis exclamationis* - 16, worms and butterflies - 4, mountain moths - 3, thin-winged mining moths - 2; dwarf, round, hollow and hollow-winged moths, as well as wave-winged moths, cocoons, white butterflies and fragrant wood carving worms (*Cossus cossus* L) - from 1 species.

2. The occurrence of species identified as cocoon pests was 47 species in Surkhandarya region, 50 species in Tashkent region, and 44 species in Fergana region. In terms of nutrition, xylophages accounted for 22.8%, phyllophages for 57.9%, and carpophages for 19.3%.

Depending on the damaging nature of the insect can be divided into the following groups: xylophages - pests of tree trunks and branches, phyllophages - pests of leaves, as well as carpophages - fruit-dwelling - fruit-eaters [27]. The trunks and branches of fruit trees are damaged by the following pests: **(***Synanthedon myopaeformis* Bokh., (*Aegeria myopaeformis* Bokh.) [28], it is monophagous - mainly infecting the apple, sometimes even at the pear. The worms form pathways under the upper layer of the bark on the body and skeletal branches, disrupting the conductive tissues of the plant body [29]; and, *Cossus cossus* L, The surface of the seedlings and fruit trees - fragrant wood carver (*Cossus cossus* L.), [30], especially damages the pear tree. The worms feed under the bark and inside the trunk. Strongly

perforated tree trunks or some branches will dry out. The female of the fragrant wood carver is a large butterfly (65-90 mm spread wing). The eggs are oval, light brown, with a longitudinal black stripe, the length of the worm is 80-100 mm, and the dome is 30 mm, dark brown, located on the cocoon [31].

This group of insects belongs to the family *Noctuidae*, the worms live in the soil and feed on the underground or root part of various plants. Root rodents are pests of seedlings preparing for bud grafting in nurseries. The root portion of seedlings and saplings of fruit trees can be damaged by a number of different insects (calf beetle larvae, root-eating rodents, etc.). Insects of *Noctuidae*, a root-eating rodent from soil-dwelling pests, are important in the nursery [2-7]. Data on root-eating rodents are varied and they are sufficiently studied, but pests of young seedlings of fruit trees have not been adequately described. Only in the middle of the last century abroad, and in our country a number of works were published [10, 13, 18].

All methods of plant protection can be used in the implementation of a coordinated plant protection system: agrotechnical and biological, biologically active substances, the use of sex sterilizers as well as pesticides based on modern predictions. The main task of the system of protection of orchards from pests is to maintain the quality and quantity of the crop grown by reducing the use of pesticides through the high use of pesticide-free technologies. They are as follows: organizational-economic, agrotechnical, physico-mechanical and biological protection methods.

Biologically active substances are being tested to protect fruit trees from coin wing and other alike pests. They contain juvenioids - substances that affect the physiological function of arthropods - dimilin, nomolt, rimon, etc.

A pheromone trap is attached to the trees where the sex pheromone of the apple orchard is placed. An entomological adhesive grease that does not dry out for a long time is applied to the bottom of the pheromone trap. A rubber capsule soaked in a synthetic substance (a pheromone that mimics the smell of a female) is placed in it. It attracts pest males to the trap and forces them to stick to the sticky surface. In plant protection, a pheromone trap can be used to control some pests. There are 2 ways to apply this measure in practice: by the method of mass capture of butterflies ("Male vacuum") and by disorientation of butterflies, saturating the protected environment with the pheromone odor of the target insect. Consequently, VA Zakharenko [3] reported that the method of disorientation of oriental male fruit pest in peaches ripening at different times in orchards is effective.

In our research conducted in 2016-2018, many *Agrotis exclamationis* species can be found in the nursery area. However, the most common among them are autumn (*Agrotis segetum*) and *Agrotis exclamationis* (*A. exlamationis*). The biology and harmfulness of these two types of root rodents have been studied by many researchers [12, 17, 22]. Both pests overwinter during the adult worm season; in the spring it sprouts and from it butterflies fly out and lay eggs on the root parts of plants and elsewhere. The worms that hatch from the eggs penetrate the upper layers of the soil and begin to feed. In a year, the Agrotis segetum Schiff gives 4 generations, and the *Agrotis exclamationis* gives 2 generations (Table 1).

Table 1. Species ratio of root-gnawing nematodes detected in grafted seedlings in different regions, % (2016-2018).

#	Found species of rodents	Data collection	Total collected worms	Of these by types	
				pcs	%
Fergana region, Uzbekistan district					
1	Autumn night	May 17-20, 2016	103	73	70.9
2	Exclamation point			23	22.3
3	Moth S – black			4	3.9
4	The rest of the species			3	2.9

Surkhandarya region, Sherabad District					
1	Autumn night	May 10-12, 2018	79	55	69.6
2	Exclamation point			15	19.0
3	The root is dark gray			4	5.1
4	The rest of the species			5	6.3

The results of years of research in different regions of Uzbekistan show that Table 2 shows that in the Uzbek district of Fergana region, grafted seedlings of seeded fruits are strongly affected by *Noctuidae*. Infected plants were identified in 63% of the total sown area (3.2 ha). Of these, 21.8% of the area was severely damaged, 40.6% - moderately and 37.5% - weakly. In Surkhandarya region, the damage was slightly weaker than in Fergana region, and in Tashkent region it was even weaker.

A pheromone trap was prepared and placed in the seedlings growing seedlings of fruit trees once every 5-6 days in the evening, i.e. at night (30-40 m apart) and brought to the field shed in the morning. The rubber dispenser-capsule was replaced once every 30 days, and the adhesive pad - when it became dirty. The results of the calculations and observations are given in Table 3, which shows that by the third decade of April, the butterflies begin to fly, and it increases in mid-May, and then subsides.

This indicates that the first generation of the insect completes its development and the second begins. Under conditions of pheromone trapping, the flight of autumn nocturnal butterflies is not high, ie if 5-6 pheasants are caught per night on 1 pheromone trap, then biological control is absolutely acceptable, for which the ovary - Trichogramma Trichogramma pint.

Table 2. Infestation of grafted plants by root rotting beetles in different regions of Uzbekistan (Field observations, 2016-2018).

Surveillance area	Damaged area		From this					
			Strong		Average		Weak	
	ha	%	ha	%	ha	%	ha	%
Fergana region, Uzbekistan district	3.2	63	0.7	21.8	1.3	40.6	1.2	37.5
Surkhandarya region, Sherabad district	1.9	47	0.3	15.8	0.7	36.8	0.9	47.4
Tashkent region, Okhangaron district	2.2	13	0	0	0	0	2.2	100

Chemical protection method involves the use of synthetic pyrethroids in chemical protection to protect agricultural plants from pests. A local method of chemical protection has been tested, according to which an aqueous emulsion or suspension of the test drug is injected into the root system of the plant according to the condition of the plant. The purpose of this method is to provide protection of seedlings by destroying worms in the root zone of the plant. The experiment was conducted in the fields of Tashkent region (Akhangaron district) in 2017-2018. The concentration of the working fluid was prepared as follows: the norm of the drug per hectare was dissolved in 1000 l of water and consumed per hectare (Table 3).

Table 3. Flight of autumn moths by pheromone traps at the beginning of vegetation (Field experiments, 2017).

#	Monitoring work	Total number of butterflies caught on 3 handles in 1 night , pcs								
		April		May						June
		21	27	2	8	14	20	25	30	6
1	Baghdad district, Fergana region	7	5	19	27	61	58	23	19	12
2	Qibray district, Tashkent region	Account date :								
		18	24	6	10	16	22	28	-	7
		The total number of butterflies caught on 3 handles in 1 night , pcs								
		6	17	18	34	58	44	51	24	7

The experimental results are presented in Table 4. The duration of the protective effect at the topical application of insecticides against root rodents was 30 days. Thus, in a study conducted in May 2017-2018, the following drugs against root rodent Detsis, 2.5% k.e at a rate of 0.07 l / ha, 91.4% on 5 days of treatment, 100% on 28 days, Cypermethrin , When applied at a rate of 0.03 l / ha at 25% k.e., 100% efficiency was achieved in 5 days of treatment and 91.2% in 28 days.

Cossus cossus L. is a herbivorous insect belonging to the family (*Cossidae*). It harms many fruit trees, but is clearly fond of pears; from forests and ornamental trees: willow, poplar, birch, aspen and others. As they feed under the bark and in the trunk of the tree, the worms damage the conducting systems, paving the way for infection and secondary insects, which ultimately leads to the drying up of the tree.

Table 4. Biological efficiency of chemical protection of seedlings from autumn nightfall by topical application of insecticides (Field experience, May 12-15, 2017-2018).

Insecticides tested (options)	Working fluid concentration , %	Average number of worms per m2 of the nursery, pcs	Effectiveness on control days, %			
			5	12	19	28
Sumi - alpha , 5% k.e. (esfenvalerate)	0.04	1.7	78.4	96.1	100	100
Detsis , 2.5 % k.e. (deltamethrin)	0.07	2.2	91.4	100	100	100
Cypermethrin , 25 % k.e. (cypermethrin)	0.02	0.9	84.2	96.2	98.2	87.9
Cypermethrin , 25 % k.e. (cypermethrin)	0.03	1.6	100	100	100	91.2
Tsiperfos , 55% k.e. (cypermethrin + chlorpyriphos)	0.1	1.4	82.2	100	100	93.9
Tsiperfos , 55% k.e. (cypermethrin + chlorpyriphos)	0.15	3.2	100	100	100	100
Control (untreated)	-	2.1	***Density of worms, pcs/m²***			
			3.6	4.2	3.1	1.7
EKF $_{05}$			3.4	0.9	0.4	2.2

It is a large insect, the butterflies reach 65-70 mm when they spread their wings, and the females are larger 75-90 mm. The worms reach a length of 90 mm, pink in young, and then brown - red, with a black head. The pupa is up to 30 mm long, dark brown, located on a spider's web inside the gnawing body. The whole development process of the worm takes place inside the wood and it lasts long enough; overwinters as a one- or two-year-old worm. In the spring, the worms swarm near the hole near the outside. In our conditions, the flight of fragrant wood carving worms (*Cossus cossus* L) butterflies is usually observed in May and lasts for more than 1 month. Each female lays between 300 and 1,000 eggs in cracks and other damaged areas of tree bark. The worms that hatch from the eggs live in groups under the bark until the spring of the following year, after which each of them separates and penetrates deep into the trunk of the tree, where it spends the winter. Phenological calendar of observations in the orchards of the experimental farm of Tashkent State Agrarian University in Qibray district of Tashkent region for 2017-2018.

It has been found that odorous wood carving worms can withstand sufficiently low ambient temperatures and do not die. These results are consistent with the data. Investigations into the infestation of fruit trees in the country with fragrant wood carving worms (*Cossus cossus* L) revealed that this species feeds on more than 10 fruit trees (Table 5).

Table 5. Fruit trees infested with stinky wood borer

Fruit tree species		**Level of damage**
English name	**Latin name**	
Walnut	*Juglansregia* L.	+ *)
Apple	*Mallusdomestica* Bornh .	+ +
Peach	*Prunus persica* L.	+ +
Pear	*Pyruscommunis* L.	+ + +
Plum	*Prunus domestica* L.	+ + +
Apricot	*Armeniaca vulgaris* L.	+
Quince	*Cydonia vulgaris* Pers.	+
Cherry	*Prunuscerasus* L.	+
Almond	*Amygdalis communis* L.	+
*) +++ - severe damage, ++ - moderate damage, + - weak damage.		

Data show that apples, peaches, pears and plums are the most affected. The texture of the trunks of these fruit trees is relatively loose. In Central Asian conditions, trunk pests develop not only in weakened but also in absolutely healthy trees. Fragrant wood carving worms (*Cossus cossus* L) worms damage the lub-fiber tubes and disrupt the movement of the sap. Apple, pear and peach trees are damaged to almost the same extent (average 11.6-12%) by fragrant wood carving worms (*Cossus cossus* L).

The strongest affected trees are in Boka district (20-14.9-17.6%, respectively); the weakest damage (8-8.9-9.8%) was registered in the territory of Qibray district. The results of the study of the prevalence of the pest on the most common fruit trees (apple, pear and peach) in the Tashkent region are presented in Table 6.

Table 6. Stinky wood borer in farms of Tashkent region (Field observations, 2017-2018).

ti	Amount of trees									Dead and dying trees					
	Apple			Pear			Peach			Apple		Pear		Peach	
	*)	Z	%	O	3	%	O	Z	%	#	%**)	#	%	#	%
Boka	50	10	20	47	7	14.9	51	9	17.6	2	4	1	2.1	2	3.9
Yangiyul	50	5	10	46	6	13	50	5	10	2	4	1	2.2	1	2
Yukori Chirchik	50	5	10	46	6	13	54	6	11.1	3	6	1	2.2	2	3.7
Bostonlik	50	6	12	47	6	12.8	52	6	11.5	2	4	0	0	2	3.8
Kibray	50	4	8	45	4	8.9	51	5	9.8	2	4	0	0	1	2
Average	-	-	12	-	-	12	-	-	11.6	-	4.3	-	1.5	-	3.2
Total	30	36	-	275	33	-	310	-	-	1	-	4	-	1	-
*) O is the number of trees observed, pieces, Z is the number affected, and **)% - relative to the total number observed															

Drying of the tips and trunks of trees was observed on average (3% in apples, 1.4% in pears and 2.2% in peaches). These data indicate the high harmfulness of fragrant wood carving worms (*Cossus cossus* L) and the ineffectiveness of protective measures carried out in the field. Monitoring of the object under study during these years, it was studied that in six districts of Surkhandarya region, fruit trees were infested with fragrant wood carving worms (*Cossus cossus* L). According to the study, fruit trees are seriously affected by the pest: an average of 13.3% in apples, 11.7% in pears, and 9.9% in peaches. In the territory of Termez district, trees are more damaged than on other lands (16-14.9-7.5%, respectively, for fruit trees). Dried and withered trees accounted for 2-4% of apples, 0-2.2% of pears and 0-3.8% of peaches Table 7.

Table 7. Infestation of fruit trees by stinky wood borer in farms of Surkhandarya region districts (Field observations, 2018-2019).

Districts	Amount of trees									Dead and dying trees					
	Apple			Pear			Peach			Apple		Pear		Peach	
	*)	Z	%	O	Z	%	O	Z	%	#	%	#	%	#	%
Den hunt	50	7	14	48	6	12.5	55	6	10.9	2	4	1	2.1	2	3.6
Jar fortress	50	6	12	46	5	10	53	6	11.3	2	4	1	2.2	1	1.9
Term trace	50	8	16	47	7	14.9	53	4	7.5	2	4	1	2.1	2	3.8
Hangar	50	7	14	45	5	11.1	54	5	9.3	1	2	1	2.2	1	1.9
Muzrobod	50	6	12	46	5	10.9	55	6	10.9	1	2	0	0	1	1.8
Boys	50	6	12	47	5	10.6	53	5	9.4	1	2	0	0	0	0
Average	**-**	**-**	**13**	**-**	**-**	**11.7**	**-**	**-**	**9.9**	**-**	**3**	**-**	**1.4**	**-**	**2.2**
Total	**30**	**40**	**-**	**27**	**33**	**-**	**32**	**32**	**-**	**9**	**-**	**4**	**-**	**7**	**-**
*) O is the number of trees observed, pieces, Z is the number affected, and **)% - relative to the total number observed															

To study the possibilities of insecticide control through the root system of the tree against fragrant wood carving worms (*Cossus cossus* L), 3 infested trees were selected in each variant; (Table 8). Under them (at a distance of 1 m from the trunk) a rectangular pit was dug

to a depth of 40 cm, to which was poured 10 l of working fluid of the insecticide, and then buried.

Table 8. Biological efficacy of topical application of systemic insecticides against stinky wood borer (Akhangaron district, 2018-2019).

Options (used systemic insecticides)	Working fluid concentration, %	Method of a dministration of the drug	Signs of the presence of worms in trees , pcs			Efficiency, %
			After 1 month	After 4 months	After 12 months	
Camelot, 20 % etc. (acetamiprid)	0.02	The working juice of the emulsion was poured into the root system under the tree from 10 L)	In the trees no change was observed	The condition of the trees has improved	7.8 young worms per tree	36.6
Camelot, 20 % etc. (acetamiprid)	0.05				it was found that there were 2.9 young worms per tree	76.4
Danadim, 40 % k.e. (dimethoate)	0.2					
Danadim, 40 % k.e. (dimethoate)	0.3				It was found that 3.2 young worms were present in 1 tree	73.9
Control (unprocessed)	-	-		The condition of the trees has deteriorated	It was found that 12.3 sub-years were present in 1 tree	-

Follow-up of insecticide effects was performed after 1, 4, and 12 months. Camelot, which is characterized by an excellent systemic effect for the experiment, has a 20% n.k. and danadim, 40% e.k. insecticides were selected. From the results obtained, it can be seen that the best results were recorded in the variants with increased drug concentration: camelot - 0.05% and danadim - 0.3%. Therefore, these options were recommended for practical application in the protection of individual trees in individual gardens. The second way to protect individual trees infested with trunk pests is to pour the insecticide's working fluid into the infested hole in the path of the pest worm. In practice, this should be done using large-volume syringes or rubber balloons, which has also been reflected in our experiments (Table 9). In the experiment, 6 variants of control were tested. Studying the experimental results 1, 4 and 12 months after treatment showed that in this method, after some time, the trees damaged by the fragrant wood carving worms (*Cossus cossus* L) healed, the general condition of the tree improved.

In general, the studied insecticides and their consumption variations turned out to be acceptable, and it is advisable to use at concentrations of detsis-0.05%, confidor-0.03%, dimilin-0.05%. The third method of research tested spraying the working fluid of insecticides on trees during the flight of butterflies and laying eggs, so the flight of this insect was observed once a year, mainly in May. Treating trees once or twice at the beginning of the season can eliminate damage with fragrant wood carving worms (*Cossus cossus* L).

Table 9. Efficacy of topical cast against odorous woodcarver in Okhangaron district (5 trees in options, July 12, 2019).

Variants (used systemic insecticides)	Working fluid concentration, %	Preparation	Signs of the presence of worms in trees :			Summary
			After 1 month	After 4 months	After 12 months	
Detsis, 2.5% e. k. (deltamethrin)	0.05	It was poured into the affected hole in the body using a syringe or a syringe (from 20 to 100 ml) and covered with a cotton swab.	Young worms died	The condition of the trees has improved	No juvenile worms were found	The method can be applied practically
Detsis, 2.5% e. k. (deltamethrin)	0.1					
Confidor, 20% e. k. (imidacloprid)	0.03				2-3 worms were found in the trees	
Confidor, 20% e. k. (imidacloprid)	0.06				No worms found	
Dimilin, 48% d.c. (diflibenzuron) .	0.05					
Dimilin, 48 % s.k. (diflibenzuron).	0.1					
Control (unprocessed)	-	-	The condition of the trees has not changed, the worms are alive	The condition of the trees has deteriorated	Withered trinity, trees began to wither	-

4 Conclusions

In general, the studied insecticides and their consumption variations turned out to be acceptable, and it is advisable to use at concentrations of detsis-0.05%, confidor-0.03%, dimilin-0.05%. The third method of research tested spraying the working fluid of insecticides on trees during the flight of butterflies and laying eggs, so the flight of this insect was observed once a year, mainly in May. Treating trees once or twice at the beginning of the season can eliminate damage with fragrant wood carving worms (*Cossus cossus* L).

Fragrant wood carving worms (*Cossus cossus* L) gives high efficiency when treated twice with insecticide during the flight of butterflies and egg laying. Based on the above, the following conclusion can be drawn.

1. The main types of *Noctuidae* that gnaw the roots of seedlings in the saplings of fruit trees: *Agrotis segetum* Schiff and *Agrotis exclamationis* (69.8-70.9%).

2. In protecting seedlings and grafts from root rodents sumi-alpha, 5% e.c., at a concentration of 0.04% detsis-0.07%; tsipermetrin-0.03% and tsiperfos-0.1% by local-topical application of working fluids of the following insecticides gave good results.

3. The scope of development of the fragrant wood carver is completed in the third year of its life. The trunk and skeletal branches of apples, pears, plums and peaches are most severely damaged. Damage to untreated trees reaches an average of 11.6-12.0%. Drying of the tops and drying of the trees were observed in more apples (4.3%), less peaches (3.2%) and less

peas (1.5%). It was found that the body diameter of the affected trees decreased by 29.2-32.5% compared to the uninfected ones.

4. Positive results were obtained from the protection of trees damaged by fragrant wood carving worms (*Cossus cossus* L) in 2 ways: 1 - Poisoning with systemic drugs (camelot, danadim) through the root system; 2 – topical poisoning by placing an insecticide buffer in the path of the worms (detsis - 0.1%, confidor - 0.06%, dimilin - 0.05% concentrations).

5. Insecticide-acaricidal mixtures during the flight of butterflies (May) to prevent damage to trees by fragrant wood carving worms (*Cossus cossus* L)s and alike pests: dalmetrin (0.05%), atilla (0.05-0.1%), bagira (0.05%) and 2 treatments with other insecticides were recommended.

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