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Distribution of cutworms in vegetable crops, their harm and the effectiveness of insecticides tested against them

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Abstract

In this article, from the tunnels that infect the underground part of vegetable crops: turnip moth (*Agrotis segetum* Den.et Schiff), cut worm (*A. exclamationis.* L.), turn black-C (*Xestia c-nigrum* L.), wild turn (*Euxoa agricola* V.), gamma turn (*Mamestra suasa* Schiff.), tobacco turn (*Agrotis obesa* B.) and epsolon turn (*A. ipsilon* Rotl) encounter was detected. Underground cutworms damage to tomatoes is estimated at 6-10% in Navoi, Bukhara and Khorezm regions, 12-20% in the Republic of Karakalpakstan and Surkhandarya, Jizzakh and Syrdarya regions, and 20% in other regions such as Samarkand, Kashkadarya, Andijan, Fergana and Namangan. Up to 31% of underground tunnels were found to be damaged. The damage of the aboveground part cutworms was determined by 18% in Navoi, 15% in Jizzakh, 15-18% in Bukhara and Khorezm regions, 12-15% in Sirdarya, Surkhondarya, Karakalpakstan, 25-30% in the remaining regions. Against worms of months in tomatoes, Deltasis, 2,5% concentration of emulsion (deltametrin), 50% concentration of emulsion in Kurarfon (Profenofos) and Torpedo Jet, 14% soluble powder (Indoxicarb+emamectin benzoate), 2,5% concentration of emulsion in Defentox (deltametrin), when their preparations were tested, 87-93% efficiency was achieved. Contraindications: the drug Kapito 9,3% suspension concentrate (Chlorantraniliprol) is used on the account of 0,45 l/ha to 89,5%, the drug Emafos 42% soluble powder (emamectin benzoate +chlorpyrifos) to 0,6 l/ha. When used on account of 91, 3%, Koragen, 200 soluble powder (chlorantraniliprol) preparation, when applied to 0,2 l/H, 91,6% efficiency was achieved

Keywords: Tomato; Above-ground pest; Turnip moth; Bollworm; Damage; Yield; Efficiency

1. Introduction

One of the most pressing issues today is that agriculture in our country is aimed at improving the living conditions of the population in a market economy, as well as protecting the environment. In particular, the basis of the agrarian policy pursued in the Republic is to bring the country to the level of highly developed countries in terms of production and consumption of agricultural products per capita.

Presidential Decree No. 4947 of February 7, 2017 "On the Action Strategy for the further development of the Republic of Uzbekistan" developed the "Action Strategy for the five priority areas of development of the Republic of Uzbekistan for 2017-2021", which protects agricultural crops from pests and diseases. the development and implementation of protection measures have been identified as priorities.

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Further strengthening food security in the country, expanding the production of environmentally friendly products, significantly increasing the export potential of the agricultural sector, reducing the area under cotton and cereals, creating vegetable and potato varieties resistant to disease and pests in the vacant lands. , the expansion of research work on the introduction of environmentally friendly methods of pest control is one of the most pressing issues today.

Today, more than a few thousand species of arthropods have been identified in agricultural crops. In particular, in Uzbekistan, many agricultural crops are damaged by many different rodents and sucking pests. About 10 of them cause serious damage to turpentine and about 5 to cucumber. Among the rodent pests: the root rodent cutworm (*Agrotis segetum* Den. Et Schiff) and the bollworm (*Helicoverpa armigera* Hbn.) And other underground and aboveground pests have been reported to cause serious damage in the literature [1; 2].

According to scientific studies conducted by some researchers, turnip moth (*A. segetum* Den. Et Schiff) is one of the most common pests in irrigated cotton-growing areas. Its worms damage hundreds of crops belonging to a family of 34 plants. Cotton, alfalfa, sugar beet, corn, wheat, oilseeds, and apolysis crops, as well as ivy, wild coconut, sorghum, and the most popular foods of the turnip moth [3; 4; 5].

When the A.Khudoykulov and O.Pulatov [6] studied the species composition of Root rodent cutworms wintered in various fields, it was determined that 68.2% of the cutworms wintered in vegetable planted areas constitute turnip moth, 21.2% exclamation cutworms, 10.6% and other root rodent cutworms.

Bollworm – *Helicoverpa armigera* Hbn In addition to cotton, tomato is one of the most serious pests in Uzbekistan. All (3-4) joints of the pest can develop in this crop. The pest lays its eggs individually on the stems, flowers and nodes of the plant. The worms that hatch from the eggs enter the plant by eating the stems, flowers and fruits. The damaged crop dries up, and the large ones rot. In some cases, damaged large fruits do not rot, but may form a scar, but the quality and appearance of the product are lost [7; 8].

2. Material and methods

The research was conducted at the farm "Sevara brand style" in Qibray district and RIVMCP in the fields planted with tomatoes, as well as in field surveys throughout the country.

Work was carried out to control the cutworms in tomatoes, which were planted on vegetable farms. To do this, 5 of the 10 locations of the field were taken along three parallel directions of the plant dive.

2th indicator was taken as the basis for the calculation of cutworms.

- Degree of plant damage.
- Its density when damaged.

The degree of damage is determined by determining how many of each 100 plants are damaged (5 of 10 places of each dive were taken depending on the plant). The intensity of the insect was also determined by 2 indicators, through which the biological effect was determined. a) The Entomological net was used in calculating the density of pest. From 4 places of the square was moved 25 times, calculated according to the formula below.

$$X = \frac{W}{2R \times L \times N};$$

Here: W – total number of insects; R – radius of the net, m; L – the average length of the roundness of the net; N – number of moves.

Scientific research has been conducted to determine the biological effects of anti-cutworm chemicals. Most of the chemical processing was carried out using a motorized suspension arm apparatus. Insect counting was carried out on days 1, 3, 7, 14 and 21 before and after spraying. The effectiveness of the chemicals was calculated using the Abbot's formula [9, 10].

$$BE = \frac{Ab - Ba}{Ab} \times 100;$$

Here: *BE* - biological efficiency, %; *A* – the number of pests before spraying in the experiment, pcs; *a* - this is also the number of days after spraying, pcs; *B* – the number before spraying the drug in the control variant of the pest, pcs; *b* – this is also the number of days after spraying, pcs.

3. Results

In the course of our directional observations, it was studied that several species of pests (cutworms) found in tomato crops in the regions of the country are developing, causing serious damage to the quality and quantity of crops, the extent of their distribution (strong or weak). Among them are: from tunnels that damage the underground part of the tomato was detected: turnip moth (*Agrotis segetum* Den.et Schiff), cut worm (*A. exclamationis* L.), turn black-C (*Xestia c-nigrum* L.), wild turn (*Euxoa agricola* B.), gamma turn (*Mamestra suasa* Schiff.), tobacco turn (*Agrotis obesa* B.) and epsolon turn (*A. ipsilon* Rotl).

In vegetable (tomato) crops from the cutworms damaging the upper part of the land, there was a trace of bollworm (*Helicoverpa armigera* Hbn), metallic turn (*Pusia chrysitis* L.), gamma turn (*Autographa gamma* L.), alfalfa turn (*Heliothis viriplaca* Hufn).

The monitoring, in which the cutworms are distributed throughout the Republic, is presented in the first picture. Here: mostly turnip moth in tomato crop (*Agrotis segetum* Den. et Schiff), bollworm (*Helicoverpa armigera* Hbn) was strongly developed (dominant species). Cut worm (*A. exclamationis* L.), metallic turn (*Plusia chrysiti* L.), turn black-C (*Xestia c-nigrum* L.) and wild turn (Euxoa agricola V.) the average prevalence was observed. Gamma turn (Autographa gamma. L), alfalfa (*Heliothis viriplaca* Hufn), gamma turn (Mamestra suasa Schiff.) and tobacco turn (Agrotis obesa B.) it was determined that the weak spread.

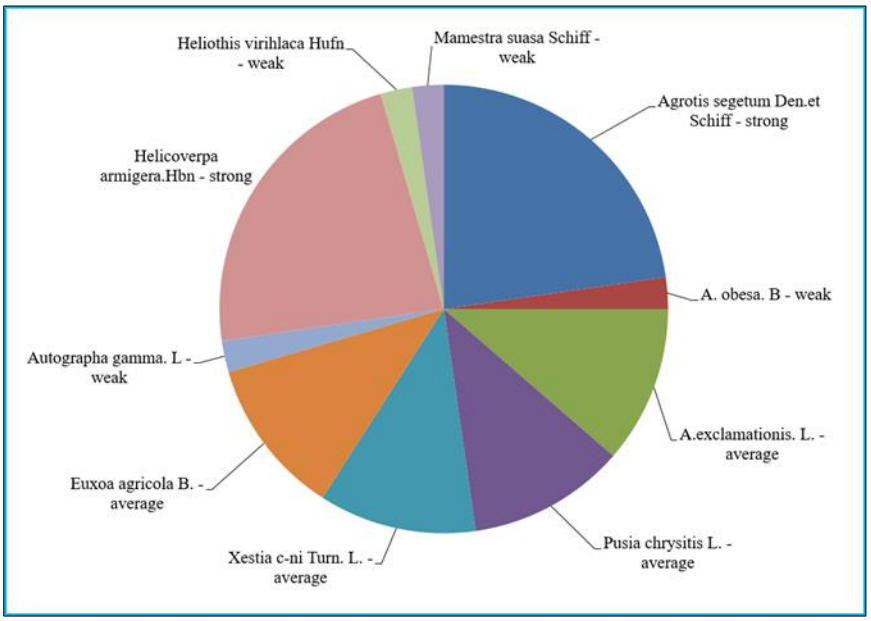


Figure 1 Prevalence rate of cutworms in the regions of the Republic in 2019 -2020 years

In 2019-2020, our directional observations were carried out on the development of aboveground and underground part cutworms in vegetable crops and the percentage of damage in vegetable crops of the Republic on farms specializing in vegetable growing.

These observations were carried out in cooperation with the branches of the Research Institute of vegetable, melon crops and potato in the regions of the Republic. The damage of underground part cutworms to tomatoes was analyzed on the basis of a comparison with the area in which vegetable crops were planted and treated against pests. According to the analysis of our observations, the damage of underground cutworms was confirmed in Navoi, Bukhara, Khorezm regions up to 6-10%, in the Republic of Karakalpakstan and Surkhandarya, Jizzakh, Sirdarya regions up to 12-20%, in the remaining regions - Samarkand, Kashkadarya, Andijan, Fergana and Namangan up to 20-31%. The results of the experiment are presented in Figure 2.

In the vegetable (tomato) crops grown in all regions of the Republic, the distribution area and the damage of the bollworms were observed more often than in other cutworms. Here: 18% in Navoida, 15% in Jizzakh, 15-18% in Bukhara, Khorezm regions, 12-15% in Sirdarya, Surkhandarya, Karakalpakstan , 30% in Samarkand, 22% in Fergana, 25% in Andijan and 30% of tomato crops in Tashkent and Namangan regions were infected with bollworm (Figure 3).

The night of the bollworms eggs from one to one, and in some cases two to the point of growth of the tomato, which basically entered in the tomato. 1-year-old worms from eggs were first fed with young leaves at the point of growth of the plant, later 2-3-year-olds damaged the germination and flowering, worms in the older age were observed to damage the fruit.

We conducted lysimeter experiments on the study of the harm caused by the night of bollworms in tomatoes in Uzbekistan-178 varieties of tomatoes. Artificially infected plants with pests were dripped with a cloth on nets (so as not to be infected with other insects).

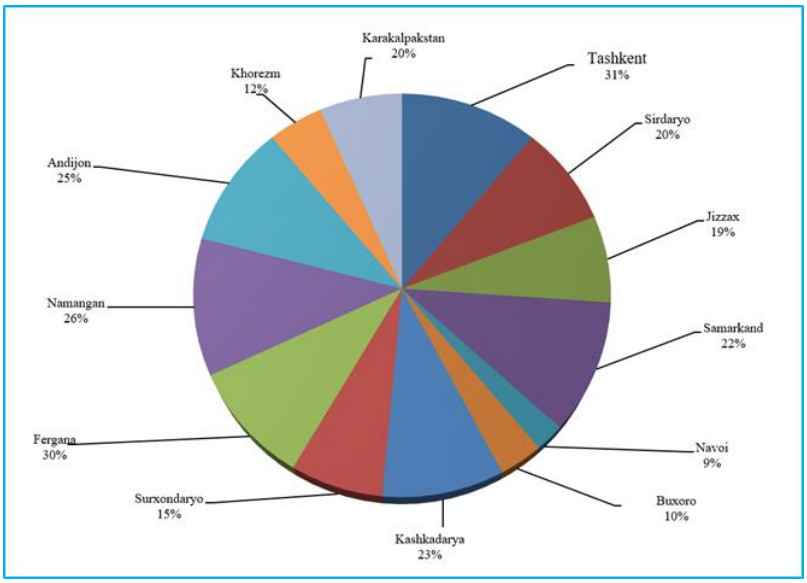


Figure 2 In the Republic of Karakalpakstan and in the regions in 2020, the damage of underground (turnip and cut worm) cutworm in tomatoes

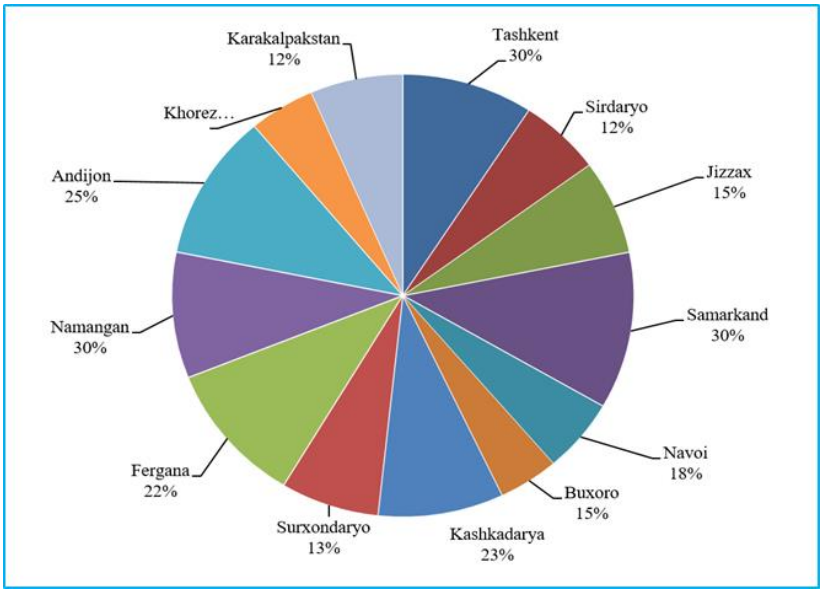


Figure 3 In 2020, the Republic of Karakalpakstan and the regions will be affected by bollworm

During the flowering and fruiting periods of the plant, the first young worms of 3 nightshades were placed in 3 cutworms and the control variant plant was left without pests. It was observed that the laid young worms begin to infect the leaves and growth points and stems of tomatoes.

Damaged stems and flowers began to wither, and the damaged fruits rotted under the influence of fungi and bacteria. The results of the experiment are presented in Table 1. It is seen from this table that during the flowering period of tomatoes in the variant infected with pest worms, it was found that the yield of tomatoes decreased by 73, 3% compared to control. In the total yield obtained, an average reduction of 2, 15 kg was determined in each plant. In the case of a variant infected with a bollworm during the fruit ripening period, 53, 3% decrease in the yield compared to the control was observed, with an average loss of 1, 4 kg of yield in 1 bush plant was observed as a result of experiments.

Table 1 The harm of bollworms to the yield of tomatoes (in the lysimeter 2019-2020)

№	**Tomato variety**	**Period of growth of pests**	**Repea-tability**	**Yield from 1 bush plant, kg**	**Lost yield relative to control**	
					kg	**%**
1	Uzbekistan - 178	flowering	1	0.8	2.2	73.3
			2	0.9	2.1	70.0
			3	0.8	22	73.3
	Average		-	0.83	2.15	72.2
2	Uzbekistan - 178	fruit ripening	1	1.5	1.5	50.0
			2	1.4	1.6	53.3
			3	1.3	1.7	56.6
	Average			1.4	1.6	53.3
	Control		-	3.0	-	-
	LSD $_{05}$			1.2		

This indicates that there are specific difficulties in the development of methods and tools to combat bollworms. One of the reasons for this is that the worms that hatch from the pest's eggs enter the tomato fruit. This, in turn, can reduce the biological effectiveness of the insecticides used. Therefore, we found it necessary to use drugs that have a systemic effect on bollworms.

We conducted experiments against this pest using drugs that belong mainly to the group of modern synthetic pyrethroids and neonicotinoids. Fragments not treated with insecticides served as controls. The sample was obtained Avaunt, a 15% concentrate emulsion preparation that gives good results against pest worms. The experiments were conducted in Tashkent region. The results of our research are presented in the table.

At the same time: 86,0-89,5% biological efficiency was obtained on days 3-7 when Kapito 9,3% suspension concentrate was used at a rate of 0,45 l/ha. When Emafos 42% soluble powder was used at the rate of 0,6 l per hectare, the biological efficiency was achieved at 90,2-91,3%, while at the application of 0,8 l/ha in the second variant, the biological efficiency was 90,9-92,8%. Koragen, a 200-soluble powder preparation, was effective at 89,7-91,6% when applied at 0,2 l/ha.

Table 2 The harm of bollworms to the yield of tomatoes (in the lysimeter 2019-2020)

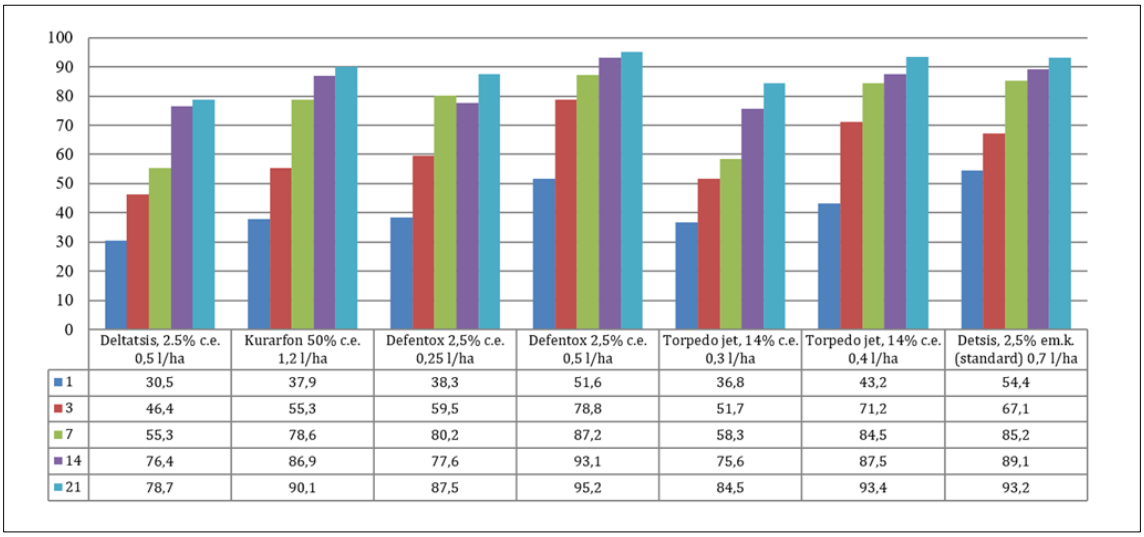
Options	Consumption amount, l/ha	impacting substance	Number of pests	Biologically effective days,%			
				1	3	7	14
Capito 9,3% EC	0.45	*Chlorantraniliprol*	11.3	86.0	88.0	89.5	87.0
Emafos, 42% EC	0.6	*Emamectin benzoate + chlorpyrifos*	9.1	86.7	90.2	91.3	87.8
Emafos, 42% EC	0.8		8.3	88.8	90.9	92.8	89.5
Koragen 200 EC	0.2	*chlorantraniliprol*	9.5	87.3	89.7	91.6	87.7
Avaunt, 15% EC (standard)	0.45	*Indoxacarb*	9.8	85.8	89.3	91.2	88.2
Control(no-treatment control)	-	-	8.6	-	-	-	-
LSD $_{05}$			2.2				

Research work was carried out in the Tashkent region in 2019-2020 to determine the optimal norms and regulations (regulations) for the use of chemicals belonging to different groups of turnip moth worms in tomato plants and to determine their biological effectiveness against pests.

Laboratory experiments were carried out on small 1-2-year-old worms in the tomato plant under laboratory conditions, and the following drugs were selected for testing in field experiments from highly effective chemicals.

Field experiments in Tashkent region against tomato turnip moths (mainly young ones) Deltatsis, 2.5% EC (Deltametrin), Kurarfon 50% EC (Profenofos) and Torpedo jet, 14% WSP (water soluble powder) (Indoxicarb + emamectin benzoate), Defentox 2.5% EC (Deltametrine), the drugs were tested.

The following efficiencies were obtained from the chemical preparations tested in the field experiments: Deltatsis, 2.5% concentration of emulsion preparation 0, 5 l/ha. By the 14th day, 76, 4%, Kurarfon 50% EC, 1, 2 l/ha on the 14th day of the normal variant, 86, 9% efficiency was achieved. Defentox 2, 5% EC, when the drug is used at a dose of 0, 25 l/ha, the efficiency is 77, 6%, 0, 5 l/ha 93, 1% in the normal variant and 95, 2% on the 21st day. Torpedo jet, 14% WSP preparations 0, 3 l/ha at a consumption rate of 75, 6%, and on day 21, 84, 5%, 0,4 l/ha. In our experiments, it was found that on the 14th day the efficiency was equal to the standard variant, and on the 21st day the efficiency was 93,4% (Figure 4).



	Deltatsis, 2.5% c.e. 0,5 l/ha	Kurarfon 50% c.e. 1,2 l/ha	Defentox 2,5% c.e. 0,25 l/ha	Defentox 2,5% c.e. 0,5 l/ha	Torpedo jet, 14% c.e. 0,3 l/ha	Torpedo jet, 14% c.e. 0,4 l/ha	Detsis, 2,5% em.k. (standard) 0,7 l/ha
1	30,5	37,9	38,3	51,6	36,8	43,2	54,4
3	46,4	55,3	59,5	78,8	51,7	71,2	67,1
7	55,3	78,6	80,2	87,2	58,3	84,5	85,2
14	76,4	86,9	77,6	93,1	75,6	87,5	89,1
21	78,7	90,1	87,5	95,2	84,5	93,4	93,2

Figure 4 Biological efficacy of drugs used against turnip moth worms in tomatoes (Field experience, Tashkent region, 2019-2020)

4. Conclusion

Hence, in the experiments of 2019-2020, it was found that the predominant species in the tomato crop, the turnip moth (*Agrotis segetum* Den. et Schiff.) and the bollworm (*Helicoverpa armigera* Hbn) were strongly developed and damaged. The average development of cut worm (*A. exclamationis* L.), turn black-S (*Xestia c-nigrum* L.), wild turn (*Euxoa agricola* V.) and gamma turn (*Autographa gamma* L.) was confirmed in observations, while alfalfa turn (*Heliothis virihlaca* Hufn) weak distribution was detected.

Deltatsis, 2,5% EC (Deltametrin), Kurarfon 50% EC (Profenofos) against worms of autumn nightshade in tomatoes and Torpedo jet, 14% WSP (Indoxicarb + emamectin benzoate), Defentox 2,5% EC (Deltametrin), drugs, and against cotton bollworm: Kapito 9,3% SC (Chlorantraniliprol) preparations 0,45 l/ha, Emafos 42% WSP (Emamectin benzoate + chlorpyrifos) preparation 0,6 l/ha, Koragen, 200 WSP (chlorantraniliprol) preparations, 0,2 l/ha the expected result is achieved if applied to the account.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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