Planes of origin and bioecological development characteristics of tomato moth (Tuta Absoluta Meyr)

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Abstract: This article analyzes the literature on the origin and spread of the tomato moth (Tuta absoluta), which has been causing significant damage to the tomato crop in Uzbekistan in recent years, and provides information on scientific research on its development, damage, and countermeasures in Uzbekistan. In this, it is shown that it damages cultural crops and weeds belonging to a number of other ituzum family, and partially develops in them as well. According to the scientific research of foreign scientists, one female tomato moth lays up to 160-260 eggs when the air temperature is 300C. During the year, it was found that the pest gives up to 9-10 generations. According to our information, 300.9 eggs were laid in the air temperature of 25-30°C and 55-60% humidity, and 290.1 eggs were laid when the humidity reached 65-70%. During the year, 9-12 generations have been confirmed. When the level of damage caused by the tomato moth during the development of the plant was studied, it was observed that if the tomato is damaged during the seedling period, the plant dries up before reaching the flowering period, when the tomato is damaged during the flowering period, the tomato yield is reduced by 72.2%, and when it is damaged during the fruiting period, the fruits are reduced by 53.3%.

1 Introduction

Due to the increasing demand of the world population for food products, it is necessary to increase the production of agricultural products, especially the cultivation of vegetable crops, because today it has become the favorite product of everyone in the constant season of the year and is the leader in plants used for food consumption. took the place. In recent years, it has been shown how important it is to get a high and quality harvest from vegetable crops.Spreading of the main harmful organisms found in the tomato crop, which

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is the main vegetable crop, studying the bioecological development characteristics of introduced pests and determining the effectiveness of natural pesticides in reducing the number of pests, as well as giving an agrotoxicological assessment of new modern and highly effective tools. Also, scientific research aimed at further improvement of countermeasures is gaining importance.

In recent years, hundreds of types of harmful organisms have been found in vegetable crops. Among them, aphids, plant, arachnids, spider mites, and nematodes are serious pests and cause serious damage to agricultural crops. In addition, a new insect appeared in our republic 3-4 years ago, the Tomato moth - Tuta absoluta Meir causing significant damage to the tomato crop.

The tomato moth was first observed in 1970 in Bolivia, Paraguay and Uruguay, and later, in 1979, information was given on the spread of this pest in the South American state of Peru, the city of Lima, and in the south of the state of Paraná, Brazil [1].

S. Izhevsky and others [1-10] stated that the tomato moth is a dangerous pest and was not found in Europe until 2006. First in Spain (2006), then in Morocco, Algeria, and the Netherlands (2008), France, Italy, Portugal, and England (2009), and since 2010, it has spread throughout Europe.In November 2010 in the Krasnodar region of Russia, tomato moth was first identified by experts and included in the list of dangerous quarantine pests. By the end of 2011, this pest had spread to more than 30 European countries after being found in Spain. It has been noted by many scientists that the spread of the pest in the eastern border has passed through Iran, Russia, Ukraine, Belarus, and Lithuania, causing severe damage to crops belonging to the tomato family, causing 50-60% and in some years up to 100% yield loss.

G.A. Jarmukhamedova and V.A.Shlyakhtich according to the observations of [3], in 2015, the tomato moth was found in the border zones in Kazakhstan and entered into the quarantine list. With the introduction of tomato moth along with vegetable crops (potato, tomato, eggplant, sweet pepper) products, this pest began to spread in Kazakhstan and it was found that it started causing severe damage to vegetable crops (in open field and greenhouse).

According to L.H. Sargsyan, South America is the home of the tomato moth, and the tomato moth was detected in Armenia for the first time in 2012. Due to its strong adaptability, it has damaged many tomato farms throughout the Republic, especially in the Ararat Valley [6].

According to the scientific research of foreign scientists, female tomato moths lay their eggs in the upper part of the plant. Worms hatch in 4-6 days and live for an average of 2 weeks. In the absence of food, they go into diapause. It turns into a mushroom on the plant trunk or on the ground. The lowest temperature for the development of one generation is 9oC, and the duration is 29-38 days. This type of pest has a high biotic potential, the female lays up to 250-300 eggs if there is enough food, and gives up to 10-12 generations per year at a temperature of 25-30 °C. [7].

In some sources, it is stated that the caterpillars of the tomato moth can live by feeding on bean leaves. In Argentina, it has been found that it can develop by feeding on tobacco leaves and causing damage. After 1-2 days, the butterflies that emerge from the cocoon begin to mate. During the day, they sit in a sheltered place and move towards evening.According to the results obtained in laboratory conditions, the average number of offspring left by the female is 40.9±6.9 eggs. Butterflies lay one or more eggs on the leaves of the plant. In California, a scientific study was conducted on the development and survival of lycopersicella under the influence of temperature.

Favorable conditions for its development (in the determined indicators) were 10.2°C - 35°C. It was determined that the temperature for the general development of one generation is 454°C. In addition, when the density of the worm is high, the leaves look like they are burnt and the yield drops sharply. If 1-6 appear on one plant, the worm reduces the yield by 10-40% within 45 days [8].

Sh. Rawadshekh [6], in his research conducted in Jordan, observed that female moths lay one or two to five eggs on plant leaves and branches. He noted that one female lays up to 160-260 eggs when the air temperature is 300C. During the year, it was found that the pest gives up to 9-10 generations.

The purpose of the study: According to the information presented in the literature, the tomato moth is spreading in more than 100 countries, including Uzbekistan, causing great damage to the economy. Without studying the bioecological development characteristics of the tomato moth, it is impossible to develop scientifically based control measures against this pest.Relying on the sources mentioned above, it was aimed to conduct scientific research on the species composition, distribution, development characteristics of the tomato moth, and measures to combat them.

2 Research methods

Our experiments were carried out in experimental fields, laboratory and lysimeter at the scientific-research institute of vegetable and potato crops. A scientific study of the distribution of tomato moth was carried out according to the generally accepted method in entomology.Collecting samples from pests and studying the level of plant damage and statistical analysis of the obtained data were carried out by the method of B.D. Dospekhov. Accounting works of tomato moth Ya. Weiser [1] and V.M. Lukomets and others. [5] was conducted on the basis of methodological manuals.

An entomological comb was used to calculate the pest density.

Counting with a handkerchief was carried out in the afternoon (at 17-19 hours), when the butterflies of the tomato moth are active.The number of pests per 1 m² was calculated based on the formula of Sh. Khojaev [9].

$$X=W/2R\cdot L\cdot N$$

W - total number of insects;

R is the radius of the hair, m;

L is the average length of the hair circle, m;

N is the number of moves.

To determine the average number of pests per plant, 100 plants in the field were selected (5 plants from 20 locations), the total number of pests per plant was calculated and divided by the number of 100 plants. In studying the level of damage caused by pests, V.V. Tansky methodological manual was used.

In the open field, we conducted special experiments to study the damage caused by the tomato moth to the yield of different varieties.

A plant (Uzbekistan-178 variety of tomato) was grown in specially made boxes, fenced with small mesh nets so that it would not be damaged by another pest, and the damage caused by the pest was studied in this plant.

The results of the research showed that the first outbreak of the tomato moth in greenhouses in the Navoi and Bukhara regions of our Republic was found in 2015. In the

same year, in Zangiota and Qibray districts of Tashkent region, information was received about damage in greenhouses.In 2016-2020, during our fast-track observations, it was found that the tomato moth is really causing severe damage in Zangiota, Qibray, Yangiyol districts, and scientific research measures have been started in this regard.

We recorded the degree to which the tomato moth damages various plants in our targeted observations for 2018-2022 and conducted observations by artificially infesting plants in special experiments. According to our observations, the tomato moth mainly feeds and develops well on tomatoes and causes great damage. Our observations confirmed that the level of damage and development is moderate in potatoes.In eggplant, sweet pepper and black grape, the damage of tomato moth was almost not noticed, and it was found that the moth develops slowly in these plants. In Bangidevona and Physalis, the tomato moth could not develop at all, and therefore the laid worms began to move towards the lower part of the plant without feeding and did not develop in these plants (Table 1).

So, it was observed that the tomato moth mainly damages tomatoes, but it can also damage and develop in other crops and weeds belonging to the ituzum family.

Table 1. Plants affected by tomato moth

The name of the plant	Latin name	A moth's encounter	Average number of moths per plant
Tomato	*Solanum lycopersicum*	+ + +	4,2-7,4
Potatoes	*Solanum tuberosum*	+ +	2,3-4,7
Eggplant	*Solanum melongena*	+ +	2,2-4,6
Sweet pepper	*Capsicum annuum*	+	1,0
Black ituzum	*Solanum nigrum*	+	1,0
Bangidewona	*Datura stramonium*	-	-
Physalis	*Physalis angulata*	-	-
Beans	*Solanum sisymbriifolium*	-	-

Note: - - - insect will grow up, leave;
+ - tomato moth grows slowly, damages the kidneys;
tomato-Tomato pumpkin cultivation, damage to seasonal plants;
+ + + - tomato moth grows fast, damages the kidneys

Tomatoes of kuyasining tours have developing composition features. insect tomatoes-Tuta absoluta Meyr. tulips grow insects: Insectivores-class Insecta Lepidoptera –group Lepidoptera It belongs to the Gelechiidae family. While the night was mostly moving, it was covered with spots and partially covered with hid (1-Fig.).

They fight 2-3 times in a row. Female butterflies at night male butterflies 5-6 stumps were destroyed naturally. 200-300 berries grown by young deciduous seeds were destroyed naturally. They are mainly insects that feed on insects, that feed on insects, that feed on insects, that feed on insects, that feed on insects, that feed on insects. As a rule, they cause direct damage.

A B

Fig. 1. A-tomato moth butterfly, B - tomato moth worm.

The tomato moth is a tropical species, developing mainly in the open field from early spring to late autumn. Protected and pana emerge from wintering in places. Plants in the south of Uzbekistan have been found to be able to easily overwinter even in the open field (on weeds), in conditions where they continue their growing season even in winter. Gives up to 9-12 offspring throughout the year. The duration of the life cycle of the pest, the period of laying eggs, the laying of his eggs more or less, the survival will depend on various factors. Among these factors, the main ones are the relative humidity of temperature and air and the type of plant. Taking into account the above, we studied the effect of air temperature and humidity on the pinkness of the tomato moth in laboratory conditions (Figure 2).

Fig. 2. The process of studying the development of tomato moths in laboratory conditions.

According to our observations, it was found that at 15-20 °C temperatures and humidity 40-50%, 45.9 eggs were laid, at humidity 55-60%, 87.5 eggs were laid, and at humidity 65-70%, 96.4 eggs were laid. In the second option of the experiment, 78.8 eggs were laid at an air temperature of 20-25°C and 40-50% humidity, 211.3 at 55-60% humidity and 208.6 eggs when humidity reaches 65-70%. While 20-25°C is considered the optimal temperature for this pest, but low humidity has caused female butterflies to decrease egg casting (Table 2).

In our next option, it was observed that 290.1 eggs are laid when the air temperature reaches 25-30°C and 40-50% humidity, 93.7 pieces at 55-60% humidity, 300.9 pieces at 55-60% humidity and 65-70% humidity. It was found that the number of eggs laid reached 34.7 units when the air temperature reached 30-35°C and 40-50% humidity, 41.5 units at 55-60% humidity, 89.8 units at 55-60% humidity and 65-70% humidity.

Table 2. The effect of air temperature and humidity on the pinkness of tomatoes (laboratory experiments 2018-2022).

Experience options	temperature, °C	Relative air humidity, %		
		40-50	55-60	65-70
1	15-20	45,9	87,5	96,4
2	20-25	78,8	211.3	208,6
3	25-30	93,7	300,9	290,1
4	30-35	41,5	89,8	34,7

So, the air temperature is 25-30°c, a humidity of 55-70% was considered favorable conditions for the population of the tomato moth in Uzbekistan, and it was observed to lay up to 300 eggs.

The harm that tomato moth brings to plant productivity. Tomato moth mainly damages the plant at the stage of worms (Figure 2).

One moth worm damaged the plant during its lifetime by damaging an average surface of 0.92 cm2 of the tomato leaf. Worms that Hatch are in low demand for nutrients on the first day, and their harm to the plant increases as they grow larger. The tomato moth worm feeds on the parenchyma tissue of the Leaf (evenly), forming a whitish-coloured veil on the leaf. One or more worms can occur on one leaf. Also, the degree of damage varies depending on the number of worms in the leaves. Small damage to the leaf surface can reduce the process of photosynthesis, but hardly affect plant productivity.

However, if the density of boxes in the plant is too high, they can seriously affect the condition and yield of the plant, causing most of the crop to die. (Figure 3).

a **b**

Fig. 3. a-tomato fruit infestation, b-tomato leaf infestation.

Experiments were carried out at the Research Institute of vegetable crop and potato growing in order to study the harm that tomato moth causes in tomatoes grown in the open field. Plants artificially infested with the pest were covered with Marley in saddles (so as not to be damaged by other insects).

During the flowering and fruiting periods of the plant, the first young worms of 3 moths

were laid on 3 returns, leaving the plant in the control option without a pest. It was observed that the laid young worms begin to damage the leaves and growth points of the tomato, as well as the Shona.

Damaged bulbs and flowers began to dry out, while the fruits were observed to rot under the influence of fungi and bacteria. The results of the experiment are presented in Table 4.

From this table, it can be seen that when tomatoes are damaged during germination, that is, when they release 3-4 leaves, the plant has observed a state of drying out without reaching the period of flowering. A variant infested with pest worms during the tomato flowering period found an average 72.2% reduction in tomato yield compared to control, and this was 2.17 kg organized. In Option 2, where tomatoes are infected with moths during the fruiting period, there was a 53.3% decrease in HSIL compared to control, with a yield of 1,600 kg in 1 bush plant. the loss was determined by experiments carried out (Table 3).

Table 3. The harm that tomato moth brings to tomato yield

№	Tomato's type	Pest infested with the growth period	back	Harvest from 1 bush plant, kg.	Lost yield relative to control	
					kg	%
1.	Uzbekistan -178	seedling		0	0	0
2.	Uzbekistan -178	bloom	1	0,8	2,2	73,3
			2	0,9	2,1	70,0
			3	0,8	2,2	73,3
	avarage		-	0,83	2,15	72,2
3	Uzbekistan -178	Fruit harvest	1	1,5	1,5	50,0
			2	1,4	1,6	53,3
			3	1,3	1,7	56.6
	avarage			1,4	1,6	53,3
	control		-	3,0	-	-

3 Conclusion

Tomato moth mainly infects tomatoes, while also infecting and developing in them cultural crops and weeds that belong to another family of kennels. The earlier the tomato moth falls on the plant, the higher the damage it causes, it was found that it causes a strong loss to the yield, making the resulting crop of poor quality and unsuitable for eating.

The tomato moth worm feeds on the parenchyma tissue of the Leaf (evenly), forming a whitish-coloured veil on the leaf the degree of damage varies depending on the number of worms in the leaves. Small damage to the leaf surface can reduce the process of photosynthesis, but hardly affect plant productivity. However, if the density of boxes in the plant is too high, they can seriously affect the condition and yield of the plant, causing most of the crop to die. When tomatoes were damaged during germination, a state of drying out was observed before the plant reached the period of molting. It was found that tomato yield decreased by 73.3% when infected with pest worms during the flowering period of the tomato, and a decrease in fruiting by up to 53.3% when damaged during the fruiting period was observed. it was observed that 290.1 eggs were laid when the air temperature reached 25-30°C and 40-50% humidity 93.7 pieces, 55-60% humidity 300.9 pieces and humidity

65-70%. It was found that the number of eggs laid reached 34.7 units when the air temperature reached 30-35°C and 40-50% humidity, 41.5 units at 55-60% humidity, 89.8 units at 55-60% humidity and 65-70% humidity. So, the air temperature is 25-30°c, a humidity of 55-70% is considered favorable conditions for the population of the tomato moth in Uzbekistan, it is observed to lay up to 300 eggs and give up to 9-12 offspring in a year.

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