Dynamics of plants and non-quarantine organisms internal quarantine objects spread

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Abstract. Today, the number and damage of pests and diseases that damage agricultural crops and their products in the regions and districts of our republic is increasing year by year. Below, we would like to provide information on the dynamics of the spread of internal quarantine facilities in the Bukhara district of the Bukhara region and the measures taken against them.Data were collected in the field of farmers and homesteads in Bukhara district of Bukhara region, and field monitoring data conducted on the "field control" electronic platform was also used.

1 Introduction

The agricultural field of the region (in hectares) is divided as follows: Irrigated land - 22002 ha. arable land areas - 18032 ha. Areas of grain crops are 5172 ha. area of fruit crops - 2114 ha. vineyards-1251 ha.

Phytosanitary measures in these areas include the destruction of plant residues harbouring pathogenic organisms, agrotechnical processing of grain fields, weed removal, and chemical and physical treatment against pathogenic organisms in the soil, which cause the spread of disease. processes such as disinfection of working tools and machine parts are carried out throughout the year. The main role of water bodies and rivers, streams, birds and animals in the spread of diseases was studied. Together with the specialists of the Bukhara Regional Office of the Plant Quarantine and Protection State Agency, systematic measures are being taken against agricultural pests, weeds and diseases [1-20].

Below, we will consider the indicators of damage caused by harmful organisms at the regional level and the countermeasures taken against them in the example of the Bukhara district.

2 Materials and Methods

2.1 Infestation by apple borer

Harm: The apple borer is the most dangerous enemy of apples. In addition, it can attack pears, quinces, plums and peaches, and sometimes apricots and cherries. The larva of the

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apple fruit borer penetrates the upper layer of the fruit and feeds by moving towards the seeds. Their waxy sap waste can often be seen on the fruit. Infected fruits lose their marketability, and failure to control these pests risks serious yield loss.

Control measures: In areas with a high rate of reproduction of the apple borer, the use of some insecticides against them and the following control methods in addition to them will help to reduce the damage to a satisfactory level. In order to reduce the use of insecticides, control measures should be implemented in time. A careful study of the life cycle of this pest is the key to determining the timing of chemical spraying. If it is not possible to use pheromone traps to determine when their life cycle begins in the spring, we should set the time of spraying about 18-21 days after the fruits have fully bloomed.

Using pheromone traps to determine the life cycle and the timing of the next generation of fruit pests is considered the most effective method. For determining the temperature, both maximum and minimum temperatures are monitored daily. This method indicates the most favourable timing for the application of the pesticide (the effective temperature for initiating the first treatment should be at least 25°C). The subsequent treatment is carried out after the residual traces of the previously applied pesticide have disappeared (usually indicated on the label of the drug), typically 10-14 days later. For effective control, two to three treatments are required against each generation. It is necessary to refrain from using pyrethroid insecticides as much as possible until the end of the season (after August), otherwise, this may lead to the development of resistance in many beneficial insects and an increase in the population of harmful insects, including mites.

Table 1. Indicators of damage caused by apple fruit pests across different districts of the Bukhara region.

№	Name of the Districts	Apple borer (Carpacapsa pomonella)	
		Number of households	Hectare
1	Kuchkumar	3	3,1
2	Kavla Mahmud	8	8,15
3	Sufikorgar	5	5,05
4	Bogikalon	4	4,2
5	Istiqbol	5	5,05
6	Kunjiqala	7	7,19
7	Shergiron	2	2,01
8	Yurunbolo	6	6,05
9	Rabotiqalmoq	7	7,1
10	Gulshanobod	6	6,1
11	Bogidasht	2	2,2
12	Yangi-Hayot	2	2,05
	Total	**8**	**8,15**

2.2 Infestation by the Tomato Moth

The tomato moth belongs to the family of tortricid moths (Lepidoptera) or leaf-mining moths (Gelechiidae). Tuta absoluta was first identified and studied by the scientists Meyrick (1917) and Povolny (1994). The moth is known in English as the Tomato Pinworm, Tomato Leafminer, and South American Tomato Moth.

Spread: Native to South America. The tomato moth has been causing damage to tomato crops in large areas in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela for many years and continues to do so. In Europe, the infestation of

tomato crops by the tomato moth was first recorded in Spain in 2006 and subsequently spread to other countries.

Damage to Tomato Plants:

- Leaves: 73%
- Leaf veins and stems: 21%
- Fruit clusters: 5%
- Fruits: 1%

Damage. Strong damage to the leaves affected by the moth leads to complete defoliation. The infestation by the tomato moth can reduce the yield of affected tomato plants by 80-100%. Infested areas can be fully defoliated within two weeks from the onset of the infestation. In Spain, where the infestation occurred, insecticide spraying was done up to 15 times per season, costing up to 450 euros per hectare each time. Due to the invasion of T. *absoluta* into other regions of the world (formerly unaffected by it), the estimated annual cost of fighting against infestations has increased by $600 million in the USA.

According to available information, the tomato moth has spread in Uzbekistan since 2015, affecting the regions of Bukhara, Navoi, Samarkand, Tashkent, and Surkhandarya provinces, as well as the Ferghana Valley. The infestation damages the fruit-bearing part of tomato plants, reducing their productivity and creating favourable conditions for the development of damaging fungi and bacteria in the affected areas. It has been found that if not promptly controlled, the infestation can result in a yield reduction of 80-100%.

Table 2: Indicators of damage caused by tomato moth infestation across different districts of the Bukhara region.

№	Name of the Districts	Tomato moth (Tuta absoluta)	
		Number of households	Hectare
1	Kuchkumar	4	0,38
2	Kavla Mahmud	19	0,49
3	Sufikorgar	11	0,9
4	Bogikalon	16	1,04
5	Istiqbol	5	0,2
6	Kunjiqala	14	0,3
7	Shergiron	12	0,32
8	Yurunbolo	3	0,44
9	Rabotiqalmoq	11	0,7
10	Gulshanobod	13	0,4
11	Bogidasht	3	0,3
12	Yangi-Hayot	7	0,33
	Total	**98**	**5,8**

Combat Measures:

1. **Agrotechnical combat measures:** It has been found that removing damaged branches from the field before the development of the tomato crop, without interrupting the development of the crop, and removing 50-70% of the damaged stems from the field can reduce the number of pests.
2. **Chemical combat measures:** It has been found that the use of preparations containing Deltamethrin + Triazophos lambda-cyhalothrin, dimethoate, and other effective substances against tomato moths yields good results.
3. **Infestation by Eastern fruit moth:**

The Eastern fruit moth (Grapholita molesta Busck.), belonging to the Insecta class and the Tortricidae family of the Lepidoptera order, is considered an internal quarantine pest. This pest was first identified in China and Korea and was first recorded as a pest in Japan in 1899. It reached Uzbekistan in 1980 and is currently found in an area of 118 hectares in the region.

Damage: The Eastern fruit moth primarily infests apricots, as well as other stone and pome fruits, causing damage to the fruit and foliage. Infested apricots and other trees experience altered growth patterns; the affected fruits become unsuitable for consumption. The larvae of the Eastern fruit moth burrow into the inner parts of the fruit, consuming it and causing it to rot. As a result of their feeding, tunnels measuring 12-15 cm in length are formed within the fruit, leading to premature dropping of the fruit. This process slows down the growth of the tree and weakens it, resulting in a decrease in fruit yield by 40-50%.

Table 3: Indicators of damage caused by the Eastern fruit moth across different districts of the Bukhara region.

№	Name of the District	Total area of orchards (hectares)	Eastern fruit moth (Grapholitha molesta Busck)	
			Number of households	Hectare
1	Kuchkumar	153	0	0,07
2	Kavla Mahmud	17	8	6,08
3	Sufikorgar	605,2	7	5,065
4	Bogikalon	21,8	4	3,055
5	Istiqbol	39,9	2	2,045
6	Kunjiqala	580	6	6,075
7	Shergiron	22,3	2	1,025
8	Yurunbolo	22	9	8,085
9	Rabotiqalmoq	472	7	5,105
10	Gulshanobod	155,9	5	4,1
11	Bogidasht	10	2	1,06
12	Yangi-Hayot	431,9	2	1,045
	Total	**2531**	**54**	**42,81**

4. Infestation by the California red scale.

The California red scale (Quadraspidiotus perniciosus Coms.) belongs to the armoured scale insects, a family of true scales, Diaspididae. The native habitat of the California red scale is considered to be in northeastern Asia, including the Primorsky Krai and Khabarovsk Krai of the Russian Federation, China, and Korea. This pest was identified in the 70s of the past century. It was discovered and described by the American zoologist Comstock in California. At present, the California red scale is found in most countries worldwide.

Damage: Until 1964, the California red scale was not encountered as a serious pest of fruit and ornamental trees in Uzbekistan. However, it was first found in Tashkent in 1964. After its discovery in Tashkent, sharp control measures were implemented against it, and quarantine service staff worked to prevent the spread of this pest to other regions. Despite all the measures taken, the scale insect eventually spread to other regions of Uzbekistan. The California red scale damages more than 200 plant species. It damages plants by sucking out the sap, especially targeting young shoots, and can cause significant damage to fruit trees. After aphids, the California red scale is the second most harmful pest to plants.

Table 4. Indicators of damage caused by the California red scale across different districts of the Bukhara region.

№	Name of the District	Total area of orchards (hectares)	California red scale (Quadraspidiotus perniciosus Comstock)	
			Number of households	Hectare
1	Kuchkumar	153	0	0,04
2	Kavla Mahmud	17	6	4,06
3	Sufikorgar	605,2	3	2,06
4	Bogikalon	21,8	2	2,08
5	Istiqbol	39,9	0	0,05
6	Kunjiqala	580	5	5,08
7	Shergiron	22,3	0	0,02
8	Yurunbolo	22	2	1,04
9	Rabotiqalmoq	472	7	6,08
10	Gulshanobod	155,9	3	2,08
11	Bogidasht	10	2	2,05
12	Yangi-Hayot	431,9	2	1,02
	Total	**2531**	**32**	**25,65**

5. Infestation caused by the Citrus Leaf Miner.

The Citrus Leaf Miner (Phyllocnistis citrella Stainton) belongs to the family **Gracillariidae** of the leaf-mining moths, which are part of the ***Lepidoptera*** order. The Citrus Leaf Miner was first identified in India in 1956 by G.T. Steinton. In 1993, it was observed causing damage to citrus crops in the state of Florida, USA. It was detected in Uzbekistan in 1981 and is now considered an internal quarantine pest that has been significantly spread. Based on studies conducted by our country's scientists, this pest is also known as the Citrus Leaf Moth.

Damage: The Citrus Leaf Miner is considered a dangerous pest of lemon trees. Additionally, it has been observed to infest mandarins, oranges, grapefruits, eucalyptus, pomegranates, and jasmine plants. Research and studies indicate that strong damage to the yield, ranging from 55% to 70%, has been attributed to plants infested by the Citrus Leaf Miner. Primarily, the larvae of the Citrus Leaf Miner cause harm to the plants. They tunnel beneath the surface of young citrus leaves, consuming the internal epidermal layer. This pest can cause significant damage to citrus plantations and nurseries by affecting the growth of young citrus shoots.

Table 5. Indicators of damage caused by the Citrus Leaf Miner across different districts of the Bukhara region.

№	Name of the District	Total area of orchards (hectares)	Citrus Leaf Miner (Phyllocnistis citrella Stain)	
			Number of households	Hectare
1	Kuchkumar	153	1	3,5
2	Kavla Mahmud	17		
3	Sufikorgar	605,2	1	7,6
4	Bogikalon	21,8	1	5,4
5	Istiqbol	39,9		
6	Kunjiqala	580		
7	Shergiron	22,3	1	3,5
8	Yurunbolo	22		
9	Rabotiqalmoq	472		
10	Gulshanobod	155,9	1	5,3

11	Bogidasht	10		
12	Yangi-Hayot	431,9		
	Total	**2531**	**5**	**25,3**

Chemical control measures: Tested substances such as abamectin, imidacloprid, and deltamethrin 25 g/l, with a recommended dosage of 0.5 l per hectare, have been evaluated for their effectiveness against the Citrus Leaf Miner. Due to its specific mode of action, which penetrates into the tissue, it is currently considered the most effective solution against this pest.

Quarantine measures: It is necessary to implement strict quarantine procedures for the importation of plant products from countries affected by the Citrus Leaf Miner. Any imported plant material must undergo quarantine inspection, and its use should be based on the results of the inspection. Sending fruits, damaged twigs, and plant parts from areas affected by the Citrus Leaf Miner to clean areas within the Republic is restricted.

6. **Infestation caused by the creeping thistle (Acroptilon repens (L) D.C.)** The creeping thistle, belonging to the Asteraceae family, is a perennial quarantine weed.

Morphological characteristics**:** The stem of the creeping thistle is branched and can grow from 20 cm to 40 cm tall. Its leaves are alternate, well-developed, with serrated edges, and covered with short hairs, measuring 5-10 cm in length. The flowers are bisexual, with 5 petals, forming reddish spherical heads clustered within the foliage. Its seeds are winged, with short bristles, and develop within the dry fruit from May to June, maturing in July.

Damage: The creeping thistle is an extremely harmful weed. It reduces the productivity and quality of crops, as well as the fertility of the soil. When mixed with straw during processing, it remains bitter in taste. The creeping thistle accumulates many alkaloids, leading to poisoning in farm animals that consume plants contaminated with it. The thistle, especially its seeds, poses a danger to livestock as it dramatically spoils the taste of cow's milk. It depletes the soil of water and soluble minerals, absorbing nutrients from the soil 2-5 times more than other plants. Additionally, it releases substances that inhibit the growth and development of other plants.

Table 6. Indicators of damage caused by the creeping thistle across different districts of the Bukhara region.

№	Name of the District	Creeping thistle (Acroptilon repens)	
		Number of households	Hectare
1	Kuchkumar	18	0,41
2	Kavla Mahmud	13	1,52
3	Sufikorgar	15	0,51
4	Bogikalon	17	0,61
5	Istiqbol	11	0,61
6	Kunjiqala	10	0,41
7	Shergiron	5	0,51
8	Yurunbolo	16	0,21
9	Rabotiqalmoq	18	0,21
10	Gulshanobod	21	0,71
11	Bogidasht	14	0,72
12	Yangi-Hayot	6	0,21
	Total	**164**	**6,64**

Quarantine measures: Quarantine measures against the Creeping Plumeless Thistle include strict monitoring of seed materials, adherence to crop rotation rules, and ensuring that fields infested with the weed are left fallow for at least two years. In addition to the comprehensive control measures against the Creeping Plumeless Thistle, it is also essential

to conduct awareness-raising activities among the general population to engage them in combating the weed effectively.

7. Damage caused by Dodder (Cuscuta spp.)

Dodders belong to a separate taxonomic group called the dodder family (Cuscutaceae) in the plant kingdom.

There are over 274 species of dodders worldwide, with 36 species recorded in the Mediterranean region and 17 species registered in Uzbekistan. Among them, 13 species cause serious harm to plants.

Morphological Characteristics. Dodders have a parasitic lifestyle, undergoing significant structural changes. They differ from ordinary flowering plants in many aspects. Dodders lack the ability for photosynthesis, and do not have stems, leaves, or roots; instead, they attach to the host plant using specialized structures called haustoria.

Damage. Dodders cause significant damage to agricultural crops. They parasitize various herbaceous plants, trees, shrubs, fruits, and ornamental plants. Dodders are particularly harmful to field crops, such as beans, cotton, hemp, vegetables, onions, and other common crops. They deprive the host plant of nutrients by attaching to their stems and extracting organic and inorganic substances, leading to stunted growth and reduced yield. When heavily infested with dodder, crops such as grasses and legumes may become contaminated with dodder seeds or fragments during harvesting, potentially leading to poisoning of animals. Dodder contains toxic alkaloids like "cuscudine" and "cuscutine," which can cause poisoning in animals. Plants infested with dodder remain vulnerable to further damage and diseases.

Spread. Dodders spread through various means, including seeds, agricultural produce, contaminated irrigation water, soil, farm equipment, transportation vehicles, and animals. Dodder seeds can remain viable in the soil for several years and can also spread through the wind.

Table 7. Indicators of damage caused by dodder across different districts of the Bukhara region.

№	Name of the District	Field dodder (Cuscuta sampestris)	
		Number of households	Hectare
1	Kuchkumar	23	0,10
2	Kavla Mahmud	19	0,12
3	Sufikorgar	18	0,13
4	Bogikalon	21	0,17
5	Istiqbol	14	0,17
6	Kunjiqala	16	0,12
7	Shergiron	11	0,21
8	Yurunbolo	24	0,07
9	Rabotiqalmoq	26	0,23
10	Gulshanobod	28	0,17
11	Bogidasht	24	0,12
12	Yangi-Hayot	16	0,06
	Jami	**240**	**1,66**

8. Bindweed Infestation

During the months of June and July, dodders flourish, with hot weather conditions facilitating their growth, and within two to three weeks, their seeds germinate. The dormancy period of dodder seeds can vary, lasting from several days to several years. Dodder-infested plants typically begin to wither and die after being parasitized, with young plants often succumbing to dodder infestation, leading to thousands of dodder seeds falling into the soil. Dodders are generally intolerant of cold temperatures, ceasing growth when the temperature exceeds 140°C and perishing as a result. All dodder species are considered annuals.

Field bindweed (Cuscuta campestris) has a thread-like stem, ranging in color from yellow to reddish-yellow, and is approximately 0.8 mm thick. Its flowers are short-stalked and found in clusters. Dodder seeds can survive in the soil for up to three years. It parasitizes various crops, including potatoes, sugar beets, vegetables, melons, flax, onions, and more than 200 other plant species.

Bindweeds are among the most harmful and quarantine-worthy weeds. They extract nutrients from cultivated plants, causing significant damage to agricultural crops and horticulture. In particular, they pose a significant threat to orchards and perennial crops.

Table 8: Indicators of damage caused by bindweeds across different districts of the Bukhara region.

№	Name of the District	Bindweeds (Cuscuta Lehmaniana Bge)	
		Number of households	Hectare
1	Kuchkumar	2	0,04
2	Kavla Mahmud	4	0,10
3	Sufikorgar	3	0,04
4	Bogikalon	5	0,07
5	Istiqbol	2	0,03
6	Kunjiqala	3	0,01
7	Shergiron	2	0,003
8	Yurunbolo	4	0,06
9	Rabotiqalmoq	3	0,04
10	Gulshanobod	3	0,04
11	Bogidasht	4	0,01
12	Yangi-Hayot	2	0,02
	Total	**37**	**0,46**

Combatting techniques. The strategies for combating dodder plants involve both agrotechnical and mechanical measures. Agrotechnical and mechanical measures are paramount in the fight against dodder plants, targeting both the plants themselves and the affected areas. Strongly affected plants are uprooted or cut down, and the surrounding environment is thoroughly cleaned. Moderately affected crops are harvested along with their respective sections, either by cutting or uprooting, and then disposed of. The affected areas undergo continuous monitoring, with surveillance conducted every 7-10 days until the dodder is completely eradicated. Infested fields are properly cultivated, and land preparation activities are carried out 10-15 days before planting.

3 Conclusion

In conclusion, it should be noted that in the district we have studied, the increase in the number of pests is prevented by timely application of the measures of the year-round coordinated control against the above-mentioned dangerous pests. In particular, observations were made in these areas in 2022 (calendar year) and no significant difference was found in the experiments conducted in 2023. This indicates that pest control is being carried out in a positive way.

Quarantine and protection of plants, Bukhara regional administration with experts in the field of internal quarantine objects scattered on the territory of the republic, the dynamics of their spread, taking the areas that cause damage under control, and applying relevant

measures using scientific achievements is our ecologically clean and abundant We hope that it will create the ground for high-quality crop production.

References

1. N. Turayeva. E3S Web of Conferences **389**, 03062 (2023)
2. N.M. Turayeva. E3S Web of Conferences **389**, 03011 (2023)
3. N.Torayeva. E3S Web of Conferences **389**, 02010 (2023)
4. A. Hamroyev, H. Jumayeva, E3S Web of Conferences **420**. 10007 (2023)
5. B. Mamurov et al., E3S Web of Conferences **538**. 05025 (2024)
6. B. Mamurov et al., E3S Web of Conferences **538**. 05031 (2024)
7. G. Akramova et al., E3S Web of Conferences **538**. 05034 (2024)
8. Kuldoshev R. A. Methodological foundations of teaching left-handed students of primary grade to write (Doctor of Philosophy (PhD) dissertation in pedagogic sciences). Termiz - 2021.
9. Kuldoshev R. A. Methodological foundations of the creation of elementary school textbooks in Uzbekistan (Doctor of Pedagogical Sciences (DSc) dissertation). Bukhara - 2023.
10. M. Axmedov, O. Sharipov. E3S Web of Conferences **460**, 11004 (2023)
11. M. Shirinova et al., E3S Web of Conferences **538**. 05016 (2024)
12. Qo‘ldoshev A. R. Psychology and Education Journal. **58**. 1. 4981-4988 (2021)
13. R. Kuldoshev et al., E3S Web of Conferences **371**. 05069 (2023)
14. R. Qo’ldoshev et al., E3S Web of Conferences **538**. 05017 (2024)
15. R. Qo’ldoshev et al., E3S Web of Conferences **538**. 05042 (2024)
16. R. Yunusov. E3S Web of Conferences **389**, 03061 (2023)
17. R.Yunusov. E3S Web of Conferences **389**, 04011 (2023)
18. R.Yunusov. E3S Web of Conferences **389**, 02008 (2023)
19. Sh.X. Tuxtaev, M.F. Xayrulloev, and M. Ochilova E3S Web of Conferences **389**, 02009 (2023)
20. U. Khayitov et al., E3S Web of Conferences **538**. 05022 (2024)