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Study of the Species Composition of Harmful Organisms in Akunk Educational Research Farm

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ABSTRACT

The article considers the species composition of pests studied in the apple and pear orchards of Akunk Organic Agricultural Experimental Farm in 2020-2021.

Twenty four species of harmful organisms have been identified, 17 of which are pests, 1 is a tick and 6 are diseases. Among the harmful organisms the *Hoplocampa testudinea* and *Cydia pomonella* were identified on the apple trees, and *Fire blight* was found on the pear trees.

Introduction

Organic farming is a system aimed at improving and promoting agricultural production, which considers the soil improvement as a cornerstone in the production of high quality and ecologically clean food. Organic agriculture is a system where toxic substances and chemical fertilizers are not used, while organic fertilizers are used instead.

The amount of nutrients in organic food is up to 3 times more than in the crops grown with the use of pesticides and mineral fertilizers in traditional agriculture.

The highest value of organic food is related to the fact that it is safe for health, contains more vitamins, minerals and other nutrients; it is also free from harmful chemicals, which are used as food, flavor additives and preservatives in processed food and has a beneficial effect on the overall human health (http://old.minagro.am/).

It is worth mentioning that SHEN NGO is the first in Armenia to start organic farming to create a new, sustainable and environmentally friendly source of income for rural households (https://shen.am/hy/node/1324). In 2019, Shen NGO donated a previously certified land plot in Akunk village, Kotayk region to ANAU. In the mentioned plot organic cultivation of fruit trees is carried out and, hence, it was fit for our research activities.

Materials and methods

The research was conducted in 2020-2021, during the vegetation period, the aim of which was to study the species composition of pests in Akunk Organic Agricultural Experimental Farm against the background of biological struggle.

Pear and apple trees were the study objects. The works

were carried out during the whole vegetation period through observations, investigations and sampling. Trees were viewed from all geographical locations according to tiers. The scaffold branches, bark, leaves of trees, the fruits both dropped and those on the tree, the plant remains under the trees and after harvest, the tree wastes and mummified fruits were all examined. The collected samples were taken to the laboratory, where the species composition of harmful organisms was identified.

The collection and fixation of harmful organisms was carried out according to the methods accepted in entomology and phytopathology (Dobrozrakova, 1974, Dementyeva, 1985, Forecast of the Appearance and Registration of Pests and Diseases of Agricultural Crops, 1959).

Results and discussions

As a result of our research concerning the apple and pear trees in Akuk Organic Agriculture Experimental Orchards, 24 species of harmful organisms have been registered, out of which 17 are insects, 1 is a tick and 6 are diseases. The harmful organisms detected in the Akunk orchards with their harm symptoms are presented in Table 1 and 2.

In figures 1 and 2, the photos of pests and diseases common in the apple and pear orchards of Akunq ERF are introduced.

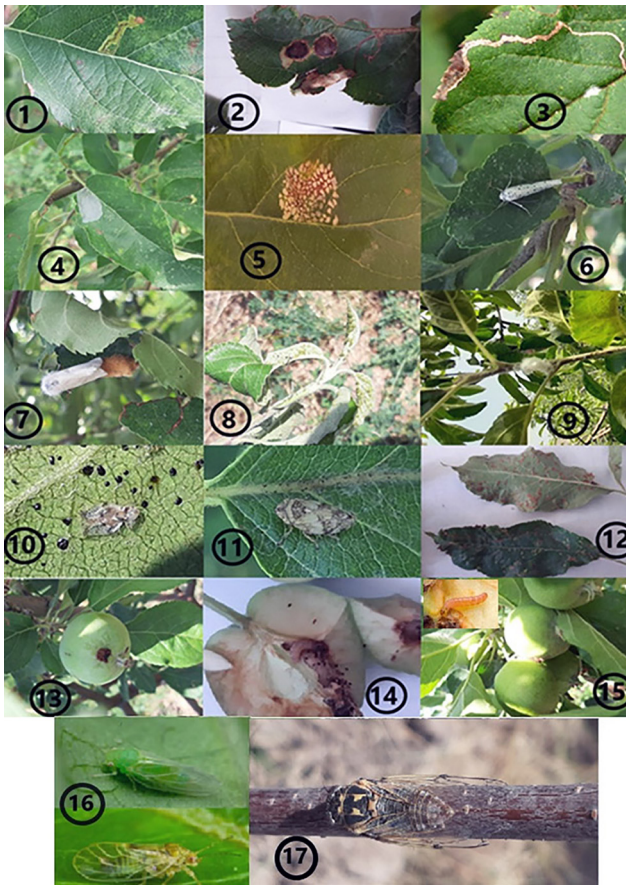

Figure 1. Pests common in Akunk ERF and damages caused.

1. Stigmella malella (Stainton), 2. Leucoptera malifoliella (Costa), 3. Lyonetia clerkella Linnaeus, 4. Phyllonorycter corylifoliella (Hübner), 5. Phyllonorycter blancardella (Fabricius), 6. Hyponomeuta malinella, 7. Euproctis chrysorrhoea L., 8. Eriosoma lanigerum Deg., 9. Eriosoma lanigerum Hausm., 10. Stephanitis piri F., 11. Philaenus spumarius, 12. Eriophyes malinelus, 13. Hoplocampa testudinea Klug., 14. Cydia pomonella, 15. Grapholitha molesta Busch., 16. Psyylla mali Schmdbg. and Psylla pyri L., 17. Cicadatra hyalina (all photoes except the 3rd (https://en.wikipedia.org/wiki/Lyonetia_clerkella) *and 16th* (https://www.nexles.com/articles/apple-sucker-psylla-mali/) *were taken by the authors*)

Figure 2. Diseases common in Akunk ERF.

1. Apple powdery mildew, 2. Fire blight, 3. Apple scab and Pear scab, 4. Apple Mosaic virus, 5. Moniliosis, Monial burn (all photos were taken by the authors)

Table 1. Species composition of pests in apple and pear orchards of Akunk ERF*

N	Name of the pest	The nature of the damage	Year of detection
1	Stigmella malella (Stainton)-	The larvae form serpentine mines, which gradually expand. Entering the tissue of the leaf, the larvae bite holes that are visible from above in the form of spotted mines with 2 to 5 cm length. The larval secretion in the mine is in the form of a thin chain and that does not touch its side walls.	2020, 2021
2	Leucoptera malifoliella (Costa)	The larvae eat the entire parenchyma of the leaf - the spongy and horseshoe chlorophyll-bearing cells, and moving in a circle, form round mines in which the excrement is in concentric circles.	2020, 2021
3	Lyonetia clerkella Linnaeus-	The larvae form long serpentine mines, the secretion is in line, that doesn't reach the end of the mine.	2020, 2021
4	Phyllonorycter corylifoliella (Hübner)-	The mines made by larva are located at the top of the leaf blade; they are large, and due to the tension of the silk thread caused by the larva, the mines become spotty and corrugated.	2020, 2021
5	Phyllonorycter blancardella (Fabricius)	When feeding on the leaf parenchyma, the larvae produce silk fibers, which make the mine look like an oval swollen boat, and due to the partial feeding of the epidermis, the mine later becomes meshy.	2020, 2021
6	Hyponomeuta malinella-	Young larvae feed on the leaf parenchyma, reducing the leaf blade to a skeleton, and later the leaves intertwine each other with silk to form a web.	2021
7	Stephanitis piri F.	As a result of the feeding of the bug, the leaves lose their colour, gradually dry out and get a dark color. The underside of the infected leaf is contaminated with the secretions of the bug, which can be seen in black, shiny spots.	2020, 2021
8	Eriosoma lanigerum Deg.	Aphids suck the juice of buds, leaves and flower bud, as a result of which the affected organs are transformed.	2020, 2021
9	Eriosoma lanigerum Hausm.	Swelling occurs in the affected areas as a result of the feeding of the aphid.	2021
10	Psyylla maliSchmdbg.	During feeding, a sticky juice is secreted, which covers the leaves, the bud and later such leaves develop incompletely, the flower buds do not open and do not organize fruits.	2020, 2021
11	Psylla pyri L.	Damaged spring and fruits grow slowly, change shape, leaves lose their colour, are covered with psylla excrement, after some time the leaves fall.	2020, 2021
12	Euproctis chrysorrhoea L.	As a result of feeding, the larvae eat the entire leaf blade, leaving the central nerve unharmed.	2021
13	Eriophyes malinelus	A thin, smooth coating develops on the leaves, which first turns into white and then becomes yellowish-grey.	2020, 2021
14	Cydia pomonella	The larvae enter the fruit from the side part or from the cup, gnawing the flesh, they go deeper into the seminal cavity and eat the seeds.	2020, 2021
15	Meadow spittlebug	As a result of the damage, the leaves are wrinkled, the generative-vegetative organs are deformed.	2021
16	Grapholitha molesta Busch.	The larvae enter the fruit mainly from the stem, and sometimes from the contact point of the two fruits, from parts covered with leaves. Insects eat seeds.	2020, 2021
17	Hoplocampa testudinea Klug	The larvae eat the seminal cavity with seeds, filling them with rusty-red secretions, food remnant, which is visible from the outside of the fruit.	2020, 2021
18	Cicadatra hyalina	Damage is caused by cutting the stem during spawning.	2021

*Composed by the authors.

Table 2. Species composition of diseases in apple and pear orchards of Akunk ERF*

N	The name of the disease	Pathogen	Type of fruit	The infected part of the plant	Year of detection
1	Apple scab	Venturia inaequalis	Apple tree	Leaf, fruit	2020, 2021
2	Pear scab	Venturia pirina	Pear tree	Leaf, fruit	2020, 2021
3	Apple powdery mildew	Podosphaera leucotricha	Apple tree	Inflorescence, Leaf, fruit, spring	2020, 2021
4	Moniliosis, Monial burn	Monilinia fructigena	Apple tree, pear tree	Fruit, spring,	2020, 2021
5	Fire blight	Erwinia amylovora	Apple tree, pear tree	Fruit, spring, leaf	2020, 2021
6	Apple Mosaic virus	Apple Mosaic virus	Apple tree	Leaf	2021

*Composed by the authors.

Conclusion

As a result of research conducted in the apple and pear orchards of Akunk ERF we have registered twenty- four species of harmful organisms, among which 17 are insects, 1 is a tick and 6 are diseases.

The most common pests of the apple trees were *Hoplocampa testudinea Klug*. and *Cydia pomonella*, while the most widespread disease of pome fruits was *Fire blight*.

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