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**ABOUT PESTS AND DISEASES OF SOME MAGNOLIA SPECIES IN THE ABSHERON CONDITIONS**

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**О ВРЕДИТЕЛЯХ И ЗАБОЛЕВАНИЯХ НЕКОТОРЫХ ВИДОВ МАГНОЛИИ В УСЛОВИЯХ АБШЕРОНА**

**Abstract.** The article examines the reproduction, frequency, distribution, density, preventive measures against pests of some *Magnolia* species on a scientific basis. Pests belonging to the species of this genus have been observed to be *Icerya purchasi* Mack, 1878, *Ceroplastes sinensis* Guer., *Tetranychus urticae* Koch., *Helix pomatia* Lin., 1758 and *Pseudomonas syringae* van Hall 1904. On the basis of phytosanitary monitoring, route observations and stationary examinations of magnolia plants grown in the experimental fields of the Institute of Dendrology in Absheron Peninsula (2020-2021), plant samples infected with pests and pathogens were collected and systematically analyzed. As a result of the monitoring of pests, magnolias were first discovered in Absheron: *Icerya purchasi, Ceroplastes sinensis, Tetranychus urticae, Helix pomatia*. Some bioecological features of the dangerous larvae of Icerya purchasi and Ceroplastes sinensis have been revealed. For the first time, a number of promising insecticides against their larvae have been selected. The data on the experimental work on the selection of drugs and their concentration as the most effective measure to control pest species are presented. The reason for the weakening of plants, and sometimes their death, is a complex of factors of negative impact: biotic – harmful arthropods and damage by various diseases; abiotic – unfavorable climatic conditions; anthropogenic – violation of the soil cover and natural herbaceous vegetation, insufficient and untimely care of plants due to the limited funds allocated for this purpose.

**Keywords**: *Magnolia* L., pest, pathogen, coccoidea, preventive measure.

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**Аннотация.** В статье рассмотрены размножение, частота, распространение, плотность, меры профилактики против вредителей некоторых видов магнолий. Вредителями, принадлежащими к видам этого рода, являются *Icerya purchasi* Mack, 1878, *Ceroplastes sinensis* Guer., *Tetranychus urticae* Koch., *Helix pomatia* Lin., 1758 и *Pseudomonas syringae* van Hall 1904. На основании фитосанитарного мониторинга, маршрутных наблюдений и стационарных обследований растений магнолии, выращенных на опытных полях Института дендрологии Абшеронского полуострова (2020-2021 гг.), были собраны и систематически проанализированы образцы растений, зараженные вредителями и патогенами. В результате мониторинга вредителей магнолий впервые обнаружены на Абшероне: *Ceroplastes sinensis* Guer., *Tetranychus urticae* Koch., *Helix pomatia* Lin., 1758. Выявлены некоторые биоэкологические особенности опасных личинок *Icerya purchasi* и *Ceroplastes sinensis.* Впервые подобраны ряд перспективных инсектицидов против их личинок. Представлены данные по экспериментальной работе по подбору препаратов и их концентрации как наиболее эффективной меры борьбы с видами-вредителями. Причиной ослабления растений, а иногда и их гибели, является комплекс факторов негативного воздействия: биотические – вредные членистоногие и поражение различными болезнями; абиотические – неблагоприятные климатические условия; антропогенные – нарушение почвенного покрова и естественной травянистой растительности, недостаточный и несвоевременный уход за растениями в связи с ограниченными средствами, выделяемыми для этой цели.

**Ключевые слова:** *Magnolia* L., вредитель, болезнь, насекомое, яйцо, личинка.

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**Introduction.** Most magnolias are considered to be 'trouble-free' with few pests and plant diseases [19]. Held found *M. grandiflora*, *M. ×soulangeana* and *M. virginiana* were resistant to Japanese beetle (*Popillia japonica*), as are *Magnolia* spp. in general [20; 21]. Similarly, *M. ×soulangeana* exhibited host plant resistance to *Lymantria* dispar (*Linnaeus*) (gypsy moth; *Lepidoptera: Lymantriidae*) by losing less than 4% of its foliage in a study of gypsy moth feeding and defoliation of 21 shade and flowering trees [25]. In feeding preference choice test studies with eight woody taxa, *M. grandiflora* was not consumed by adult *Phyllophaga ephilida* (Say) (June bug; *Coleoptera: Scarabaeidae*) [18]. Phytochemicals in *Magnolia spp*. show a wide range of biological activity. Phenolics and neolignans are among the magnolia compounds with antimicrobial, nematicidal and insecticidal properties [22; 24; 26]. Other magnolia compounds act as attractants of natural enemies [16].

Recently, ornamental species of the genus *Magnolia* L. have been widely used in landscaping in the Absheron Peninsula, as well as in various regions of Azerbaijan. These introduced valuable plant species are constantly exposed to the harmful effects of many pathogens and pests in the unfavorable soil and climatic conditions of the Absheron Peninsula. As a result, they get diseases, injured, weakened, and in danger of extinction. It should be noted that *Magnolia* L. species in Absheron are less resistant to pests. However, these plants also face many problems when the peninsula's infertile soils and mild dry subtropical climate condition are conducive to the growth of many pests, as well as when cultivation rules are not followed properly. Therefore, in order for Magnolia plants to be aesthetically beautiful and healthy, it is important requirement, but also crucial and significant, to protect them from pathogens and pests [9; 15; 23].

Armored scale insects (*Hemiptera: Diaspididae*) and lecaniums (*Hemiptera: Lecaniidae*) damaging subtropical plants in Azerbaijan were described by the authors in 2019 [23]. The phytophagous form of this group is the most dangerous pests of fruit trees and park – decorative plants. In particular, these pests emerge in subtropical hot zones, on the bodies, leaves, and even on the fruits of the plants, leading to the drying of the branches and the weakening of plants [12]. Pests damage the surface area of the plants, especially the young branches, infected leaves. In some cases, armored scale insects cover the body of plants in the form of whole colonies, causing great damage. As a result of infection, the growth and development of the branches weaken, stops, the decorative beauty of green plants disappears, and in most cases, the plants dries. There are many spots on the fruits that are damaged by the armored scale insects, the fruits are shriveled and their taste is very bad. Pests suck plant juice and nutrients and destroy plant seeds. Their type of polyphagous and oligophagous, high egglaying ability, and adaptability to every condition make it even more common for pests. Some species are cosmopolitan [17].

In the peninsula, in introduction and acclimatization, it is important and significant to protect the magnolia plant from the harmful effects of pests. In this regard, scientific research was carried out to clarify the composition of some species of studied pests, to identify those of major economic importance, and to conduct scientific studies on developing regulations for the application of environmentally friendly plant protection products against them [6; 9; 12].

**Materials and Methods.** The condition of the plants was established as a result of a visual examination of their appearance (healthy, oppressed, drying out, having lost its aesthetic appeal due to the presence of a change in the color of the foliage, deformation of the leaves, shoots, the presence of galls, entrance and flight holes, and other deviations from the normal state). All factors of plant weakening were taken into account. Identification of diseases and pests in the studied species and preventive measures to

fight against them were performed according to the methods of K.A. Gar, T.D. Garshina, M.K. Khokhryakov and A.S. Leley, using dendroclimatological equipment [1-4; 8; 14].

The entomological materials were collected for the identification of the species of these pests. Collected materials were stored in cotton or in 70% alcohol. The samples of armored scale insects and lecaniumwere kept together with the cut pieces of the plant. The research was carried out in both field and laboratory conditions. The spreading of pests, their fodder crops, and their damaging features has been studied. Studies were conducted mainly in spring and summer, but biological characteristics of pests and they're entomophagous were studied during autumn and winter [12].

The following guidelines have been used in the study of the determination, density, assessment and effectiveness of preventive measures of studied harmful coccoidea species [2; 6; 7].

The following 5-point scale was used to assess the degree or density of pest infection in coccoidea-infected Magnolia plants in the area [7]:

0 – no coccoidea was observed on the tree;

I point – occasionally coccoidea is found in the tree;

II point – coccoidea is found on the tree, branch or trunk in 10 cm2;

III point – the tree has the seldom coccoidea colony;

IV point – 50% of the surface of the tree trunks and branches is covered with coccoidea;

V point – the entire surface of the tree (trunk and branches) is covered with coccoidea.

The following 4-point scale was used to assess the damage caused by Tetranychus urticae Koch. in Magnolia plant [5].

I point – individual leaves of the plant are infected with mites, the plant has no signs of weakening;

II point – initial small reddish-yellow spots are formed on the upper apex leaves of the plant, single colonies of mites are found, covering 10-15% of the leaf surface, the number of mites in the colony is 10-15;

III point – the leaves of the plant have large spots, the spot is brown, covers 25-50% of the leaf surface, there are 15-25 mites in the mite colony. The leaves of the plant have not fallen off, the leaves have turned yellow and shrunk;

IV point – the lower surface of the leaf of the plant is covered with 75% of mite colonies; the number of mites in the colony is 25-50 and more, the lower surface of the leaf is dark brown, the leaves are yellowed and shrunk, most of them are fell off.

**Analysis and Discussions.** On the basis of phytosanitary monitoring, route observations and stationary examinations of *Magnolia* plants grown in the experimental fields of the Institute of Dendrology in Absheron Peninsula (2020-2021), plant samples infected with pests and pathogens were collected and systematically analyzed [1; 3; 8].

Species belonging to this genus have been found to be *Icerya purchasi* Mack., 1878 *Ceroplastes sinensis* Guer., *Tetranychus urticae* Koch., *Helix pomatia* Lin., 1758 and *Pseudomonas syringae* Species: Ceroplastes sinensis Guer, 1900 [13].

It lives mainly in sprout, branches and leaves of citrus plants. It also harms the Japanese palm, pomegranate leaf. It gives one generation per year. Distribution: Widespread in Western Europe, North Africa, Turkey, the Black Sea coast of the Caucasus [23].

For this purpose, in the Absheron peninsula, the frequency of occurrence of pests and pathogens in species belonging to the genus *Magnolia* was analyzed (tabl. 1).

Fig. 1. *İcerya purchasi* Mack. their adult and larvae (M. *kobus*)

Fig. 2. *Ceroplastes sinensis* Guer. – Leaves and shoots infected by M. *grandiflora*

Table 1

**Pests and pathogens on the trunk, shoots and leaves of the plant**

| Species of pest or pathogen | Found in plant parts | | | | Frequency of occurrence |
|---|---|---|---|---|---|
| | Leaf | Shoot | Branch | Trunk | |
| *İcerya purchasi* Mack., 1878 | + | | + | + | ++ |
| *Ceroplastes sinensis* Guer. | + | | + | | + + |
| *Tetranychus urticae* Koch. | + | | | | + + + |
| *Helix pomatia* Lin., 1758 | + | | + | | + + |
| *Pseudomonas syringae* | + | + | | + | + |

*Symbols:* "+" – weak infection, "++" – moderate infection, "+++" – strong infection

Distribution and density of pests (3, 4) of some species of genus *Magnolia* in the Absheron peninsula were studied (tabl. 2).

Table 2

**Distribution and density of pests of some species of genus *Magnolia* in Absheron (15.07.2021)**

| Pest specie | Pest spread, % | Density rate, point (average) |
|---|---|---|
| *İcerya purchasi* Mack., 1878 | 61.0 | 2.1 |
| *Ceroplastes sinensis* Guer. | 65.0 | 1.8 |
| *Tetranychus urticae* Koch. | 68.0 | 2.3 |

*Stationary:* Experimental field of the Institute of Dendrology, 2021.

As can be seen from Table 2, despite the recent introduction of the *Magnolia* plant to the Absheron peninsula, the risk of infection with a number of dangerous pests and pathogens is high. The results of the study showed that the infection of *Icerya purchasi* Mack., 1878 and *Ceroplastes sinensis* Guer., was 65.0% and the infection of *Tetranychus urticae* Koch., was 68%, respectively.

Stationary: Experimental field of the Institute of Dendrology, 2021.

The density of pests in the area was 2.1, 1.8 and 2.3 points, respectively. The bioecological characteristics of I. *purchasi* and C. *sinensis* pests in genus *Magnolia* were studied in the peninsula, and the degree of damage was determined.

*İcerya purchasi* Mack., is a polyphagous pest that causes serious damage to citrus plants and ornamental crops. The Australian sagebrush is found in the Absheron peninsula along with many subtropical plants, as well as species belonging to the genus *Magnolia*. The pest produces 2 generations per year in the research area, and fertilized adult females hibernate. In spring, in the end of May, female secretes an egg sac and lays an egg in it, which significantly prolongs the larval stage.

*Ceroplastes sinensis* Guer. is polyphagous, damaging citrus, fruit trees and ornamental park plants. İt completes one generation per year in Absheron conditions, winters as a fertilized adult female. Females lay eggs in late June, and larvae are born in first decade of July.

Unlike *Lopholeucaspis japonica* Cockerell., when female *Ceroplastes sinensis* Guer. reproduces, the body swells from the lumbar region, high peaks and clearly defined edges appear, and the body of the coccinea takes on a polygonal shape.

On the one hand, the pests cause serious damage to plant by sucking the sap of the plant, on the other hand, the surface of the plant massively contaminated with the pest secretions, and a number of mold fungi develop on these secretions, covering the surface of leaves and shoots. In this case, the plant can not breathe normally, stops growing, the leaves turn yellow, fall off, after severe infections, even the young shoots and branches of the plant dry up, and sometimes the plant is completely destroyed. A number of abiotic disorders caused by winter cold damage can be confused with pest injury and plant diseases. Alternatively, these abiotic disorders may predispose magnolia to injury from opportunistic arthropod pests and infection by plant diseases. Also, recognition of abiotic disorders can prevent unnecessary pesticide applications resulting from misdiagnosis of pests and diseases by nursery and landscape managers.

In order to carry out chemical preventive measures against dangerous pest species (I. purchasi and C. sinensis) damaging the magnolia plant in the dendroflora of Absheron, the plants infected with the pest were selected and labeled in the experimental field. Research has been conducted on the species composition and effective activity of their natural enemies in the sample plants infected with coccinea. The natural entomofauna of the mentioned coccinea species was not found in the study area. Therefore, chemical preventive methods were used in the control of dangerous pests in magnolia species grown in the dendroflora of Absheron. Chemical preventive measures were carried out during the formation of a new generation of larvae. Because the young larvae of the pests are sensitive to chemicals, the effectiveness of the preventive work during this period is high, and the consumption rate of the tested medications is low. Dentis (EC number 25%), Desis (EC number 2.5%), Fastac (EC number 10%) and Poliqor (EC number 40%) preparations were tested against the young larvae of coccinea species mentioned in the magnolia plant in the dendroflora. The experiment was conducted 3 times in each variant on 3 types. Hand sprayer (ОПР-10) was used to treat the trees. Consumption of working solution was 2 l / tree. To study the biological efficacy of the drugs, a pest report was performed before and 15 days after treatment (tabl. 3, 4) [13].

Table 3

**Biological effectiveness of chemicals against young larvae in Magnolia plant (*Icerya purchasi* Mask.) in Absheron (11.VI.2021)**

| Variants | Concentration of working solution, % | The number of pests per 1 leaf (average) | | The amount of pests has decreased (-) or increased (+) |
|---|---|---|---|---|
| | | before treatment | after treatment | |
| Desis (EC number 2.5%) | 0.05 | 8.1 | 1.3 | -83.4 |
| Dentis (EC number 25%) | 0.1 | 7.3 | 1.5 | -79.2 |
| Fastac (EC number 10%) | 0.05 | 9.1 | 1.8 | -80.3 |
| Poliqor (EC number 40%, standard) | 0.2 | 7.6 | 2.1 | -70.2 |
| Control (without medication) | - | 8.4 | 14.0 | +175 |

Table 4

**Biological effectiveness of chemicals against young larvae in the Magnolia plant (*Ceroplastes sinensis* Guer.) in Absheron (9.VII.2021)**

| Practice options | Concentration of working solution in% (according to the drug) | Quantity of pest, 1 leaf (average) | | The amount of pest has decreased (-) or increased (+) |
|---|---|---|---|---|
| | | before treatment | after treatment | |
| Desis (EC number 2.5%) | 0.05 | 12.0 | 1,2 | -89.4 |
| Dentis (EC number 25%) | 0.1 | 10.3 | 1,2 | -87.2 |
| Fastac (EC number 10%) | 0.05 | 11.2 | 1.6 | -85.4 |
| Poliqor (EC number 40%, standard) | 0.2 | 9.4 | 9.1 | -76.6 |
| Control (without treatment) | - | 10.3 | 17 | +170 |

**Conclusion.** Phytosanitary monitoring, route observations and (stationary) examinations were carried out on species belonging to the genus *Magnolia* (2020-2021) cultivated in the experimental areas of the Institute of Dendrology, plant samples infected with pests and pathogens were collected and systematically analyzed.

As a result of phytosanitary monitoring, *Pseudomonas syringae* and these pests were found in the *Magnolia* species studied for the first time in Absheron: *Icerya purchasi* Mack, 1878, *Ceroplastes sinensis* Guer., *Tetranychus urticae* Koch., *Helix pomatia* Lin., 1758. Frequency of occurrence of pests and pathogens, prevalence and density of pests were analyzed.

In the conditions of Absheron, some bioecological features of dangerous larvae in *Magnolia* species – *Icerya purchasi* Mack., 1878 and *Ceroplastes sinensis* Guer. were studied. For the first time, appropriate preventive measures were selected against their young larvae using a number of perspective insecticides.

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