Study of the resistance of economically important pine species to dangerous pests on the Absheron Peninsula

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Abstract. The main goal of the research is to study the resistance of widely used pine species in the landscaping of the Absheron Peninsula to serious dangerous pests, to select relatively resistant species, and to recommend them for landscaping farms. At the initial stage of scientific research, phytosanitary monitoring of various types of pine trees cultivated on the peninsula was carried out, dangerous organisms were studied, analyzed, and identified (2020-2023). As a result of the research, it was established that dangerous microorganisms that are often found in economically important pine species in the studied region: pine bark beetle, sub-bark pine bug, pine scale insect, and the causative agent of tar cancer, cause serious damage to the lifestyle and productivity of plants. This is explained by the fact that harmful organisms cannot cause serious harm to the plant due to the activation of protective and regenerative processes inside the plants. Thus, taking into account the resistance of *P. eldarica* to other unfavourable soil and climatic factors of the peninsula, including the mentioned dangerous pathogenic and harmful insects, in comparison with other species, it is advisable to widely use it as the dominant species in the region's landscaping.

1 Introduction

Many pine species, including *Pinus eldarica* Medv., *P. halepensis* Mill., *P. longiflora* Roxb. L., *P. pinea*, etc., are widely used in the greening of the Absheron Peninsula. In our republic, sufficient scientific studies have been conducted on the relationship of individual pine species to the soil-climate conditions, including many environmental factors in the peninsula. In addition, recent cases of drying and destruction of pine trees in the Absheron Peninsula and various regions of our republic, as well as in many foreign countries, are often encountered. The bibliographic analysis of literature sources shows that the prevalence of many harmful organisms in pine species has been recorded in our republic until now [13, 22, 23], but no substantial scientific research has been conducted to identify pine species resistant to them. Identifying and recommending a type of pine resistant to

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harmful organisms and recommending it to the farms is of exceptional importance for the peninsula, so the researched issue is urgent, therefore, there is a serious need to conduct scientific research in this direction.

The main direction of the research is to ensure the stability of the ecological balance in the region by opening wide opportunities for the protection of plants and protecting and developing biodiversity, thanks to the application of resistant plants to the economy in the system of complex control measures against dangerous harmful organisms as an effective result of scientific research. The use of plants resistant to harmful organisms is extremely important in ensuring the ecological security of the peninsula.

2 Material and Methods

As it is known, up to the present period, no attention was paid to conducting fundamental scientific research on the study of the persistence of pine species used in the greening on the Absheron peninsula against dangerous pests and disease agents.

Phytosanitary monitoring was carried out in the cultivated pine plantations in the study area to prepare complex control measures by identifying pine species resistant to harmful organisms. By determining the infection density, the damage was assessed, and a relatively resistant type of pine was selected [3-6, 17, 20].

The report of bark beetles, a dangerous pest of pines in the peninsula, was conducted by inspecting the trunk of infected 5-25-year-old specimen pines from August to September. The prevalence of the pest in 8-year-old and older pines was studied in infected special control plots.

A report of underbark saplings, a dangerous pest of pine in the Peninsula, sampled plants with varying degrees of infestation from at least 2 sample sites infested with the pest. The census of pine bark beetles, the density of the pest is studied by looking at 100 plants in a 10 ha area (2-5 samples), the degree of infection of the plants is evaluated and grouped [2, 8, 9].

In order to determine the state of infection and distribution area of pine scales in the Absheron peninsula, various pine species cultivated in park-gardens and greening farms were examined and accurate examinations were carried out. The plants were checked and examined chess wise and diagonally and registration of the pest was carried out [11-15].

For the assessment of the pathological condition of pine trees, E.G. Mozolevskaya, O.A. Kataev, E.S. Sokolova's (1984) standard forest pathology methodology was used [13]. During the examination, the presence of the disease in the trunk and branches was fixed.

Phytopathological monitoring of pine trees in Absheron was carried out based on the methodology of I.I. Minkevich, T.B. Dorofeyeva, V.F. Kovyazin [12]. Unusual morphological changes in the external structure of the diseased plant were based on visual observations. After the visible changes were noted, the diseased material was collected and brought to the laboratory, the causative agent of the disease was examined under a microscope, and the determination was made. Later, the causative agent of the disease was identified and determined by growing it in a humid chamber (removal to a clean environment, re-infection of the causative agent through inoculum, etc. [13]. Distribution of the disease agent in the area was evaluated by the diagonal or checkerboard method, and the development and the degree of density were studied in sample plants selected in the stationary. Visual observation and notes are made from all sides of the plant. The causative agent of the disease enters the plant through the damaged tender parts of the bark of the trunk, branches and young shoots. From the wound on diseased plants, the resin stream flows from the top down along the stem and is absorbed into the bark. At this time, the bark cracks and peels (flakes), peels and wounds appear on the trunk. The number and size of the wounds caused by the disease agent on the trunk and branches of the tree were evaluated according to the symptoms on a 5-point scale [11, 16].

For study of the changes caused by the harmful agents of pine plants infected with harmful organisms in the morphological structure of the plant - was used method of growth and development of Vajina E.V., Aminov P.I. and Tanskiy V.I. [1, 18, 19].

3 Results and Discussion

Immune varieties have an indispensable role in increasing high-quality abundant crops and productivity. In cultivated plant breeding, new plant varieties are created in a short period, they are more sensitive to harmful organisms than their wild ancestors and are subject to serious deprivations. A reliable defence system formed historically in the wild plant organism limits the growth and multiplication of damage caused to the plant for any reason, restoration and protection processes are activated, and in cultured plants, these qualities gradually disappear.

As a result of scientific research conducted from this point of view, resistance of various pine species cultivated on the Absheron Peninsula to serious harmful pests and disease agents was studied and analyzed. In the study area, the percentage and degree of infection of various pine species of economic importance with the pine scale insects was determined, and the level of sustainability was studied [7]. It was determined that among the pine species cultivated in the study area, there is no species that is not completely infected with the pine scale insects, but the infection of the studied species with the pest and the density of the infection are different. according to this feature, they differ from each other. Thus, in the study area, *P. longifloria* and *P. pinea* species showed some sensitivity to pine mould, the infestation of plants with the pest and the density of infection were higher than other species, 61.1% - 1.9 points and 60,5% - 1.1 points, respectively. *Pinus eldarica* and *P. halepensis* species showed some resistance to pine mould and were less infected than other species. While *P. eldarica*'s infection with pine scale insects was 43.3%, and its density was 0.7 points, respectively, these indicators were 56.2% and 0.8 points for *P. halepensis* species. At the time of observation, it was recorded that the pest density was at a low level in both species. The effect of the pest on the growth and development of individual pine species was also studied. The height of the infected plant and the diameter of the stem were compared with the healthy plant. Depending on the degree of infection, individual pine species were more or less weakened by the pest. So, in the research area, the height growth of eldar pines infected with scale insects at a density of 0.7 points decreased by 1% on average, and the diameter of the stem decreased by 2.3% in the study year compared to healthy plants. Italian candles were the most damaged by the impact of the scale insects. *P. pinea* trees were the most affected by the pest, the growth of infected plants was 2% compared to healthy plants, and there was a 6.8% decrease in the diameter of the trunk. In the Absheron Peninsula, the infection of various pine species with bark-eating pine beetles has been studied. Research has established that the pine species cultivated on the peninsula are not equally resistant to bark-eating insects. During the phytosanitary monitoring conducted on pine trees in different areas of the peninsula, it was determined that the prevalence and density of the pest in pine plantations of different ages (5-25 years) and individual species have not been the same. It was determined that the spread of the pest in pine species in the region varied between 45.0-57.5%, and its density varied between 0.8-1.4 units (in a 0.25 m^2 sample). The species *P. longifolia* was somewhat sensitive to the pest, the distribution of the pest by species was 57.5%, and the density was 1.4 pieces. *P. eldarica* showed some resistance to the pest, its infection and density were relatively low (45.0% and 0.8 units). The damage of bark-eating pine beetles to the plant has been studied. It was determined that different types of pine grown in the region are not infected with these insects in the same density and the plants are weakened by their influence. The height growth of *Pinus eldarica* species, relatively weakly infected with the bark-eating beetle, decreased by 1%, and the diameter of the stem decreased

by 2% compared to the healthy plant. In the case of *P. pinea*, this indicator was 1.7-3.4%, respectively.

The infection of the pine species under the bark with pine borer was studied (table 3). From the analysis of Table 3, it can be seen that all cultivated pine species are infected with underbark pine borer. In the region, the distribution of pine borers in different types of pine was 35.9-58.3%, and their density on 0.25 cm^2 samples was 0.6-1.2 (on average). It was noted that eldar pines are somewhat resistant to the pest in the study area. The morphological effect of the pest on the plant has been studied. So, on average, it was 0.6-1.2 units (on average). In the presence of a seedling, due to the effect of the pest, the growth of the stem diameter of the plant decreased by 2% compared to a healthy plant, and the growth of the height decreased by 0.4%. In the case of *P. pinea*, this number is 4.2, respectively and was 0.7%. Also, resistance of different pine species to resinous cancer disease was studied in the peninsula. It has been proven by researches that the pine species grown in the Absheron valley are sensitive to the causative agent of the resinous cancer disease, there is no species that is not completely infected with the causative agent of the disease, they are infected to varying degrees. Since the causative agent lives inside the plant for a long time, it repeatedly infects the plant, develops and gives birth to a new generation, so the species differ from each other in terms of infection density. Thus, in the peninsula, young pine trees (5-7 years old) of the *P. eldarica* type are infected with the pathogen by 43.7%, the density is 0.7 points (on average), and in other pine species, this indicator is 48.8-66.6% and 0.8-1.2 points, respectively. It was determined that eldar pine is slightly less susceptible to the disease agent than other species, relatively resistant, and the density of the pest in the plant was low. The causative agent of the disease continues to develop inside the plant for a long time, causing serious damage to the plant, so the symptoms of the disease are more obvious in old pine trees, and the disease takes on a more complex form. The effect of the pathogen on the growth of the plant and the increase in the diameter of the stem was studied. Thus, in eldar pines infected with the causative agent of resinous cancer, the growth of plants decreased by 0.9% and the diameter of the trunk by 3.0% compared to a healthy plant, while in plants belonging to the *P. pinea* species, this figure was 1.6 and 3,4%, respectively.

The infection of the studied pine species with the underbark pine beetle was studied. It has been determined by researches that all cultivated pine trees are infected with underbark pine beetle species. Depending on the degree of infection, there are slight changes in the growth and development of plants, they are of great importance. In this regard, eldar pines in the study area are slightly more resistant to harmful organisms than other species, so they are weakly infected, and as there is no fundamental difference in the growth and development of plants compared to healthy plants, they are the dominant species in greening. They are suitable for wide use.

Conclusion

As a result of the research, the stability of economically important pine species widely used in the greening of the Absheron peninsula against serious harmful pests was studied, and a relatively resistant species was selected and recommended for the farm. Dangerous microorganisms that are often found in economically important pine species in the study area, which seriously damage the lifestyle and productivity of plants, including the pine bark beetle (I. Acuminatus Gyll), the pine bark beetle (*Aradus cinnamomeus* Panz), the pine scale insect (Leucaspis pusilla Löv.) and the causative agent of resin cancer disease (*Peridermium pini* Kleb) were identified. The level of resistance of different types of pine against dangerous harmful organisms was studied through research, and the relatively resistant ones were determined and recommended for greening farms. The persistence of pine species against pests and diseases was determined by the degree or density of their infestation with harmful

organisms. In order to determine the damage caused by pests to pine plants depending on the degree of infection, the growth and development of the infected plant was compared with the healthy plant. Analyzing the results of scientific research, it can be concluded that among the pine species *Pinus eldarica*, *P.halopensis, P.longifolia* and *P.pinea*, which are widely used in greening on the Absheron Peninsula, there is no species completely resistant to the above-mentioned harmful organisms, they are few or are highly infected with these microorganisms. However, it should be noted that among the studied pine species, *P.eldarica* species is relatively resistant to harmful phytophagous microorganisms compared to other species, so it is less infected with pests. Although certain changes were observed in the normal life processes of plants, the difference in growth and development of an infected plant and a healthy plant was not very big. Summarizing the results of the conducted research, it can be concluded that *P.eldarica* on the Absheron Peninsula is resistant to serious harmful pests, it is less infected than other species, there was no strong weakening or significant difference in the growth and development of infected plants compared to healthy plants, taking into account all this, *P.eldarica* is suitable for wide use as a persistent dominant species.

Authors' contribution

Methodology, Shamaddin Gahramanov, Mardan Taghiyev; Software, Vusala Ismayilova, Konul Musayeva; Investigation, Shamaddin Gahramanov, Huseyn Mammadov; Resources, Shamaddin Gahramanov, Huseyn Mammadov; Writing – Original Draft Preparation, Shamaddin Gahramanov; Funding Acquisition, Shamaddin Gahramanov.

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