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Farg’ona Davlat Universiteti magistri.998941239710

Abstract: *Peach (*Prunus persica* L.) is one of the most important fruit crops widely cultivated in many countries around the world. This crop is distinguished by its high productivity, nutritional value, and economic significance. However, various fungal, bacterial, and viral diseases, as well as insect pests, cause serious damage to both the quantity and quality of peach yields. This article analyzes the major diseases and pests of peach plants, their biological characteristics, distribution, degree of damage, and modern control methods. The research findings indicate that the implementation of integrated pest management systems plays a crucial role in maintaining productivity and ensuring environmental safety. Based on international and local scientific sources, the article highlights the main phytopathological and entomological problems encountered in peach plantations.*

Keywords: *Peach, *Prunus persica*, leaf curl, moniliosis, shot-hole disease, powdery mildew, oriental fruit moth, aphids, scale insects, integrated pest management, phytopathology, entomology.*

Introduction

Peach (*Prunus persica* L.) belongs to the Rosaceae family and is considered one of the most important stone fruit trees worldwide. According to data from the Food and Agriculture Organization of the United Nations (FAO), more than 25 million tons of peaches and nectarines are produced annually across the globe [1].

The soil and climatic conditions of Uzbekistan are highly favorable for peach cultivation, and this crop is widely grown in many regions of the country. However, diseases and pests that negatively affect yield and fruit quality have become a major cause of economic losses in production systems [2].

The principal diseases affecting peach trees include peach leaf curl, moniliosis (brown rot), shot-hole disease, and powdery mildew. Among the most significant pests are the oriental fruit moth, green peach aphid, scale insects, and spider mites [3].

Effective management of diseases and pests requires a thorough understanding of their biology, developmental cycles, and ecological characteristics. Therefore, the objective of this article is to analyze the major diseases and pests affecting peach plants and to discuss modern approaches for their control.

Methodology

During the study, local and international scientific literature related to phytopathology, entomology, and plant protection was reviewed. In particular, publications and reports from FAO, CABI, EPPO, as well as articles published in scientific journals, were analyzed [4].

The biological characteristics of diseases and pests, their damaging effects, and the methods used for their control were examined using a comparative analysis approach. The study employed scientific observation, data comparison, and generalization methods.

Results

As a result of the analyses, the major diseases and pests commonly affecting peach plants were identified, and their levels of damage were evaluated.

Peach Leaf Curl

Peach leaf curl is caused by the fungus *Taphrina deformans*. This disease is considered one of the most destructive diseases of peach trees. Infected leaves become thickened, reddish, and deformed. Under severe infection conditions, trees shed their leaves, resulting in a significant reduction in yield [5].

The disease develops particularly rapidly during the spring season under cool and humid weather conditions. Air temperatures ranging from 10°C to 20°C are considered favorable for pathogen development [6].

Brown Rot

Brown rot, caused by the fungi *Monilinia laxa* and *Monilinia fructigena*, affects flowers, shoots, and fruits. Brown spots develop on infected fruits, which subsequently begin to decay [7].

It has been reported that brown rot may cause yield losses of up to 30–50% in certain years [8].

Shot Hole Disease

Shot hole disease, also known as perforated leaf spot, is associated with the pathogen *Clasterosporium carpophilum*. The disease causes the formation of small brown spots on leaves, and the central portions of these lesions later fall out, resulting in characteristic holes in the foliage [9].

The disease also affects shoots and fruits, leading to a reduction in photosynthetic activity.

Powdery Mildew

Powdery mildew, caused by *Sphaerotheca pannosa*, produces a white powdery coating on young leaves and shoots. Severe infections inhibit shoot growth and reduce fruit quality [10].

Oriental Fruit Moth

The oriental fruit moth (*Grapholita molesta*) is regarded as one of the most serious pests of peach. Larvae penetrate young shoots and fruits, feeding internally. As a result, shoots wither, while fruits become deformed and prematurely drop from the tree [11].

The pest can produce 4–6 generations during a single growing season, which significantly increases its destructive potential.

Green Peach Aphid

The green peach aphid (*Myzus persicae*) is widely distributed in peach orchards. Aphids feed on plant sap, causing leaf curling and yellowing. In addition, this pest serves as a vector for numerous viral diseases [12].

Scale Insects

Scale insects inhabit the bark and shoots of trees, feeding on plant sap. Their activity weakens overall tree growth, reduces productivity, and decreases winter hardiness [13].

Spider Mites

Spider mites belonging to the family *Tetranychidae* reproduce rapidly under hot and dry conditions. They colonize the undersides of leaves and feed on cellular sap. Infested leaves develop a bronze discoloration, and the photosynthetic process is adversely affected [14].

Analysis and Discussion

Diseases and pests occurring during peach (*Prunus persica* L.) cultivation have a significant impact on yield and fruit quality. Global experience and scientific studies indicate that among stone fruit crops, peach is one of the most sensitive species to phytosanitary problems. In particular, fungal diseases and insect pests developing at different stages of the growing season reduce yield, lower the marketability of fruits, and negatively affect the long-term productivity of trees.

Among the diseases found in peach orchards, peach leaf curl (*Taphrina deformans*) occupies a special place. This disease occurs in almost all peach-growing regions of the world and causes substantial economic losses. Research has shown that in years of severe infection, the leaf apparatus of trees is significantly damaged, resulting in a reduction in photosynthetic activity and disruption of nutrient assimilation processes. Premature leaf fall leads to poor development of young shoots, which subsequently reduces the formation of fruit buds for the following season. Therefore, peach leaf curl affects not only the current year's harvest but also the productivity of the subsequent growing season.

The development of this disease is closely associated with meteorological factors. Prolonged rainfall and relatively low temperatures during spring create favorable conditions for the germination of fungal spores. In some foothill and humid climatic regions of Uzbekistan, the risk of disease development is particularly high. Consequently, implementing preventive control measures before the onset of vegetation is of great importance.

Brown rot, caused by *Monilinia* species, is another widespread disease in peach orchards. Studies have demonstrated that brown rot is especially destructive during the flowering and fruit-ripening periods. Pathogens enter through flowers, subsequently infecting shoots and fruits. As infected fruits rot, not only is yield reduced, but postharvest losses during storage also increase. Some reports indicate that brown rot can destroy up to 50% of the crop under favorable conditions for disease development. This highlights the considerable economic significance of the disease.

The agro-technical condition of the orchard plays an important role in the development of brown rot. Excessive tree density, canopy thickening, and poor air circulation accelerate disease spread. Therefore, in modern orchard management, formative and sanitary pruning are regarded as essential components of phytosanitary practices. Timely removal of infected shoots and mummified fruits contributes significantly to reducing sources of infection.

Shot-hole disease (*Clasterosporium carpophilum*) also poses a serious threat to peach production. By affecting leaves, shoots, and fruits, the disease weakens the overall physiological condition of trees. Numerous lesions and perforations formed on leaves reduce the photosynthetic surface area, thereby limiting energy metabolism and nutrient synthesis within the plant. As a result, fruit growth and development are negatively affected. The disease is particularly prevalent in cool and humid climatic conditions.

Powdery mildew develops actively during periods of intensive growth of young leaves and shoots. The white mycelial layer formed on leaf surfaces restricts photosynthesis and reduces physiological activity. Furthermore, deformation of young shoots interferes with the normal formation of the tree framework. Scientific observations indicate that orchards severely affected by powdery mildew produce fruits with lower average weight and reduced market quality.

Among peach pests, the oriental fruit moth (*Grapholita molesta*) is of particular economic importance. This pest is recognized worldwide as one of the most destructive insects affecting stone fruit crops. Larvae penetrate young shoots and feed on plant tissues, causing dieback of shoot tips and suppression of vegetative growth. Later generations attack fruits directly, initiating decay processes that significantly reduce their commercial value.

The harmfulness of the oriental fruit moth is largely associated with its high reproductive potential. Under favorable climatic conditions, the pest can produce several generations during a single growing season, resulting in rapid population growth. Climate change and rising temperatures may further shorten developmental cycles and increase the number of generations produced annually. Consequently, the economic significance of this pest is expected to increase in the future.

The green peach aphid (*Myzus persicae*) is dangerous not only because of the direct damage it causes but also because of its role as a vector of viral diseases. Aphid infestation results in leaf curling, deformation, and reduced plant growth. The development of young seedlings is also negatively affected. Moreover, the honeydew secreted by aphids creates favorable conditions for the growth of saprophytic fungi, which further decreases photosynthetic efficiency.

In recent years, insecticide resistance has become an increasingly important issue. Populations of *Myzus persicae* in several regions have developed resistance to various chemical pesticides. Therefore, the role of biological control methods within integrated pest management (IPM) programs is becoming more significant. Beneficial organisms such as ladybird beetles, lacewings, and parasitic wasps play an essential role in naturally suppressing aphid populations.

Scale insects and spider mites are also common pests in peach orchards. Their harmful effects are often manifested through prolonged physiological weakening of trees. Scale insects inhabit bark and branches, feeding on plant sap and disrupting the nutritional balance of the tree, ultimately reducing productivity. Spider mites, on the other hand, multiply rapidly under hot and dry weather conditions. Infested leaves experience a reduction in chlorophyll content and frequently fall prematurely, further weakening the tree and decreasing its productive potential.

The combined impact of diseases and pests is a matter of particular concern. In many cases, tissues damaged by pests serve as entry points for secondary infections. For example, the development of brown rot (moniliosis) accelerates in fruits injured by the oriental fruit moth. Similarly, plants infested with aphids become more susceptible to various viral diseases. This situation further emphasizes the necessity of implementing integrated plant protection measures.

According to the modern concept of plant protection, relying solely on chemical methods for controlling diseases and pests is not sufficient. Excessive use of chemical pesticides may lead to environmental problems, negatively affect beneficial entomofauna, and contribute to the development of resistant pest populations [3]. Therefore, the integrated pest management (IPM) system is recommended as the most effective and sustainable approach.

Within the integrated protection system, agrotechnical measures occupy a central role. The use of healthy planting material, proper orchard establishment, and the implementation of optimal irrigation and fertilization practices enhance plant resistance. In addition, regular sanitation measures conducted during autumn and spring help reduce sources of infection and the populations of overwintering pests.

The development of biological control methods is also considered one of the most promising directions in modern plant protection. The use of entomophagous insects, microbiological preparations, and pheromone-based technologies not only ensures environmental safety but also improves the export potential of agricultural products. In particular, pheromone traps can be used to monitor the flight dynamics of the oriental fruit moth and determine the optimal timing for control measures.

The above analysis indicates that improving the phytosanitary condition of peach orchards requires a thorough understanding of the biological characteristics of diseases and pests, the enhancement of monitoring systems, and the widespread implementation of integrated protection strategies. Such an approach is a key factor in increasing productivity, reducing economic losses, and promoting environmentally sustainable horticulture.

Conclusion

Peach (*Prunus persica* L.) is one of the fruit crops with high economic importance, and its productivity and fruit quality are significantly reduced by the impact of various diseases and pests. According to the results of this study, peach leaf curl, brown rot (moniliosis), shot-hole disease (clasterosporiosis), and powdery mildew were identified as the major diseases affecting peach plants. Among the most destructive pests are the oriental fruit moth, green peach aphid, scale insects, and spider mites.

An integrated pest management (IPM) system that combines agrotechnical, biological, and chemical control methods is considered the most effective and environmentally safe approach for managing diseases and pests. Regular monitoring, preventive measures, and the rational use of modern plant protection tools contribute to increasing peach productivity and reducing economic losses.

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