

FUNGAL DISEASES OF APPLE AND SYSTEMS TO FIGHT AGAINST THEM

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Abstract: This article describes the fungal diseases of apple, one of the most consumed fruits in the world, and modern methods of combating them. Several pathogenic fungi that damage apple trees and their fruits are highlighted. Modern methods of control include chemical, biological, and agrotechnical methods. This article discusses in detail the main fungal diseases of apple trees, the factors that lead to their development, and the systemic methods used to combat these diseases.

Key words: *Malus domestica*, flower, moisture, protein, mildew, tree, areation, leaf, fungus, fungicide.

Apple (*Malus domestica*) is a widespread and economically important fruit tree in many countries. Apple trees play an important role in agriculture due to their high yield potential and long storage life. However, a number of diseases, in particular fungal diseases, can occur during apple cultivation, which negatively affect the quality, quantity and marketability of the crop. Fungal diseases, in turn, lead to deterioration of apple fruit quality, significant yield reduction and damage to the agricultural economy.

Fungal Diseases of Apples Various fungal diseases are observed in apple trees. Each of these diseases has its own characteristics and develops depending on different conditions and climate. The main fungal diseases of apples are:

Apple rot (*Venturia inaequalis*) The fungus *Venturia inaequalis* is one of the most common and damaging pathogens of apple trees. This disease mainly affects leaves, flowers, branches and fruits. The onset of the disease is mainly associated with unfavorable climatic conditions (constant humidity) and excess

water in agricultural areas. The main effect of the fungus is the appearance of black spots on the leaves, which reduces the photosynthesis process of the apple and negatively affects the overall development of the tree. The disease also causes rotting of the apple fruit, which leads to the loss of a significant part of the crop.

Apple powdery mildew (*Podosphaera leucotricha*) Powdery mildew, caused by the fungus *Podosphaera leucotricha*, appears on the leaves and branches of the apple tree. In this disease, whitish, cotton-like spots form on the new plant parts. If the disease persists for a long time, the leaves dry and wither, and the fruits become small and lose quality. To significantly reduce this disease, it is necessary to properly care for the trees and remove the affected parts.

Apple Downy Mildew (*Botrytis cinerea*) *Botrytis cinerea* is the pathogen that causes a disease called gray mold. This disease develops in conditions of high humidity and mainly affects apple fruits. The disease causes the appearance of gray and black spots on the surface of the fruit, which deteriorates the appearance of the crop and makes it unmarketable. The disease spreads quickly, especially in connection with dead or damaged fruit.

Apple Downy Mildew (*Pseudoperonospora cubensis*) Downy mildew, caused by the fungus *Pseudoperonospora cubensis*, causes white spots on the leaves of apple trees. This disease often develops in conditions of high humidity and cold weather. It slows down the growth of the tree, causes leaf fall and deterioration of fruit quality. It also causes a decrease in apple yields.

Fungal Disease Control Systems Modern and effective approaches are required to combat fungal diseases of apples. Systems for combating such diseases include chemical, biological, agrotechnological and ecological methods. Each method has its advantages and disadvantages, and their combined use gives the most effective results.

Chemical control methods Chemical methods are widely used in the fight against fungal diseases of apples. Fungicides are chemicals used to prevent or treat diseases. There are special preparations to control *Venturia inaequalis*, *Botrytis cinerea* and other fungi. Chemicals are sprayed on trees or leaves and stop the spread of diseases.

However, caution should be exercised in chemical control. Because excessive and improper use of chemicals can harm the environment and lead to resistance of plants and microorganisms. Therefore, chemical control methods should be carried out carefully and under the supervision of specialists.

Biological control methods In biological control, natural antagonistic organisms, such as beneficial bacteria or other fungi, are used to combat fungal diseases. Such organisms destroy harmful fungi or slow down their growth. Biological control methods are a more environmentally friendly and sustainable approach. For example, microorganisms such as *Trichoderma harzianum* can be used to protect apple trees.

Agrotechnological methods Agrotechnological methods are carried out in plant care, soil preparation, and crop irrigation. To prevent damage and diseases of apple trees, proper irrigation regime, maintaining the distance between trees, stable care, and free air circulation between plants are necessary. Another important agrotechnological method is the regular removal of damaged parts and keeping the trees clean.

Mechanical and ecological services With the help of mechanical and ecological services, manual cleaning and cutting of diseased leaves also play an important role in protecting apple trees from fungal diseases. Also, the spread of diseases can be prevented by regularly aerating the soil between plants, reducing excess moisture, and maintaining the correct distance between plants.

Fungal diseases of apples pose a major problem for agriculture, as they negatively affect the quality and quantity of the apple crop. The use of effective methods to combat these diseases includes chemical, biological,

agrotechnological and ecological approaches. By using the right control systems, significant success can be achieved in combating fungal diseases of apples.

To protect apple crops from fungal diseases, it is necessary to properly combine these methods and use resources efficiently. Thus, it is possible to obtain a high-quality harvest of apples and successfully sell them on the market.

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