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The Ustomycetes Class and the Downy Mildew Disease in Plants: Symptoms, Spread and Control Methods 111

Abstract

The class Ustomycetes consists of a group of distinct and significant microorganisms in the fungal world. Fungi belonging to this class can cause smut diseases in various plants. Smut diseases typically manifest with symptoms on plant leaves, flowers, and fruits, and they pose a serious threat to plant health. Ustomycetes fungi spread rapidly, especially in humid and warm conditions, which makes managing these diseases of great importance. This article will discuss the symptoms, transmission pathways, and control methods of smut diseases caused by Ustomycetes fungi in plants.

Keywords: *smut disease in plants, plant health, spread of plant diseases, fungal pathogens, biological infections*

Introduction

The class Ustomycetes is a widely distributed class in the fungal world. Among the members of this class, the genera *Peronosporaceae* (Figure 1) and *Plasmophora* (Figure 2) are particularly notable.

Figure 1



Peronosporaceae is primarily a group belonging to the class Oomycetes, and many of its members cause various diseases in plants. One of the main diseases caused by this class is downy mildew. Numerous members of the *Peronosporaceae* family, particularly species like *Peronospora*, *Plasmopara*, and *Bremia*, are responsible for this disease. Symptoms of the disease include yellowing of plant leaves, dark green or white spots, followed by drying and deformation of the leaves (Cheng, Zhang, Lin, 2020). If left uncontrolled, the disease weakens the plant's growth. It thrives in moist environments, especially during the spring and fall. The spores of Oomycetes

spread via wind and water. Eventually, fungal infections can also be encountered in affected plants (Agrios, 2005; Chaurasia, Meena, 2021).

Research

Various colored spots (blue, purple) appear on the leaves and stems. Different fungicides are applied to combat diseases caused by *Peronosporaceae*. Infected plants should be cleaned, and proper ventilation should be ensured while avoiding humid conditions. To prevent the spread of the disease, it is important to avoid replanting the same plant species in the same area (Becher, Lenz, 2019; Fischer, Klein, 2018).

There are also diseases caused by the fungus *Plasmopara viticola* in grapevines. White or gray-green spots, typically appearing on the underside of the leaves, are observed on the grapevine leaves. This disease can cause significant damage to grape crops, especially in dry climate conditions. The disease spreads more rapidly in high humidity, particularly during the spring and fall seasons (Muradov, 2009). The spores spread through wind and water. These fungi cause various smut diseases by damaging both the leaves and the roots and stems of plants. Smut fungi are particularly active in plants growing in wet and humid areas, where they have harmful effects on the leaves, stems, and fruits (Muthumeenakshi, Sundararaj, 2015; Ellingboe, Dyer, 2010).

Figure 2



Smut disease typically manifests on the leaves and flowers of plants with distinct symptoms. The main symptoms of this disease are as follows (Pascoe, 2012):

1. **White or yellow spots on the leaves:** White or yellow spots appear on the plant's leaves, especially on young leaves. Over time, these spots grow, reducing the plant's ability to perform photosynthesis.

2. **Leaf deformation and shedding:** Leaves affected by smut disease gradually deform and eventually curl up and fall off.

3. **Poor plant growth:** This disease slows down the overall development of the plant, potentially leading to a loss in yield. Slow growth and poor development further deteriorate the plant's health.

4. **Damage to flowers and fruits:** The fungal infection also affects flowers and fruits. Flowers turn brown or dry up, while fruits rot and are destroyed.

Smut fungi can spread to plants through various pathways. For example, **airborne spread** occurs when smut fungi spread via spores suspended in the air. These spores travel over large areas through wind, rain, and other weather conditions, landing on plants. Another method of spread is waterborne transmission—high humidity and irrigation facilitate the spread of fungi. Water from irrigation or rain carries the fungal spores between plants. Additionally, certain insects, especially aphids (plant lice), can transport fungal spores from plant to plant (Tóth, Papp, 2013; Linde, Zhan, 2014).

There are various methods to prevent or combat smut disease. For example, the use of fungicides: Chemical agents, especially fungicides, can be effective in combating fungal diseases. However, fungicides must be applied in the correct dosage and at the appropriate time to ensure their effectiveness and avoid harming the plants. Growing the same crops in the same area every year can lead to the spread of fungal diseases. By practicing crop rotation and planting different types of plants, these diseases can be prevented (Singh, Gupta, 2017; Wilson, Nichols, 2016). Additionally, damaged plant

parts, particularly rotting leaves and fruits, should be promptly cleaned and removed to reduce the spread of the disease. This will help prevent the spread of fungal spores. The growing conditions of the plants should be properly managed. In particular, good ventilation should be ensured to prevent high humidity on the plants. Biological control methods can also be used to prevent fungal diseases. For example, certain microbial products or other natural antimicrobials can destroy fungal spores, providing a natural way to combat the disease (Muradov, Bakshaliyeva, Arabova, Iskandar, 2024; Zambare, Jha, 2020).

Conclusion

Finally, it was concluded that the class *Ustomycetes* primarily encompasses fungi that cause smut diseases in plants. The members of this class affect various parts of plants, especially the leaves, stems, and roots, leading to serious health issues. These diseases can result in crop losses in agriculture and the degradation of plant cover. Smut diseases caused by *Ustomycetes* spread more rapidly under high humidity conditions, particularly during the fall and spring seasons. The most notable symptoms of the disease are the appearance of various colored and shaped spots on plants. In the early stages of the disease, yellow or white spots, and sometimes gray and green spots, appear on the plant leaves. These spots mainly develop on the underside of the leaves and gradually expand, covering more area. In many cases, plant death and crop loss occur. The damage to the leaves reduces the plant's ability to photosynthesize, weakening its overall growth. The disease can also affect the roots and stems of plants, making it difficult for the plant to absorb nutrients and water.

Smut diseases caused by *Ustomycetes* spread more rapidly in humid environments and under high-temperature conditions. The spores are disseminated through water and wind, increasing the risk of infection. Even over short distances between plants, the spread of the infection is possible. The main factors contributing to the spread of the disease include high humidity: *Ustomycetes* pathogens thrive in moist and water-saturated environments, which leads to the rapid spread of the disease, especially during rainy and humid weather. Infected plant material: The roots and leaves of affected plants serve as another factor in spreading the disease. In most cases, smut diseases proliferate more rapidly when transmitted by pests. For instance, insects and other arthropods can carry these spores from one plant to another, further accelerating the spread of the disease. There are several approaches to combating smut diseases, with the aim of halting the spread of the infection and protecting plant health. The most effective control methods are outlined as follows:

First, chemical treatment is the most common method for combating smut diseases. Fungicides are used to prevent infection or reduce the effects of the disease. It is recommended to apply fungicides to infected plants during early stages. This helps prevent the spread of spores and limits the progression of the disease. For example, fungicides such as mancozeb, metalaxyl, or maneb are commonly used to combat these diseases. Another method of control is the removal and destruction of infected plant parts. This helps prevent the further spread of the infection. Damaged plant parts should be promptly cleaned and removed, as they increase the risk of transmission to other healthy plants.

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