Protect your plants from powdery mildew

Powdery mildew is one of the most ubiquitous and easily recognized fungal diseases affecting Wyoming gardens, agronomic crops, greenhouses, and high tunnels.

The use of high tunnels, also known as hoop houses, for vegetable, fruit, and cut flower production has been a real boon in Wyoming. These relatively simple, inexpensive plastic film structures extend the growing season and protect plants from harsh weather, marauding birds, and some animals. However, high tunnels are characterized by warm and humid environments—ideal conditions for disease development, especially powdery mildew.

Although this article focuses on powdery mildew in high tunnels, the information provided is applicable to other growing environments as well. All aspects of powdery mildew symptoms, biology, and management are similar, whether in a greenhouse, high tunnel, or backyard garden.

What is powdery mildew?

The term powdery mildew actually refers to a tribe of thousands of individual species, each with their own unique host range. As a group, powdery mildews infect virtually all types of plants, including many landscaping plants, vegetables, fruits, and agronomic crops.

This does not mean one species alone can infect hundreds of plant species. An individual species of powdery mildew typically has a narrow host range. For example, a species that infects your roses will likely not infect your tomatoes.

Powdery mildews are native to the Americas. Introduced plants are more susceptible to infections than native species that have developed tolerance or defense mechanisms.

Symptoms

Despite the vast numbers of powdery mildew species, they all produce similar symptoms. Powdery mildews only grow and infect the surface cell layer of the plant, most commonly on the upper leaf surfaces, but can also appear on the bottom sides of leaves, succulent stems, fruit, flowers, and buds.

Infections are characterized by spots or patches of white to grey powdery, mat-like growth. Infected leaves may turn yellow or necrotic, become twisted, and fall prematurely. Later in the season, pinhead-sized spherical fruiting structures (cleistothecia) of the fungus can be seen within the fungal mat area. The color of these structures varies depending on species and maturity, ranging from white, yellow, and orange to brown and black.

Biology

Powdery mildews are obligate pathogens, meaning they cannot live without a host. While they rarely kill their host, powdery mildews can weaken the host and cause defoliation, fewer blooms, reduced yields, and reduced overall growth.

The fruiting structure of powdery mildews is important for both the fungal sexual cycle and its overwintering structure. In the spring, cleistothecia in plant residue release spores that move to susceptible tissue through wind and rain splash.

The fungus can also survive as a network of fungal threads (mycelium) in the buds of perennial plants. The observed white powdery growth represents fungal mycelium with thousands of asexual spores; these spores (conidium) are responsible for rapid development of the disease during the growing season.

Unlike other fungi, powdery mildews do not require

free water (water droplets or films on plant surfaces) for spores to germinate. Instead, they are adversely affected by free water.

What powdery mildews do require is warm temperatures (60–85°F) and high humidity (percentages in the upper 90s at night and 40–70 percent during the day) for spore germination and infection. In general, young succulent tissue is most susceptible to infection, but disease is typically seen on lower leaves initially.

Disease is more common in crowded plantings, shaded locations, and areas of limited air circulation—all conditions found in high tunnels. Management of powdery mildew can be challenging and requires a multi-pronged approach for best results.

Management

Environmental changes

High tunnels tend to be warmer and more humid than ambient conditions, creating ideal environments for powdery mildew development. The best management options mitigate these factors. Some high tunnels have roll-up sides; raising them during the heat of the day can reduce temperature and improve airflow. For new constructions, orient hoop house openings with prevailing winds. This is especially important for hoop houses that do not have roll-up sides.

To help reduce humidity, make sure to prevent standing water from collecting in the high tunnel. Try to avoid closely spaced plants and overlapping plant canopies as well. These microclimates typically have higher relative humidities and are often the first place powdery mildew takes hold.

If power is available at the site, portable fans can greatly improve airflow when placed at one of the high tunnel end openings.

Sanitation

Eliminating sources of infection prevents pathogens from spreading to healthy plants. Once an infection is noted, immediately dispose of diseased plant material.

Powdery mildew overwinters on plant residue, so removal of infected tissue removes inoculum that can cause infection the following year. Material should be removed from the site and disposed of as waste, not composted. Composting temperatures may not be 100 percent efficient in destroying the fruiting bodies.

Decontamination of tools and surfaces with a bleach solution (9 parts water, 1 part bleach) is recommended in an enclosed area like a greenhouse, but is usually not necessary in a location with open access to outside air.

Weed control

Excessive weed growth in the high tunnel impedes airflow and creates zones of high humidity. Weeds can also harbor insects, pests, and some diseases, including powdery mildew.

Varietal selection

If powdery mildew is a persistent problem, consider selecting tolerant or resistant plant varieties if available. Resistant varieties can be found in seed catalogs, at nurseries, and online.

Chemical control

Sometimes cultural controls are not enough when disease pressure is too great, and a fungicide application may be necessary. Depending on the crop, several fungicides are labeled for powdery mildew management in high tunnels.

Fungicides need to be applied at the first sign of disease. For best results, fungicides should be combined with cultural control. If favorable disease conditions persist, fungicides will need to be applied at 7- to 14-day intervals for season-long control. Follow label directions for use on specific plant species, varieties, rates, application timings, fungicide resistance management, and waiting period before harvest.

For those seeking a more environmentally friendly or organic option, sulfur, neem oil, or potassium bicarbonate can be used instead. Caution must be taken when using sulfur and neem oil to avoid burning foliage (make sure to read label instructions). If you're concerned about how a treatment might affect a particular plant, test the treatment on one leaf and see if there is a reaction.

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