Don’t Confuse Downy Mildew with Powdery Mildew!

Despite their similar names and the fact that they both produce powdery growth on leaves, the pathogens that cause powdery mildew and downy mildew diseases are very different. So why does it matter which mildew is causing disease on the plants? It's because different chemistries are required to manage downy and powdery mildew and failure to accurately identify and treat the disease can result in significant economic losses. While both diseases are common on a wide range of plants, diseases caused by the downy mildew pathogens are generally more destructive and more difficult to manage.

**Downy Mildews:** Contrary to popular belief, downy mildews are not fungi. The downy mildew pathogens (Figure 1) are in a different taxonomic group and are more similar to algae than fungi. They are grouped with the water molds and this group includes two other economically important plant pathogens: *Phytophthora* and *Pythium*. The downy mildews produce brownish-gray, lavender or white spores on the underside of leaves. On the upper leaves, angular yellow (chlorosis) spots form and as the disease progresses the spots often turn brown (necrosis). On some hosts, including some varieties of basil, spots are not observed but rather the entire leaf turns yellow. The downy mildew pathogens favor cool temperatures (45–75°F) and high humidity (>85%). Infection and spore production require the presence of free moisture.

**Powdery Mildews** are caused by true fungi (Figure 2) and in most cases they form white circular spots on the upper surfaces of leaves. Exceptions include strawberry and pepper powdery mildew, which produce spots on the lower leaf surface, and cucumber powdery mildew, which forms spots on both the upper and lower surfaces of leaves. Powdery mildews produce a range of symptoms such as leaf discoloration (yellowing, reddening, browning), leaf cupping or curling, and leaf distortion. Powdery mildew favors moderate to high temperatures (68–85°F) and high humidity (95%). However, free water is not required for the pathogen to reproduce or initiate infection.
Accurate Identification
Accurate and rapid diagnosis is essential for successful management of downy and powdery mildew diseases. Diagnosis without confirmation can be costly and result in 100% crop losses. To the experienced eye the type of mildew causing disease can accurately be identified by observing the color, location, and pattern of the pathogen on the leaves. However, disease manifestation is variable and both types of pathogens can cause disease on the same plant at the same time. Therefore, microscopic confirmation (see figures) is strongly recommended. While fresh tissue samples are always preferred for disease diagnostics, tape mounts along with images can also be used.

![Microscopic structures of the powdery mildew pathogen.](image)

**Figure 2. Microscopic structures of the powdery mildew pathogen.**

Powdery or Downy Mildew Disease Conformation

**Fresh Tissue Samples**
1. Collect 10-15 symptomatic (but not dead) leaves.
2. Place the leaves in a sealable bag with a slightly damp paper towel.
3. Seal the bag and label the outside of the bag with the collection date and time.

**Tape Mounts**
1. Take a 1-1.5 inch piece of transparent tape (glossy finish) and press the sticky side of the tape over the areas on the leaves with mildew.
2. Transfer the tape sticky side down onto a clear glass microslide.
3. Collect 2-3 tape mounts.
4. Place the tape mounts in a small bubble envelope or secure the mounts so that they do not break while in the mail.
5. Email images of the diseased leaves to mivey@agcenter.lsu.edu.
   Mail the tape mounts via next day or second day delivery.

Disease Management Strategies
Whether you are dealing with downy or powdery mildew diseases an integrated disease management (IDM) program is recommended. While the chemistries used to manage the two types of mildews differ, the cultural and sanitation practices used to prevent introduction and minimize spread of the pathogens are similar. Below is an example of a generalized IDM program for downy and powdery mildews.

- Start with high quality seed or transplants.
- Select varieties with genetic resistance to each disease. Most seed catalogues or plant labels will indicate whether the variety has resistance to downy mildew (DM) or powdery mildew (PM).
- Use high quality water for irrigation and other agricultural uses.
• Scout routinely for signs and symptoms of disease. Remember to look on the underside of the leaves for downy mildews.
• Minimize humidity within the canopy by increasing plant spacing or providing continuous airflow (greenhouse environment). Avoid overwatering and overhead irrigation. Water early in the day so that plants have an adequate amount of time to dry during the day.
• Remove and destroy plant debris and weeds.
• Use registered biopesticides as protectants (i.e. Serenade, Cease, Plantshield, Actinovate).
• Use appropriate registered synthetic fungicides. The mildew pathogens are very prone to chemical resistance development and therefore should be used in a manner that minimizes the risk of resistance development.
  o **Synthetic fungicides for downy mildews**— Protectants such as mancozeb or copper can be alternated or mixed with fungicides with systemic activity such as mefenoxam, strobilurins, phosphorus acid salts, dimethomorph, and phosphonates.
  o **Synthetic fungicides for powdery mildews**— Contact protectant fungicides such as potassium bicarbonates, sulfur, and neem oils are effective during early and mild infections. For more severe infections systemic fungicides can be applied including, but not limited to, strobilurins, triflumizole, myclobutanil and propiconazole.

A list of fungicides with known efficacy against these pathogens on specific hosts is available in the Louisiana Plant Disease Management Guide.