



The Plant Doctor's LANDSCAPE TIPS

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THE DOWNY MILDEWS



Photo 1



Photo 2

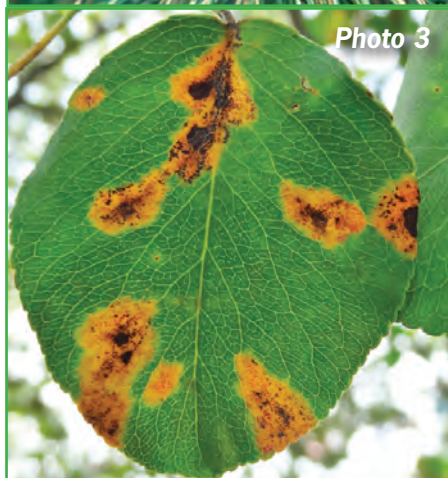


Photo 3

Photo 1-3: Scab on Crabapple, Diplodia Tip Blight of Pines and Trellis Rust of Pears, respectively, are caused by what are considered the "Advanced Fungi."

INTRODUCTION

Fungi comprise the largest group of causal agents of plant diseases. Fungi are often grouped into classes and families just as plants and critters (insects, arthropods) are classified. Most fungi are classified according to whether they are "Advanced" and "Primitive." Plant diseases can often be diagnosed by looking at symptoms that specific disease agents cause. Many of us are familiar with such diseases as Scab on Crabapple (*Venturia inaequalis*) (Photo 1), Diplodia Tip Blight on Pines (*Diplodia sapinea*, formerly known as *Sphaeropsis sapinea*) (Photo 2) and various rust diseases . . . like Trellis Rust (*Gymnosporangium sabinae*) (Photo 3). Many of us are also quite familiar with the Powdery Mildews (Photos 4A & 4B). All of these aforementioned fungal diseases belong to the "Advanced" or "Higher" fungal classification.

In a recent article in *The Landsculptor*, January, 2018, I discussed "**Phytophthora: The Plant Destroyer.**" *Phytophthora* is a member of the "primitive" group of fungi. But as mentioned in the article, there is nothing primitive about *Phytophthora*'s manner to be very destructive; it takes no back seat to most other fungi from the standpoint of economic importance. Being very closely related to *Phytophthora*, Downy Mildew is also considered a "primitive fungus," which also means it's more closely related to algae. Downy Mildew resides on the opposite end of the family tree from Powdery Mildews. While the Powdery Mildews and Downy Mildews share some common features such as production of spores and mycelium (fungus body), essentially in the fungal world, their only common relatedness is the word "mildew."

SYMPTOMS AND DISEASE CYCLE OF DOWNY MILDEWS

Downy Mildews attack plants in a much different way than Powdery Mildews.



Photo 4A

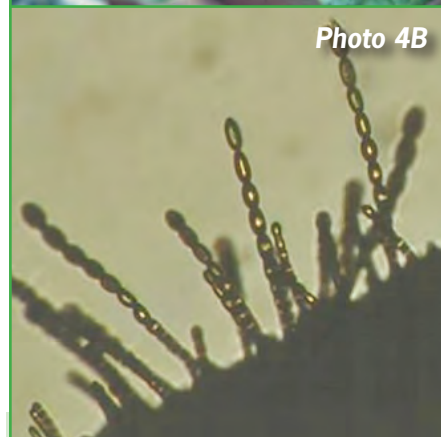


Photo 4B

Photos 4A & 4B: Powdery Mildew is also a member of the "Advanced Fungi" and should not be confused with the more "Primitive" Downy Mildew. Spores and mycelium of Powdery Mildew are typically produced on the upper surfaces of foliage, such as this example of Tall Phlox. Photo 4B is a microscopic view of chains of Powdery Mildew spores called conidia.

Powdery Mildews tend to produce spores and mycelium (hyphae=fungus body) that are characterized by the white mold visible on the upper sides of leaves and stems of plants (Photos 4A & 4B). Downy Mildew is far less conspicuous; the fungus produces fewer spores and mycelium, and, most importantly, the fungus tends to sporulate on the undersides of leaves. It usually takes some good vision to find

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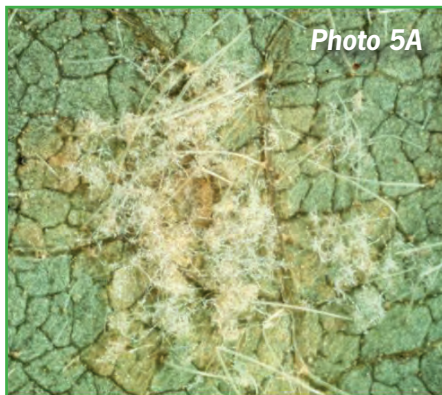


Photo 5A

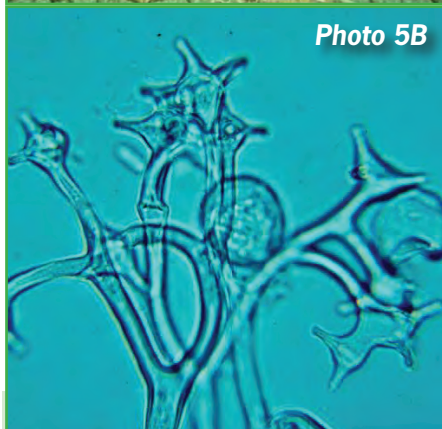


Photo 5B

Photos 5A & 5B: Downy Mildew typically produces inconspicuous spores and mycelium (fuzz) on the undersides of leaves. Photo 5B represents a microscopic view of typical Downy Mildew spores known as sporangia.



Photo 6

Photo 6: Downy Mildew can be particularly destructive on some woody plants. Here, rose is affected with blighted foliage and stems.

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the relatively inconspicuous “fuzz” on the undersides of leaves affected by Downy Mildew fungi (Photos 5A & 5B). Symptoms of Downy Mildew attack on various plants range from leaf curl/deformation, leaf yellowing, leaf browning (necrosis), stem blights and whole plant death (Photos 6 & 7). Downy Mildew is generally favored by abundant moisture/humidity and cool temperatures. The disease may be very destructive in nursery operations where plants are stored in polyhouses overwinter; fluctuations in temperatures that cause abundant condensation readily predisposes plants to Downy Mildew aggression (Photos 6 & 7).

The Downy Mildew fungi produce spores known as sporangia that are blown around in the wind (Photo 5B). The spores are generally quite durable and can be carried by wind currents for many miles to new locations where plants may become infected if the environmental conditions are favorable. As with *Phytophthora*, the Downy Mildew sporangia may release motile

“zoospores” (essentially microscopic tadpoles) under certain temperature and moisture conditions. The fungus may survive moderate climates as mycelium and sporangia. In very cold and harsh climates, an overwintering survival or resting spore (oospore, pronounced “Uh Oh Spore”) may be produced.

Some of the common Downy Mildews include: Downy Mildew of Grape (*Plasmopara viticola*), Downy Mildew of Allium (*Peronospora destructor*), Downy Mildew of Roses (*Peronospora sparsa*), Downy Mildew of Impatiens (*Plasmopara obduscens*) and Downy Mildew of Cabbage (*Peronospora parasitica*).

DOWNY MILDEW OF GRAPE: A SPECIAL DISEASE?

At the dawn of people's understanding of plant diseases, Downy Mildew of Grape was one of the first Downy Mildews ever reported. Up to that time, and well beyond for some individuals, especially the “flat earthers”, it was believed that God caused the grape crop to fail through spontaneous destruction, probably stimulated by sinful behavior by the superstitious peasants and landowners. What a fitting punishment: no grapes, no wine, no communion. Downy Mildew of Grapes was discovered in France in 1878; it had spread from the United States and soon threatened the entire grape crop in Europe. It wasn't unusual for 50%, 70% or even more of the crop to be destroyed by the disease. Symptoms on grapes include severe leaf blight and defoliation. In France, a fellow by the name of Millardet had been spraying the grapes with a bluish-white mixture of copper sulfate and hydrated lime to make the grapes appear ugly to discourage pilferers. He noted that grape leaves sprayed in this manner tended to contract very little Downy Mildew. Upon refining the deterrent by 1882, this concoction became the first fungicide known as the Bordeaux Mixture. Hence, the first fungicide was discovered by accident!



Photo 7

Photo 7: Downy Mildew on creeping phlox is sometimes difficult to discern from anthracnose. In the 1990s, the author discovered a new Downy Mildew on field grown Phlox subulata that caused \$3 million in crop value loss to one nursery grower in a single year! Decreasing the overhead irrigation and application of metalaxyl (Subdue 2E) solved the problem.


MANAGEMENT OF THE DOWNY MILDEWS

As with Powdery Mildews and Rust diseases, Downy Mildew is not capable of being cultured in a diagnostic lab. For diagnosis, portions of the affected plant need to be examined microscopically to find the characteristic sporophores (Photo 5B). Confirmation of Downy Mildew is needed before implementing disease control measures.

Cultural Control: Of the various environmental factors affecting severity of Downy Mildew, moisture probably plays the biggest role. Avoid overhead, excessive irrigation and high humidity as much as possible.

Sanitation: Plants that have been killed by Downy Mildew should be carefully disposed so that overwintering/oversummering structures cannot spread to new plantings.

Plant Genetics: Some species or varieties of plants are more susceptible than other species. For those that have attempted to grow Impatiens in the landscape in recent years, Downy Mildew has all but made that plant undesirable for landscape use. Because Downy Mildew tends to be specific to its host, it would be advisable to switch to a different species.

Chemical Control: Fungicides can have a significant impact on Downy Mildew disease development. For a list of possible fungicides for management of Downy Mildew, please see Table 1. Please note that in general, fungicides that work for control of “Advanced Fungi” do not work for “Primitive Fungi” such as Downy Mildew (there are some exceptions). 

The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.

Chemical Management of Impatiens	
Downy Mildew	
Trade Names	(chemical names)
Adorn or Presidio	(fluopicolide)
Fenstop	(fenamidone)
Stature	(dimethomorph)
Alude	(phosphoric acid)
Protect	(mancozeb)
Subdue Maxx	(mefenoxam)
Heritage	(azoxystrobin)
ETC.	

Table 1. Possible fungicides for management of Downy Mildew.