

Downy Mildew of Grape

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Downy mildew is a major disease of grapes throughout the eastern United States. The fungus causes direct yield losses by rotting inflorescences, berries, clusters and shoots. Indirect losses can result from premature defoliation of vines due to foliar infections. This premature defoliation is a serious problem because it predisposes the vine to winter injury. It may take a vineyard several years to fully recover after severe winter injury.

Symptoms

On leaves, infections can occur throughout the growing season. Young infections are very small, greenish-yellow, translucent spots that are difficult to see. With time the lesions enlarge, appearing on the upper leaf surface as irregular pale-yellow to greenish-yellow spots up to 1/4 inch or more in diameter (Figure 1). On the underside of the leaf, the fungus mycelium (the “downy mildew”) can be seen within the border of the lesion as a delicate,

dense, white to grayish, cotton-like growth (Figure 2). Infected tissue gradually becomes dark brown, irregular, and brittle. Severely infected leaves eventually turn brown, wither, curl, and drop. The disease attacks older leaves in late summer and autumn, producing a mosaic of small, angular, yellow to red-brown spots on the upper surface. Lesions commonly form along veins, and the fungus sporulates in these areas on the lower leaf surface during periods of wet weather and high humidity.

On fruit, most infection occurs during the period from early bloom through 3 to 4 weeks after bloom. By 3 to 4 weeks after bloom, fruit are resistant to infection; however, the fruit stems (pedicels) remain susceptible. When infected at this stage, young berries turn light brown and soft, shatter easily, and under humid conditions are often covered with the downy-like growth of the fungus (Figure 3). Generally, little infection occurs during hot summer months. Infected fruit will never mature normally. On

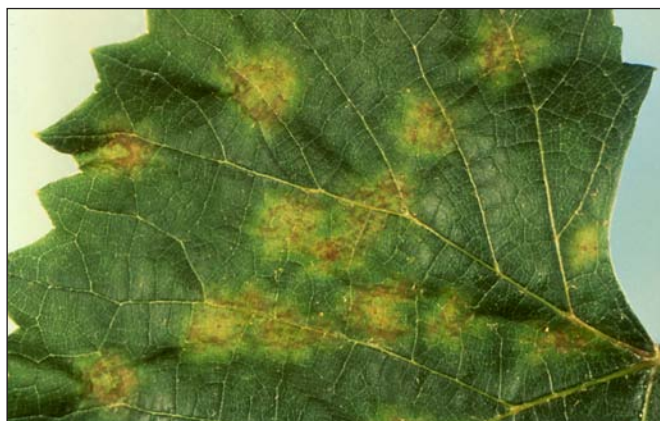


Figure 1. Pale yellow leaf spots on upper surface of grape leaf caused by downy mildew.



Figure 2. White “downy” fungus growth on the underside of infected leaves. This downy growth is directly under the pale-yellow spots on the upper surface.



Figure 3. Grape berries infected with downy mildew. Note the cottony growth on the surface of the berries.

shoots and tendrils, early symptoms appear as water-soaked, shiny depressions on which the dense downy mildew growth appears. Young shoots usually are stunted and become thickened and distorted. Severely infected shoots and tendrils usually die.

Causal Organism

Downy mildew is caused by the fungus *Plasmopara viticola*. The fungus overwinters in infected leaves on the ground and possibly in diseased shoots. The overwintering spore (oospore) germinates in the spring and produces a different type of spore (sporangium). These sporangia are spread by wind and splashing rain. When plant parts are covered with a film of moisture, the sporangia release small swimming spores, called zoospores. Zoospores, which also are spread by splashing rain, germinate by producing a germ tube that enters the leaf through stomates (tiny pores) on the lower leaf surface. The optimum temperature for disease development is 64 to 76 degrees F (18 to 25 degrees C). The disease can tolerate a minimum temperature of 54 to 58 degrees F (12 C to 13 degrees C), and a maximum

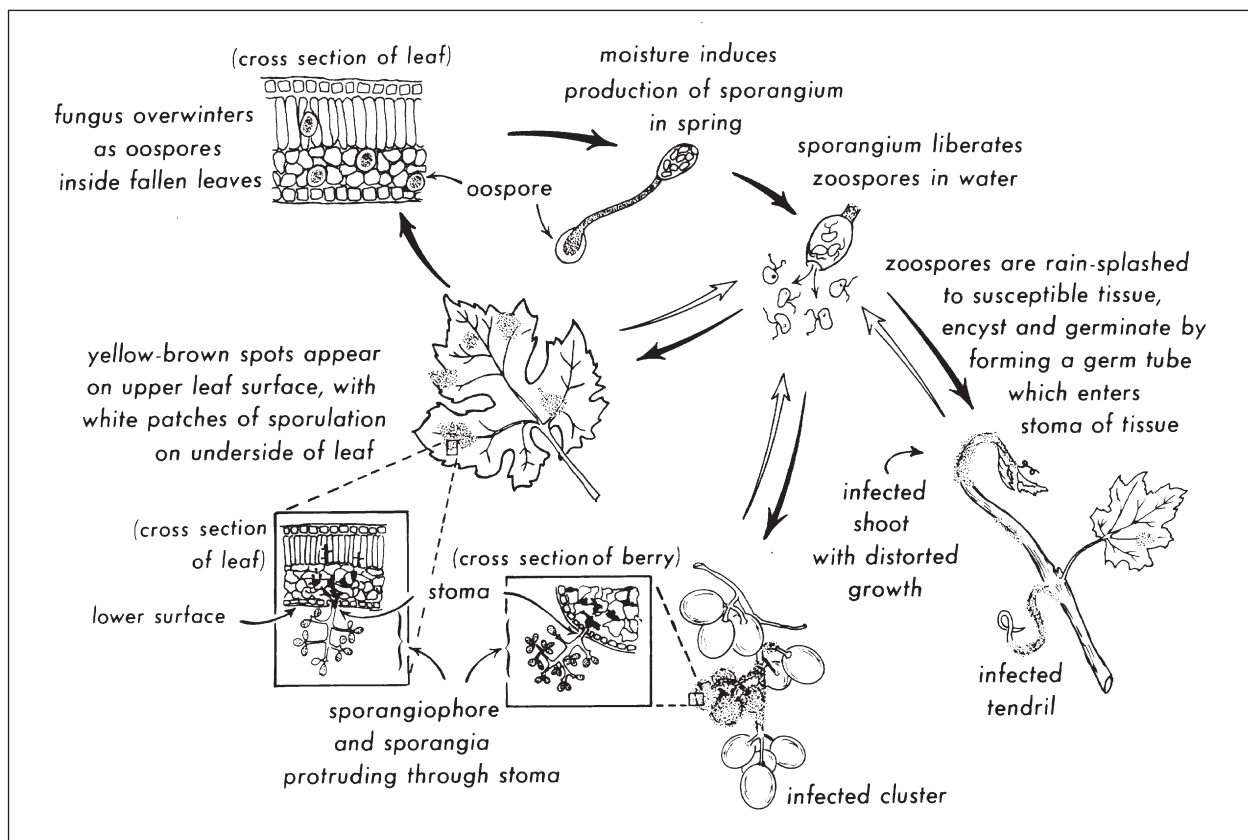


Figure 4. Disease cycle of downy mildew on grape. We wish to thank the New York State Agricultural Experiment Station for the use of the figure. It was taken from the Grape IPM Disease Identification Sheet No. 5.

temperature of about 86 degrees F (30 degrees C). Once inside the plant, the fungus grows and spreads through tissues. Infections are usually visible as lesions in about 7–12 days. At night during periods of high humidity and temperatures above 55 degrees F (13 degrees C), the fungus grows out through the stomates of infected tissue and produces microscopic, branched, tree-like structures (sporangiophores) on the lower leaf surface. More spores (sporangia) are produced on the tips of these tree-like structures. The small sporangiophores and sporangia make up the cottony, downy mildew growth. Sporangia cause secondary infections and are spread by rain.

Control

Any practice that speeds the drying time of leaves and fruit will reduce the potential for infection. Select a planting site where vines are exposed to all-day sun, with good air circulation and soil drainage. Space vines properly in the row, and, if possible, orient the rows to maximize air movement down the row.

Sanitation is important. Remove dead leaves and berries from vines and the ground after leaf drop. It may be beneficial to cultivate the vineyard before bud break to cover old berries and other debris with soil. Cultivation also prevents overwintering spores from reaching developing vines in the spring.

To improve air circulation, control weeds and tall grasses in the vineyard and surrounding areas. When pruning, select only strong, healthy, well-colored canes of the previous year's growth. Practices such as shoot positioning and leaf removal that help to open the canopy for improved air circulation and spray coverage are also very important.

Grape varieties vary greatly in their susceptibility to downy mildew. In general, vinifera (*Vitis vinifera*) varieties are much more susceptible than American types, and the French hybrids are somewhat intermediate in susceptibility. Cabernet Franc, Cabernet Sauvignon, Catawba, Chancellor, Chardonnay, Delaware, Fredonia, Gewurytraminer, Ives, Merlot, Niagara, Pinot Blanc, Pinot Noir, Riesling, Rougeon and Sauvignon Blanc are reported to be highly susceptible to downy mildew.

A good fungicide spray program is extremely important. Downy mildew can be effectively controlled by properly timed and effective fungicides. For the most current spray recommendations, commercial growers are referred to Bulletin 506-B2, *Midwest Commercial Small Fruit and Grape Spray Guide*, and backyard growers are referred to Bulletin 780, *Controlling Diseases and Insects in Home Fruit Plantings*. These publications can be obtained from your county Extension educator or the Extension Publications Office, The Ohio State University, 216 Kottman Hall, 2021 Coffey Road, Columbus, Ohio 43210-1044.

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