

Plant Pathology Fact Sheet

Downy Mildew of Grape

by John R. Hartman, Julie W. Beale, and Cheryl A. Kaiser

INTRODUCTION

Downy mildew is an important disease of commercial and backyard grapes in Kentucky. This disease causes direct losses when flowers, clusters, and shoots decay and yields are reduced. Indirect losses result when premature defoliation predisposes grapevines to winter injury. It may take a vineyard several years to fully recover after severe winter injury.

SYMPTOMS AND SIGNS

Early in the season, infected leaves develop yellowish-green lesions on their upper surfaces. As lesions expand, the affected areas turn brown, necrotic, or mottled (FIGURE 1). Severely infected leaves may curl and drop from the vine. The disease also attacks older leaves in late summer and autumn, producing a mosaic of small, angular, yellow to red-brown spots on the upper leaf surface (FIGURE 2). Lesions commonly form along leaf veins. The pathogen sporulates on the underside of foliar lesions, producing the white, downy fungal-like growth that is characteristic of this disease (FIGURE 3).

Infected green fruit turns light brown to purple, shrivels, and detaches easily. White, cottony



FIGURE 1. DOWNY MILDEW LESIONS ON UPPER LEAF SURFACE

sporulation is abundant on these berries during humid weather (FIGURE 4). Later in the season, infected berries turn dull green to reddish purple, remain firm, and are easily distinguished from non-infected ripening berries in a cluster. Diseased berries are easily detached from their pedicels leaving a dry stem scar. Fruit are thought to become resistant to downy mildew infection about 3 to 4 weeks after bloom, but cluster stems (rachis) and leaves remain susceptible throughout the growing season.

When young shoots, petioles, tendrils, or cluster stems are infected, they frequently become distorted, thickened, or curled



FIGURE 2. WHITE DOWNY MILDEW FUNGAL-LIKE GROWTH ON LEAF UNDERSIDE (RIGHT) CORRESPONDS TO YELLOW LESIONS ON UPPER LEAF SURFACE (LEFT)

(FIGURE 5). White, downy sporulation can be abundant on the surface of infected areas. Eventually, severely infected portions of the vine wither and die.

CAUSE AND DISEASE DEVELOPMENT

Downy mildew is caused by the fungus-like organism *Plasmopora viticola*. This organism overwinters as thick-walled oospores in leaf debris on the vineyard floor. During wet periods in spring the oospores germinate to form sporangia. The sporangia, which are disseminated by wind or rain-splash, release small swimming zoospores when free water (e.g., rain or dew) is present. Zoospores are disseminated by rain splash to grape tissues where they swim to the vicinity of leaf stomata (tiny natural pores that are mainly located on leaf undersides). Infection occurs when encysted zoospores form germ tubes that invade the inner plant tissues via the stomata.



FIGURE 3. CLOSE-UP OF PATHOGEN SPORULATION ON LEAF UNDERSIDE

The pathogen can infect all green, actively growing parts of the vine that have mature, functional stomata. Visible lesions develop in about 7 to 12 days after infection, depending on temperature and relative humidity. At night, during periods of high humidity and temperatures above 55° F, the fungus-like organism produces sporangia capable of initiating secondary infections. The sporangia are produced on numerous branched structures that protrude out through stomata and give the leaf its typical downy appearance.



FIGURE 4. THE DOWNY MILDEW PATHOGEN SPORULATING ON INFECTED BERRIES

DISEASE MANAGEMENT

Cultivar selection

Avoid planting highly susceptible grape cultivars. In general, vinifera (*Vitis vinifera*) cultivars are much more susceptible than American types, with the French hybrids somewhat intermediate in susceptibility. Examples of cultivars highly susceptible to downy mildew include Catawba, Chancellor, Chardonnay, Delaware, Fredonia, Ives, Niagara, White Riesling, and Rougeon.

Site selection and cultural practices

Grapevines should not be planted in low or shady areas. Keeping plants well-spaced and the canopy thinned out will help to promote good air circulation and reduce humidity. Remove and destroy diseased plant material at the end of the growing season.

Fungicides

Producers with susceptible cultivars should plan for a full-season fungicide program to control downy mildew. Because symptoms do not begin until after bloom, downy mildew has been labeled the “late season disease.”

However, it is especially important on highly susceptible cultivars to begin an early season fungicide program. The period from immediate pre-bloom through 3 to 4 weeks after bloom is critical for controlling fruit or cluster infections.



FIGURE 5. DOWNY MILDEW-INFECTED SHOOTS BECOME THICKENED AND DISTORTED.

Some growers might be tempted to put away their spray equipment after grape harvest. However, in some years downy mildew causes post-harvest defoliation well before the onset of cool weather in the fall. Premature defoliation predisposes the vines to winter injury and reduces fruit set the following season. Thus, it is essential to maintain at least some protection against downy mildew infections through the remainder of the season.

There are many different kinds of fungicides effective against this disease. Commercial growers can find information on specific fungicides, application rates, and suggested chemical combinations in the *Midwest Commercial Small Fruit and Grape Spray Guide* (ID-94). Homeowners should consult *Disease and Insect Control Programs for*

Homegrown Fruit in Kentucky (ID-21) for fungicide recommendations.

ADDITIONAL RESOURCES

The following publications are available at County Extension offices, as well as on the Internet.

- Disease and Insect Control Programs for Homegrown Fruit in Kentucky, Including Organic Alternatives, ID-21 (University of Kentucky, 2008)
<http://www.ca.uky.edu/agc/pubs/id/id21/id21.pdf>
- Midwest Small Fruit and Grape Spray Guide, ID-94 (University of Kentucky et al.)
2 MB file
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ID-94.pdf
- Midwest Grape Production Guide (Ohio State University) *5 MB file*
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/MwGrapeGuide.pdf
- Midwest Small Fruit Pest Management Handbook, B-861 (University of Kentucky et al.) *73 MB file*
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/MwSmFruitPMHandbook.pdf

Photos: Julie Beale, University of Kentucky (Figures 1 & 3); Clemson-USDA Cooperative Extension. Bugwood.org (Figure 2); Roger Pearson, New York State Agricultural Experiment Station, Geneva (Figure 4); University of Georgia Plant Pathology Archives, Bugwood.org (Figure 5)

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