UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

PPFS-FR-S-16

Plant Pathology Fact Sheet

Black Rot of Grape

Nicole A. Ward, *Extension Plant Pathologist*
& Cheryl A. Kaiser, *Extension Associate*

Importance

Black rot is the most prevalent and one of the most important grape diseases in Kentucky. While this disease can affect all young developing plant tissues above ground, fruit infections are the most destructive. Without an adequate disease management program, both home and commercial vineyards suffer significant yield losses.

Symptoms and Signs

The black rot fungus infects young canes, flowers, tendrils, leaves, and fruit (Figure 1). Generally, leaves and fruit are the most susceptible before they fully mature.

Figure 1. Black rot symptoms on grape.

Leaves

Black rot symptoms first appear as minute, round, reddish-brown spots that enlarge to 1/8 to 1/4 inch diameter (Figure 2); spots may coalesce into larger blotches (Figure 1). Enlarging spots develop dark margins with light brown to tan centers. Within spot centers, numerous small, black spore-bearing fungal fruiting structures (pycnidia) develop. Pycnidia appear as tiny black spots that may be visible to the naked eye (Figure 3). Newly developing leaves can become infected anytime during the growing season. However, as leaves mature, they become resistant to infection.

Shoots

Black rot symptoms appear as irregular or diamond-shaped, somewhat sunken, tan to brown lesions on shoots, petioles, and tendrils. Lesions become peppered with tiny black fungal fruiting structures (pycnidia) (Figure 4).

Fruit

Soft, light brown spots (Figure 5) rapidly enlarge on fruit until they envelop entire berries (Figure 6). Diseased berries then

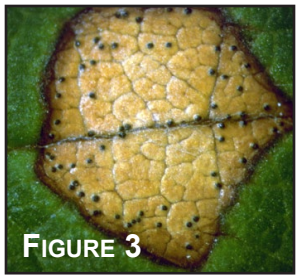
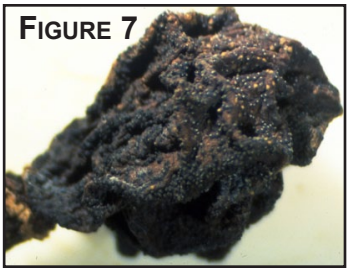


FIGURE 2. BLACK ROT ON GRAPE LEAF. **FIGURE 3**. CLOSE-UP OF A SINGLE SPOT; NOTE FUNGAL FRUTING BODIES APPEARING AS SMALL BLACK SPECKS. **FIGURE 4**. LESIONS ON GRAPE VINE; PYCNIDIA ARE PRESENT.

FIGURE 5. EARLY FRUIT LESIONS. **FIGURE 6**. ADVANCED DECAY OF BERRIES. **FIGURE 7**. GRAPE MUMMY PEPPERED WITH FUNGAL FRUITING STRUCTURES.



shrivel into black, wrinkled mummies (FIGURE 7) that either drop to the ground or remain attached to clusters. These fruit mummies are the primary overwintering source for the black rot fungus. As with other infected tissues, black rot mummies are covered with pycnidia. Grape berries are susceptible to infection until 3 to 4 weeks after bloom.

CAUSE AND DISEASE SPREAD

The black rot fungus, *Guignardia bidwellii,* produces two different types of fruiting bodies (perithecia and pycnidia). These structures enable the pathogen to overwinter in mummies, fallen leaves, and stem lesions, as well as spread throughout vineyards during the growing season. In early spring, when temperatures are as low as 50°F, perithecia produce ascospores from fruit mummies. These ascospores initiate the disease cycle by producing the first infections of the season. The majority of ascospores from fallen mummies are discharged during the period from one-inch shoot growth to 10 to 14 days after bloom. Mummies hanging from vines may continue to discharge ascospores and conidia throughout the growing season.

Primary infections occur when plant surfaces remain wet long enough for spores to germinate and penetrate plant tissues. Length of leaf wetness required for infection is dependent upon air temperature (TABLE 1). Symptoms develop approximately 2 weeks after infection.

The second type of fruiting body (pycinidia) is produced within leaf spots, shoot lesions, and infected fruit during the growing season. Pycinidia produce repeating spores called conidia. Secondary infections occur when conidia infect nearby susceptible tissue. This cycle of spore production and infection continues throughout the season, as long as environmental conditions are favorable (see TABLE 1).

Table 1. Leaf wetness and temperature periods required for black rot infection.

Temperature (degrees F)	Hours of leaf wetness required for infection
45	No infection
50	24
55	12
60	9
65	8
70	7
75	7
80	6
85	9
90	12

Disease Management

Sanitation

Good sanitation practices are critical for management of black rot. The removal and destruction of diseased plant tissues eliminates sources of inoculum, thus reducing disease risk. This includes infected canes, as well as mummies on trellised vines and the vineyard floor.

Resistant cultivars

Use of grape cultivars with reduced susceptibility to black rot should be a considerable part of a disease management program. Cultivars are classified by disease susceptibility, ranging from slightly susceptible to highly susceptible; few are considered resistant. Table 2 indicates the relative susceptibility of selected grape cultivars adapted to Kentucky growing conditions; refer to the publication *Growing Grapes in Kentucky* (ID-126) for additional cultivars.

Additional Cultural Practices

Growers should also employ a wide range of cultural practices for the most effective disease management program:

- Select a site with good air circulation and leaf drying characteristics. This is an especially important step during vineyard establishment.
- Avoid planting in low lying, poorly drained sites.
- Train vines onto high trellises to promote good air circulation and to allow for better fungicide penetration into the canopy.
- Remove weeds and basal sprouts for better air movement within the vines. This practice will hasten the drying of dew and rain on black rot-susceptible tissues.

Fungicides

Fungicides are an important component to a successful black rot management program. However, proper fungicide timing is required for maximum effectiveness. Protectant sprays must begin at bud break (after 1/2-inch of new shoot growth) and continue through berry maturity. Control of primary infections during spring results in fewer fungicide applications later in the season. Note that early season sprays must be applied according to spray guide recommendations to ensure proper coverage of susceptible tissue. Vines that are not protected early in the season may become infected, resulting in inoculum build-up and infection of berries later in the season.

Fungicide recommendations and their application times can be found in the *Midwest Small Fruit and Grape Spray Guide*, ID-94 (commercial growers) and *Disease and Insect Control Programs for Homegrown Fruit in Kentucky*, ID-21 (homeowners).

Disease Forecasting

Disease prediction models are available to analyze local weather data and to help growers determine risk for infection. Using these prediction models, growers apply fungicides only during periods of high risk, resulting in lower numbers of applications

when compared to calendar-based spray programs. Most universities have predictive systems in place; Kentucky growers should refer to the UK Ag Weather Center site for risk evaluations.

Additional Resources

- Ag Weather Center Disease Prediction Models (University of Kentucky) http://wwwagwx.ca.uky.edu/plant_disease.html
- Disease and Insect Control Programs for Homegrown Fruit in Kentucky, ID-21 (University of Kentucky, 2012) http://www.ca.uky.edu/agc/pubs/id/id21/id21.pdf
- Growing Grapes in Kentucky, ID-126 (University of Kentucky, 1997) http://www.ca.uky.edu/agc/pubs/id/id126/id126.pdf
- Midwest Commercial Small Fruit and Grape Spray Guide, ID-94 (University of Kentucky et al., 2012) https://ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx
- 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 and Grape Spray Guide, ID-94 (University of Kentucky et al.) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ID-94.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

Table 2. Relative black rot susceptibility of important Kentucky grape cultivars.[1,2]

Cultivar	Rating[3]
Cabernet Franc	HS
Cabernet Sauvignon	HS
Catawba	HS
Cayuga White	SS
Chambourcin	MS
Chardonel	MS
Chardonnay	MS
Concord	HS
Diamond	HS
Foch (Marechal Foch)	MS
Jupiter	MS
Limberger (Lemberger)	HS
Mars	SS
Marquis	SS
Niagara	HS
Norton	SS
Reliance	HS
Riesling	HS
Seyval (Seyve-Villard 5-276)	MS
Traminette	SS
Vanessa	HS
Vidal Blanc (Vidal 256)	SS
Vignoles (Ravat 51)	SS
Villard Blanc	HS

[1] Disease ratings compiled from New York, Illinois, Ohio & Indiana information.

[2] Disease ratings can be affected by the occurrence of significantly more or less disease pressure during the growing season.

[3] SS = slightly susceptible; MS= moderately susceptible; HS=highly susceptible

Issued October 2012

Photos: Nicole Ward (Figures 1 & 2) and Cheryl Kaiser (Figures 3, 4 & 7), University of Kentucky; Clemson-USDA CES, Bugwood.org (Figure 5); and Bruce Watt, University of Maine, Bugwood.org (Figure 6)