



Black Rot of Grapes

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IMPORTANCE

Black rot is the most serious and prevalent grape disease in Kentucky. While it can affect all developing above-ground plant tissues, fruit infections are the most destructive. Both residential and commercial vineyards suffer significant yield losses without an adequate disease management program.

SYMPTOMS & SIGNS

The black rot fungus infects immature leaves, shoots, tendrils, and fruit (FIGURE 1).

Leaves

Black rot symptoms first appear as small, round, reddish-brown spots that enlarge to 1/8 to 1/4 inch in diameter; spots may coalesce into larger blotches (FIGURE 1). Enlarging spots develop dark margins with light brown-to-tan centers (FIGURE 2). Numerous fungal fruiting structures (pycnidia) develop within spot centers and are visible to the naked eye as tiny black specks (FIGURE 3). Newly developing leaves can become infected anytime during the growing season; however, as leaves mature, they become resistant to infection.

Shoots, petioles, tendrils

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

Fruit

Soft, light brown spots (FIGURE 5) rapidly enlarge on fruit until entire berries are affected (FIGURE 6). Diseased berries then shrivel into black, wrinkled mummies (FIGURE 7) that either drop to the ground or remain attached to clusters. As with other infected tissues, black rot mummies become covered with pycnidia. Grape berries are susceptible to infection until 3 to 4 weeks after bloom, although symptoms may develop later.



FIGURE 1. BLACK ROT AFFECTS SHOOTS, TENDRILS, LEAVES, AND FRUIT; HOWEVER, IT IS DAMAGE TO FRUIT THAT RESULTS IN DEVASTATING YIELD LOSSES.

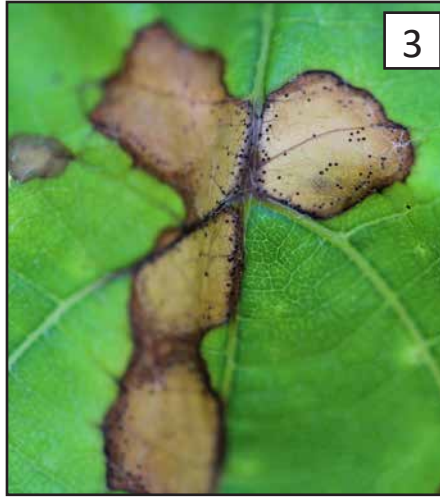


FIGURE 2. BLACK ROT LEAF SPOTS ARE TYPICALLY LIGHT BROWN OR TAN WITH A DARKER MARGIN. (PHOTO: NICOLE GAUTHIER, UK)

FIGURE 3. BLACK FUNGAL FRUITING BODIES (PYCNIDIA) APPEAR AS BLACK SPECKS WITHIN LEAF SPOTS. (PHOTO: NICOLE GAUTHIER, UK)

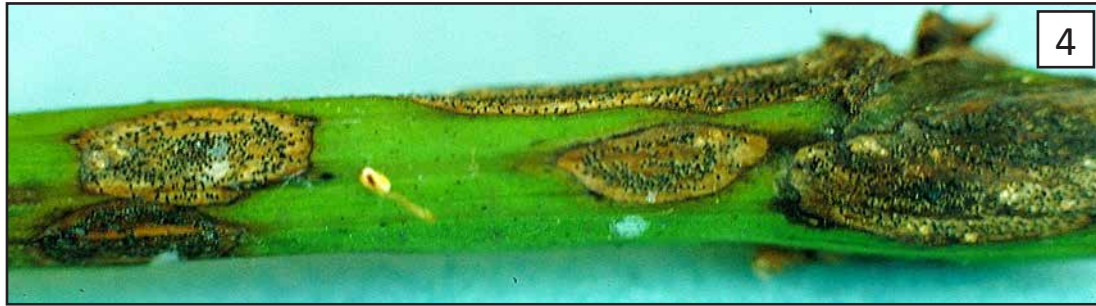


FIGURE 4. BLACK ROT LESIONS ON SHOOTS ARE IRREGULAR OR ELLIPTICALLY SHAPED. NOTE THE FUNGAL STRUCTURES (PYCNIDIA) APPEARING AS BLACK SPECKS WITHIN LESIONS. (PHOTO: CHERYL KAISER, UK)



FIGURE 5. SPOTS ON INFECTED FRUIT ARE SOFT AND COVERED WITH PYCNIDIA. (PHOTO: NICOLE GAUTHIER UK)

FIGURE 6. AS FRUIT INFECTIONS PROGRESS, BERRIES BEGIN TO SHRIVEL INTO MUMMIES. (PHOTO: NICOLE GAUTHIER, UK)

FIGURE 7. MUMMIFIED BERRIES BECOME COVERED WITH BLACK FUNGAL FRUITING BODIES (PYCNIDIA). (PHOTO: CHERYL KAISER, UK)



CAUSE & DISEASE SPREAD

The black rot fungus, *Guignardia bidwellii*, primarily overwinters in fruit mummies; however, it can also survive in fallen leaves and stem lesions. In early spring, once air temperatures increase to 50°F and above, fungal fruiting bodies on mummies (perithecia) release spores (ascospores), which produce the first infections of the season. Most ascospores from fallen mummies are discharged during the period from one-inch shoot growth through 10 to 14 days after bloom; however, mummies hanging from vines may continue to discharge ascospores throughout the growing season.

Fruiting structures (pycnidia) produced within leaf spots, shoot lesions, and infected fruit discharge another spore type (conidia), which is released throughout the growing season; conidia provide a source of secondary infections. This cycle of spore production and infection continues as long as environmental conditions are favorable (see TABLE 1).

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.

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

Growers should employ a wide range of cultural practices for the most effective disease management program; however, fungicides are also an important component to successfully managing black rot.

General cultural practices

- Select a site with good air circulation and leaf drying characteristics when establishing a new vineyard.
- 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 canopies.
- Remove weeds and basal sprouts for better air movement within the vines. This practice will hasten the drying of dew and rain on susceptible tissues.

Resistant cultivars

- Select grape cultivars with reduced susceptibility to black rot. Cultivars are classified by disease susceptibility, ranging from slightly susceptible to highly susceptible; few are considered resistant.
- Refer to TABLE 2 for the relative susceptibility of selected grape cultivars. The publication *Growing Grapes in Kentucky* (ID-126) lists additional cultivars.

Sanitation

- Remove diseased fruit during the growing season, when possible.
- Remove and destroy diseased vines during dormant pruning.
- Remove mummies remaining on vines; do not drop them to the ground. Prune onto tarps or carts and remove all diseased tissue from the vineyard.

Fungicides

- Apply protectant sprays at bud break (after 1/2-inch of new shoot growth) and continue through berry maturity. Controlling primary infections during spring results in fewer fungicide applications later in the season. Apply early season sprays according to label rates and coverage recommendations to ensure proper disease protection 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 Fruit Pest Management Guide* (commercial growers) and *Disease and Insect Control Programs for Homegrown Fruit in Kentucky* (residential growers).

Disease Forecasting

- Use a disease predictive model to determine when conditions favor disease development. These models utilize local weather data to determine when risk for infection is high. Using predictive models, growers apply fungicides only as needed, resulting in fewer applications when compared to calendar-based spray programs.
- Kentucky growers can refer to the UK Ag Weather Center website for a black rot predictive model. The publication *Using Prediction Models to Manage Diseases in Fruit* (PPFS-FR-T-07) provides step-by-step instructions for utilizing UK's disease prediction models.

ADDITIONAL RESOURCES

Production & Management Information

- Disease and Insect Control Program for Homegrown Fruit in Kentucky including Organic Alternatives (ID-21) <http://www.ca.uky.edu/agc/pubs/id/id21/id21.pdf>
- Growing Grapes in Kentucky (ID-126) <http://www.ca.uky.edu/agc/pubs/id/id126/id126.pdf>
- Midwest Fruit Pest Management Guide (ID232) for commercial growers https://ag.purdue.edu/department/hla/extension/_docs/id-465.pdf

Disease Prediction Models

- Ag Weather Center Disease Prediction Models (University of Kentucky) http://www.agwx.ca.uky.edu/plant_disease.html
- Using Prediction Models to Manage Diseases in Fruit (PPFS-FR-T-07) <https://plantpathology.ca.uky.edu/files/ppfs-fr-t-07.pdf>

TABLE 2. RELATIVE BLACK ROT SUSCEPTIBILITY OF IMPORTANT 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

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

²Disease ratings can be affected by the occurrence of significantly more or less disease pressure during the growing season, as well as environmental conditions.

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

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