Disease Identification Sheet No. 102GFSG-D4
2003

GRAPES

Cornell Cooperative Extension

IPM Integrated Pest Management

Black rot

Guignardia bidwellii (Ellis) Viala and Ravaz.

Wayne F. Wilcox
Professor, Department of Plant Pathology, Cornell University, NYSAES, Geneva, NY

Introduction

Black rot is an important fungal disease of grapes that originated in eastern North America, but which now occurs in portions of Europe, South America, and Asia as well. It can cause complete crop loss in warm, humid climates, but is virtually unknown in regions with arid summers. There is a wide variation in susceptibility to this disease among native American and hybrid cultivars, whereas all common cultivars of *Vitis vinifera* appear to be highly susceptible.

Symptoms and Signs

All young green tissues of the vine are susceptible to infection. Relatively small, brown circular lesions develop on infected leaves (Fig. 1), and within a few days tiny black spherical fruiting bodies (pycnidia) protrude from them (Fig. 2). Elongated black lesions on the petiole (Fig.3) may eventually girdle these organs (Fig. 4), causing the affected leaves to wilt (Fig. 5). Shoot infection results in large black elliptical lesions (Figs. 5 and 6). These lesions may contribute to breakage of shoots by wind, or in severe cases, may girdle and kill young shoots altogether.

Infection of the fruit is by far the most serious phase of the disease and may result in substantial economic loss. Infected berries first appear light or chocolate brown (Fig. 7), but quickly turn darker brown, with masses of black pycnidia developing on the surface (Fig. 8). Finally, infected berries shrivel and turn into hard black raisin-like bodies that are called mummies (Fig. 9).

PHOTO BY R. PEARSON

Fig. 1. Small, circular lesions on leaves.

PHOTO BY R. PEARSON

Fig. 2. Tiny, black pycnidia in leaf lesion.

PHOTO BY R. PEARSON

Fig. 3. Elongated lesions on petiole.

PHOTO BY W. WILCOX

Fig. 4. Girdled petioles cause leaves to sag and wilt.

PHOTO BY W. WILCOX

Fig. 5. Shoot and petiole lesions from spores in mummies attached to wire.

PHOTO BY R. PEARSON

Fig. 6. Elliptical lesion on shoot.

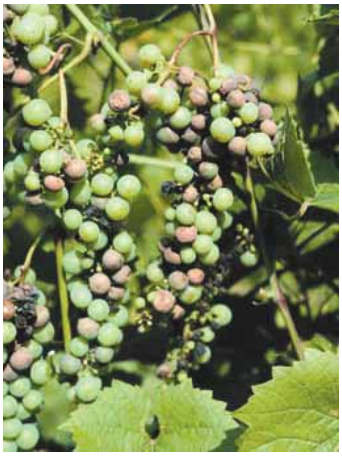


PHOTO BY W. WILCOX

Fig. 7 Early symptoms of berry infection.

PHOTO BY R. PEARSON

Fig. 8. Infected berries with numerous black pycnidia.

PHOTO BY R. PEARSON

Fig. 9. Infected mummies remain in fruit cluster.

Disease Cycle and Conditions for Development

The black rot fungus overwinters primarily in mummies within the vine and on the ground, although it also can overwinter for at least 2 years within lesions of infected shoots that are retained as canes or spurs. Spring rains trigger release of airborne spores (ascospores) that form within mummies on the ground and in the trellis, and these can be blown for moderate distances by wind. Spores of a second type (conidia) can also form, both within cane lesions or on mummies that have remained within the trellis, and these are dispersed short distances (inches to feet) by splashing rain drops. Infection occurs when either spore type lands on susceptible green tissue and it remains wet for a sufficient length of time, which depends on the temperature (Table 1). The period during which these overwintering spores are available to cause infections depends on their source. From mummies on the ground, significant discharge of ascospores begins about 2 to 3 weeks after bud break and is virtually complete within 1 to 2 weeks after the start of bloom. In contrast, mummies within the trellis can continue to release both conidia and ascospores from the early prebloom period through veraison. From overwintering cane lesions, conidia can be dispersed from bud break through mid-summer.

Table 1. Duration of continuous leaf wetness necessary for infection by the black rot fungus at different temperatures.

Temperature		Hours of Leaf Wetness
C	F	
7.0	45	No Infection
10.0	50	24
13.0	55	12
15.5	60	9
18.5	65	8
21.0	70	7
24.0	75	7
26.5	80	6
29.0	85	9
32.0	90	12

R. A. Spotts, Ohio State University.

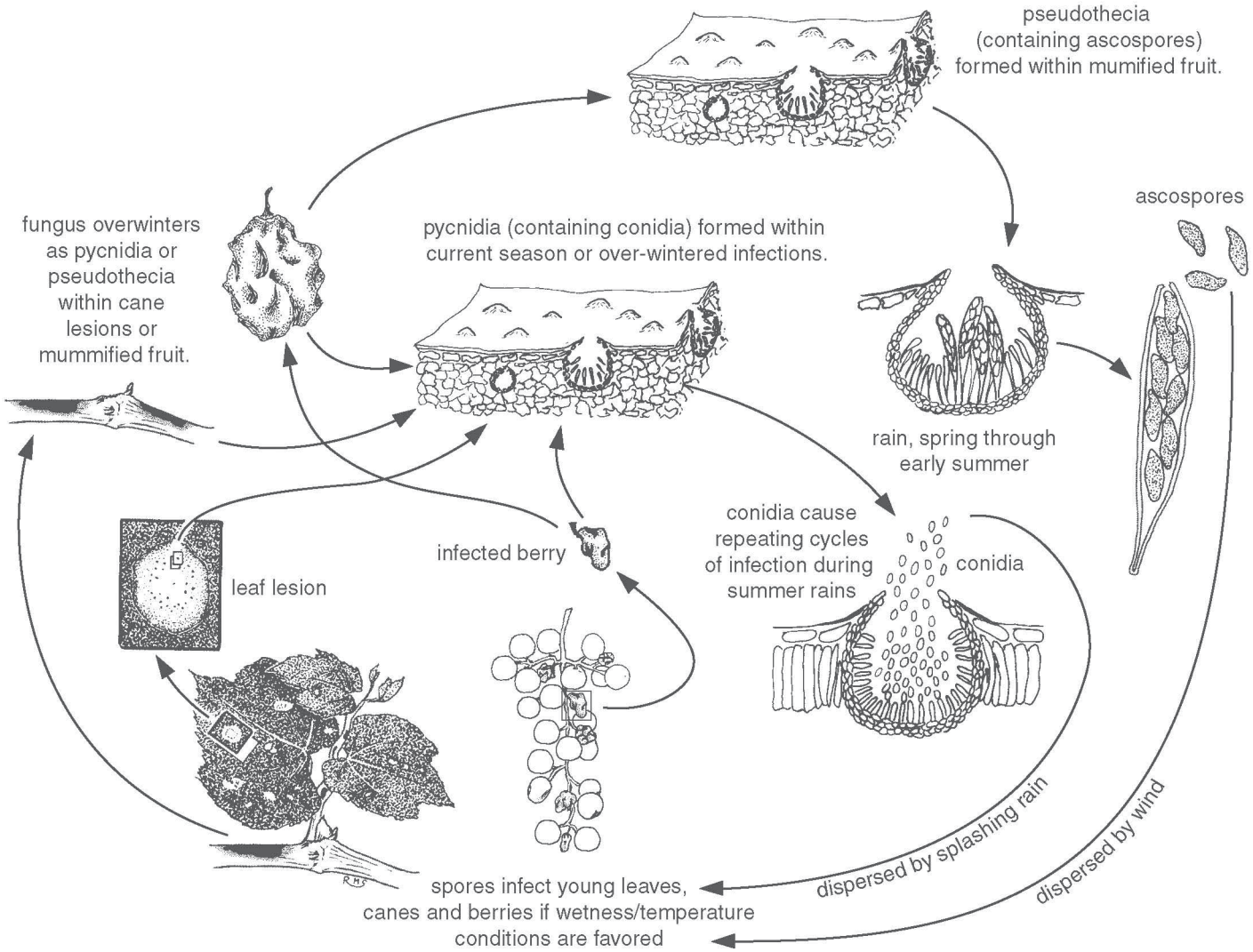
The period of time required for symptoms to appear after the occurrence of an infection period depends on both the temperature and the age of the tissue at the time it's infected. In New York vineyards, young leaves and fruit generally start showing symptoms about 2 weeks after they become infected and the small black pycnidia form within them after another few days. The splash-dispersed spores (conidia) that form within these structures can cause substantial spread of the disease under warm and rainy conditions, particularly if berries are still susceptible to infection after conidia develop (see next section below). Most berries that become infected near the end of their period of susceptibility do not show symptoms until at least 3 weeks later, and the majority do not begin to rot until 4 to 5 weeks after the infection event. These incubation periods should be considered when trying to determine the origin of unexpected disease problems.

Period of Susceptibility

Young leaves are highly susceptible to the disease as they unfold, but become resistant about the time that they finish expanding. Berries do not become infected while the caps remain attached, but in New York they are extremely susceptible for the first 2 to 3 weeks after cap fall. Susceptibility begins to decline progressively after that time, with Concord berries becoming highly resistant about 4 to 5 weeks after bloom and immune 1 week later. Berries of *V. vinifera* cultivars maintain a reduced level of susceptibility until 6 or 7 weeks after bloom, depending on the season, i.e., age-related resistance develops more quickly in warm seasons.

Management

Black rot should be managed through a combination of cultural and chemical methods. The success of any fungicide program will be greatly enhanced by sanitation practices designed to reduce inoculum of the black rot fungus, and these may be essential for avoiding losses in vineyards where the disease is a perennial problem. It is critical to remove all mummies from the canopy during the dormant pruning process; because such mummies produce spores immediately next to susceptible grapevine tissues throughout the season, even relatively few can cause significant damage (Fig. 5). Cultivating beneath the vines near bud break in order to bury mummies will also greatly reduce the number of spores that are released from them, which could otherwise cause infection. Although many growers do not need to perform this operation, particularly if they



obtained good black rot control the previous year, it should be beneficial for those who have trouble controlling the disease and may be particularly important for those who choose to severely limit or avoid the use of highly effective fungicides. As with all fungal diseases, control also is improved by canopy management practices that promote air circulation, speed drying of the leaves and fruit, and improve spray penetration.

Traditional fungicide recommendations specified regular applications from the early shoot growth stage through veraison. In New York, however, research and experience have shown that excellent control can be obtained in most vineyards when fungicides are applied from the immediate prebloom stage through 4 weeks postbloom. However, sprays should start at least 2 weeks prebloom if disease was severe the previous year. The elimination of sprays in the early and late season has received only limited testing in other states. However, because fruit are most susceptible during the first few weeks after the start of bloom, this is when the fungicidal component of black rot management programs should be focused most strongly, whether additional sprays are applied or not. Common grape fungicides differ greatly in their effectiveness against black rot. Furthermore, some have significant activity when applied up to several days after the start of an infection period (Table 1) whereas others are effective only if applied prior to the start of the rain that induces infection. Understanding the traits of individual fungicides will improve one's ability to use these tools most efficiently.

Publication number 102GFSG-D4. Produced by the New York State Integrated Pest Management Program, which is funded through Cornell University, Cornell Cooperative Extension, the NYS Department of Agriculture and Markets, the NYS Department of Environmental Conservation, and USDA-CSREES. Designed by Media Services, Cornell University. Cornell Cooperative Extension provides equal program and employment opportunities.