



GRAPE PHOMOPSIS CANE AND LEAF SPOT

Phomopsis cane and leaf spot, caused by the fungus *Phomopsis viticola*, is an important disease of grapes in the Midwest. Crop losses up to 30% have been reported in some vineyards. The most commonly observed symptoms are on shoots. Lesions on shoots serve as an important source of inoculum for cluster stem (rachis) and fruit infections.

Symptoms

In infected leaves, small, light green or chlorotic, irregular to circular spots with dark centers develop. The spots may be puckered along veins near the perimeter, or the margin may be turned under. Dark brown to black necrotic spots may also occur along primary and secondary leaf veins and on petioles. The necrotic spots may drop out of the leaf, causing a "shot hole" appearance. Infected portions of the leaf may turn yellow, then brown (Figure 1). Severely infected leaves and leaves with infected petioles usually abscise.

Chlorotic spots with dark center develop on infected young shoots, cluster stems (rachises), and petioles. As these spots enlarge, the infected tissues turn dark brown to black and appear as streaks and blotches. When infections on a shoot are numerous, they often coalesce to form dark blotches, which may involve much



Figure 1. Yellowing and necrotic tissue on leaves infected with *Phomopsis viticola* (Courtesy APS, W. B. Hewitt).



Figure 2. Lesions of *Phomopsis* cane and leaf spot on a shoot and rachis, with pycnidia visible on the one-year-old cane (Courtesy APS, R. C. Pearson).

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of the surface of the basal three to six internodes (Figure 2). During rapid growth of shoots, these dark, necrotic blotches often crack and become open fissures in the cortex tissue. Cracks in the epidermis and cortex of shoots tend to heal during the growing season and become rough as the tissues mature. Cluster stems may blight and become brittle from numerous infections, resulting in breakage of the cluster and loss of fruit.

By midseason, symptoms become obscure because of vine growth and leaf cover. Although symptoms are generally seen on portions of the basal three to six internodes, they also can be found on two or more internodes at intervals along some shoots. These infections occurred at the shoot tip during successive rain-induced infection periods.



Figure 3. *Black pycnidia on ripe fruits infected with Phomopsis viticola (Courtesy APS, R. C. Pearson).*

The fungus also causes fruit rot (Figures 3 & 4). Fruit rot first appears close to harvest. Infected fruit gradually turn brown and shrivel. Pycnidia develop sparsely in the epidermis of the berry. Some grapes of highly susceptible cultivars may become infected through the skin when very young and show blackish flecks in the skin. When the grapes are mature, the fungus in some of the black-fleck lesions resumes growth and rots the fruit. Most fruit infections, however, come from lesions on the rachis or pedicel. Infected fruits may abscise from the pedicel, leaving a dry stem scar.

At the advance stage of infection, *Phomopsis* fruit rot can be easily mistaken for black rot disease. Growers should remember that black rot fungus does not infect berries late in the growing season, and black rot symptoms develop long before harvest. Berries become resistant to infection by lack rot pathogen by three to four weeks after bloom. Fruit rot symptoms caused by *Phomopsis* generally do not appear until harvest. Although the fungus of *Phomopsis* cane and leaf spot does not appear to be active during the warm summer

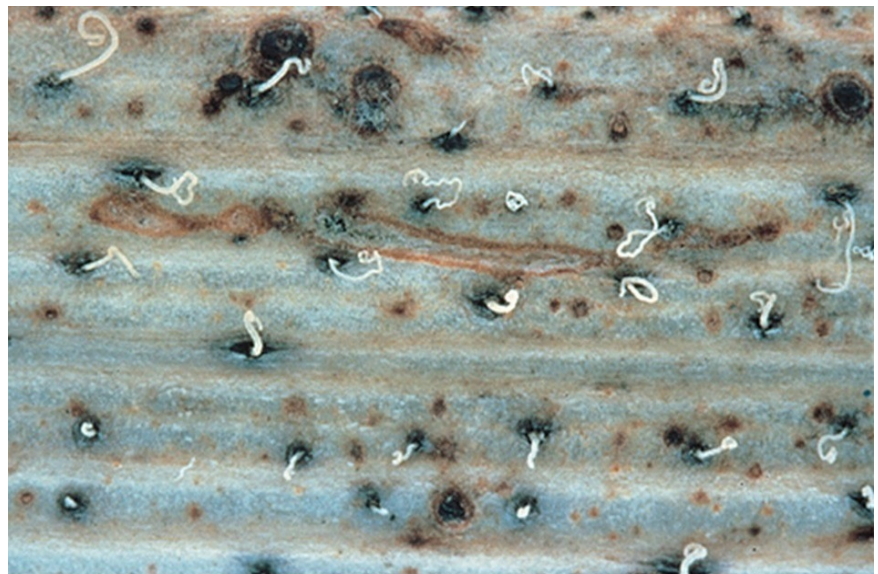


Figure 4. *Pycnidia exuding spores of Phomopsis viticola in cirri on the surface of a one-year-old cane (Courtesy APS, W. Gartel).*

months, it can become active during cool, wet weather later in the growing season

Disease cycle

Phomopsis viticola overwinters in lesions or spots on one- to three-year-old wood infected during previous seasons (Figure 5). It requires cool weather and rainfall for spore (conidia) release and infection. Conidia are released from pycnidia (fungal fruiting bodies) in early spring and are spread by rain to developing shoots and leaves (Figure 4). Shoot and leaf infection is most likely during the period from bud break until shoots are 6 to 8 inches in length. Lesions appear three to four weeks after infection.

The critical period for fruit and rachis infection is also early in the season. The rachis and young fruits are susceptible to infection throughout the growing season; however, most infections appear to occur early in the growing season. The fungus does not appear to be active during warm summer months, and most or all of its primary inoculum is probably released and expended early in the growing season. Thus, the critical period to provide fungicide protection for fruit and rachis infection is from when the clusters are first exposed until two to four weeks after bloom.

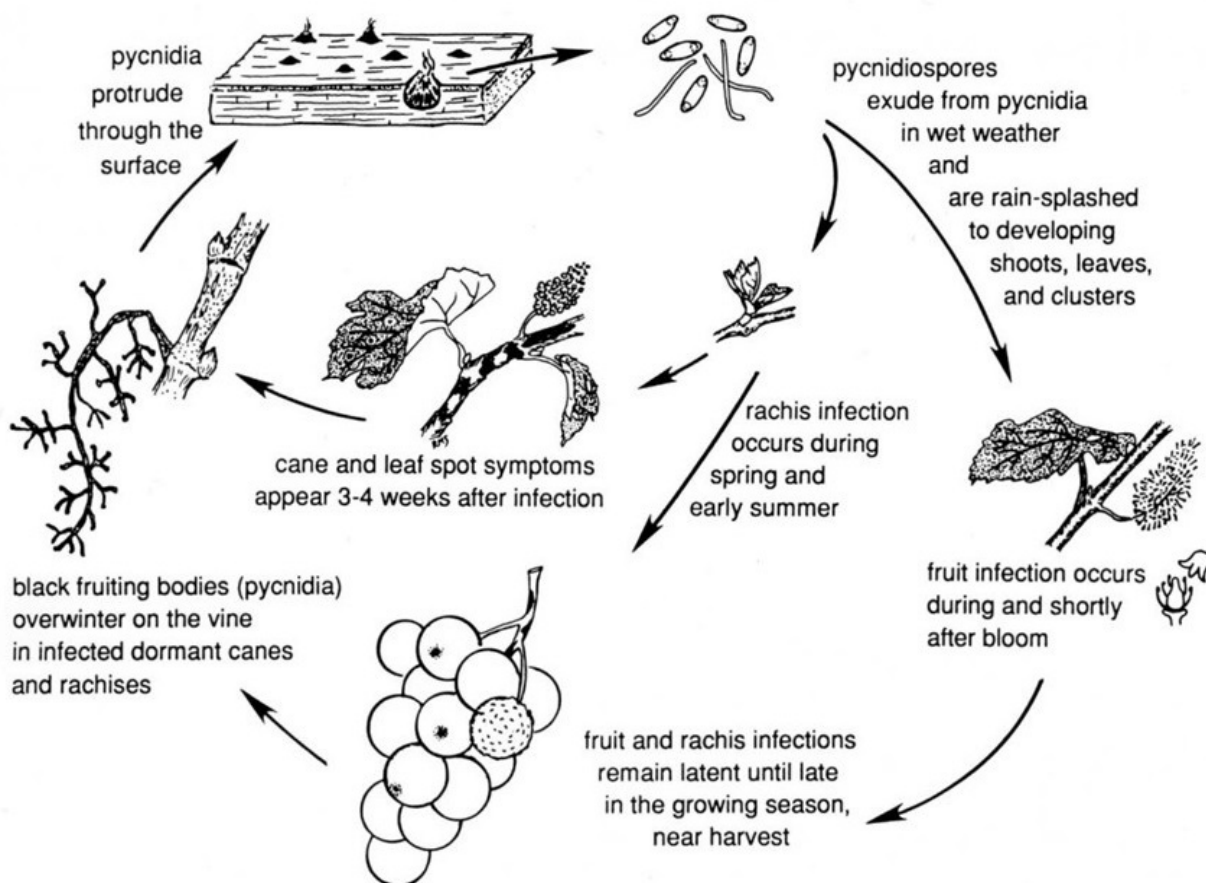


Figure 5. Disease cycle of *Phomopsis* cane and leaf spot of grape (Courtesy New York State Agricultural Experiment Station, Cornell University).

The tiny green fruits that are infected during the critical period may appear to remain normal. The fungus remains inactive in these fruits as a latent infection. Not until the fruit starts to ripen near harvest does the fungus become active and cause the fruit to rot. Therefore, fruit rot that appears at harvest is probably due to infections that occurred during or shortly after bloom.

Disease management

Grape cultivars differ in their susceptibility to Phomopsis cane and leaf spot. The reactions of major grape cultivars to Phomopsis cane and leaf spot and other important grape diseases are provided in Table 1.

Phomopsis cane and leaf spot can be managed by a combination of sanitation and fungicide application. To avoid introduction of the pathogen into the vineyard, use pathogen-free propagation materials (cuttings, buds, rootings, and grafted or budded nursery stock) when planting or replanting. Once the disease has appeared, remove as much diseased and dead wood as practical during pruning. Destroy debris after pruning by shredding it, disking or plowing it into the soil, or burning it.

Chemical management of Phomopsis cane and leaf spot is usually necessary. For the up-to-date information on chemical management of this disease and other grape diseases, refer to the Midwest Fruit Pest Management Guide, University of Illinois Extension - ICSG (<https://ag.purdue.edu/hla/hort/documents/id-465.pdf>). This is an annually updated publication.

Table 1. Relative Susceptibility and Sulfur and Copper Sensitivity of Grape Cultivars

Cultivar	Susceptibility								Sensitivity	
	BR	DM	PM	Bot	Phom	Eu	CG	ALS	Sulfur ¹	Copper ²
Aurora	+++	++	++	+++	+	+++	++	+++	No	++
Baco Noir	+++	+	++	++	+	++	+++	++	No	?
Cabernet Franc	+++	+++	+++	+	?	?	+++	?	No	?
Cabernet Sauvignon	+++	+++	+++	+	+++	+++	+++	?	No	+
Candice	+++	++	+	++	?	?	++	++	?	?
Cascade	+	+	++	+	++	++	+	?	No	?
Catawba	+++	+++	++	+	+++	+	+	+	No	++
Cayuga White	+	++	+	+	+	+	++	++	No	+
Chambourcin	+++	++	+	++	?	?	++	?	Yes	?
Chancellor	+	+++	+++	+	+++	+	+++	+++	Yes	+++
Chardonel	++	++	++	++	?	?	++	++	No	?
Chardonnay	++	+++	+++	+++	+++	++	+++	++	No	+
Chelois	+	+	+++	+++	+++	+++	++	+++	No	+
Concord	+++	+	++	+	+++	+++	+	+	Yes	+
Cynthiana/Norton	+	++	+	+	+	?	+	?	Yes	?
DeChaunac	+	++	++	+	+++	+++	++	+++	Yes	+
Delaware	++	+++ ³	++	+	+++	+	+	+	No	+
Dutchess	+++	++	++	+	++	+	++	+	No	?
Elvira	+	++	++	+++	+	+	++	++	No	++
Einset Seedless	+++	++	+++	+	?	?	+	?	?	?
Foch	++	+	++	+	?	+++	+	+	Yes	?
Fredonia	++	+++	++	+	++	?	+	+	No	?
Frontenac	++	+	++	++	+	?	?	?	No	?
Gewüztraminer	+++	+++	+++	+++	?	?	+++	+	No	+
Himrod	++	+	++	+	?	?	?	+	No	?
Ives	+	+++	+	+	?	++	+	+	Yes	?
Jupiter	++	+	+++	+	+	?	?	?	?	?
LaCrosse	+++	++	++	+++	++	?	?	?	?	?
Leon Millot	+	++	+++	+	+	+	?	?	Yes	?
Limberger	+++	+++	+++	+	?	+++	+++	?	No	?
Marechal Foch	++	+	++	+	?	+++	?	+	Yes	?
Marquis	+	+++	+	+	+++	?	?	?	?	?
Mars	+	+	+	+	+	?	+	?	?	?
Melody	+++	++	+	+	?	?	?	?	No	?
Moore's Diamond	+++	+	+++	++	?	++	?	?	No	++
Muscat Ottonel	+++	+++	+++	++	?	+++	+++	?	No	?
Niagara	+++	+++	++	+	+++	+	++	+	No	?
Pinot Blanc	+++	+++	+++	+++	+++	+++	+++	+++	No	+
Pinot Gris	+++	+++	+++	++	?	+++	+++	?	No	?

Table 1. Relative Susceptibility and Sulfur and Copper Sensitivity of Grape Cultivars - Continued

Cultivar	Susceptibility								Sensitivity	
	BR	DM	PM	Bot	Phom	Eu	CG	ALS	Sulfur ¹	Copper ²
Pinot Meunier	+++	+++	+++	+++	?	+++	+++	?	No	?
Pinot Noir	+++	+++	+++	+++	?	?	+++	+	No	+
Reliance	+++	+++	++	+	++	?	?	?	No	?
Riesling	+++	+++	+++	+++	++	++	+++	+	No	+
Rosette	++	++	+++	+	++	++	++	++	No	+++
Rougeon	++	+++	+++	++	+++	+	++	+++	No	+++
Saint Croix	?	++	++	++	?	?	?	?	?	?
Sauvignon Blanc	+++	+++	+++	+++	?	?	+++	?	No	+
Seyval	++	++	+++	+++	++	+	++	++	No	+
Steuben	++	+	+	+	?	?	+	++?	No	?
Traminette	+	++	+	+	?	?	++	?	?	?
Vanessa	+++	++	++	+	+	?	+	?	?	?
Ventura	++	++	++	+	+	?	+	+++	No	?
Vidal Blanc	+	++	+++	+	+	+	++	+	No	?
Vignoles	+	++	+++	+++	++	++	++	++	No	?
Villard Noir	?	+	+++	+	?	?	?	?	?	?

Key to susceptibility: BR = Black rot; DM = Downy mildew; PM = Powdery mildew; Bot = Botrytis; Phom = Phomopsis; Eu = Eutypa; CG = crown gall; ALS = angular leaf scorch.

Key to rating: + = slightly susceptible or sensitive; ++ = moderately susceptible or sensitive; +++ = highly susceptible or sensitive; No = not sensitive; Yes = sensitive; and ? = relative susceptibility or sensitivity not established.

¹ Slight to moderate sulfur injury may occur even on tolerant cultivars when temperatures are 85°F (30°C) or higher during or immediately following the application.

² Copper applied under cool, slow-drying conditions is likely to occur injury.

³ Berries not susceptible.