

# Phomopsis cane and leaf spot management

Belinda Rawnsley, South Australian Research and Development Institute (SARDI)

## Summary

Phomopsis cane and leaf spot (Phomopsis) of grapevine is caused by the fungus *Phomopsis viticola*. Phomopsis infects grapevines grown in many viticulture regions of Australia but has not been reported in Western Australia. Phomopsis develops during wet springs when spores are spread by rain splash. Infection appears as elongated cracks on shoots, leaf spots and bleached canes. Cool wet weather and prolonged leaf wetness increase the appearance and severity of Phomopsis symptoms. Crop loss occurs as a result of girdling at the base of shoots, weakening and cracking of canes, which consequently lowers vine productivity. Yield loss can also occur due to infection of bunch stems and berry rot.

## Disease cycle

### Winter

The fungus overwinters in the buds, bark and canes of infected vines. Spores are produced in black spots (pycnidia) on bleached cane.

### Spring

Spores are dispersed and infect new shoots in spring. At least 10 hours of rain at 16–20°C is favourable for spore production. For infection to occur, 6–8 hours of leaf wetness is required. Prolonged leaf wetness increases the severity of disease. Spores on the cane are spread by water and rain-splashed on to young, newly developed green shoots. Spores are moved about in water droplets blown from infected vines. Leaf spots (brown with a yellow halo) usually appear about 21 days after an infection, while stem symptoms can take 28 days or more.

### Summer

The fungus is relatively inactive during the hot dry summer months (above 30°C). The fungus can persist for several seasons in the vine and, if left untreated, infected canes and spurs may produce spores for around 3 years.

## Risk assessment

### Seasonal conditions

Spores need moist conditions to germinate and infect the vine. Prolonged periods of cool wet weather in spring create the greatest potential for crop losses from Phomopsis. The risk of Phomopsis infection is low if there are few extended rainfall periods in spring.

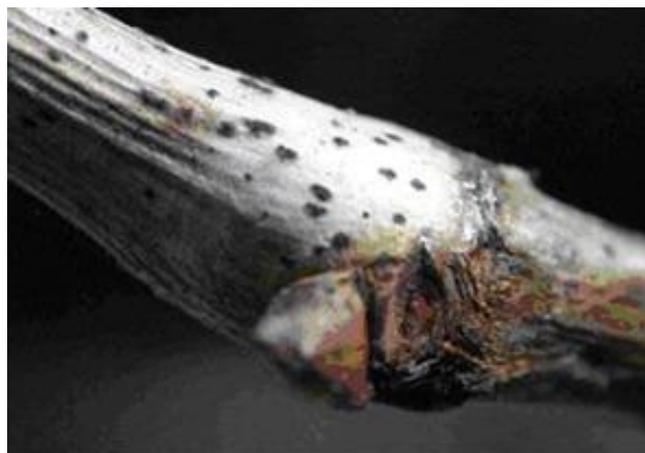


Figure 1: In winter, Phomopsis causes bleached dormant cane with small black spots.



Figure 2: Black longitudinal cracks evident on bleached dormant cane.



Figure 3: Small leaf spots, each surrounded by a yellow halo.

### Pruning system

Pruning systems that retain high bud numbers and infected shoots from the previous season may assist in the build-up of Phomopsis.

### Vineyard and vine microclimate

Vineyards with topographies that restrict airflow or vines that have dense canopies will be at greater risk of infection due to prolonged periods of wetness following rain events.

## Symptoms

### Winter

In winter, infected canes develop bleached white areas on speckled with small black spots (Figure 1). These small black spots (pycnidia) contain spores. Where severe infection has taken place, black cracks are also evident (Figure 2). Cane bleaching is not a reliable sole indicator of Phomopsis infection, however, as bleaching can also be caused by a range of factors such as weather extremes and other types of fungi.

### Spring and early summer

Phomopsis causes distinct, small leaf spots, each surrounded by a yellow halo. Leaf spots remain small and become numerous (Figure 3). Shoot symptoms appear as black elongated cracks on lower internodes (Figure 4). Lesions can coalesce, deepen and become large cracks that cause shoots to become girdled and break. Severely affected shoots are prone to wind damage and stunted growth. Table 1 provides a summary of Phomopsis cane and leaf spot symptoms.

Site	Symptoms
Leaves	<p>Leaf symptoms first appear in spring on the lower leaves of shoots.</p> <ul style="list-style-type: none"> <li>• Small dark brown spots, usually less than 1 mm in diameter, with 2–3 mm of yellowish halo surrounding the brown spot.</li> <li>• Spots can become more numerous, but do not grow in size.</li> <li>• Leaves can distort as spots darken and drop out.</li> <li>• Leaves with badly affected stems can turn yellow and fall.</li> <li>• Leaf petioles can have black spots and lesions</li> </ul>
Green shoots	<ul style="list-style-type: none"> <li>• Small spots with black centres develop, usually on the lower internodes, gradually expanding and elongating to form black crack-like lesions up to 5–6 mm long.</li> <li>• Large numbers of merging spots on badly infected shoots may give a ‘scabby’ or ‘corky’ appearance. As canes grow and harden, the fissures crack and scar.</li> <li>• Girdled shoots can fail to mature, or become stunted and die.</li> <li>• Severe infections can lead to dwarfing, deformation and death of infected shoots, which break off near the base.</li> <li>• Weakened older shoots (30–60 cm long) can break under a heavy crop load or in strong winds.</li> </ul>
Inflorescences and bunches	<p>Although this is not as common as foliar and shoot symptoms, Phomopsis can cause black speckled rotting of berries, particularly in cool wet conditions. Berry rot rarely occurs without prior leaf and shoot symptoms.</p> <ul style="list-style-type: none"> <li>• Flower cluster rachis develops spots like those found on leaves.</li> <li>• Severely infected clusters wither.</li> <li>• If rain occurs just before harvest, previously uninfected berries can develop light brown spots, which enlarge, blacken and exude yellowish spore masses.</li> <li>• These berries shrivel and become mummified.</li> </ul>
Lignified canes	<ul style="list-style-type: none"> <li>• Infected canes may be bleached white in winter.</li> <li>• Bleached areas, particularly those around the nodes, become speckled with small black spots (the resting structures of the fungus).</li> <li>• These spots are prominent in the cortices of infected one-year-old canes, on spurs, bunch and berry stems, and tendrils.</li> </ul>

Table 1: Checklist of symptoms for Phomopsis cane and leaf spot.



Figure 4: Lesions on green shoots.

## Monitoring

Monitoring is critical to determining whether Phomopsis is present in the vineyard. The majority of infection occurs during or shortly after budburst. *Early detection and knowledge of any previous infection are critical for control of the disease* as first chemical sprays are required at 50% budburst to avoid infection of newly emerged shoots.

### Choosing monitoring sites

Sheltered or low-lying parts of the vineyard and/or vines with dense canopies should be closely monitored. Vines with Phomopsis should be monitored for several years after the last recorded infection.

### How to sample

In winter, look for bleached canes and spurs, with and without scarring. In the growing season, symptoms can be seen from budburst onwards. Inspect 200 shoots, particularly in parts of the vineyard where disease has occurred in previous seasons, and in low-lying areas. Briefly examine leaves and lower internodes on shoots. Later in the season, inspect rachis and bunches if long wet periods (20–30 hours) occur at flowering.

### When to sample

Begin monitoring for bleached and cracked canes around 4 weeks before budburst, particularly in areas where leaf and shoot symptoms were observed in the previous season. If Phomopsis is suspected, cane samples can be sent to a diagnostic laboratory for confirmation. Infection occurs following 10 hours of rainfall at optimum temperatures of 16–20°C and prolonged leaf wetness, so monitor vines every 1–2 weeks from 3 weeks after budburst. Leaf spots usually appear about 3 weeks after an infection period; stem symptoms can take 4 weeks or more.



Figure 5: Chemical spray damage on leaves.

## Confusion with other symptoms

### Diaporthe

Symptoms appear as bleached white canes speckled with small black spots. Symptoms do not appear on green shoots or leaves. Diaporthe was once confused as a type of Phomopsis but Diaporthe is harmless.

### Chemical spray damage

Numerous yellow leaf spots appear on leaves where spray contact has occurred, but the spots are larger than those of Phomopsis; no shoot lesions appear (Figure 5).

### Insect damage

Yellow leaf spots appear on leaves but these are often associated with leaf veins. No brown or black spotting occurs on leaves.

### Black spot (anthracnose)

Symptoms appear as brown-purple spots that are typically larger than those of Phomopsis. Infections on green shoot are more circular with a roughened appearance (Figures 6a,b).

### Bud mite

Leaves exhibit similar distortion and stunting to those seen with Phomopsis but without the leaf spots. Mites can cause elongated scars on green shoots but these do not elongate.

### Botrytis, Botryosphaeria, frost

All can cause greyish bleaching of canes but not cracking. Spotting on shoots or leaves does not occur.

## Management

If the disease is not present in the vineyard, preventative treatment is not necessary. If the vineyard was infected in the previous season and an infection period is

(a)



(b)



Figure 6: Black spot symptoms can be confused with those of Phomopsis – (a) leaf spots, (b) stem infection.

suspected, early-season fungicide applications are recommended. Do not wait for leaf and shoot symptoms to appear, as the infection has already occurred by this time.

**Chemical**

If Phomopsis is detected or has previously been a problem, appropriate registered fungicides (Table 2) must be applied before the fungus produces spores and has the chance to infect new growth. The chemicals available for Phomopsis are preventative only and do not have any curative properties. Therefore, the best time to apply chemical is before rainfall events during spring to prevent infection. Additional applications will be required if wet conditions persist, in order to protect new growth. Refer to [http://www.awri.com.au/industry\\_support/viticulture/agrochemicals/agrochemical\\_booklet/](http://www.awri.com.au/industry_support/viticulture/agrochemicals/agrochemical_booklet/) for details of products currently registered for use in Australian viticulture.

*Dormancy spray*

One application during dormancy (3–4 weeks before budburst) inhibits spore production. Note that there are long re-entry period restrictions with this approach.

*Spraying after budburst*

If Phomopsis infection has been a problem in the previous one or two seasons, a protectant fungicide should be applied at 50% budburst and 2 weeks after budburst. If wet conditions persist after budburst, further fungicide applications may be required to prevent further infection.

Note that fungicides registered for Phomopsis are protectants only and do not have an effect if applied after disease symptoms appear. Consider fungicides with dual activity on other diseases such as Black spot, Botrytis and Downy mildew (see Table 3 for examples).

**Cultural**

*Vineyard hygiene*

Always use clean grafting and planting material that is free from any pest or disease, including Phomopsis. Hot water treatment on dormant vine cuttings is effective at

Active constituent(s)	Activity group	Example of registered product
Fluazinam (dormancy spray only)	29	Emblem
Mancozeb	M3	Mancozeb 750 WG
Dithianon	M9	Delan 700 WG
Captan	M4	Captan 900 WG

Table 2: Some recommended protectant fungicides registered for Phomopsis control in Australia.

Active constituent(s)	Activity group	Example of registered product	Other disease targets
Captan + metalaxyl	M4 + 4	Duplex WG	Black spot, Botrytis, Downy mildew
Copper sulphate tribasic + mancozeb	M1 + M3	Novofix Disperss	Downy mildew
Dithianon	M9	Delan 700 WG	Black spot
Captan	M4	Captan 900 WG	Black spot, Botrytis, Downy mildew
Mancozeb	M3	Dithane Rainshield Neo Tec	Black spot, Downy mildew
Metiram	M3	Polyram DF	Black spot, Downy mildew

Table 3: Some fungicides registered for use in Australian viticulture, with activity against Phomopsis and other fungal diseases.

controlling infection in budwood and cuttings. Consider pruning out any infected canes or mummified bunches during pruning where practical. Do not retain diseased spurs or canes as fruiting wood for the following season.

#### *Removal of prunings*

Prune off diseased and dead wood from vines, and remove prunings from the vineyard floor (where practical) and bury or burn them to reduce the amount of inoculum.

#### *Modifying the vine/vineyard environment*

Canopy management practices can be used to encourage air movement, reduce humidity within the canopy, and improve the penetration of sunlight and access for fungicide application, thereby reducing the risk of disease. This may include reducing vine vigour by pruning to reduce bud numbers, using foliage wires to lift and hold shoots, or removing excessive shoots or foliage. Large numbers of unpruned canes (e.g. as a result of mechanical hedge pruning) can provide a significant source of inoculum for the following season.

## References

- Eircik O, Madden LV, Ferree DC & Ellis MA (2003) Temperature and wetness-duration requirements for grape leaf and cane infection caused by *Phomopsis viticola*. *Plant Disease* 87(7): 832–840.
- Nicholas P, Magarey P & Wachtel M (eds) (1994) *Diseases and Pests, Grape Production Series No. 1*, Winetitles: Adelaide.

#### **Disclaimer**

In publishing this factsheet, Wine Australia is engaged in disseminating information, not rendering professional advice or services. Wine Australia and the author expressly disclaim any form of liability to any person in respect of anything included or omitted that is based on the whole or any part of the contents of this factsheet.