



**PHOMOPSIS
CANE
and
LEAF SPOT
of
GRAPES**

Division of Agricultural Sciences
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Phomopsis Cane and Leaf Spot of Grapes

Introduction

This disease, caused by the fungus *Phomopsis viticola* and long known as "deadarm," first appeared in the American River section of Sacramento County in May 1935. Original reports and descriptions of the disease earlier in the century—especially from the northeast—mistakenly attributed a whole range of symptoms to the one pathogen; it has recently been established that *Eutypa armeniacae* is responsible for pruning wound cankers and dead arms on vines, whereas *P. viticola* causes mainly leaf, shoot, and cluster stem spotting.

In wet spring years, *Phomopsis* cane and leaf spot can be particularly severe on Tokay, Thompson Seedless, and Grenache varieties growing in the Central Valley between Lodi and Visalia. Other varieties grown in the Central Valley and susceptible to a lesser degree include Cardinal, White Malaga, Emperor, Calmeria and Rish Baba. In districts other than the Central Valley, it has been seen on other varieties but is relatively less important. Actual economic loss from *Phomopsis* in most years is minor. However, in years of severe infection losses can occur from:

- Shoots breaking off near the base where heavy lesions developed, thus reducing cluster count.
- Infected weakened wood retained at pruning time, which can reduce the next season's crop level; careful selection of good, clean, mature wood can increase pruning costs.
- Fruit infection, which occasionally occurs prior to harvest under cool, wet weather conditions.

- Inability to store table grapes for a long period of time; infected fruit stored under cool temperatures and high humidity can develop *Phomopsis* rot.

Symptoms

Infection occurs on leaves, shoots, cluster stems, and berries. Symptoms and development of the disease are as follows:

Leaves. The first symptoms appearing on leaf blades and veins are tiny dark-brown to black spots with yellowish margins. These spots first show 3 to 4 weeks following a rain after bud-break. If large numbers of spots develop, they may kill portions of the leaf. Basal leaves with heavy infection become distorted and usually never develop to full size. When leaf stems are heavily infected, leaves will turn yellow and abscise. Later in the season normal leaves develop on subsequent internodes, hiding the distorted primary leaves.

Shoots. Small spots with black centers, very similar to those found on the leaves, are the first evidence of shoot infection. This infection usually occurs on the basal portion of the shoots. When these spots become a few millimeters long, the epidermal layers of the shoots usually crack at the infected parts. Where the spots are numerous they coalesce and may ultimately give a scabby appearance to parts of the shoots. Heavily infected shoots can be dwarfed or retarded in their growth pattern; some may be killed. After shoots have developed 12 to 24 inches, shoot breakage can occur during strong winds; breakage occurs in the area of heavy scabbing and lesion development, which is usually below the cluster. Shoot lesions become inactive during the summer.

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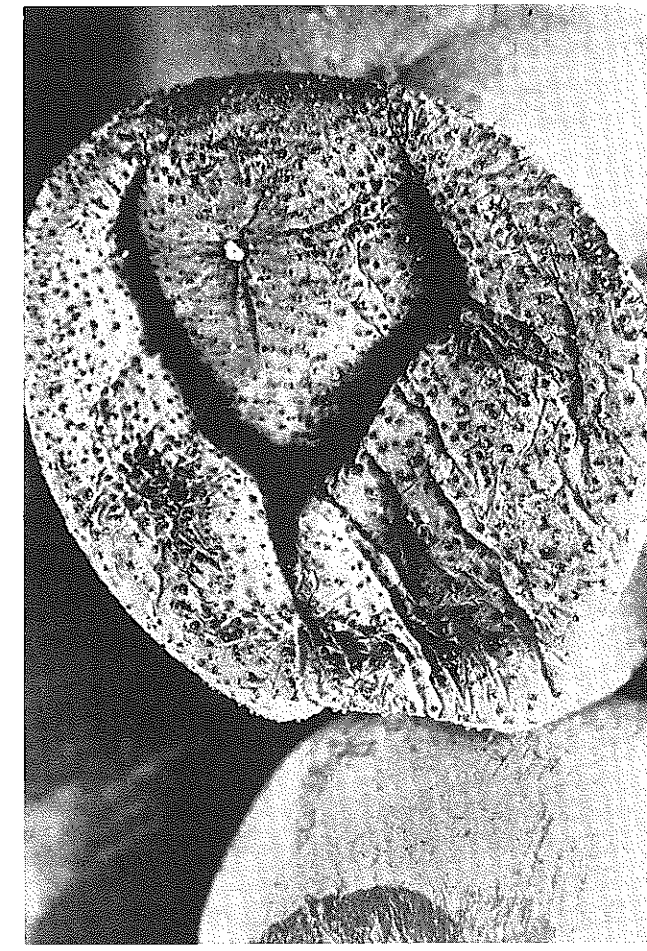
Infected leaves show tiny dark-brown to black spots with yellowish margins.



Basal portions of young shoots show numerous spots which eventually coalesce to give a scabby appearance.



Close up of shoot spots illustrates how the epidermis cracks at the infected spots.



Berry rotting due to *Phomopsis* infection is dark-brown with fruiting bodies (pycnidia) of fungus breaking through the skin.

Cluster stems. In spring, spots similar to those on shoots and leaves also appear on flower cluster stems. Occasionally, cluster stems are so badly infected that the clusters wither. Early fall rains combined with cool weather may activate the disease area on the cluster stems, sometimes resulting in berry and bunch rotting. Fruit symptoms are generally not extensive, with only isolated bunches affected on any one vine. Rain just prior to harvest can result in light-brown spots on undamaged berries; the spots enlarge quickly and become dark brown. Black pycnidia (spore-bearing bodies), often in concentric rings, break through the skin and yellow spore masses may exude. Finally, the berries shrivel and become mummified.

Infected canes. During the late dormant

season, infected wood will appear as bleached areas on basal portions of the canes. Severely affected canes or spurs exhibit an irregular, dark-brown to black discoloration intermixed with the whitish, bleached areas. Tissue in the vicinity of the original lesions and at the nodes is also whitish with black speckling. These black specks are the pycnidia which develop during the dormant season. As they break through the surface, they appear as minute black pimple-like pustules; they provide the overwintering source of spores for the following season. Severely affected canes and spurs are more sensitive to low temperature injury which can cause extensive killing of the spurs and weakening of the canes, leading to occasional dead arms. However, dead arms are not a major characteristic of this disease.

The Disease Cycle

Infection generally occurs in spring when shoots begin to grow. Rain during this growth period is required for infection. Spores are released in large quantities from the overwintering pycnidia on diseased canes, spurs, and bark about the time of budbreak. The spores are then splashed onto newly developing shoots; infection occurs if free moisture remains on unprotected green tissue for many hours. Heavy and prolonged rains in March and April soon after budbreak are ideal for spring infection, which becomes visible shortly afterwards. The number of basal nodes affected will vary according to the duration of weather suitable for infection, hence the disease is seasonal in its occurrence.

Management of the Disease

Because spur and cane lesions provide most of the inoculum for new infections, control of this phase of the disease is very important. Careful pruning out of badly infected canes will reduce the carryover of spores.

The use of an eradicant chemical late in the dormant period (at least 1 month after pruning and tying if sodium arsenite is used) will help clean up overwintering inoculum and lessen the risk of new shoot infection. Both sodium arsenite and Premerge (2-sec-butyl-4,6-dinitrophenol) have been successfully used for this purpose. A thorough application of one of these eradicant materials provides the grower with considerable insurance

against shoot infection if early spring weather turns unusually cool and wet. However, there are disadvantages: both chemicals are hazardous to the applicator and require certain safety measures in application, and can also be toxic to the vines if used with improper timing. Sodium arsenite can be used through budswell to budbreak. On the other hand, Premerge can damage vines after buds have begun to swell and should only be used during complete dormancy. Growers should check with their grape buyers before applying sodium arsenite. Not all wineries approve of its use, although it is legally approved by regulatory agencies at the time of writing.

Another alternative available to the grower involves treatment with a fungicide during the early growth stages. Captan, folpet, and mancozeb all give satisfactory protection of young shoots if applied *before* prolonged cool, wet weather. Sprays applied at budbreak to 1/2-inch (1.3 cm) shoot length and again when shoots are 5 to 6 inches (12 to 15 cm) long will provide good control. In severely affected vineyards, both dormant and early growth stage treatments may be advisable. The decision as to whether to apply a second foliar spray can be made according to the weather; for example, a heavy spring rain during early shoot growth would necessitate re-treatment for continued protection.



Infected canes in late winter show irregular dark-brown to black discoloration intermixed with whitish bleached areas.

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in their original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Recommendations are based on the best information currently available, and treatments based on them should not leave residues exceeding the tolerance established for any particular chemical. Confine chemicals to the area being treated. **THE GROWER IS LEGALLY RESPONSIBLE** for residues on his crops as well as for problems caused by drift from his property to other properties or crops.

Consult your County Agricultural Commissioner for correct methods of disposing of leftover spray material and empty containers. **Never burn pesticide containers.**

PHYTOTOXICITY: Certain chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high. Injury may also result from excessive amounts or the wrong formulation or from mixing incompatible materials. Inert ingredients, such as wetters, spreaders, emulsifiers, diluents, and solvents, can cause plant injury. Since formulations are often changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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