



Characteristics of powdery mildew

Other topics in this Viti-Notes series include:

- Managing powdery mildew
- Monitoring for powdery mildew
- Symptoms of powdery mildew

Many commercially important grapevine varieties are prone to powdery mildew infection and early season control is important to prevent a buildup of the disease.

Lifecycle of powdery mildew: Disease development from infected buds (asexual reproduction)

Powdery mildew can lay dormant in buds infected before the bud scales turn brown, early in the previous season. In the following spring these infected buds produce diseased and deformed shoots called 'flag shoots'. Usually only a few flag shoots are produced (about one in every 1000 shoots), although this number can be greater if there was a high level of the disease in the vineyard in the previous season.

Flag shoots produce a wind-dispersed spore called a conidium. These spores land on surrounding shoots and vines and infect the green tissue. Conidia germinate within 24 hours, although germination is inhibited by water. At each of these new infection sites, the organism multiplies, and around 5 to 12 days later new colonies produce their own conidia.

Disease development from cleistotheca (sexual reproduction)

Cleistothecia are the sexual fruiting bodies produced by the powdery mildew organism. They only form on the surface of heavily diseased vine tissue and take about 90 days to fully mature. Immature cleistothecia are yellow, and gradually turn brown, then black. When mature they look like tiny black specks the size of a pinpoint on the surface of heavily diseased tissues. They form from mid-summer to autumn and survive over winter on the bark around the vine crown and cordon, and on mummified bunches and in vineyard floor leaf litter.

When cleistothecia are wetted, they eject ascospores which are spread by wind and water to infect the lower leaves near where the cleistothecia have overwintered. Similarly to infection by conidia, these also produce characteristic yellow leaf splotches as the colony develops. The colonies that develop from ascospores go on to produce asexual conidia that can then start new infections.

Conditions favouring powdery mildew development and symptoms of infection

The disease spreads as conidia are produced and new colonies establish throughout the season while favourable conditions apply. Conidia germinate in the absence of free water when relative humidity is over 40%.

Ascospores are released from cleistothecia when wet by 2.5 mm or more of rain or overhead irrigation, and when temperatures are above 10°C. These conditions usually occur between budburst and flowering, and sometimes post-flowering.

Cleistothecia do not persist as a viable infection source for more than a year, and are unlikely to be an important source of infection if powdery mildew has been well controlled in the previous season.

Regardless of whether initial infection results from flag shoots or cleistothecia, unless the disease is controlled, the infection cycle continues many times throughout the growing season resulting in a rapid increase in disease incidence. After about 40 days from budburst, spore numbers increase dramatically and disease severity escalates if controls are not applied, or are ineffective.

Powdery mildew occurrence from season to season varies considerably depending on the levels of the disease in the previous season, the effectiveness of controls applied and the resulting amount of diseased buds and cleistothecia carried over to the next season, and the occurrence of favourable conditions in the current season.

Symptoms of infection by powdery mildew include:

- Yellowish leaf spots which produce grey to white powdery spores. Severe infections may deform young leaves or turn leaves black.
- Flag shoots, which are characteristically distorted and stunted and may become covered in powdery spores. Later in the season, previously uninfected shoots may also become diseased, exhibiting oily grey blotches which develop spores. These blotches may eventually turn dark red-brown as canes mature.
- Powdery ash-grey spores can grow on berries and bunch stalks causing berries to become scarred and distorted, and to split, rot and shrivel.
- Diseased canes may mature irregularly and in winter may die back from the tip, or exhibit a red-brown to black web-like pattern on their surfaces.

Economic impacts

Leaf loss, and shoot and leaf damage results in less effective photosynthesis for the production of sugars required for plant metabolism and fruit quality. Vine vigour and productivity can be decreased by several seasons of severe powdery mildew infection.

Diseased berries can cause off flavours in wine. Minor powdery mildew disease levels (as little as three or four bunches in a bin) can result in some wineries rejecting grapes. Another economic impact can be splitting of infected berries and exposure to bunch-rotting organisms.

Factors influencing susceptibility to powdery mildew

Previously infected areas, or shaded or dense parts of vine canopies, or sheltered vineyard sites such as hollows are at greatest risk of developing the disease, particularly where sprinkler irrigation may maintain humid cool microclimates. Closed vine canopies also reduce spray penetration and prohibit effective application of chemicals. Shiraz and Grenache are among the less susceptible varieties while the most susceptible varieties include Chardonnay, Chenin Blanc, Muller Thurgau, Muscadelle, Riesling, Semillon and Verdelho. An understanding of the cycle of this disease, and its history in the vineyard, as well as monitoring for symptoms will enable an effective management program to be implemented if powdery mildew is identified.

Further information

Product or service information is provided to inform the viticulture industry about available resources, and should not be interpreted as an endorsement.

A useful reference with illustrations of the lifecycle and symptoms is

- Diseases & Pests, editors, Nicholas, P., Magarey, P.A. and Wachtel, M., 1994, Grape Production Series 1, Hyde Park Press, Adelaide, (available Winetitles, 08 8223 4700, or www.winetitles.com.au).
- See also the glove box edition of the above, Field Guide to Diseases and Pests.

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- Enquiries to Peter Mansfield on (08) 8222 9255 or visit www.crcv.com.au/education/rtp for more information.

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