viti-notes

[pests and diseases]

Research to Practice

Characteristics of powdery mildew

Viti-note Summary:

- Economic impacts
- Factors influencing grapevine susceptibility
- Life cycle of powdery mildew
  - Disease development from infected buds (asexual reproduction)
  - Disease development from chasmothecia (sexual reproduction)
- Conditions favouring development and symptoms of infection

Other topics in this Viti-Notes series include:

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

Powdery mildew is the common term for a group of plant diseases. In grapevines the disease is caused by the fungus originally named *Uncinula necator*, now renamed *Erysiphe necator*. Infection and subsequent disease development is influenced by many factors including the presence of infected grapevine tissue, spores, and the occurrence of particular weather conditions. Disease progress early in the season may be slow depending on weather conditions, but is not usually impeded in most areas of Australia.

Development of the disease can be slow in the early part of the season when conditions are less favourable for the fungus. The critical time for development of powdery mildew falls in the period just prior to flowering through to fruit set. The disease can be carried over from season to season in infected buds, or as 'resting spores', called chasmothecia [formally known as cleistothecia].

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

Economic impacts

Leaf loss, and shoot and leaf damage reduces photosynthetic activity and the production of sugars required for plant metabolism and fruit quality. Vine vigour and productivity can be decreased for several seasons following severe powdery mildew infections.

Diseased berries can cause off flavours in wine. Minor powdery mildew disease levels (3–5%) can result in wineries rejecting grapes. Table-grape quality can also be compromised by scarring and discolouration of the berries and berry stems, and the storage life of table-grapes can be shortened by infection of the bunch stem. Splitting of infected berries increases susceptibility to bunch rots.

Factors influencing grapevine susceptibility

Previously infected areas, shaded or dense parts of vine canopies, and 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.

Sources of infection upwind also make downwind infection more likely, though the distance viable spores can travel is not known.

Vitis species differ in susceptibility, with the commercially important *Vitis vinifera* and some of the Asiatic species being particularly prone to infection. Shiraz and Grenache are less susceptible, as are hybrids with other *Vitis* species. The most susceptible cultivars include: Chardonnay, Chenin Blanc, Crouchen, Frontignac, Muller Thurgau, Muscadelle, Riesling, Semillon, Verdelho, Palomino, Doradillo, Muscat Hamburg, Zante Currant.

Life cycle of powdery mildew

An understanding of the pathogen life cycle in a grapevine helps identify when preventative action will provide the most cost-effective level of control.

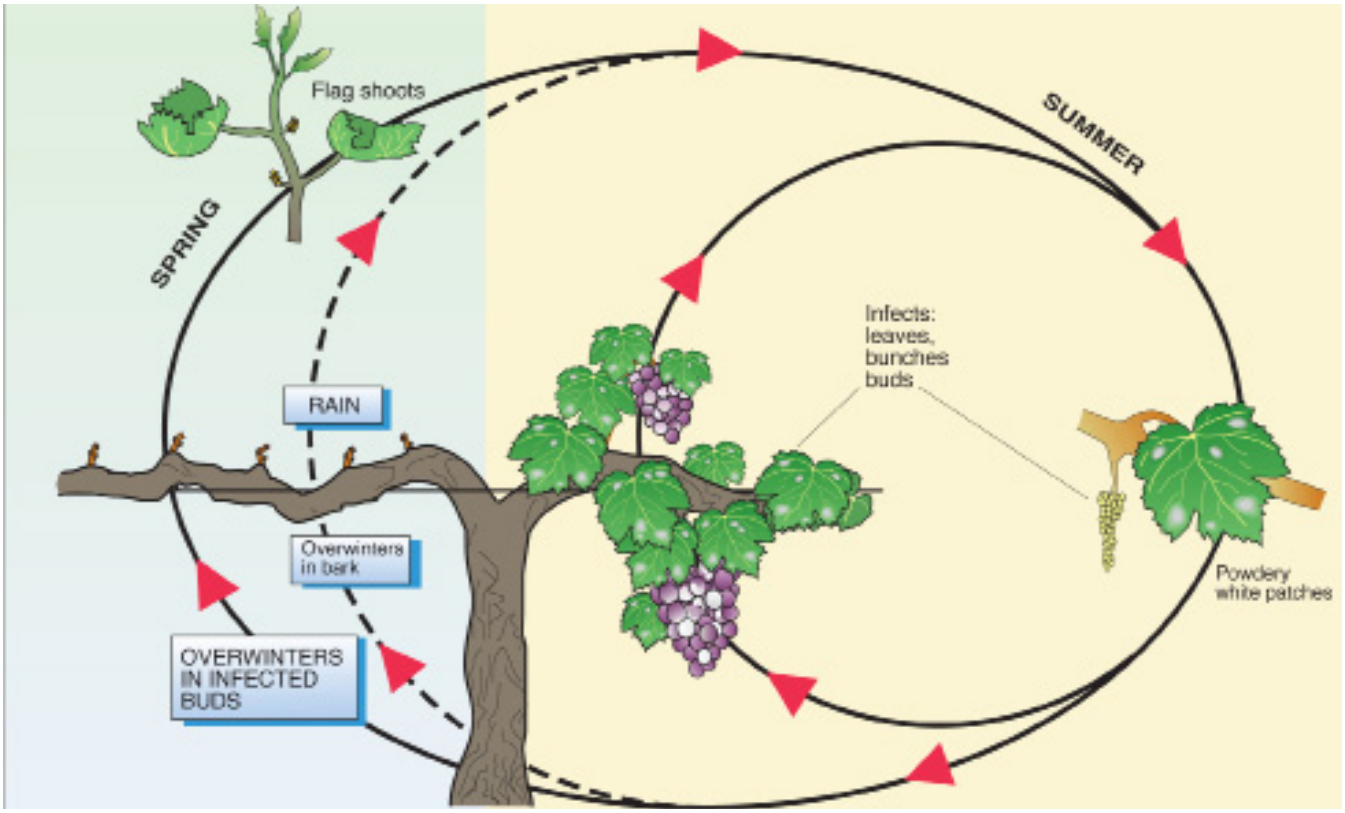

Figure 1. Life cycle of powdery mildew
(Diagram courtesy of Nicholas, Magarey and Wachel, 1994, Grape Production Series Number 1: Diseases and Pests, Winetitles)

Disease development from infected buds (asexual reproduction)

Powdery mildew survives in dormant buds infected before the bud scales turn brown, early in the previous season. In the following spring the infected buds produce diseased and deformed shoots called 'flag shoots'. Usually only a small number of 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 in the absence of free water when relative humidity is greater than 40%. At each of these new infection sites, the fungus multiplies, and around 5-12 days later these new 'colonies' produce another generation of conidia.

Regardless of whether initial infection originates from flag shoots or chasmothecia, 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.

Figure 2. Flag shoot

Disease development from chasmothecia (sexual reproduction)

Chasmothecia 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 chasmothecia are yellow, and gradually turn brown, then black. When mature they are just visible to the naked eye and 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.

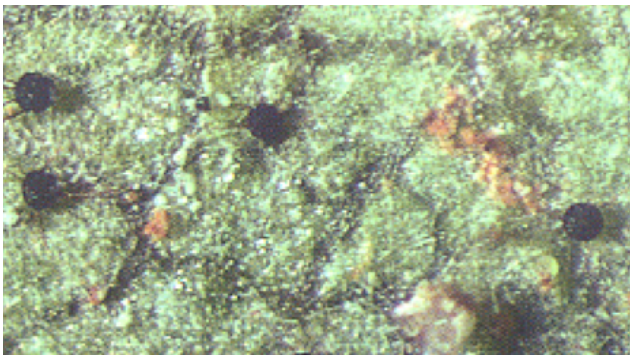

Figure 3. Mature chasmothecia

When chasmothecia are wetted by 2.5 mm or more through rain or irrigation and temperature is greater than 10^{0}C, they eject ascospores which are spread by wind and water to infect the lower leaves near where the chasmothecia have overwintered. Similarly to infection by conidia, these also produce characteristic yellow leaf splotches as the colony develops. These colonies go on to produce asexual conidia that can then start new infections.

Conditions favouring development and symptoms of infection

Seasonal differences of powdery mildew severity varies considerably depending on a number of factors. The levels of the disease in the previous season in conjunction with the effectiveness of controls applied influence the amount of diseased buds and chasmothecia carried over to the next season. The occurrence of conditions favorable to the disease in the current season also has considerable impact.

Weather that is mild (between 20-30°C) and cloudy, coupled with low to moderate light favours disease spread. Alternatively, temperatures greater than 35°C decrease fungal growth on exposed leaf surfaces.

Low levels of rain (2.5 mm or more) combined with temperatures greater than 10°C enable spores to be released from resting bodies.

Relative humidity above 40% provides conditions suitable for spore germination.

Sheltered parts of a vineyard and shaded parts of a canopy provide are conditions that suit initiation and development of the disease.

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Further information

Innovator network factsheets

Managing Powdery Mildew

http://www.gwrdc.com.au/webdata/resources/files/PowderyMildewFact_Sheet.pdf

Training

For regional specific training in pest and disease control, the AWRI is running Research to Practice: Integrated Pest Management for changing viticultural environments.

Contact

Marcel Essling: rtp@awri.com.au for more information.

Agrochemical information

Agrochemicals registered for use in Australian Viticulture - updated annually.

Visit www.awri.com.au for the latest version.

Useful references

Nicholas, P., Magarey, P.A. and Wachtel, M. (Eds.) 1994 Diseases and pests, Grape Production Series 1, Hyde Park Press, Adelaide (a glove box edition of this book is also available).

For images of grapevine symptoms visit www.winetitles.com/diagnosis/index.asp.

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

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