

## Monitoring for downy mildew

Other topics in this Viti-Notes series include:

- Characteristics of downy mildew
- Symptoms for downy mildew

Downy mildew is a disease spread by wind and water which develops after favourable weather conditions in warm wet weather, especially in late spring and early summer. The disease organism is carried over in the vineyard in resting bodies found in diseased vineyard floor litter.

Infections lead to characteristic 'oilspots' and downy spore growth which can be recognised during vineyard inspections. Strategic management of downy mildew, however, primarily involves weather monitoring to determine when conditions may be right for the fungal disease to become active.

### Why monitor?

Downy mildew has very specific moisture and temperature requirements, and the organism is able to continue its infection cycle throughout the season whenever suitable conditions occur.

Failure to prevent infections, or inadequate control, can result in severe crop losses due to premature leaf fall and infection of flowers and bunches. In severe circumstances, 100% of inflorescences or bunches may be lost to infection.

With careful monitoring of these conditions, prediction of the likelihood of disease occurrence can be accurate and appropriate pre-infection (protectant) or post-infection (eradicant) sprays can be applied. Monitoring can also ensure that any chemicals applied are targeted more effectively at vulnerable stages of disease development. Subsequent monitoring for 'oil spots' ensures that predictions are accurate and spray coverage is effective. If no downy mildew is detected by monitoring, the need for spraying or other actions can be reduced or eliminated.

### Conditions favouring infection

Downy mildew is a disease driven by specific environmental conditions. Determining where and when to monitor requires an understanding of the conditions that favour downy mildew development.

These include:

- 10:10:24 weather conditions which facilitate primary infections from resting oospores. This is when the temperature remains 10°C or more, and there is at least 10 mm of precipitation over a 24 hour period.
- Suitable conditions for secondary infections to develop from 'oil spots' which occur when humidity is at least 98% and the temperature is 13°C or above (optimum 20-25°C) for at least 4 hours of darkness and leaves are wet for 2 to 3 hours predawn. After a single warm humid night, as few as 20 to 50 'oil spots' which may have developed from a preceding primary infection weather event, can result in the development of 100,000 secondary 'oil spots' in an area of 50 m radius of each initial primary 'oil spot'.

What to look for: Symptoms of infection by downy mildew include:

- Characteristic yellowish oily spots appear on leaves. These can merge to cover the whole leaf. After suitable conditions, clumps of white downy spore bodies grow from the undersides of leaves. Late season infection of older leaves can appear 'mottled'. Severely infected leaves may fall.
- Oily brown patches spread along infected shoots, stems and tendrils. Leaves on these shoots can die and fall, and shoots may break.
- Infected flowers, bunches and berries turn brown and oily in appearance, and produce the downy spore masses. Berries become resistant to infection

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around 5-6 mm (pea size), however those infected when young can shrivel and fall. Mature berries can also shrivel and fall if berry or bunch stems become infected.

## Where to monitor

Focus monitoring efforts on:

- Parts of the vineyard with a history of the disease which may already be harbouring oospores in infected vineyard floor materials
- Blocks where susceptible varieties are planted, eg. Sultana (Waltham Cross), Pinot Noir
- Parts of the vineyard structured or located so as to encourage humidity and leaf wetness for long periods, such as sheltered rows, within dense canopies, or sites where overhead irrigation sprinklers overlap
- Closed vine canopies which shelter the organism and reduce spray penetration
- Areas of the vineyard closest to sources of infection (eg unsprayed blocks, vines on pergolas).

After a primary infection event, concentrate on lower leaves of vines in areas where infection is likely. 'Oil spots' may be as infrequent as one per 50 m of vine row. If any are found (these sites should be marked with flagging tape) further monitoring should focus within about a 50 m radius of the tagged vines. After any application of chemicals for downy mildew, remember to also focus monitoring on areas of the vineyard downwind of potential sources of infection upwind (eg unsprayed blocks, ornamental grapevines such as those on pergolas).

## When to Monitor

Sampling in the vineyard should occur when weather reports or disease prediction models indicate potential for conditions which may result in a new generation of 'oil spots.'

- Vines with 'oil spots' should be tagged and these sites checked again after suitable warm, wet nights to see if the downy spore symptoms appear, or if the disease has been controlled by any post-infection fungicides applied
- Vineyards should be monitored every 1 to 2 weeks for downy mildew once favourable conditions occur.

## How to monitor vines

Inspect a sample of 50 vines, initially examining leaves and later bunches as well. Check outer leaves plus the inside of the canopy where less light penetrates

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Use a hand lens to check suspect patches on leaves for downy mildew growth (resting spores will not be visible)

- Orientate leaves at an angle to the sun to make downy mildew easier to identify on the surface of leaves
- Mark infection sites to allow later assessments of disease spread and the effectiveness of control treatments.

It is a good idea to train everyone working in the vineyard to recognise the symptoms of a range of pests and diseases, even if you have dedicated staff who are primarily responsible for monitoring. Remember to keep records of all monitoring results.

A simple 'desk-top' test for downy mildew can be conducted to verify monitoring results:

- Seal suspect leaves and bunches in a lightly moistened plastic bag (not wet, 3-5 drops of water per cm<sup>2</sup> of bag surface is enough)
- Incubate in the dark at temperatures higher than 13°C (20-25°C is best).

If infection is present, fresh white down will be obvious next morning. Note: Berries greater than 5 mm will not produce spores, but the downy spore structures will be visible on any infected bunch and berry stems.

## How to monitor weather conditions

Monitoring and processing of information related to weather conditions, such as 10:10:24, can be done in a number of ways:

- Using a rain gauge and maximum-minimum thermometer. These usually need to be reset each day and can only provide a guide to the suitability of conditions for disease development
- Automatically, using data collected by a computerised weather station (AWS) which monitors temperature, rainfall, leaf wetness and humidity (some automatic weather stations also have basic disease prediction capabilities)
- By inputting AWS data into disease modelling programs.

## Modelling disease development

Disease prediction models are designed to give vineyard managers and monitoring staff a tool with which they can indicate higher risk periods for disease development and spread, to allow more targeted management programs to be put in place in the vineyard.

### 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](http://www.winetitles.com.au)).
- See also the glove box edition of the above, Field Guide to Diseases and Pests.

*PAM AusVit*, which is a disease modelling program designed to assist in Australian vineyard management decision making through the recording, analysis and reporting of critical activities, events and conditions within the vineyard. The software assists growers and managers achieve their target levels of vineyard efficiency, yield and fruit quality, while reducing the risk of crop losses and minimising the use of chemicals. Details about PAM AusVit can be found at [www.crcv.com.au/products/pamausvit/](http://www.crcv.com.au/products/pamausvit/) or by phoning 1800 500 195

*IPM Viticulture: Research to Practice™* is a training program whose delivery can be fine-tuned to suit each region.

- Enquiries to Winetac on (08) 8373 7090 or visit [www.crcv.com.au/education/rtp](http://www.crcv.com.au/education/rtp) for more information.

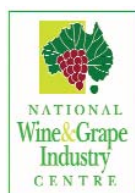
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