

DOWNY MILDEW

CASUAL ORGANISM

Plasmopara viticola

Downy mildew is fungal like disease that is specific to grapevines which requires particular weather conditions to establish and infect. It can attack all green tissue with functioning stomata, which include the underside of leaves, shoots and flowers. Downy mildew can be extremely devastating if infections are permitted to establish early especially before flowering.

SYMPTOMS

LEAVES

Symptoms on leaves first appear as slight yellow oilspots (Figure 1). They are often surrounded by a slightly darker ring at the edge that gives them their oily appearance. On older leaves oilspots can become restricted by the veinlets and spots become more irregular in shape. With severe infections on older leaves the infected leaf tissue can have a tapestry appearance (Figure 1.2).



Figure 1 Downy mildew oilspots on merlot

If secondary infection conditions have occurred the underside of the oilspots

will have a distinctive white down visible.

SHOOTS

Oily brown areas may develop on young shoots and tendrils. These infections can lead to death of the shoot tip beyond the infection site.

FRUIT

Young flowers and berries are particularly susceptible and can turn an oily brown upon infection. Under ideal conditions they may appear covered with white downy growth but will eventually brown and wither. Berries remain susceptible to infection up to about pea size after which they are generally considered resistant. Berries that have been previously infected may stop growing harden and turn purple. Occasionally they can be covered in white downy growth (Figure 2).



Figure 2 Sporulation on Niagara grapes

Mature berries are considered resistant but may be lost if infection occurs on the susceptible bunch stems

BAG TEST

Often spots are seen on leaves in the vineyard during the spring. Confusion often arises as to whether these spots are downy mildew or some other cause. A simple test used to determine whether downy mildew is the cause is to perform a bag test on the suspect tissue. The bag test creates conditions that resemble secondary infection

conditions and enables the mildew to sporulate.

To verify the existence of downy mildew place suspected tissue in a plastic bag with a few drops of water. Seal and place in a dark warm position (18°C min.) overnight and examine for white down on the underside of the tissue.

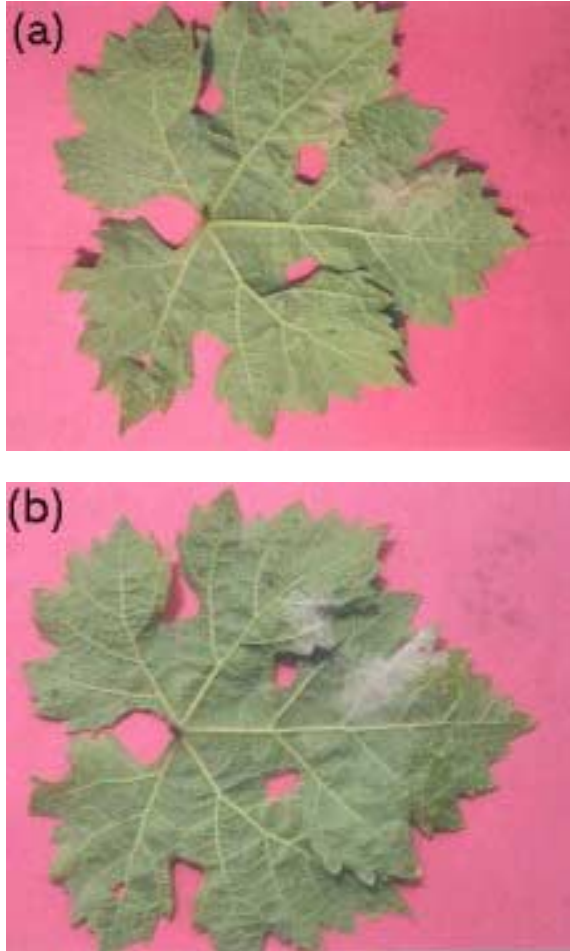


Figure 2 Downy mildew (a) before and (b) after a bag test

LIFECYCLE

OVERWINTERING

Downy mildew overwinters as small survival structures called oospores. These spores are formed in previous infection sites and can become trapped in the bark of crowns and cordons or in the soil as the leaf tissue breaks down. These spores are very resilient and are believed to last in excess of 5 years. Considerable wetting of these spores is required to permit their germination,

however only those in a mature state will germinate upon wetting.

PRIMARY INFECTION

The general rule of thumb for a primary infection is 10:10:24.

- Rainfall - 10 ml
- Temperature - 10°C min
- Over 24 hour period

The primary infection cycle is more accurately described in three phases.

1. Initial wetting up and germination of the oospore to form a sporangium. The sporangium then releases motile spores called zoospores. This phase is temperature dependent and can take in excess of 16 hours depending on minimum temperature.
2. Following release of the zoospores, a rain-splash event is required to carry the zoospores to the underside of the leaf or other susceptible green tissue.
3. Infection by the zoospore at the stomata only occurs if the leaves remain wet for a further 2–3 hours.

Under Australian conditions, primary infections typically result in 1–3 oilspots per 50m of vine row. As such, primary infections on their own, pose little threat to the crop. However, where primary infections have previously established, secondary infections can lead to significant loss of both crop and leaf area. This is particularly so when infections are allowed to build up prior to flowering.

SECONDARY INFECTION

Secondary infection conditions are quite different to primary infections and can occur outside the 10:10:24.

For a secondary infection to occur there must be existing oilspots in the vineyard or located nearby.

Secondary infections occur when existing oilspots sporulate to release

new spores in to the vineyard. Spores develop from existing oilspots after:

- 98% humidity
- more than 13°C
- 4 hours darkness
- leaves wet 2-3 hours pre dawn

Sporangia are produced through the stomata of infected tissue and are then wind dispersed to other tissue where they germinate in free water to release zoospores. Under optimum conditions the time from germination to infection can be as less than 90 minutes.

TREATMENTS

CULTURAL

Cultural controls methods that will reduce the incidence of downy mildew are those that will permit rapid drying of the canopy to reduce potential infection periods. Canopy management systems that permit good aeration will also allow good spray penetration and coverage.

BIOLOGICAL

There are no biological treatments for downy mildew registered for use in Australia.

CHEMICAL

Traditionally, downy mildew has been controlled using a combination of protectant fungicides and eradicant fungicides, which are applied after potential infection conditions.

Protectant fungicides include:

- Copper formulations
- Dithiocarbamate (Thiram, Ziram, Mancozeb)
- Quinone (Delan)
- Chlorophenyl (Bravo)
- Azoxystrobins (Amistar, Flint)

It is important that these fungicides are applied before infection conditions occur, as they need to be on the tissue

prior to the spores landing. These chemicals are not systemic and residues can be reduced by rainfall. They will not protect new growth after application. The azoxystrobins are partially systemic and are not subject to loss from rainfall. Ideally protectant fungicides should be applied as close to a predicted infection event as possible.

Eradicant fungicides include:

- Phosphonate (Agriphos, Foliar Fos, Phosacid etc.)
- Phenylamide (Ridimil Plus, Galben M)

These fungicides work best when applied immediately after an infection event and before appearance of oilspots. There have been reports of resistance to phenylamide overseas so these fungicides should not be used more than twice in any one season.

FURTHER READINGS

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