

CRC for Viticulture

Pesticide application fact sheet 1

Targeting sprays for vineyard pests and diseases

An important first step in achieving effective pest and disease control is correctly timing and targeting pesticide applications. Determining where and when a chemical should be applied requires an understanding of what the biological and application target is and how it influences the application process.

- ❑ The **biological target** refers to the pest that is to be controlled, for example botrytis, lightbrown apple moth or weeds.
- ❑ The **application target** is the place where the pesticide spray must be deposited in order to work on the biological target, for example, the flowers or bunches for botrytis control or the soil for pre-emergent herbicides.

Examples of changing application targets as the vine canopy develops through the season



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These targets will determine the timing of pesticide applications (to coincide with the most vulnerable or most destructive life cycle stages of the target pest), selection of the most appropriate chemical and, application method and sprayer adjustments required to achieve adequate coverage and dose. The following questions should be considered to correctly determine (or define) a spray target.

Has the pest or disease been correctly identified?

Accurately identifying the pest or disease causing vine damage or yield loss will enable the correct control strategy to be implemented, for example:

- ❑ Misdiagnosis of pest mites can lead to inappropriate chemical application and a reduction in predatory mite populations. Crinkled, distorted leaves resulting from early season rust mite damage may be mistakenly attributed to cold damage, phomopsis, bud mite, herbicides or 'restricted spring growth'.
- ❑ The decision to apply chemicals for phomopsis depends on whether Type 1 (Disporthe) or Type 2 is present in the vineyard. Chemical control is only required for Type 2 infections as no obvious link has been found between Disporthe infection and abnormal budburst or reduced grapevine productivity.

What are the biology, ecology and behaviour of the pest or disease?

Understanding the behaviour and distribution of pests as well as their relationship to the environment and other organisms in the vineyard is important. This knowledge will often identify stages in a pest or disease's life cycle when they are most susceptible to control measures. For example:

- ❑ Rust mites spend the winter under the bark of cordons and vine crowns, and to a much lesser extent under the outer scales of dormant buds. In spring rust mites migrate from winter shelters to swelling buds where they lay eggs. Sprays timed to coincide with the onset of spring migration are most effective in controlling this insect pest.
- ❑ Grape bunches are most susceptible to botrytis primary infection at flowering. Once botrytis infection has occurred the disease remains latent until berries start ripening. Latent infection can be reduced by correctly targeted protectant sprays up until post-flowering in combination with good cultural practices.

What are the grapevine characteristics that will affect this application?

There are many grapevine characteristics that affect pest and disease development and incidence, and the ability to target sprays to where the pest is located. For example:

- ❑ Dry bark of cordons, canes and spurs can be difficult to wet. A sufficient spray volume to thoroughly wet the bark is required for effective pesticide application.
- ❑ Rapid shoot development between budburst and flowering can result in new plant tissue not being protected even when using protectant fungicides. Accurate timing and targeting of sprays during this stage of the season is critical to ensure effective disease control.
- ❑ Leaf surfaces can have different characteristics depending on grape variety and leaf age. These can affect the way spray droplets are captured and spread. Leaves may be dusty, hairy, harden off as they age and will naturally repel water.
- ❑ Changes in bunch distribution, structure and size during development will impact on the spraying technique used. Spray penetration and retention in bunches after closure can be difficult due to waxy berry surfaces, tight bunches in some varieties and bunch position in dense canopies. Spraying to run-off using high spray volumes, or using adjuvants in lower spray volumes, and specifically targeting bunches, can improve pesticide deposits.

Improving access to the application target

Vine canopy application targets change rapidly through the growing season and are influenced by factors such as variety and canopy management system.

When canopies are dense outer leaf layers intercept much of the spray applied. Penetration is poor to the centre of the canopy often where fruit is located. Canopy microclimate can affect the incidence and severity of fungal disease such as powdery mildew, downy mildew and botrytis. Dense canopies that have high humidity, are shaded and in which foliage and bunches dry slowly can accelerate disease development.

Canopy management techniques to improve the exposure of the application target to the sprays being applied include:

- ❑ Regulating water and nutrient inputs. For example, practices such as regulated deficit irrigation (RDI) impose stress on the vines at strategic times in the season resulting in reduced vegetative growth and also, reduced grape size and consequently more open bunch configurations.
- ❑ Changing the trellising system or retraining vines. For example, using foliage wires to lift and hold shoots above and/or below the bunch zone. Reducing vigour by training shoots downwards is also possible using some systems.
- ❑ Using pruning methods to alter bunch configuration and distribution. For example, with minimal pruning, bunches are generally smaller and looser, enhancing penetration of sprays.
- ❑ Removing foliage from around the bunch zone by leaf plucking or blowing will be effective on some vines. Normally one or two leaves are removed per shoot 2-4 weeks before veraison so that approximately 60% of fruit is visible.

- ❑ Lateral shoot removal in the bunch zone can also reduce canopy density around the bunch zone in medium to high vigour vines.
- ❑ Summer pruning or trimming of shoots during the growing season can reduce problems associated with shoots falling back over the bunch zone in shoot positioned canopies.

With the move to less persistent and more selective pesticides greater attention is needed on defining the target and how the chemical is applied to ensure it reaches the pest.

Outcomes from recent research on rust mite control in Australia have clearly demonstrated that understanding the target behaviour and correct target definition can result in effective strategic spraying.

Case study - Targeting and timing rust mite sprays

Life cycle

- Mites over winter as adults underneath bark and outer bud scales
- Eggs are laid in spring
- Mites move onto shoots at budburst to feed
- Mites are most vulnerable at the onset of migration at woolly bud

Monitoring for migration

- Select areas of the vineyard where mites have been a problem in previous seasons
- Use double-sided sticky tape pre-budburst to detect rust mite movement
- Monitor where chemical controls are being applied to check the effectiveness of the treatment

Spray timing

- Sprays timed to the onset of migration when mites are exposed before they begin feeding and laying eggs
- Chardonnay spray window of a few days at woolly bud
- Cab Sav spray window from bud swell to woolly bud
- Sprays for other varieties aimed at woolly bud
- Temperature must reach at least 15°C for a few hours

Spray targeting

- Target bark of cordon and crown of vine
- Use high water volume for mature vines
- Use sulphur chemical label rate for rust mite

Sprayer setup

- Adjust sprayer to target cordon and wet bark
- Minimum air speed and volume required (no vine canopy at this stage of the season)
- Droplet size from nozzles not critical (cordon needs to be drenched)
- Increase water volumes when using low volume, air shear sprayers
- Use boom sprayer if available to target and drench cordon

Further information

- *Spray Application Viticulture: Research to Practice*[®] is a training package that can be fine-tuned to suit regional requirements and includes workshops, short courses and a comprehensive manual.
- *Australian and New Zealand Field Guide to Diseases, Pests and Disorders of Grapes*. P. Magarey et al. (2000). Winetitles, Adelaide.
- *Diseases and Pests*. P. Nicholas, P. Magarey & M. Wachtel (ed.) (1994). Grape Production Series - Number 1, Winetitles, Adelaide.