

# CRC for Viticulture

## Pesticide application fact sheet 5



### Equipment adjustment and evaluation to maximise spray coverage

Correctly setting up a sprayer and evaluating spray coverage are necessary procedures to ensure that enough chemical is delivered to the vine and target pest or disease. When spraying we are attempting to achieve even coverage throughout the vine canopy while minimising off-target impacts and excessive run-off.

Sprayer set up and evaluation should be carried out at least three or four times during the season for each trellising system. Sprayer adjustment will be necessary each time the vine canopy or target changes, for example, at budburst, 20 cm shoots, flowering, pre-bunch closure and veraison. Correctly targeting sprays is particularly important for late season grape bunch applications.

**Sprayer set up** is the process of matching the sprayer to the canopy, weather and target to maximise spray coverage and minimise chemical waste by adjusting and optimising:

- ❑ Tractor speed
- ❑ Air volume, velocity and direction
- ❑ Nozzle size, number and direction

**Calibration** refers to measurement of travel speed and volume output per minute from the sprayer from which is calculated the volume leaving the sprayer per 100 metres of vine row or per hectare. But this tells you nothing about what is required for:

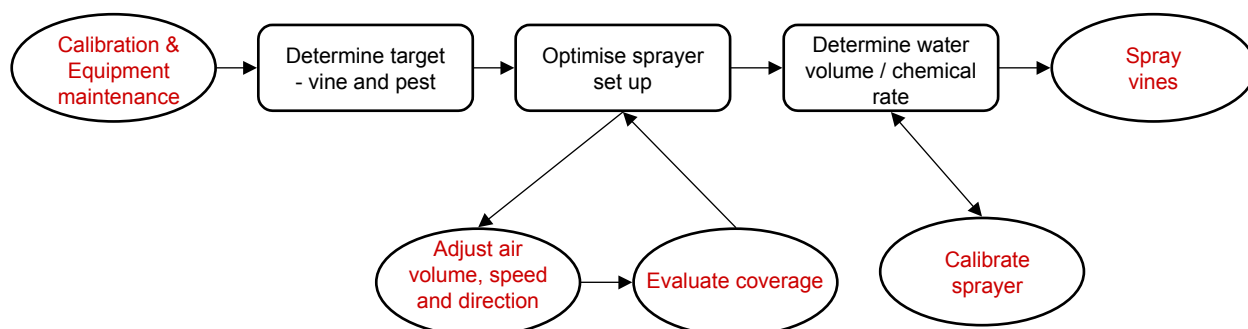
- ❑ A particular canopy
- ❑ A specific pest or disease
- ❑ The weather conditions on the day
- ❑ The application target ie. Where on the vine the spray needs to reach

The three factors to consider during sprayer set up are:

1. *Vine canopy* - Identifying the pest or disease and the appropriate pesticide for effective control. Also determining where the spray has to reach ie. What is the application target?
2. *Air quality* - The vine canopy and application target determines the air quality required from the sprayer
3. *Application volume* - The vine canopy, air quality and application target determine the volume of liquid and the amount of chemical needed.

**Prior to the first spray application each season**

**Before each spray application during the season**



### Adjusting air output

Air largely controls spray penetration into a canopy and evenness of chemical distribution across target surfaces. These two objectives can be achieved during sprayer set up by adjusting air quality ie. volume, speed and direction to suit the requirements of the vine canopy.

- ❑ Air set-up depends on the target, growth stage, canopy architecture
- ❑ Air quality is the right combination of air volume, direction and speed for a specific target
- ❑ Air volume, air speed, air convergence / mixing and air direction may be adjustable depending on the sprayer being used
- ❑ Air should be used to move droplets to the target - not through to the next row
- ❑ The spray plume should penetrate and settle out within a canopy so that an occasional puffing of droplet-laden air can be seen emerging from the other side of the vine
- ❑ If it is windy, the spray cloud should emerge from the upwind canopy, which may mean considerable movement beyond the downwind canopy

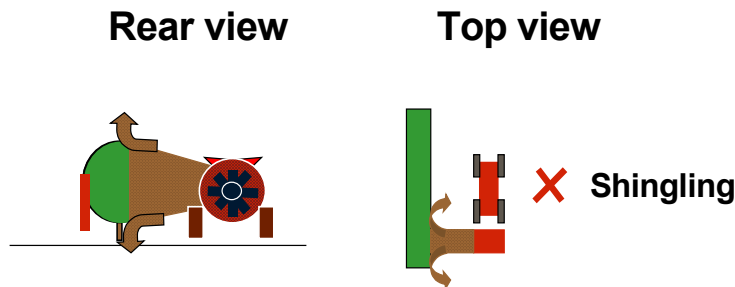
### Optimising air volume

Sprayers usually produce too much air for the vine canopy during most of the season. To reduce air volume (at the canopy):

- ❑ Speed up
- ❑ Reduce fan speed through the sprayer gearbox or tractor PTO
- ❑ Reduce blade pitch (axial fan) that will decrease air volume from the fan
- ❑ May be able to 'bleed' air from spray heads or outlets

### Optimising air speed

Air velocity produced by some sprayers can easily push the spray plume through and beyond the canopy. High velocity air can also cause 'shingling' where leaves overlap and 'wall off' the inner canopy.



To reduce air speed (at the canopy):

- ❑ Reduce fan speed through the sprayer gearbox or tractor PTO
- ❑ Increase distance of outlet from canopy by angling nozzles back or forwards (ducted and air shear sprayers)
- ❑ Enlarge the size of the air outlet (where adjustable use the largest opening or head possible to produce lower velocity, higher volume air)
- ❑ Low speed and high volume air delivery result in the best canopy penetration for axial fan sprayers only (Air shear machinery works in the opposite way)

### Optimising air direction

Accurate targeting of air from fans, nozzles, heads or ducts is required to achieve even coverage and minimise off-target impacts. Direct airflow to the target using:

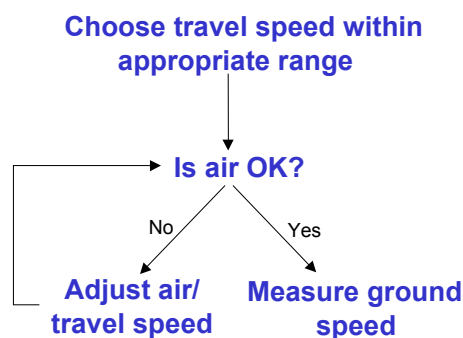
- ❑ Deflectors, towers or ducting enabling changes in head / nozzle angles and distance from the canopy
- ❑ Head placement usually 10 -15° back or forwards, and directly at canopy for multi-head fan sprayers - sequence of forwards, backwards, forwards etc. may be more effective when using multiple heads
- ❑ Canons with air shear equipment
- ❑ Angled air outlets or heads lengthen travel path of air and reduce potential for 'shingling' of the vine canopy

When directing air from a sprayer also make sure that the spray swath covers the entire canopy and remember that converging air may, or may not, improve the evenness of deposits.

#### *Travel speed*

Travel speed should, within realistic limits, be selected to enable good penetration and coverage of the vine canopy:

- ❑ Slower travel delivers more air and spray volume per metre of row
- ❑ Faster travel delivers less per metre of row therefore drive faster if air output from sprayer is too high for the vine canopy



#### **Evaluating spray coverage**

A number of techniques are available that can quickly identify problems with pesticide application without having to wait for crop damage to appear. Evaluation also has the potential to reduce chemical use and environmental contamination by identifying overdosing or where spray is missing the target. Water sensitive cards and fluorescent dyes can also be useful in evaluating the effectiveness of sprayer adjustments and operation, and to determine appropriate spray volumes.

#### *Fluorescent dyes*

Dyes provide a measure of spray coverage throughout the crop and are ideal in showing the capture of sprays inside the canopy. They require use of a good UV light at night (the darker the better) to show the dye, although a new, high output black light has recently become available, enabling deposits to be assessed during the day in the shade.

The dye or pigment particles do not necessarily behave in the same way as pesticides and dyes only be used as a guide as to where the spray liquid has deposited. A fluorescent dye assessment should be conducted at least once in the life of a sprayer. The major limitation to the use of fluorescent dye as a spray management tool is that in most cases it is too time-consuming to use for adjusting and optimising sprayer set up.

#### *Water Sensitive Cards (WSC)*

Water sensitive cards have a yellow surface that is stained blue when contacted by water droplets. The cards are placed at different locations in the canopy and after spraying they are collected and the coverage can be assessed from the staining pattern.

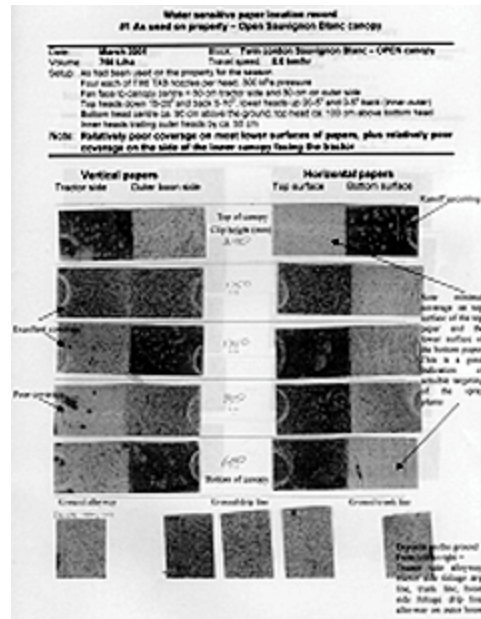
Larger droplets (>100 µm) can be clearly seen on water sensitive cards while smaller droplets (< 100 µm) are carried in the air currents above and around the very smooth surface of a card. As small droplets tend to avoid cards only compare equipment producing similar sized droplets. The results obtained for air shear applications should not be compared directly with pressure nozzle applications.

#### **WSC attached to spray poles**

The most effective way to use cards is to fix them onto poles placed within the canopy at set heights. This produces a repeatable, fixed position spray target. In this way any improvements made to coverage are due to sprayer adjustments and not to where the cards are positioned within a canopy.

Using this system various sprayer adjustments can be compared and improvements to spray coverage made. The spray pole should be placed in the centre of the most 'difficult to spray' canopy in the vineyard. During sprayer set up, equipment adjustments, climatic conditions and growth stage should be recorded. Cards showing spray deposits should also be kept as a permanent reference to assist with sprayer adjustments in the future. When using water sensitive cards the following considerations should be taken into account:

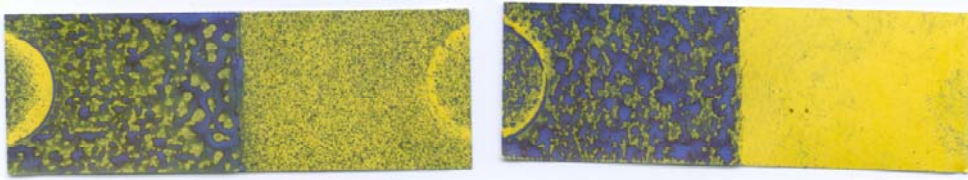
- ❑ Use WSC to even out coverage from outside to inside of canopy and from top to bottom of the canopy
- ❑ WSC give a true relative indication of droplet size from different nozzles
- ❑ Drops spread and appear twice as large as they actually are
- ❑ WSC under-estimate coverage of fine droplets of less than 100 µm
- ❑ WSC show a water stain and not the dose ie. how much chemical has landed



What to look for on water sensitive cards:

- ❑ Major gaps in spray coverage along and inside the vine canopy
- ❑ Completely yellow cards where spray has not penetrated
- ❑ Uneven coverage ie. some papers blue, others mostly yellow
- ❑ Run off (totally blue papers)
- ❑ Droplet size and distribution

It is almost always too time consuming and unnecessary during sprayer set up to count droplets and to determine the droplet distribution ie. number of droplets per square cm.



WSC deposits can be regarded as a worst case - they will be better on foliage.

**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.
- Kent J. & R. Early (2003). *Pesticide application in vineyards*. Charles Sturt University 2<sup>nd</sup> edition, 93pp.

**Disclaimer**

The advice provided in this publication is intended as a source of information only. CRCV and DPI Victoria do not necessarily endorse any company, product or brand mentioned.