

CRC for Viticulture

Pesticide application fact sheet 9



Determining dilute water volumes in viticulture

The water volume that produces coverage to the 'point of run off' where the vine canopy is thoroughly wet is termed the dilute volume. This spray volume is the key in determining the amount of chemical that should be applied to a vine canopy to deposit a lethal dose (See *Pesticide fact sheet 8*).

The dilute volume sets the amount of product that must be applied to a particular canopy **whether by dilute or concentrate spraying**.

Currently there are four options for estimating the dilute volume required for a particular vine canopy:

- ❑ Measure in-field dilute volumes by test spraying to run-off
- ❑ Estimates based on past experience or regional practices ie. What has worked before?
- ❑ Vine-Row-Volume methods such as Unit Canopy Row (UCR)
- ❑ AVCARE recommendations

Determining the point of run off for a vine canopy can be difficult and quite subjective. Any of these methods can be used to estimate the dilute volume although in-field measurement of will probably provide the most accurate result. Remember that if a sprayer has been optimised to achieve good coverage throughout a vine canopy then the estimated dilute volume need only be within 10% to 15% of the 'true' value to achieve effective application.

Measuring in-field dilute volumes

Test spraying to run-off

When spray equipment is available that can be used for dilute spraying (regardless of whether dilute or concentrate spraying is conducted) test spraying to run off is the most accurate method to determine the dilute water volume. For a particular vine canopy the sprayer is firstly set up to provide maximum spray coverage and this remains unchanged during dilute volume determination. Correctly setting up the sprayer will ensure that droplets cover all parts of the canopy as evenly as possible. If wetting agent will be used for spraying then it should be added to the water before test runs begin. During test spraying water volumes are increased or decreased until a point is reached where the spray liquid is considered to cover all parts of the canopy more or less to the point of run off (See *Pesticide fact sheet 8*). Observe the vine canopy immediately after test spraying both sides of the row at the best sprayer set up.

When using spray equipment designed to achieve coverage at low spray volumes such as air shear equipment difficulties arise in attempting to use the above method, as this type of sprayer cannot be adjusted easily to spray to run-off. On some relatively small vine canopies it may be possible to determine an approximate dilute volume using a concentrate sprayer as test water volumes used will be within the normal operating range of the equipment.

Using a knapsack sprayer

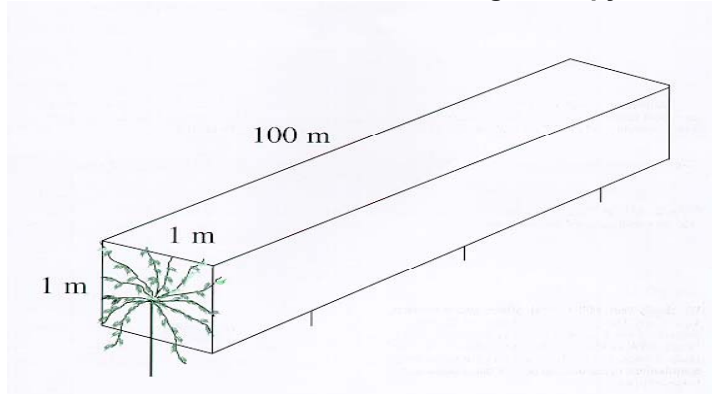
A knapsack sprayer can be used to spray a vine canopy to run off to estimate the dilute volume and early season it can be a relatively accurate method. Care should be taken though as this method can overestimate the dilute volume on larger canopies. Studies have shown that a high-pressure hand lance that is not introduced into the centre of the canopy appears to give results similar to those achieved using a sprayer. This method should be practiced before it is used to measure the dilute volume.

District knowledge or past experience may allow growers to estimate the dilute volume a particular canopy requires at a specific growth stage during the season. A neighbour with a similar trellising system who uses dilute spraying may be able to provide information on dilute volumes being used for similar canopies. If no information is available then a possibility is to continue using concentrate spray volumes and chemical rates that have provided consistent control in difficult canopies or varieties.

Unit Canopy Row calculations

Unit canopy row (UCR) is a method that enables chemical rate adjustments to be made for different canopies or growth stages in order to achieve consistent chemical doses during the season. It can be used to estimate the dilute water volume based on canopy size and is a relatively simple method using litres per 100 metre of row length rather than litres per hectare as the standard unit of measure for water volumes.

One UCR is defined as a 1 metre wide x 1 metre high canopy of 100 metre length



UCR is based on the assumption that 30 litres of spray mixture will thoroughly wet a vine canopy that is 1 metre high by 1 metre wide and 100 metres in length. This value can vary from 20 to 50 L/UCR depending on canopy type and density.

Dilute spray volume (L/100m) = 20 to 50 L/UCR x canopy height (m) x canopy width (m)

The UCR method can provide an initial estimate of the dilute spray volume but does not take into account the interaction between canopy type, density, weather and spray equipment. Sprayer set up and air output will also affect the spray volume retained by a vine canopy.

The Unit Canopy Row system is described in more detail and sample calculations provided in Furness & Magarey (1999).

AVCARE recommendations





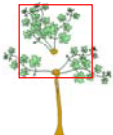
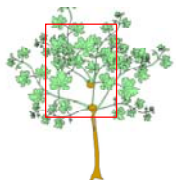
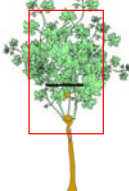
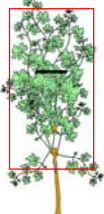
AVCARE recommendations may be useful to viticulturists with concentrate sprayers who do not spray to run off and so cannot determine dilute volumes directly or have little experience in estimating these volumes. A table of 'indicative dilute volumes' has been developed by AVCARE for sprawl and VSP canopy types based on vine dimensions. It shows a range of suggested dilute volumes for four canopy sizes and has been mainly developed for operators with air shear equipment who concentrate spray, but may also be used when dilute spraying.

When using the recommendations the following considerations should be taken into account:

- Volumes indicated are generally applicable
- If the spray volume applied is less than that indicated in the table for a particular canopy size then the application should be considered concentrate spraying
- Higher volumes in the ranges should be selected for those canopies at the upper end of each size category
- Within the ranges of volumes presented, a water volume towards the higher end should be selected when the canopy density increases
- A trial and error approach may be required to determine appropriate volumes for a particular canopy size
- When using the table to determine dilute volumes be aware of any label warnings that specify maximum concentration factors and do not exceed these
- Although volumes suggested for larger canopies are high compared to industry practice anecdotal evidence indicates that some growers have been using dilute volumes that are lower than required on larger canopies

Growers who are using lower dilute volumes than recommended in the table with consistent results should continue to do so but may consider using suggested volumes in a high-pressure season or when spraying to save a crop.

INDICATIVE WATER VOLUMES FOR DILUTE SPRAYING GRAPEVINES

SPRAWL CANOPY	Up to 0.5x0.5 m 	Up to 1x1 m 	Up to 1.5x1.5 m 	Up to 2x2m and above 	
	Indicative volume L/100 m	10 to 20	20 to 40	45 to 60	60 to 90
	Indicative volume L/ha (for 3 m row spacing *)	300 to 600	650 to 1,300	1,500 to 2,000	2,000 to 3,000
VSP CANOPY	Up to 0.5x0.5 m 	Up to 1x1 m 	"Wires up" stage, up to 1.5x0.5 m 	Up to 2x0.5 m 	
	Indicative volume L/100 m	10 to 20	20 to 40	30 to 45	45 to 75
	Indicative volume L/ha (for 3 m row spacing *)	300 to 600	650 to 1,300	1,000 to 1,500	1,500 to 2,500

Sample calculation – AVCARE recommendations

You have a 'sparse' and open VSP canopy 1.2 m high x 0.6 m wide at the 'wires-up' stage at a 2.5 m row spacing.

The indicative volumes table for a VSP canopy 1.5 m high x 0.5 m wide suggests using a dilute volume of between 30 and 55 L/100 m. Since the VSP being sprayed has slightly less canopy volume than in the recommendations and is relatively open a spray volume at the lower end of the range suggested is appropriate.

Furthermore based on previous experience with dilute spraying you know that consistent disease control has been achieved in the past using a chemical rate based on dilute volumes of between 24 and 30 L/100 m. In this example the indicative volumes table confirms that a dilute volume of between 25 and 35 L/100 m is appropriate for a sparse VSP canopy of this size and you select **27 L/100 m** as the dilute spray volume. This can be converted to L/ha if required:

$$\begin{aligned}
 \text{Dilute spray volume (L/ha)} &= \text{L/100 m} \times 10,000 \text{ sq. m/ha} \div \text{row spacing (m)} \div 100 \\
 &= 27 \times 10,000 \div 2.5 \div 100 \\
 &= 1080 \text{ L/ha (for a 2.5 m row spacing)}
 \end{aligned}$$

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.
- Furness G. & P. Magarey (1999). *Unit canopy row: a better way to calibrate your sprayer for fruit trees and grapevines*. PIRSA / SARDI, FS12-98.
- *AVCARE - National Association for Crop Production and Animal Health web site*
www.avcare.org.au