



Determining chemical rates for dilute and concentrate spraying

Viti-note Summary

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Other topics in this Viti-Notes series include:

- Targeting sprays for vineyard pests and diseases
- Maintaining product performance in spray mixes
- Selecting and using spray adjuvants
- Understanding chemical 'modes of action'
- Managing chemical resistance in the vineyard
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- A single rate per hectare – why it shouldn't be used
- *Determining chemical rates for dilute and concentrate spraying*
- Determining dilute water volumes for spraying
- Calculating chemical rates for vines

Chemical label directions provide a 'rate per 100 litres'. The water volume needed to spray a vine canopy to the 'point of runoff' is the dilute volume and is required to calculate how much chemical to use. Setting the amount of product that must be applied to a particular canopy whether by dilute or concentrate spraying.

Definitions

- Dilute spraying (high volume): This is when the vine is sprayed to the point of runoff ('thoroughly wet'), using the dilute chemical rate of grams or mL/100L from the label.
- Concentrate spraying (low volume): This is when the vine is sprayed with a water volume that is less than that required for dilute spraying while applying the same amount of chemical (per hectare) that would have been applied if dilute spraying.
- Dilute label rate: The product concentration given on the label for dilute spraying - expressed as grams or millilitres per 100 litres of spray (A lethal dose is applied if the dilute label rate is used in a volume that thoroughly wets the vine canopy).
- Application rate: The amount sprayed out per hectare or per 100 metres of vine. This is not the amount of chemical deposited on the vine. Application rate = label rate X water volume e.g. 200g/100L x 1000L/ha = 2kg/ha.
- Coverage: Percentage (%) of target surface covered by deposits.
- Dilute water volume: Volume of water required to 'thoroughly wet' a particular vine canopy (also referred to as 'high volume spraying').

- Dose: Amount of chemical deposited on a target surface such as a leaf or berry measured in $\mu\text{g}/\text{cm}^2$. Note: This is not the amount of chemical sprayed out per hectare.
- Lethal dose: Amount of chemical required to kill a pest or disease organism, or render it harmless, depending on the chemicals' mode of action.
- Point of runoff: Situation where most of the vine canopy is covered in spray droplets so that some join together and begin to run over a leaf or berry – in dense, late-season canopies it generally occurs on outer leaves well before inner leaves are wet. Sometimes also described as 'thoroughly wet'.

Effective product application - coverage and dose

Effective pest and disease control requires adequate coverage and dose. The critical steps in achieving correct spray coverage and dose are:

- Identifying the spray target (both biological and application target);
- Adjusting the sprayer setup to match air output to the canopy being sprayed;
- Selecting the appropriate spray water volume;
- Determining the dilute water volume for the canopy being sprayed;
- Calculating the chemical rates required based on the dilute volume.

Sprayer set up and spray volume adjustment for achieving coverage and dose

Correct timing and targeting of applications is critical to achieve effective control. The first step is identifying the pest or disease and understanding its biology, ecology and behaviour. From this information the application target (or where the spray has to be placed to kill the pest or disease) is determined, a chemical with the appropriate characteristics can be selected and an application technique can be adjusted to suit the target.

Sprayer adjustment and evaluation is carried out to maximise coverage throughout the canopy being sprayed. This involves determining the best spray quality (droplet size) and air quality (air volume, speed and direction) for the particular spray target. At the same time spray water volumes are adjusted to ensure good coverage to the point of runoff.

What is the 'point of runoff'?

The term 'the point of runoff' or 'thoroughly wet' is usually defined as the point at which spray starts to run off the surface of a leaf or bunch but this point can be difficult to identify. Further complications arise because not all parts of the canopy being sprayed will have the same coverage at any one time. In most cases, outer leaves closest to the sprayer nozzles will capture more droplets than leaves in the centre of the vine. Setting up the sprayer to even out the coverage throughout the canopy is therefore important.

When droplets on foliage or bunches begin to join together with some pooling of solution at the edges, the 'point of runoff' has been reached. It is important that the sprayer has been set up to ensure even coverage of inner foliage and bunches, not only outside leaves.

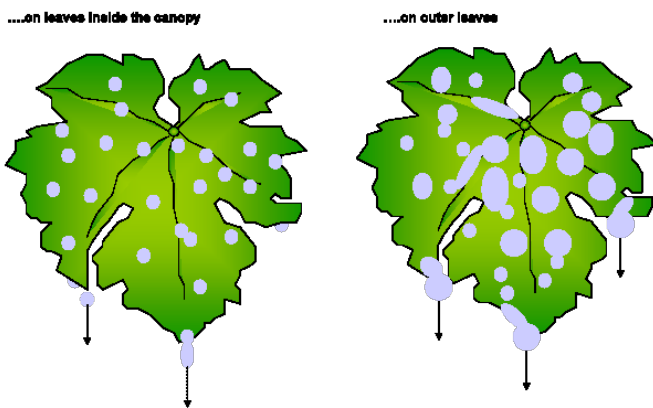


Figure 1. Comparison of levels of coverage and wetness on leaves sprayed to the point of runoff.

In estimating the 'point of runoff' and level of wetness in a vine canopy, the following factors should be considered:

- The 'point of runoff' should be estimated based on the evenness of canopy wetness;
- Leaves near the sprayer will usually show signs of runoff before the inner parts of the vine canopy;
- Aim to adequately cover the inner canopy before runoff begins on the outer canopy by correctly adjusting spray equipment;
- Runoff has not been reached if the inner canopy is mostly dry even if spray solution is dripping from outer leaves;
- Droplet sizes used for spraying will have an influence on estimating the 'point of runoff'. It is more difficult to thoroughly wet a vine canopy using fine droplets;
- When targeting bunches, the 'point of runoff' should be based on the level of wetness and coverage on berries;
- The use of water sensitive paper may help in estimating when the 'point of runoff' has been reached.

Dilute spraying

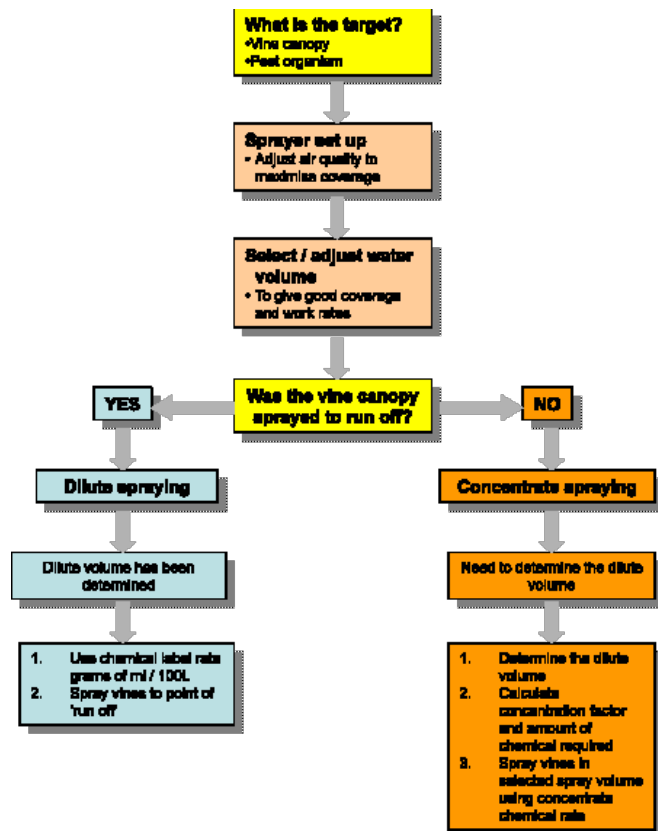


Figure 2. Determining requirement for dilute or concentrate spraying.

When dilute spraying, the chemical rate (ml or grams per 100L) taken from the label is mixed in the spray tank and the foliage is sprayed to the 'point of runoff'. Spraying to this point will optimise the amount of product applied, avoid wastage and reduce possible unwanted contamination of the environment.

When dilute spraying, higher total water volumes are used during the season in comparison to concentrate spraying and a wider range of droplet sizes is produced by spray equipment. Spray volumes are also increased through the season to closely match vine canopy growth.

Concentrate spraying

Concentrate spraying is a relatively recent development. It refers to the application of a pest or disease control product in a water volume that is less than the volume required for dilute spraying to the 'point of runoff'. The important thing to remember is that the same amount of chemical (per hectare) is sprayed that would have been applied if dilute spraying had been used. For this to be achieved, the concentration of product in the spray mixture increases proportionally as the volume of water is decreased.

Sprayers used for concentrate spraying generate spray clouds of fine droplets with a relatively narrow size spectrum. With a more effective conversion of spray mixture to useful droplets (by reducing the proportions of large and very fine droplets) the volume of spray mixture needed to achieve coverage of plant surfaces is reduced.

Spray volumes used for concentrate spraying are determined to ensure good coverage. Volumes are increased through the season as the canopy grows to ensure coverage is maintained as foliage area increases. Sprayer set up (air volume, speed and direction) and appropriate droplet sizes to ensure sufficient coverage at low water volumes are the key components to effective concentrate spraying.

Dilute and concentrate sprays can be applied by most spray equipment used in viticulture, although the highest water volumes produced by air shear sprayers are unlikely to be sufficient for late season dilute spraying.

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Further information

Innovator network factsheets

Spray application by Alison MacGregor

http://www.gwrdc.com.au/webdata/resources/files/GWR_070_Spray_Application_Fact_Sheet_FINAL_WEB.pdf

Training

For regional specific training in pest and disease control, the AWRI is running Research to Practice: Integrated Pest Management for changing viticultural environments.

Contact

Marcel Essling: rtp@awri.com.au for more information.

Agrochemical information

Agrochemicals registered for use in Australian Viticulture - updated annually.

Visit www.awri.com.au for the latest version.

Useful references

Nicholas, P., Magarey, P.A. and Wachtel, M. (Eds.) 1994 Diseases and pests, Grape Production Series 1, Hyde Park Press, Adelaide (a glove box edition of this book is also available).

For images of grapevine symptoms visit www.winetitles.com/diagnosis/index.asp.

Product or service information is provided to inform the viticulture sector about available resources and should not be interpreted as an endorsement.



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