

# CRC for Viticulture

## Pesticide application fact sheet 3

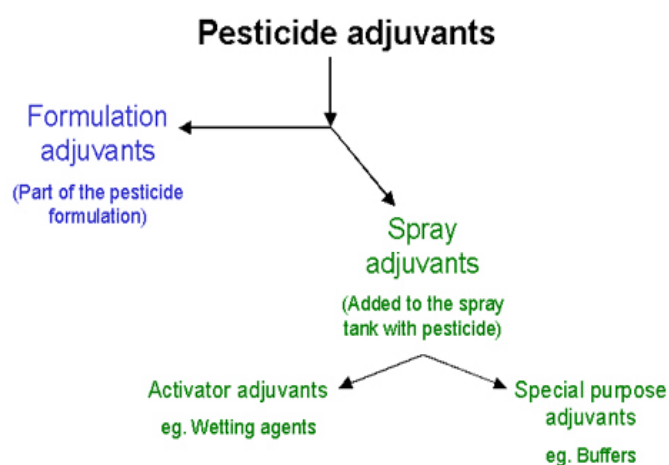
### Selecting and using spray adjuvants

An adjuvant is any ingredient that modifies or enhances the performance of the active ingredient in a pesticide. The two categories of adjuvant are:

- ❑ **Formulation adjuvants** are added to the active ingredient during manufacture of the pesticide. These are used to improve mixing and handling, increase safety and effectiveness of the pesticide and improve distribution over the target.
- ❑ **Spray adjuvants** are added to the tank with pesticides to improve the performance of the active ingredients. There are many additives available for application of fungicides, insecticides and herbicides. These can be grouped into two broad classes - activator and special purpose adjuvants.

*Activator adjuvants* can include surfactants, wetters, oils, stickers and penetrants. They are commonly used to increase droplet spread, improve pesticide rain fastness and increase pesticide uptake by plants. They enhance pesticide performance by modifying the physical and chemical characteristics of the spray solution including density, surface tension and solubility.

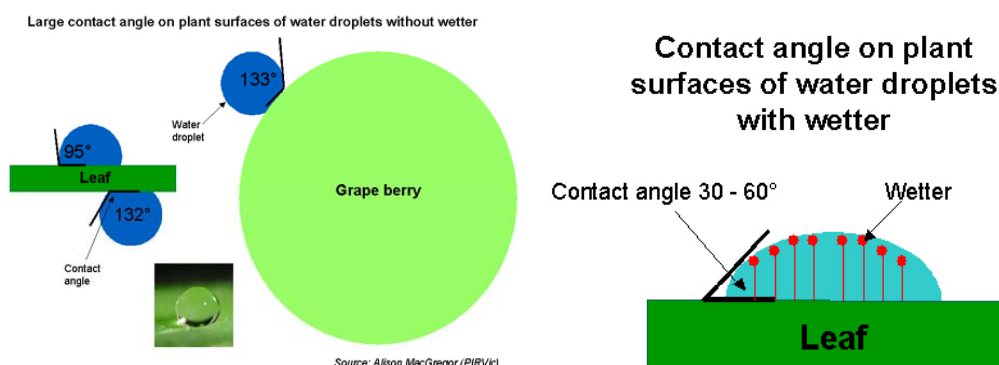
*Special purpose adjuvants* can include buffering agents, acidifiers, drift control agents and feeding attractants. They are commonly used to modify the spray solution or application conditions so that a pesticide formulation can function effectively. Sometimes they may also alter the physical characteristics of the spray solution.



#### Surfactants

A broad category of surface-acting adjuvants that improve the absorbing, emulsifying, dispersing, spreading, sticking, wetting or penetrating properties of pesticides. Water-repellent wax (cuticle) on a plant surface is the major barrier to the spreading, retention and penetration of pesticides. Surfactants are mostly used to overcome this barrier by, for example, forming bridges between water and wax on a leaf surface, or altering the permeability of the leaf cuticle.

*Wetting agents* and spreaders improve the wetting and coverage of foliage and grape bunches by reducing the surface tension between spray droplets and plant surfaces. They can be non-ionic, cationic or anionic. A non-ionic wetter has no charge when dispersed in water. A cationic wetter is positively charged while an anionic wetter has a negative charge on the surface-active portion. Phenol-based non-ionic wetters are most commonly used in viticulture and are generally compatible with most pesticides.



Examples of commercially available non-ionic wetters include BS1000®, Chemwet® 1000, Shirwet® 1000, Agral®, Viti-Wet®, Wetter® 600 LF, Wetter® 1000 LF and Spraymate™ Activator. There are many other surfactant products specifically designed to increase penetration and uptake of herbicides such as Kwickin® and Wetter TX®.

Care should always be taken when using a new surfactant and expert advice obtained before application as the interaction between a surfactant, pesticide and plant surface can be quite complex and difficult to predict.

*Stickers* enhance the retention of a pesticide by increasing the adhesion of solid particles on target surfaces. They are designed to reduce the amount of pesticide washed off during rain or irrigation and help prevent pesticide loss from wind or leaf abrasion. Stickers can also reduce pesticide evaporation and some slow ultraviolet (UV) degradation of the active ingredient. Spreader-stickers contain a wetter as well as a latex or other adhesive sticker. They are often used as a general-purpose adjuvant for fungicide and insecticide applications. Commercially available stickers include latex-based products such as Bond® and Nufilm®.

*Penetrants* and *Super spreaders* enhance the spreading and penetration of certain pesticides into plants and are designed for use with systemic and translaminar herbicides. They are also known as organosilicone super spreaders. Commercially available organosilicone penetrants for use with herbicides include Penetra®, Brushwet® and Pulse®.

Recent research in Australia and New Zealand has resulted in the development of “modified organosilicones” suitable for use in horticulture and viticulture. These have a lower phytotoxicity potential than traditional organosilicones and are designed for use with non-systemic pesticides. Modified organosilicones have the potential to reduce spray volumes used in viticulture, increase coverage and pesticide efficacy, reduce spray drift and improve spray penetration into grape bunches.

Research is continuing to develop useful prescriptions for viticulturists by determining water volumes and super spreader rates required for different pesticide tank mixes. Commercially available “modified” organosilicone super spreaders include Du-Wett® and Bond® Xtra.

#### **Special purpose adjuvants used in viticulture**

*Buffers* and *acidifiers* are adjuvants that usually contain phosphate salts used to adjust the pH (acidity or alkalinity) of a spray solution. In general pesticides are more stable in solutions that are slightly acidic to neutral, between pH 5 and pH 7. Buffers stabilise pH and tend to maintain this level even if conditions such as water alkalinity change. Acidifiers neutralise alkaline solutions and lower pH but do not have a buffering action. Commercially available buffers and acidifiers include Companion®, LI-700® and AP 700®. Primabuff® is a multi-purpose adjuvant that includes a buffering agent. Some pesticides susceptible to alkaline hydrolysis may have a buffer already incorporated into their formulations.

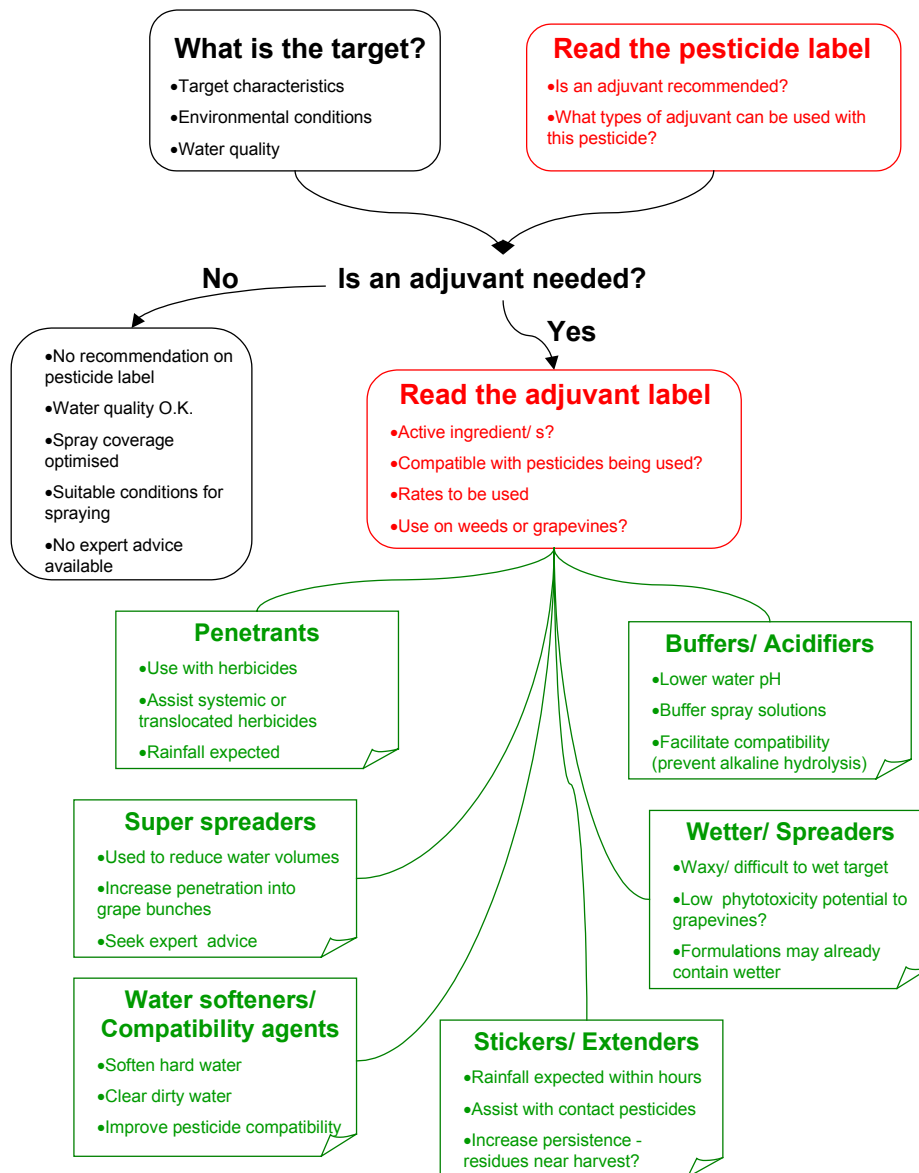
*Water conditioners* have the ability to bind calcium and magnesium ions in hard water. Excess amounts of these ions can react with susceptible pesticides in the spray solution resulting in precipitation, and affecting wetting and dispersion on plant surfaces. Pesticide grade ammonium sulphate (AMS) is commonly used to soften hard water. It is particularly useful in increasing the efficacy of weak-acid herbicides such as glyphosate. Commercially available products to address hard water issues include Liquid Boost® and Liase®. This type of adjuvant may be recommended for specific chemicals such as glyphosate herbicides.

#### **Using adjuvants for spraying vines**

Fungicide and insecticide formulations usually contain adjuvants to maximise active ingredient performance. Due to the wide range of possible spray targets and conditions under which these pesticides are likely to be applied other adjuvants may be required under certain situations.

Spray adjuvants can enhance pesticide performance and reduce off target impacts if used correctly and under the right conditions. There are many adjuvants available, each formulated to solve specific application problems. Although a particular product may perform more than one function, no single product can solve every application problem.

## Decision tree for selecting adjuvants



When considering the use of adjuvants the following guidelines should be kept in mind:

- ❑ Many pesticide formulations already contain the necessary adjuvants for effective performance. This may be the case if the pesticide label does not mention use of an adjuvant.
- ❑ Many adjuvants will have effects other than those for which the product is marketed. For example, a wetter may also increase penetration of a chemical through the cuticle and reduce the droplet size produced by a nozzle at a given pressure.
- ❑ Don't use adjuvants that enhance penetration through the cuticle of plants with protectants and contact pesticides designed to work on plant surfaces.
- ❑ Only use adjuvants developed for agricultural and viticultural uses. Avoid using detergents as wetting agents as they are ionic and likely to cause phytotoxicity in grapevines. Non-ionic adjuvants are also less likely to combine with salts in hard water.
- ❑ Adjuvant costs vary widely depending on the type and concentration of active ingredient in the product. In general non-ionic surfactants and crop oil concentrates are the least expensive followed by esterified seed oils and organosilicones.

- ❑ If two products have similar active ingredients but at different concentrations the cost of each on an active ingredient basis should be calculated to determine which should be purchased. Isopropyl alcohol or water are not active ingredients.
- ❑ The performance of spray adjuvants added to the tank mix may be affected by adjuvants in pesticide formulations. These effects are difficult to predict and new tank mixes should be tested on a limited area before full-scale use. A tank dip test can also be used to test if there is excessive wetting agent in the spray solution.
- ❑ Be aware that a wetter may be suitable for one pesticide in the tank mix but not others. Always check the chemical label for each pesticide in a spray solution.
- ❑ Always keep records of safe, compatible and effective tank mixes including pesticide formulations and adjuvants used and chemical rates added to the spray solution.

Always check the chemical label to ensure that adjuvants used are compatible with the pesticides and formulations being applied. Incorrect or excessive use of adjuvants may reduce pesticide effectiveness or cause phytotoxicity (plant damage).

#### Further information

- *Spray Application Viticulture: Research to Practice*<sup>®</sup> is a training package that can be fine-tuned to suit regional requirements and includes workshops, short courses and a comprehensive manual.
- *Adjuvant product guides*. Detailed information on specific adjuvants and their uses available from manufacturers or resellers.
- *Novel organosilicone adjuvants reduce agrochemical spray volumes on row crops*. R. Gaskin *et al.* (2000). *New Zealand Plant Protection* 53: 350 - 354.  
[http://www.hortnet.co.nz/publications/nzpps/proceedings/00/00\\_350.pdf](http://www.hortnet.co.nz/publications/nzpps/proceedings/00/00_350.pdf)
- *Spray adjuvants: powerful tools to help protect grapes from pests and diseases*. R. Gaskin & D. Manktelow (2002). *Australian & New Zealand Grapegrower & Winemaker*. September, pp 78 - 80.

#### Disclaimer

The advice provided in this publication is intended as a source of information only. Always read the chemical label before using any of the products mentioned. CRCV and DPI Victoria do not necessarily endorse any company or brand mentioned.