



**Centre for Land and Water**



# Winter Lectures 2010

Six informative lunchtime lectures in the  
Green Shed: Fridays at 12 noon

## Lecture 6

**Adjuvants: Taking the Mystery out of  
Wetters**

**Gordon Harris • David Manktelow**



# Winter Lectures 2010

---

## REGISTRATIONS REQUIRED

Phone: 06 650-4532 or Email [greenshed@claw.net.nz](mailto:greenshed@claw.net.nz)

Small charge to cover expenses: \$25 inc GST per lecture  
(\$100 inc GST for a Series Registration\*)

You will receive a light lunch (if you register on time), a lecture and an invitation to stay and discuss the topic in more depth should you wish.

## ACKNOWLEDGEMENTS:

The Centre for Land and Water thanks the Winter Lecturers who have generously given their time:



PAGEBLOOMER



## NOTES:

- \* We may cancel or vary presentations if speakers become unavailable or if registrations fail to meet minimum numbers.
- \* If a speaker becomes unavailable, we may arrange a suitable replacement to cover the same or a similar topic.
- \* Holders of a Series registration will be refunded for any cancelled lectures at \$20 inc GST per cancellation, up to \$100 inc GST total.

# CRC for Viticulture

## Pesticide application fact sheet 3

Pesticide application fact sheet 3 (Ver.1, June 2004) - John Lopresti (ed.)



### 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.

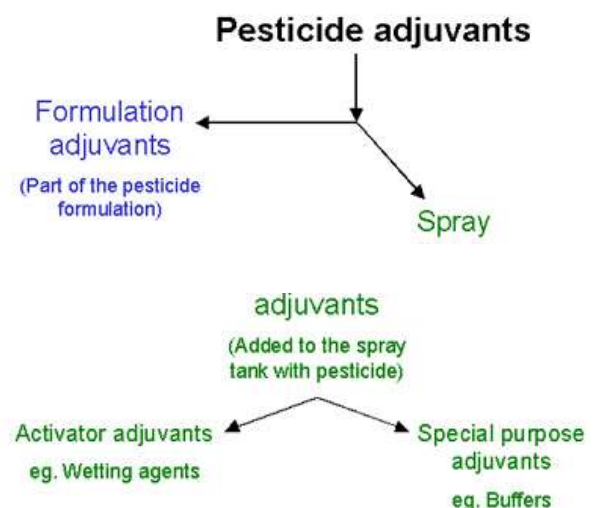
*Activator adjuvants* can include surfactants, wetters, oils, stickers and penetrants. They are commonly used to increase droplet spread, improve pesticide rain fastness and increase pesticide uptake by plants. They enhance pesticide performance by modifying the physical and chemical characteristics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

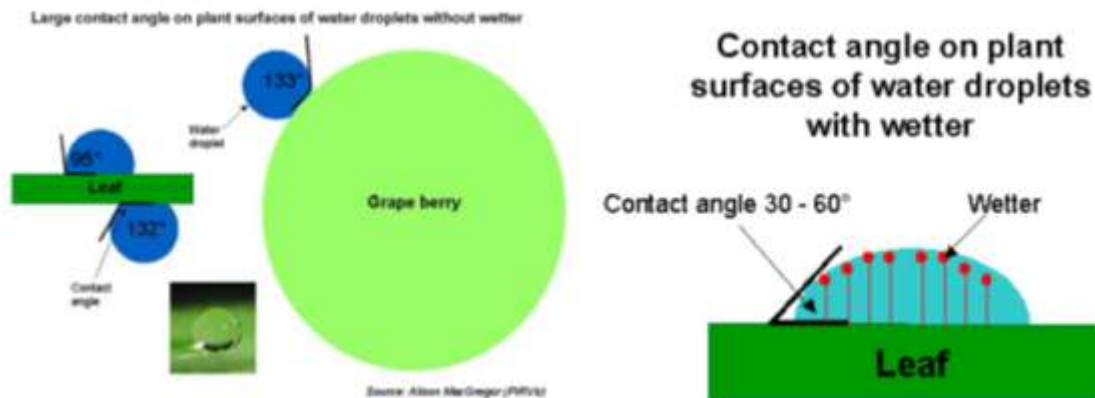
### Surfactants

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.

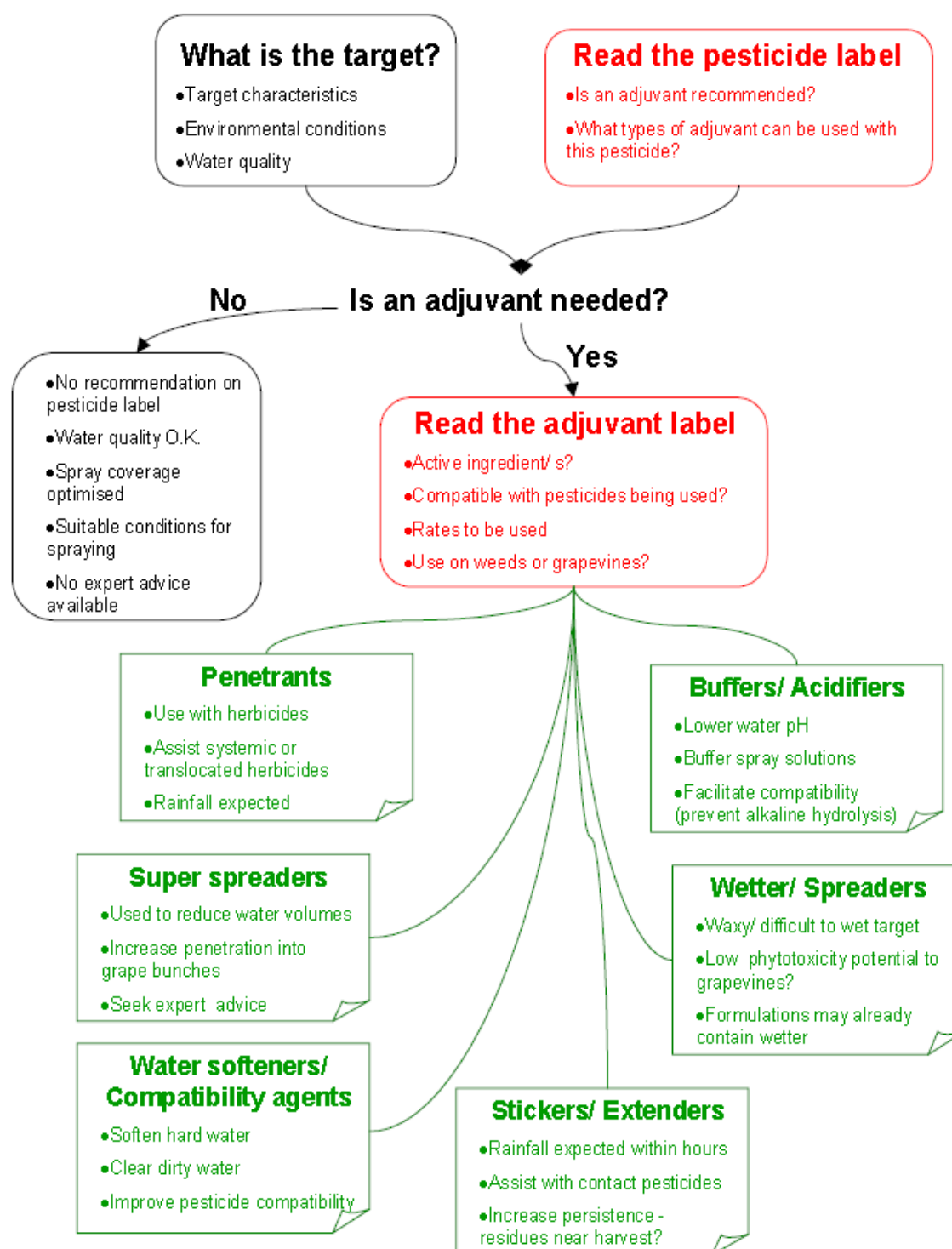
*Water conditioners* have the ability to bind calcium and magnesium ions in hard water. Excess amounts of these ions can react with susceptible pesticides in the spray solution resulting in precipitation, and affecting wetting and dispersion on plant surfaces. Pesticide grade ammonium sulphate (AMS) 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 affects 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®* 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.



## Taking the Mystery out of Wetters

Gordon Harris  
Technical Services and Development Manager  
Zelam Ltd  
027 2800974

In today's cropping industry there are so many options when it comes to choosing products to protect against disease, weeds, and insects that it can become confusing. Add the list of spray additives and wetting agents and it becomes even worse.

Spray additives have been developed by a host of companies to change the physical characteristics of the final spray mixture we put into our tank. They are meant to compliment the pesticide and give it a better chance of working to its potential. When the wrong choice is made, the reverse can be the result, where the pesticide effect is reduced.

We have to decide at the outset what we are trying to do in the field with our tank of spray material. It is a matter of thinking about the state of the crop, the target weed or pest and the weather conditions. Though some factors are more important than others we have to consider what is likely to happen on the crop leaf surface. It is here that the spray additives have the greatest effect.

The broad family of spray additives or adjuvants include wetters, spreaders, stickers, penetrants, and plenty of other terms. What they all have in common is a varying ability to reduce the surface tension of water and make a surface easier to wet.

When we use a sprayer to wet some foliage we want the chemical to make as close a contact with the surface as possible without having it all run off so that enough is retained. It's no good if we get excellent contact with the plant but there is not enough left behind to do the job for long enough. This can happen because when we reduce surface tension we also make the layer of spray deposit thinner. Therefore we have to choose our additive wisely and consider the correct water rate for the particular application being undertaken.

Most chemical products contain other ingredients with some wetting ability but they cannot cover all bases. For example glyphosate (Roundup) works

fine on its own to kill soft weeds growing actively but requires an additive when certain weeds are targeted. There is no one recommendation that fits all situations. In general most spray mixes are improved in some way by the addition of a wetting agent but they are not always required. Product labels contain information about additives and if they are required for the product to work properly.

It all comes down to the degree to which we want to reduce the surface tension of the spray mix. How much wetting and how much run-off do we want. It starts with general purpose wetting agents like the non ionic surfactants such as Multi-film Extra. They are called non ionic because they have no electrical charge and do not interact with the active ingredients in the spray. Non ionic surfactants have a moderate wetting ability and are considered general purpose wetting agents. Use rate remains constant with ground rig equipment and is based on a water ratio not an area basis. They simply make it easier for the spray mix to contact the plant surface without causing too much runoff. Use these when that is all that is required. Still check that the water rate is correct for the target.

The other extreme is where the maximum amount of wetting is required. Where the surface tension needs to be very low. The organo silicones like DewDrop cause water droplets disintegrate on contact and run into every tiny crack and crevice and even into stomatal openings. The waxy leaf surface is temporarily disrupted and maximum contact is achieved. They are usually used with systemic herbicides such as glyphosate. We don't want a layer of chemical staying on the leaf surface but we want as much as possible to enter the plant in a short space of time. This has the added advantage of reducing the time the weeds need to stay dry before rainfall washes the spray off. These super wetters are also useful when we want to run the spray mix further into a crop canopy or down into folds and under leaves. For example when applying contact insecticides. They also reduce droplet size and spray pressures should be monitored and possibly lowered. There is also a real possibility for excess run-off and water volumes need to be adjusted for the specific task in hand.

We have examined why we should put additives into our spray tank and how to decide just how far to go when providing extra wetting of foliage. It boils down to a choice between no additive, general wetting, and super wetting. Each has its place and each one needs to be considered carefully.



## Centre for Land and Water

### **WELCOME**

Welcome to the Centre for Land and Water, a venue supporting sustainable agriculture through training, research and consultancy.

The Centre provides professional offices, meeting and seminar facilities and land for research and training.

We currently have rental offices available. Terms by agreement - phone, fax, copy and print facilities available on-site.

The Green Shed seminar venue is available for training, meetings or for general event hire. Contact us: Phone: 06 650-4532 or Email [greenshed@claw.net.nz](mailto:greenshed@claw.net.nz)

The Centre is located on a 4 ha site with easy access and plentiful parking. Entry is from Ruahapia Road, accessed from Karamu Road (SH2) at Waipatu or Pakowhai Road at Chesterhope. It is 4 km (8 minutes) from the Hastings CBD, 17 km (20 minutes) from Napier CBD and 18 km (20 minutes) from Hawke's Bay Airport.

### **COMING SOON**

#### **CLAW Short Seminars:**

Communications: Media Training – 9 – 12noon 31 August 2010

Communications: Writing popular articles 9 – 12noon 21 September 2010

Communications: Writing technical reports 9 – 12noon 12 October 2010

Communications: Preparing and delivering public presentations

Irrigation: System calibration theory and practice

Irrigation: How much water do I really need?

#### **CLAW Short Courses**

NZQA Certified Irrigation Evaluator

#### **The Micro Cropping Farm for Research and Technology Transfer**

Contact us to become involved in this exciting new initiative



Centre for Land and Water

## WINTER LECTURES 2010

### **1. NIWA Virtual Climate Station Network: Friday 16 July**

Speaker: Andrew Tait, NIWA

The Virtual Climate Station Network provides daily climate estimates at 5km intervals across N.Z. Andrew will explain how the data is estimated, and how the network can be accessed.

### **2. Nitrogen Testing and Sample Preservation: Friday 23 July**

Speaker: Peter Lorentz, Analytical Research Laboratories

Peter will explain the different soil nitrogen tests, outline correct soil nitrogen sampling methods, and describe the steps needed to make sure the samples you take in the field get to the lab in good condition for analysis.

### **3. Soil pH - Crop Response & Soil Mapping Options: Friday 30 July**

Speaker: Stephen Trolove, Plant and Food Research

Stephen will discuss crop responses to pH, including critical pH ranges for key Hawke's Bay crops, and will describe a process for farmers to determine whether the expense of a detailed soil pH survey may be warranted.

### **4. Vehicle Tracking and Fleet Management: Friday 6 August**

Speaker: John Brew, Astrata

Astrata designs systems combining GPS, wireless communications and GIS to monitor machinery or other assets. John will talk about applications for agriculture, asset management, fleet & personnel tracking and health & safety.

### **5. Fuel Use Mapping and Bio-Fuel update: Friday 13 August**

Speakers: Dan Bloomer, LandWISE and Tomo Reed, EECA

Dan will explain how to capture engine data and create maps of fuel consumption by tractors and present 'proof of concept' results from fuel mapping. Tomo will up-date us on bio-fuels and how to make bio-fuel available in Hawke's Bay.

### **6. Surfactants; types, actions and combinations: Friday 20 August**

Speakers: Gordon Harris, Zelan, and David Manktelow, AR&T

Gordon and David will outline the types of surfactants available, how they work, and will give guidance for growers contemplating multiple product mixes as part of their spray programme.