TECH NOTE SERIES

SACOA Summer Spraying Technical Update

PLANTOCROP

 Match the correct adjuvant to the herbicide mode of action, weed spectrum and environmental conditions to maximise herbicide efficacy and reduce the risk of off-target damage.

ACOA

ENHANCE

- Leaf surface coverage and droplet survival are key determinants of herbicide efficacy.
- Adjuvants vary in their base ingredient types and level of emulsification, resulting in differences in spreading and penetrating properties.

For a number of years SACOA have conducted research into the role of oils and adjuvants in improving droplet survival and final herbicide efficacy under summer spraying conditions. Most recently this work has focused on three key areas;

- 1. Influence of adjuvants on droplet survival-USDA 2014
- 2. The role of adjuvants in summer grass weed control - NNSW and SEQLD 2014
- 3. The role of adjuvants in controlling melons and fleabane - WA 2012 and 2014

ENHANCE[®], PLANTOCROP[®] and XSEED[®]

SACOA's range of ENHANCE® (paraffinic oil based), PLANTOCROP® (methylated seed oil based), and XSEED® (canola oil based) are all excellent at improving the efficacy of most summer fallow herbicides such as Group A's, triclopyr and/or glyphosate, but have different characteristics suiting various situations.

ENHANCE[®], PLANTOCROP[®] and XSEED[®] improve herbicide efficacy by reducing evaporation and drift, increasing droplet survival on leaf surfaces and increasing penetration of herbicide active ingredients into the plant. Which of these is best suited to your needs depends on the active ingredient being used,



WATER 7.5% Coverage, 19% Predicted VMD 150um, Spray Quality (Fine)



PLANTOCROP 18.4% Coverage, 23.0% Predicted VMD 400um, Spray Quality (Coarse)

the weed spectrum and stage, nozzles used, water volume, desired spray quality and environmental conditions at the time of spraying.

An acidifying surfactant such as the soyal phospholipid COHORT® or LI700® may be of use as a buffering agent if water quality is poor but otherwise provides little benefit in improving droplet survival and penetration.

Other than variations in base oil or ingredient type, adjuvants will also vary in their degree of emulsification. This is important for determining their functionality as penetrants or spreaders. Coupled with the correct nozzle type, adjuvants can also play an important role in minimising off-target damage.



ENHANCE 26.8% Coverage, 28.6% Predicted VMD 350um, Spray Quality (Coarse)



WETTA 1000 28.1% Coverage, 23.01% Predicted VMD 200um, Spray Quality (Medium)

Figure 1: Spray coverage of various adjuvant types in a typical summer herbicide mixture with Al110015 nozzles @3Bar and 100L/Ha water. Temp: 30.4°C, RH 32%, Wind speed 11.0km/Hr, Delta T 11.5

Coverage analysis conducted using Snapcard® water sensitive paper analysis app. Source: SACOA internal trial December 2014.

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Differences between adjuvant types

Adjuvants have an important role in improving herbicide efficacy by

- Protecting the active • ingredient from drift and evaporative losses.
- Improving the coverage on the target surface and facilitating uptake through the leaf surface.

Oils and adjuvants can be split into two broad types penetrants and spreaders.

Penetrants

Penetrants have properties which break down waxy leaf surfaces allowing the active ingredient to enter the plant faster. They are generally plant or mineral oil--based and due to their higher viscosity, they have the ability to increase droplet size or Volume Median Diameter (VMD).

Many grass selective herbicides such as the Group A's are very poor on their own at entering leaf surfaces, particularly if they are waxy or hairy, but are translocated once inside the plant.

Hence most are labelled to be used in conjunction with an oil based penetrant adjuvant, such as PLANTOCROP® where leaf surface coverage is not as critical as penetration.

Spreaders

Most spreading type adjuvants are surfactant--based, which work by reducing the surface

tension of liquids and thereby improve coverage on the leaf surface. Improved coverage is important for non--translocated herbicides such as paraguat which work on contact and don't need to enter through the leaf surface.

As a result of reduced surface tension, non--ionic surfactants such as WETTA1000[®] can decrease droplet size and increase drift. This may result in increased runoff of the active ingredient from the leaf surface, particularly fine leaf grasses, which may result in reduced efficacy.

Paraffinic oil emulsion products like ENHANCE® have a relatively high concentration of emulsifier in their formulation and hence provide a balance between penetrative and spreading properties.

Spray coverage and droplet survival

The final efficacy of a herbicide results from the active ingredient getting from the nozzle into the plant for translocated herbicides or onto the leaf surface for contact herbicides. In most cases herbicides are sprayed out using water as a carrier and an adjuvant to improve this process.

Droplet survival on the leaf surface is an important indicator of herbicide efficacy, and is influenced by three key factors;

- Environmental loss
- Evaporation and run--off loss
- Rate of adsorption through the leaf surface



Coarse (above) and fine sprays --Uni of Queensland CPAS (Source: SACOA)

Environmental loss

Environmental loss through drift and evaporation is influenced by temperature and humidity, travel and wind speed, droplet size and viscosity of spraying liquid. It is generally measured using Delta T, volume median diameter of droplets (VMD) and coverage. As a general rule, high emulsifier loaded adjuvants or non--ionic surfactant--based wetters, such as WETTA 1000[®], reduce surface tension and droplet size and can result in increased drift. Methylated seed oils such as PLANTOCROP® and mineral oils such as ENHANCE® increase droplet size and leaf penetration.

Figure 1 (previous page) indicates how different types of adjuvant affect droplet size and coverage, whilst Chart 1 (next page) from a separate study indicates the increase in droplet size as a result of mixing higher viscosity oils with water and active ingredients.

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Chart 1: Oil based adjuvants such as ENHANCE® and PLANTOCROP® have a positive effect on increasing droplet size versus non--ionic surfactants. Source: USDA Droplet Survival study SACOA May 2014

Evaporation and run off loss

Evaporation and run off loss occurs once droplets have landed on the leaf surface. Assuming there is limited shattering or run off, larger sized droplets will remain on leaf surfaces longer, reducing evaporation of the active ingredient and improving uptake of herbicide into the plant (see Chart 2).





Chart 2 - Adjuvants such as ENHANCE® and PLANTOCROP® increase the droplet survival time on leaf surfaces, enabling time for the active ingredient to enter. Source: USDA Droplet Survival study SACOA May 2014

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Rate of adsorption

Rate of adsorption through the leaf surface as a result of penetration, is critical for slowly translocated active ingredients to work. Chart 3 indicates how adjuvants with superior penetrant type properties such as PLANTOCROP® and ENHANCE® significantly improve the efficacy of Group A grass selective mixtures, compared to mixing with a non--ionic surfactant or with no adjuvant.



Chart 3 Barnyard grass control - NNSW 2014 Source: KALYX trial KA13--828 - Narrabri March 2014 Note: Means followed by the same letter are not significantly different.

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References

GRDC -- Summer Fallow Spraying http://tinyurl.com/l5a2hy2

GRDC -- Summer Fallow Weed Management Reference Manual http://tinyurl.com/paf7j86

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