



Photo: Graham Betts

## KEY POINTS

- Review withholding periods and other label restrictions before application. Always use label rates
- Ensure thorough decontamination, particularly if the last spray was a herbicide
- Ensure correct identification of the pest or disease. Know how the selected products work and appropriate timing of sprays
- Carefully consider application volume, spray quality and nozzle type to best suit the target, crop size and product mode of action
- Utilise automatic rate controller functions where available
- Monitor conditions carefully before, during and after spraying

## Know how the products work

Many fungicides are considered 'protectant' and are used as preventive sprays. These products should be applied prior to an infection becoming established.

Other fungicides may have the ability to control some recently established infections; these are sometimes described as 'curative'. Some of these products may refer to a 'kick-back' period, which indicates how soon an application must be made after an infection occurs to provide adequate control.

While many fungicides and insecticides are described as systemic, most have limited or no downward translocation (movement in the plant). When a product has limited translocation, or it mostly translocates upwards and outwards, the placement of the spray on the crop canopy may become more important.

For products with limited or no translocation, the spray droplets need to be deposited onto all parts of the plant where control or protection is needed.

For products with mostly upward and

outward translocation, the spray must be deposited onto and/or below the areas of the plant where control or protection is required.

If a product has 'curative' properties, often the best result will be achieved by ensuring sprays not only reach the plant parts requiring protection (such as new growth), but also the source of the infection (which may be on lower parts of the plant).

Timing will be critical to obtain the maximum benefit of the 'kick-back' from these products.

Always discuss how the product works with your adviser, and check the product label and manufacturer's technical notes for further information.

## Pre-spray checks

Ensure the sprayer and the mixing equipment has been thoroughly decontaminated, particularly if the last application was a herbicide.

Check withholding periods and mixing requirements on the label before using any product, particularly if it is later in the season. Also check for other label restrictions and restraints such as no-spray zones when the wind is towards sensitive areas such as other crops, aquatic areas and pastures.

Make sure the machine is ready to go, which means it has been calibrated to provide even flow rates and correct spray patterns from all nozzles.

Ensure flow meters have been checked and are working correctly, and controller settings match the nozzles chosen (particularly the minimum hold/lower limit function).

## Water volume and spray quality

Like all applications, water volume (total litres per hectare, L/ha) is critical to ensure sufficient coverage.

Larger or denser crop canopies tend to require higher water rates. Pulse crops will often require even higher water rates than most cereals due to the plant architecture and many layers of foliage that can 'filter out' droplets before they reach the lower parts of the canopy.

Typically, cereal crops will require between 70L/ha and 100L/ha. Higher rates are usually required when more coverage is needed in the lower parts of the canopy. Pulses often require



Photo: Bill Gordon



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Bill Gordon checking nozzle outputs at an application and drift management workshop in central Queensland.

application volumes of 100L/ha or more, particularly when deposition is required in the lower parts of dense canopies.

A medium spray quality is usually preferred when using a nozzle that produces solid droplets (no-air) in order to obtain a balance between penetration and retention.

Fine spray qualities do not penetrate dense canopies very well and can often reduce deposition in the lower parts of the plant (unless an air-assisted sprayer is used).

An air-induced coarse spray quality can produce similar deposition to a solid medium, provided it is operated at sufficient pressure, the water volume is at the higher end of recommendations and the adjuvants used do not collapse the air within the droplet.

Oil-based adjuvants may reduce

the amount of air inclusion in droplets produced by air-induced nozzles, which can result in reduced droplet retention, particularly in situations where the droplet size approaches the larger end of the coarse spectrum or the nozzle is operated at too low a pressure. This often occurs when the machine slows down at the ends of runs or over contours and the automatic rate controller reduces the pressure.

Many insecticides and fungicides require the application to be made by nozzles producing a medium to coarse spray quality. Some labels further specify not to use nozzles that produce a spray quality other than medium (that is, not coarser or finer).

Always check the label requirements and the manufacturer's recommendations for application volumes, spray quality and suitable adjuvants.

Photos: Bill Gordon



Having a selection of nozzle types available makes it simpler to choose the best one for each situation.

## Sprayer set-up and operating parameters

Typically, the more even the spray deposit is on the canopy, the better the result.

### Evenness of spray deposit can be improved by:

- ensuring the nozzle height above the target is maintained to achieve double overlap at the top of the canopy, or at the top of the stubble where the canopy is shorter than the stubble. Nozzles operated closer than double overlap can reduce efficacy and promote 'striping', whereas heights above that required for double overlap increase drift potential and may reduce deposition;
- using a narrower nozzle spacing, such as 25cm with nozzles producing a standard fan pattern, or by using twin-style nozzles on a wider spacing (50cm);

- increasing the water rate or total application volume (L/ha) and limiting the maximum travel speed when spraying to about 20 kilometres per hour, especially when using twin-style nozzles; and
- spraying during suitable meteorological conditions (wind speed and direction, temperature and relative humidity) and maintaining the spray quality from the nozzle throughout the speed range.

Maintaining the spray quality is important to ensure droplet numbers and retention on the target are consistent throughout the spray job.

### Ways of maintaining spray quality include:

- using nozzles that produce the same spray quality throughout their pressure range;
- using systems that maintain droplet

size, such as pulse width modulation (for example, the aim command® system); and

- using controller functions such as the minimum hold or lower limit to prevent excessive pressure drops when reducing speed while ensuring overdosing is minimised.

### Other important factors include:

- monitoring and recording meteorological parameters before and during applications;
- DO NOT spray during hazardous surface temperature inversion conditions; and
- maintaining adequate spray records to meet legal requirements and to use as a management tool to monitor product performance during and across seasons.

## FREQUENTLY ASKED QUESTIONS

### Why do I need high water rates with my ground-rig to apply fungicides when I usually get good results from a plane at much lower volumes?

Often, if the product is designed to just protect the new growth, such as the flag leaf on a cereal, then an even application of a translaminar or a mostly xylem-transported product to the upper parts of the canopy will be sufficient. Aerial applications are very efficient at providing coverage in the upper parts of the canopy provided the conditions for spraying are suitable.

However, in situations where the product has 'curative' properties and the source of an infection is lower in the canopy, a ground application at higher water rates is more likely to provide the deposition required than

most aircraft (unless they use higher than normal water rates and larger droplets than usually used for fungicide applications in winter).

### Often I want to apply a herbicide at the same time as a fungicide or insecticide. Can this affect my efficacy?

Some products are able to be mixed, which means that they are physically compatible, but this does not guarantee that the products are biologically compatible. In some situations one product may affect the efficacy of another in the tank mix. It is always advisable to check the label and the manufacturer's technical information to ensure that the products can be safely used in the one tank mix. If in doubt, it is often best to consider split applications to ensure products perform as intended.

### Can I mix foliar fertilisers with my fungicides and insecticides?

Some foliar fertilisers can change the pH of the tank mix, typically lowering it, which may affect the stability of some formulations or the effectiveness of some adjuvants. They may also contain elements and compounds that can interact with some active ingredients.

Checking the label and manufacturer's technical information is an important first step before attempting to mix the products or make the application. Where information about compatibility is not available, usually physical compatibility of the tank mix will be the primary concern. A jar test before mixing into the tank is good practice. If the products are physically compatible and you are still concerned, consider split applications.

## GRDC PUBLICATIONS

**Weather essentials for pesticide application**  
[grdc.com.au/GRDC-Booklet-WeatherEssentials](http://grdc.com.au/GRDC-Booklet-WeatherEssentials)

**Adjuvants: Oils, surfactants and other additives for farm chemicals**  
[grdc.com.au/adjuvants-booklet](http://grdc.com.au/adjuvants-booklet)

**GrowNotes™ – Spray application manual for grain growers**  
[grdc.com.au/spray-application-manual](http://grdc.com.au/spray-application-manual)

### FACT SHEETS

**Hazardous inversions**  
[grdc.com.au/hazardous-inversion](http://grdc.com.au/hazardous-inversion)

**Spray mixing requirements**  
[grdc.com.au/mixing-requirements-for-spraying-operations](http://grdc.com.au/mixing-requirements-for-spraying-operations)

**Spray water quality**  
[grdc.com.au/GRDC-FS-SprayWaterQuality](http://grdc.com.au/GRDC-FS-SprayWaterQuality)

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## MORE INFORMATION

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