LEADA

Stubble Guidelines

Managing Pre-emergent Herbicides in Stubble Retained Systems on Lower Eyre Peninsula

Local Management Guideline for the GRDC Stubble Initiative Project (LEA0002)

High rates of stubble retention have the potential to reduce herbicide efficacy through intercepting the herbicide on its pathway to its target at the soil surface.

Across the region there are many combinations of seeder types, harvest patterns and stubble treatments, all of which will need specific consideration to maximise herbicide efficacy. This guideline provides a range of techniques to improve pre-emergent herbicide efficacy.

Stubble management

All pre-emergent herbicides require contact with the soil to be effectively taken up by weed roots and shoots. Whilst some herbicides will wash in from stubble, less soluble herbicides require direct soil contact. At harvest, it is important to manage stubble to ensure soil contact is achievable. Trash needs to be spread evenly across the entire harvester width, paying attention to the effectiveness of the straw spreader. Weed seedbank reduction practices that reduce stubble load, such as windrow burning and chaff dumping, will also improve the following season's pre-emergent herbicide efficacy.

Retaining tall stubble standing and inter-row sowing may allow herbicides to be applied more directly to the less-covered soil between rows. However tall standing stubble can accumulate quickly over successive seasons, particularly where rainfall and warm temperatures do not align, reducing stubble breakdown. Similar results can occur where summer weeds are not controlled or managed late.

Spray techniques to aid herbicides reaching the soil surface

The negative effects of the herbicide being caught within the stubble canopy are twofold:

- Some products require incorporation or direct soil contact to activate and protect them from volatilisation.
- Uneven coverage of the soil surface.

Many small adjustments to the sprayer setup can improve soil contact and minimise losses.

The heavier the stubble load, the greater the need for larger spay droplets which require higher application volumes (more than 80 L/ha) to ensure uniformity of the deposit, particularly for pre-emergent herbicides with a low solubility in the soil.

Keep your water rates high

The trade off with increasing droplet size is a large reduction in droplet numbers. Increasing water rates from 50 L/ha to 100 L/ha will significantly improve Ryegrass control.

Table 1. Ryegrass density across all herbicides/all stubble types for the three application volumes, with average control given as a percentage reduction from control, LEADA herbicide efficacy trial 2015.

Water Rate (L)	Ryegrass (plants/m^2)	Reduction from control (%)
50	21[a]	52
100	12[b]	73
150	11[b]	75

Trifluralin and Sakura® herbicides have different solubility and absorption properties. In a trial conducted at Ungarra, both trifluralin and Sakura® performed equally well when using high water rates and a very course droplet size in a moderate stubble load.

Use rear facing nozzles where the angle can offset the travel speed.

The aim is to have the droplets moving predominately downwards through the stubble or travel at slower speeds.

To cover large areas in a timely manner many boom sprays in the region operate at speeds of 16 km/h or higher. At these speeds spray droplets carry the momentum of the sprayer and do not travel straight down towards the soil surface. This increases the chances of the droplet not reaching its target destination.

Select a nozzle that produces larger droplets and ideally air inducted with narrow fan angles

Larger (Coarse to Extremely Coarse) droplets are essential for pre-emergent herbicides. Medium sized droplets are more likely to be retained on stubble and not reach the soil surface, as the smaller droplet has less velocity to penetrate the stubble.

Air induction nozzles will increase droplet size at lower water rates, and reduce spray drift. However, the trade-off is that these spray droplets are more likely to shatter and be retained on stubble, where a conventional (solid) droplet may bounce off stubble onto the ground.

When using air induction nozzles in heavy stubbles, consider using larger extremely coarse spray quality to maximize penetration and minimize retention of the product on the stubble.

Minimise the boom height but ensure at least a double overlap

Spray release height above the target affects overlap, deposition and loss to the atmosphere. As droplets fall, larger droplets tend to accelerate, while small droplets rapidly slow down – both will affect deposition.

Increasing the release height will reduce penetration into stubble with smaller droplets, and may increase large droplet shatter and bounce which is not useful when tank mixing with a knock down, if you need deposition on emerged weeds. It may also allow for greater drift and volatilisation of fine droplets.

Taller standing stubble usually requires a higher release height to ensure uniformity (double overlap), and will tend to intercept more of your droplets before they reach the ground. However, standing stubble is often easier to manage and penetrate than fallen stubble or thick chaff that is thatched on the ground. These situations require higher application volumes, over 100 L/ha.

When the Delta T exceeds 10 it is time to stop spraying.

High Delta T values greatly increase the risk of chemical not reaching its target destination.

The only situation where it may be reasonable to continue would be when using a spray quality that is larger than coarse (very coarse or extremely coarse), and there is adequate soil moisture and ground cover, such that the Delta T value at the target (soil level) is below 8.

Never spray when the wind speed is less than 3 km/h and avoid spraying when wind speeds exceed an average of 15 km/h.

Spraying in windy conditions reduces herbicide efficacy, especially when spraying into stubbles. It also increases the risk of off target damage.

Acknowledgements:

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Further Reading

https://grdc.com.au/Resources/Publications/2015/08/Soil-Behaviour-of-Pre-Emergent-Herbicides

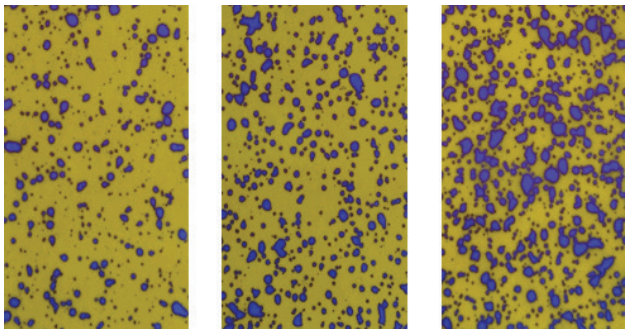
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/431247/Using-pre-emergent-herbicides-in-conservation-farming-systems.pdf

http://www.weedsmart.org.au/wp-content/uploads/2016/01/Disc-Seeders-and-PreEms-Factsheet-2015.pdf

http://www.weedsmart.org.au/ask-an-expert/high-water-rates-for-pre-emergent-herbicide-improve-ryegrass-control/

https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2011/02/Achieving-good-preemergent-spray-results

https://grdc.com.au/Media-Centre/Ground-Cover/GC110/Water-solubility-key-to-effective-pre-emergents



The effect of increasing water rate to increase spray coverage can be seen using water sensitive spray cards. Left card is 60 L/ha (11% coverage), middle card is 100 L/ha (16.5% coverage) and right card is 140 L/ha (26.5% coverage).

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