

Application timing, spray quality & water rates impact to control weeds using glyphosate in stubble.

Grain Orana Alliance

| | |
|----------------------------------|-------------------------|
| Trial code: | GAWE06522-3 |
| Season/year: | Summer 2022 |
| Location: | Spicers Run, Wellington |
| Trial partners: | Joe and Sam Mason |
| Trial establishment date: | |

Keywords

GAWE065, annual ryegrass, sow thistle, glyphosate, summer fallow, stubble management

Take home messages

Background

During recent Grain Orana Alliance (GOA) research into controlling glyphosate resistant weeds, populations with 'assumed' resistance were controlled with label herbicide rates. In some of these trials, resistance was assumed due to a 'spray failure'. This led to the need to better understand the reasons behind 'spray failures'.

Contributing factors to weed control failure include:

- inappropriate water rates (too high or too low)
- poor water quality
- incorrect droplet size for the target weed (weeds too small or large a target)
- poor spray timing
- antagonism with other herbicides
- poor weather conditions.

This is not to suggest that herbicide resistance is not real or not the sole reason for failure in some circumstances.

Grain Orana Alliance, with support of the Grains Research and Development Corporation (GRDC), has undertaken several trials to understand how these factors influence spray efficacy in the Central West of NSW.

Aims

Determine the effects of application timing, water rate or spray quality/droplet spectrum on the control of fallow weeds using glyphosate as the sole herbicide for the control of numerous weed species.

Methodology

| Trial design | |
|---------------------|---------------------------|
| Type | Small plot (~12m x 2.5 m) |
| Design | Randomized complete block |
| Replications | 4 |
| Analysis | ASREML |
| Confidence interval | 95% |

Treatments

All treatments received 285 ml AI/ha glyphosate (as Roundup Ultramax®).

Plots were sprayed using a ute mounted boom with 4 by 2.5 m sections where nozzles could be rotated to change spray quality. On each section, different nozzles were used to apply 3 differing spray qualities and an untreated control plot ([Table 1](#)).

Application timing and water rate were applied as split plot (or main plot) treatments. All spray qualities were applied at the subplot level in the same pass using the same pressure, ground speed, and environmental conditions.

Two water rates were applied by varying the ground speed. Nozzle size and operating pressures remained constant and rainwater was used:

- low = 50 L/ha (~16 km/hr)
- high = 100 L/ha (~8 km/hr).

Two application timings were used:

- early: targeting smaller weeds earlier in the application window (1/12/2023)
- delayed: targeting larger target weeds in the applications window (9/12/2023, 8 days after the early application).

Spray water quality and nozzles used are listed in [Table 1](#).

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Table 1 Nozzles used and spray quality/droplet size

| Nozzle | Spray quality |
|-------------|-----------------------|
| AIXR | Medium (M) |
| Hardi InJet | Very coarse (VC) |
| TTi | Extremely coarse (XC) |

Results

Main weeds present at the time of the first application were sow thistle and cathead, and they ranged in size from 2-8 leaf.

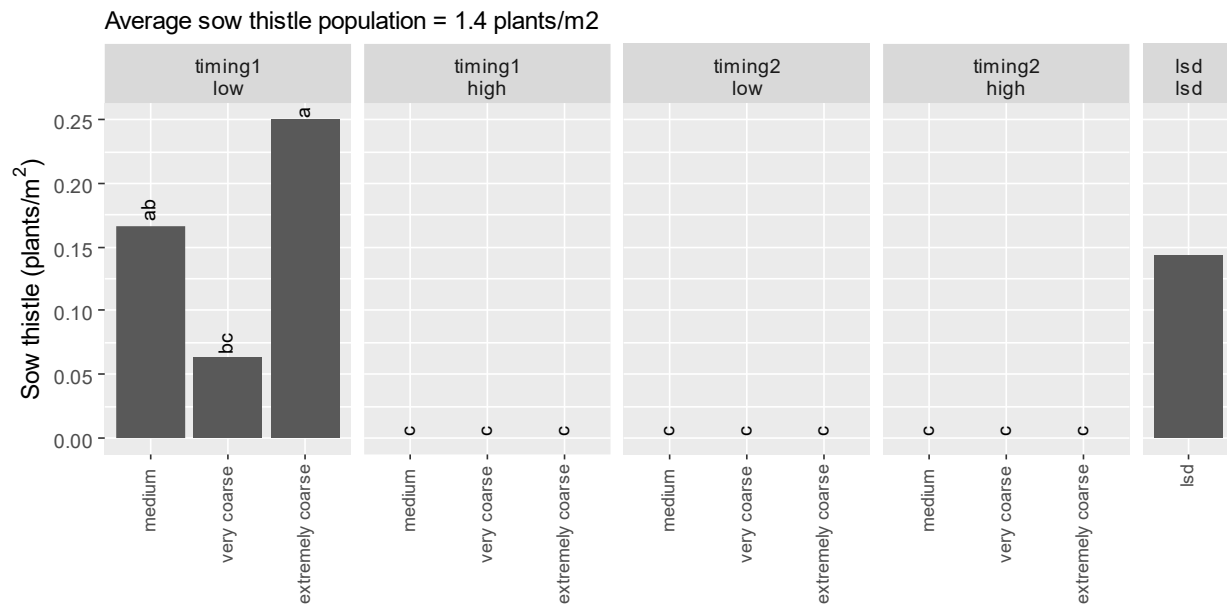


Figure 1: Number of surviving sow thistle (plants/m²) assessed 45 days (early) and 35 days (recommended) after application. Treatments with the same letter are not significantly different.

Other weeds:

Other weeds, apart from sow thistle and caltrop included volunteer canola, horehound and wild mint.

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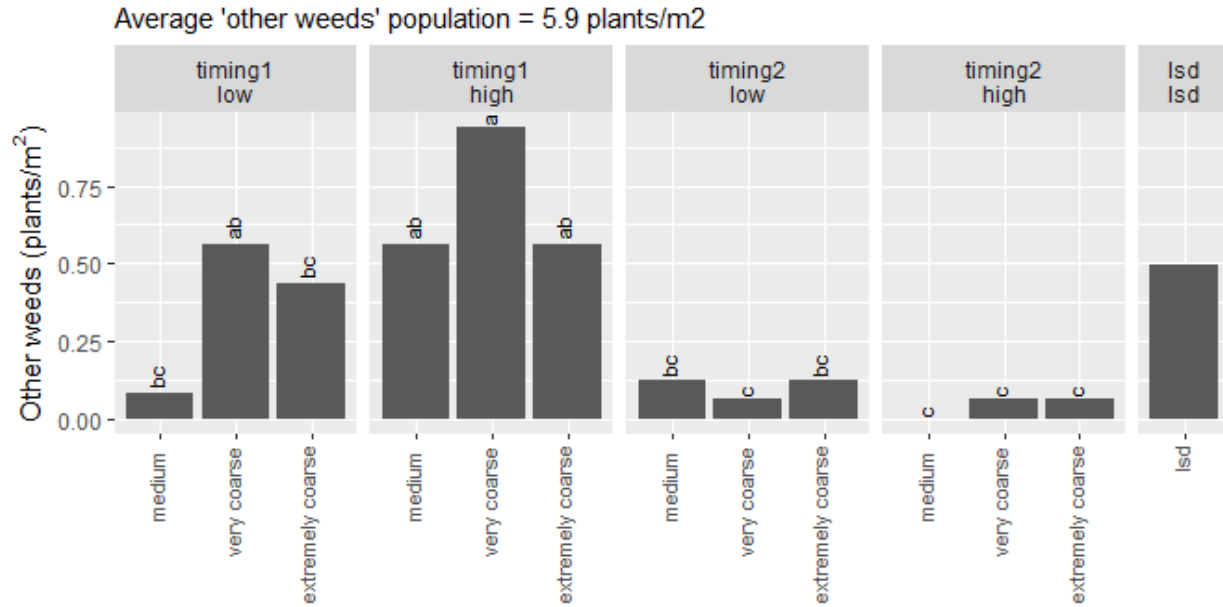


Figure 2: Number of surviving weeds (sow thistle) (plants/m²) assessed 45 days (early) and 35 days (recommended) after application

All weeds: volunteer canola, horehound and wild mint, sow thistle and caltrop.

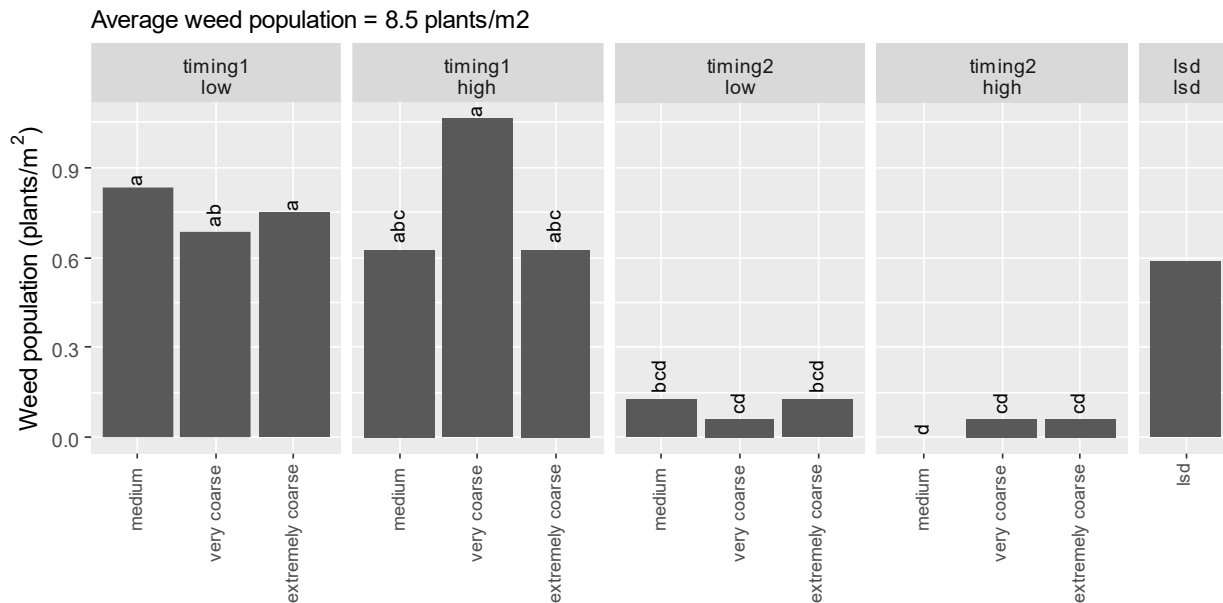


Figure 3: Number of surviving weeds (plants/m²) assessed 45 days (early) and 35 days (recommended) after application

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Discussion

The weeds present at this site included sow thistle, marshmallow, wild oats, shepherd's purse, wild mint, volunteer canola, medics and fleabane were present. The average weed population (untreated) was about 8.5 plants/m², and the average level of control across all treatments was high at ~95%.

- For sow thistle control: spray quality was less important than water rate or timing when either using a higher water rate or delaying application
- For 'other weeds': a high water rate at the later timing gave the best results.
- For both sow thistle and other weeds there were instances where the use of 'extremely coarse' spray quality gave a lower level of weed reduction than 'medium'.
- It may be that in a mixed weed population different species will respond differently to timing, water rates, and spray quality. In this trial, the later timing at a higher water rate provided the most consistent control regardless of spray quality.

Conclusions

- If targeting smaller weeds or using lower water rates, a medium spray quality may be more effective (if conditions and label requirements allow)

- **Acknowledgements**

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC. The authors would like to thank them for their continued support. Special thanks go out to Joe and Sam Mason who hosted this trial.

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Appendix

Results

| Timing | Rate | Quality | Other weeds | | Sow thistle | | Total weeds | |
|---------|------|------------------|--------------------------|----|-------------|----|-------------|-----|
| | | | (plants/m ²) | | | | | |
| Timing1 | low | medium | 0.1 | bc | 0.2 | ab | 0.8 | a |
| | low | very coarse | 0.6 | ab | 0.1 | bc | 0.7 | ab |
| | low | extremely coarse | 0.4 | bc | 0.3 | a | 0.8 | a |
| | high | medium | 0.6 | ab | 0.0 | c | 0.6 | abc |
| | high | very coarse | 0.9 | a | 0.0 | c | 1.1 | a |
| | high | extremely coarse | 0.6 | ab | 0.0 | c | 0.6 | abc |
| Timing2 | low | medium | 0.1 | bc | 0.0 | c | 0.1 | bcd |
| | low | very coarse | 0.1 | c | 0.0 | c | 0.1 | cd |
| | low | extremely coarse | 0.1 | bc | 0.0 | c | 0.1 | bcd |
| | high | medium | 0.0 | c | 0.0 | c | 0.0 | d |
| | high | very coarse | 0.1 | c | 0.0 | c | 0.1 | cd |
| | high | extremely coarse | 0.1 | c | 0.0 | c | 0.1 | cd |
| lsd | lsd | lsd | 0.5 | | 0.1 | | 0.6 | |

Spray application Details

| Spray application | Timing 1 | Timing 2 |
|-----------------------|------------------|------------------|
| Date Applied | 21/03/2022 | 4/04/2022 |
| Start time | 9:15 AM | 8:00 AM |
| Finish Time | 9:45 AM | 8:30 AM |
| Water rate (l/ha) | 50/100 | 50/100 |
| Speed (km/hr) | 8/16 | 8/16 |
| Pressure (bar) | 4 | 4 |
| Equipment | Ute mounted boom | Ute mounted boom |
| Temp (°C) | 20.3 | 15.8 |
| Wind velocity (km/hr) | 5-7 | 0-2 |
| Wind direction | NE | E |
| Humidity (%) | 74 | 77.3 |
| Δt | 3.3 | 2.0 |
| Nozzle | various | various |
| Cloud cover (%) | 5 | 100 |