GOA Trial Site Report

Impact of application timing, spray quality and water rates to control annual ryegrass using paraquat in retained stubble systems

Grain Orana Alliance

2022-09-28

Trial code:	GAWE080224
Season/year:	Summer 2022
Location:	Hillview, Wongarbon
Trial partners:	Al and Gus Kelly
Trial establishment date:	21/03/2022

Keywords

GAWE080, annual ryegrass, resistance, paraquat, paraquat, spray quality, water rates, application timing, Wongarbon

Key findings

- Medium spray quality offered the best control of AGR (>97%). This was regardless of timing or water rate.
- Coarser spray qualities were not as effective in ARG control.
- The higher water rate of 100L/ha did not provide a significant increase in control, compared with the 50 L rate.

Background

During recent research[1] investigating control of paraquat resistant annual ryegrass, *Lolium rigidum*, (ARG), Grain Orana Alliance (GOA) speculated that assuming resistance was sometimes incorrect and not the

[1] https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2020/02/is-our-ryegrass-really-getting-harder-to-kill-through-our-over-reliance-on-paraquat

cause of poor weed control. Furthermore, some of the populations with confirmed paraquat resistance were also controlled with only moderate label rates.

These findings show that commercial spray failures are not always due to resistance. Contributing factors to weed control failure include; inappropriate water rates, poor water quality, inappropriate droplet size for the target plant, poor spray timing or antagonism with other tank mixed herbicides and poor weather conditions among others.

It is not suggested that herbicide resistance is not real or not the sole reason for failure in some circumstances. However, where resistance is present, ineffective weed control is being exacerbated by sub-optimal application, which if rectified could be improved.

GOA has undertaken several investigations to better understand the potential influence of some key parameters of spray application.

Aims

Determine the effects of application timing, water rate or spray quality on the control of ARG using paraquat

Methodology

Trial design	
Type	Small plot (~12m x 2 m)
Design	Randomized split plot
Replications	4
Analysis	ASREML
Confidence interval	95%

Treatments

- All treatments: 504 gai/ha paraquat (Gramoxone 360 @ 1.4L/ha).
- Plots sprayed using a ute mounted boom with 4 x 2.5 m sections. Nozzles could be rotated to change spray quality.

Two water rates were used (varied using ground speed):

- Low = 60 L/ha (~14 km/hr)
- High = 120 L/ha (~7 km/hr).

Two application timings (application details are in the Appendix):

- Timing 1 (T1): smaller target weeds
- Timing 2 (T2): larger target weeds (10 days after timing1).

GOA Trial Site Report

Spray quality and nozzles used are listed in Table 1.

Table 1: Nozzles used and spray quality/droplet size

Nozzle	Spray quality
AIXR	Medium
InJet	Very coarse
TTi	Extremely coarse

Results

Annual ryegrass: spray quality, application timing and water rate.

- Approximately 475 ARG plans/m^2 were counted in the untreated control.
- Using medium spray quality resulted in the lowest surviving populations ARG.
- There was no difference in surviving plants between the different timings and water rates.

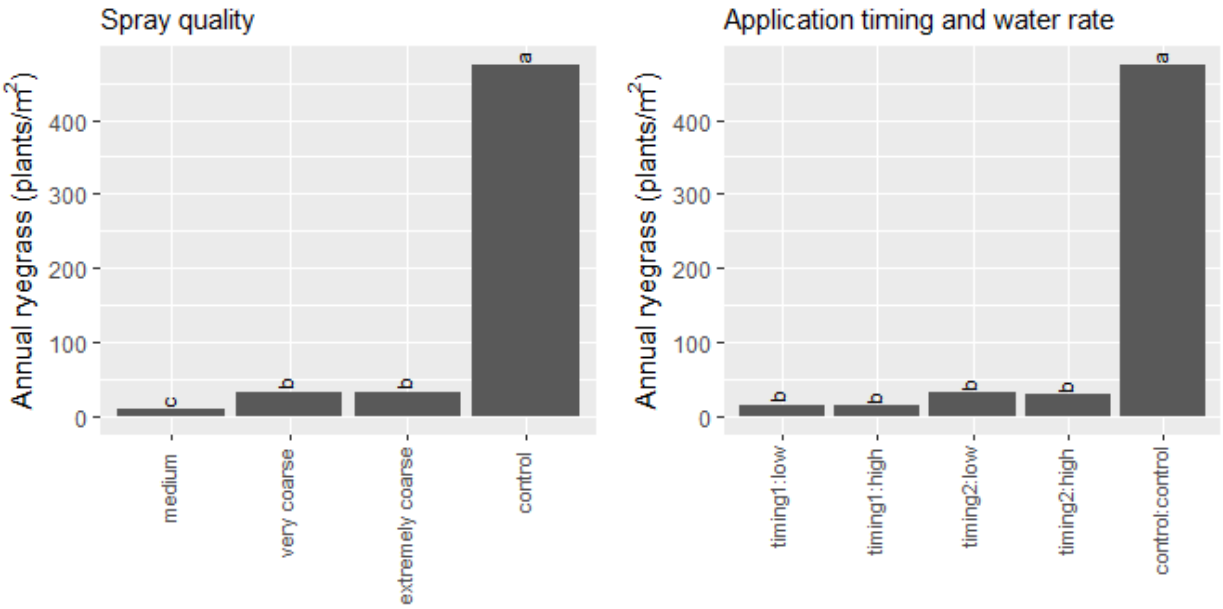

Figure *1*: Annual ryegrass assessed 29 days (early) and 18 days (recommended) after application. Treatments with the same letter are not significantly different.

Annual ryegrass:

A medium spray quality resulted in the lowest surviving ARG populations regardless of timing or water rate. The level of control was better than 97%. At the second timing the very coarse quality at a low water rate had more surviving ARG than any of the medium spray quality treatments. (Figure 2)

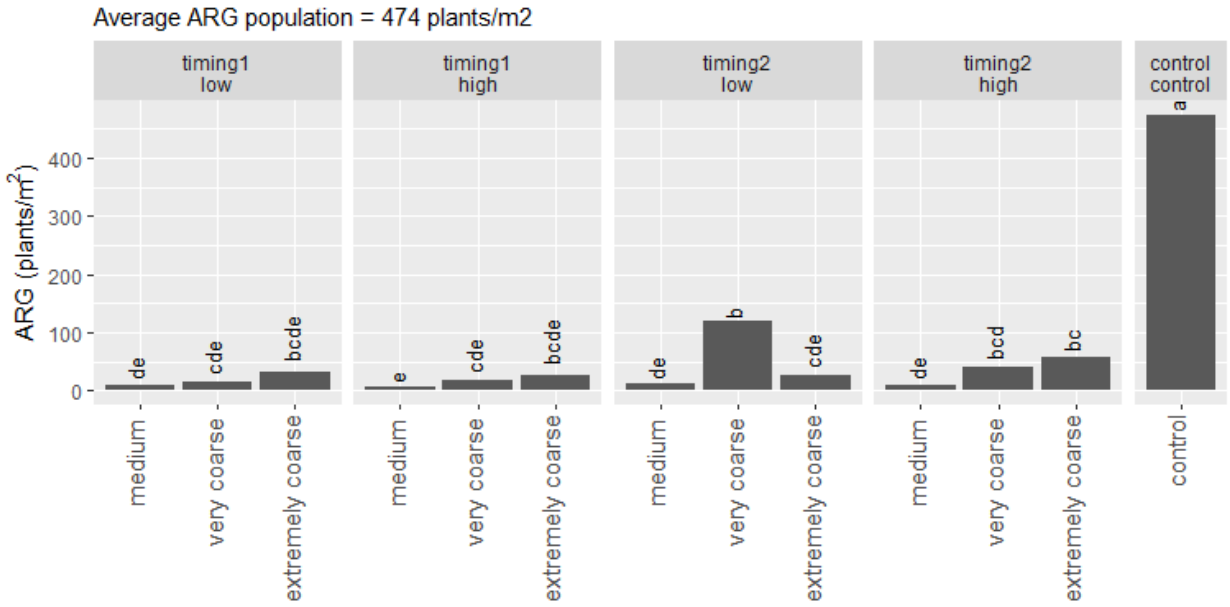

Figure 2: Number of surviving ARG assessed 29 days (early) and 18 days (recommended) after application

Discussion

There was a thick ARG population at this site. The average, untreated population was ~474 plants/m^2. The level of control when using medium spray quality was better than 97%.

There was a big difference in ARG numbers between the treated and untreated plots. There were also differences between the spray qualities tested (Figure 1). However, there was no effect on surviving plant numbers between the 2 timings nor the 2 water rates tested.

For the control of ARG with paraquat the use of a medium droplet provided the best results regardless of water rate or timing (Figure 2). This equated to a better than 97% reduction in weed numbers, whereas the courser spray qualities, while reducing the weed population by close to 83%, still left an average of 97 plants/m^2.

Conclusions

If targeting ARG with paraquat, the use of a medium quality droplet may be more effective than coarser spray qualities if label allows.

A reduction in weed numbers of around 97%, which may be considered commercially acceptable, will still leave a large number of surviving ARG where populations are very large (in this trial more than 10 ARG/m^2), requiring a much more concerted effort to control. Paraquat can be very effective as a double knock.

GOA Trial Site Report

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 Grains Research and Development Corporation (GRDC), the authors would like to thank them for their continued support. Special thanks go out to Al and Gus Kelly who hosted this trial.

DISCLAIMER — TECHNICAL

GOA Trial Site Report

Appendix

Results

Timing	Rate	Quality	ARG (plants/m2)	
Timing 1	low	medium	8.6	de
	low	very coarse	15.6	cde
	low	extremely coarse	32.7	bcde
	high	medium	7.8	e
	high	very coarse	16.8	cde
	high	extremely coarse	27.6	bcde
Timing 2	low	medium	11.0	de
	low	very coarse	120.0	b
	low	extremely coarse	25.6	cde
	high	medium	10.4	de
	high	very coarse	40.9	bcd
	high	extremely coarse	57.3	bc
Control	control	control	474.4	a

Spray application Details

Spray application	Timing 1	Timing 2
Date applied	21/03/2022	1/04/2022
Start time	11:30 AM	7:30 AM
Finish time	11:55 AM	8:00 AM
Water rate (l/ha)	60/120	60/120
Speed (km/hr)	7/14	7/14
Pressure (bar)	4	4
Equipment	Ute mounted boom	Ute mounted boom
Temp (oc)	24.7	8.2
Wind velocity (km/hr)	10-14	0-1
Wind direction	NE	E
Humidity (%)	59.7	89.5
Δt	5.1	1
Nozzle	various	various
Cloud cover (%)	5	0