GOA Trial Site Report

Pre-Emergent Herbicides Options for Annual Ryegrass Control in Lupins

Trail Code: GOWE02215-1

Year/Season: Winter 2015

Location: Narromine Station, 10 km North of Narromine

Collaborators: The Browning Family and Shannon Thomas

Keywords

Lupins, weeds, annual ryegrass pre-emergent, herbicides, Narromine, GOWE02215-1

Take home messages

This trial demonstrated that there are a number of pre-emergent herbicide options that have the potential to reduce the annual ryegrass (ARG) populations in your crops.

Commonly used herbicide choices have not performed well in terms of ryegrass control and changes in product choices can result in much higher level of ARG control in lupins

Tank mixing pre-emergent herbicides tends to provide better levels of control than single products with the additional benefit of controlling a broader weed spectrum and possible benefits for delaying the onset of resistance.

Background

Annual ryegrass (ARG) is expressing increasing levels of resistance to various herbicides across the Orana Region[1]. One product most concerning to many growers is the developing resistance to clethodim, as it represents the last remaining effective in-crop knockdown herbicide. Any remaining effectiveness of clethodim needs to be protected as much as possible to prolong its useful life. One way to achieve this is to minimise the risk and rate at which resistance is developed, this is done through reducing the weed populations to which these herbicides are applied too. One useful option in achieving this is to improve the efficacy of any pre-emergent herbicide options used.

GOA for a number of years has been investigating improved pre-emergent herbicide options focusing on ARG and this trial is a further continuation of that work.

This trial tests a range of pre-emergent herbicide options for their potential to reduce ARG establishment. The options include a number of tank mixes that take into account recent research which found that using tank mixes (at full rates) can “buy shots” and hence delay the onset of herbicide resistance. The research found that farmers who used 2.5 herbicide modes of action (MOA’s) on average per application were 83 times less likely to have glyphosate resistance than growers that had mixed 1.5 MOA’s[2] (Evans, 2015).

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[1] See GOA report: http://www.grainorana.com.au/documents?download=29

[2] Evans, J.A., Tranel, P.J., Hager, A.G, Schutte, B., Chenxi, W., Chatham, L.A., Davis, A.S. Managing the evolution of herbicide resistance, Pest Management Science, May, 2015. 10.1002/ps.4009

However, it should be remembered that information gained though this trial will only form part of the solution or management of this issue and weed populations must be targeted at every other chance. The lack of effective in-crop selective options for producers means that this must include pre-emergent options or other modes of control.

DISCLAIMER

Following is a report on a scientific experiment. It may contain some herbicide treatments that are not registered for the situation, manner or rate at which they are used in this trial. This document or anything else resulting from, construed or taken from this or by GOA or its representatives should not be taken as a suggestion, recommendation or endorsement of any unregistered herbicide uses.

Aim

This project aims compare a range of pre-emergent options to reduce ARG establishment in lupins.

Methods

The trials used a small plot randomised complete block design with three replicates. The trials were established in growers' paddocks with known populations of ARG.

Herbicide treatments were applied using an ATV mounted boom. Incorporated by sowing (IBS) treatments were incorporated using a tyne plot planter when seeding the crop. PSPE applications were applied within 12 hours after seeding.

Crop establishment, ARG populations, estimated weed biomass and panicle counts were assessed in this trial before the site was sprayed out with herbicides to prevent seed set. Note: No crop safety data was collected in this trial.

Results were analysed using ANOVA for the analysis of variance and results compared by using a least significant difference (LSD) method with a 95% confidence interval. Any references to differences between treatments should be assumed to be statistically different unless otherwise stated.

Table 1. Trial site details

Seeding date	9th June 2015
Variety and seeding rate	Albus Luxor @ 100 kg/ha
Seedling equipment	DBS, knife point and press wheel, 275 mm tine spacing
Row Orientation	North South
Nutrition	50 kg/ha MAP at seeding (approx. 4 cm below seed)
Soil type	Red Clay Loam
Paddock history	Canola Stubble, windrow burnt
Pre Application/ seeding treatment	2 L/ha of paraquat was applied to the site to remove any established ARG populations

Table 2. Herbicide application details for IBS, and PSPE treatments

IBS	**Date Applied**	9/06/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	11.40 am	17^0C	4 km/h	WSW	43%
	Finish Time	1.00 pm	**Δt**	4.6	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 bar
	Equipment	ATV	**Speed**	7 km/h		
PSPE	**Date Applied**	10/06/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	8.45am	9^0C	4 km/h	W	80%
	Finish Time	9.00 am	**Δt**	1.3	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 bar
	Equipment	ATV	**Speed**	7 km/h		

Table 3. Treatment list

Treatments	Rate (mL/ha or g/ha)
Untreated Control (UTC)	
Trifluralin (IBS)	1700
Simazine (IBS)	2200
Simazine (PSPE)	2200
Outlook® (IBS)	1000
Boxer Gold® (IBS)	2500
Sakura® (IBS)	118
Experimental 1 (IBS)[3]	1000
Trifluralin (IBS) + simazine (IBS)	1700 + 2200
Trifluralin (IBS) + Avadex Xtra® (IBS)	1700 + 1600
Trifluralin (IBS) + simazine (IBS) + Avadex Xtra®(IBS)	1700 + 2200 + 1600
Outlook® (IBS) + simazine (IBS)	1000 + 2200
Simazine (IBS) + Experimental 1 (IBS)	2200 + 1000
Simazine (IBS) + Experimental 1 (IBS) + trifluralin (IBS)	2200 + 1000 + 1700
Simazine (IBS) + Experimental 2 (PSPE)	2200 + 1000
Boxer Gold® (IBS) + simazine (IBS)	2500 + 2200
Boxer Gold® (IBS) + simazine (IBS) + trifluralin (IBS)	2500 + 2200 + 1700

[3] Experimental 1 is a Group D herbicide which may in future become registered in Lupins

Table 4. Daily rainfall totals pre and post treatment, Narromine BOM station[4] (approximately 6 km from the trial site)

Date	Rainfall (mm)
8/04/2015	23.8
22/04/2015	56.1
22/05/2015	33.7
29/05/2015	3.5
31/05/2015	7
5/06/2015	2.7
18/06/2015	42.2
25/06/2015	5.5
13/07/2015	21.7

Date	Rainfall (mm)
17/07/2015	19.9
23/07/2015	10.1
24/08/2015	29.6

Rainfall:

- Significant rain fell prior to planting/pre-emergent application, site was very wet
- 42 mm fell within 10 days of herbicide application

Results

The crop was established successfully with an average across the trial of 17 lupin plants/m^2, the application of pre-emergent herbicides did not supress emergence or subsequent plant population when compared to the UTC. However, the trifluralin (IBS) + simazine (IBS) and simazine (IBS) + Experimental 1 (IBS) + trifluralin (IBS) tank mixes resulted in the establishment of higher plant populations than the UTC, possibly due to the reduction in competition from emerging ARG.

Resultant weed populations and panicle seed head counts are detailed in

Table 5 below. As can be seen all treatments resulted in significantly lower ARG populations than UTC at both 49 and 84 days after treatment (DAT) assessments and lower ARG panicle counts at 112 DAT.

Assessment at 84 DAT showed simazine applied both IBS and PSPE, Outlook® and Boxer Gold® all performed similarly resulting in approximately 60% reduction in ARG populations. The balance of the treatments all performed similarly to one another. Treatment effects on ARG panicles tended to correlate closely to plant populations at 112 DAT.

[4] Data from Narromine Airport (Station number 05115)

Table 5. ARG populations and panicle counts in response to various pre-emergent herbicide treatments

Treatment	ARG plant/m^2 49DAT		ARG plant/m^2 84DAT		ARG Panicles 112DAT	
Untreated Control (UTC)	270	A	219	A	547	A
Trifluralin (IBS)	45	CD	34	D	127	CD
Simazine (IBS)	135	B	94	B	307	BC
Simazine (PSPE)	138	B	94	B	366	AB
Outlook® (IBS)	134	B	88	B	212	BCD
Boxer Gold® (IBS)	77	C	81	BC	344	B
Sakura® (IBS)	43	CD	34	D	105	D
Experimental 1 (IBS)	28	CD	16	D	57	D
Trifluralin (IBS) + simazine (IBS)	49	CD	23	D	100	D
Trifluralin (IBS) + Avadex Xtra® (IBS)	56	CD	29	D	121	CD
Trifluralin (IBS) + simazine (IBS) + Avadex Xtra®(IBS)	41	CD	37	D	106	D
Outlook® (IBS) + simazine (IBS)	64	C	37	D	77	D
Simazine (IBS) + Experimental 1 (IBS)	44	CD	23	D	59	D
Simazine (IBS) + Experimental 1 (IBS) + trifluralin (IBS)	12	D	11	D	35	D
Simazine (IBS) + Experimental 2 (PSPE)	66	C	45	CD	142	CD
Boxer Gold® (IBS) + simazine (IBS)	54	CD	47	CD	141	CD
Boxer Gold® (IBS) + simazine (IBS) + trifluralin (IBS)	42	CD	29	D	104	D
l.s.d	50		37		186	

Within each assessment letters represent groups, where treatments with the same letter (A, B, etc.) have means that are not significantly different from one another.

Discussion

Good rainfall in the lead up to the establishment of the trial had already seen a significant number of germinations and subsequent control of ARG. Despite this there was still a dense population of ARG present in the UTC of 270 plants/m^2 (49 DAT). Wet conditions prior to planting resulted in poor planting conditions, this may have limited the effectiveness of the incorporation for the IBS treatments, as soil throw was sub-optimal. Heavy rainfall fell within 10 days following herbicide treatment which should have ensured good incorporation and activation of the herbicides but may have had the potential to cause significant crop damage however none was observed.

ARG from the trial area was previously tested to Verdict, Select, Achieve and Hussar and showed strong resistance to all products except Select with only 5% survival. The population's resistance to other products including many of the pre-emergent's in this trial is unknown. A sample population was left for testing but was inadvertently sprayed out before sampling.

In this trial all products resulted in significantly lower ARG populations than the UTC at both assessment timings and lower panicle count (with the exception of Simazine and PSPE), see Figure 1 and Table 5 below

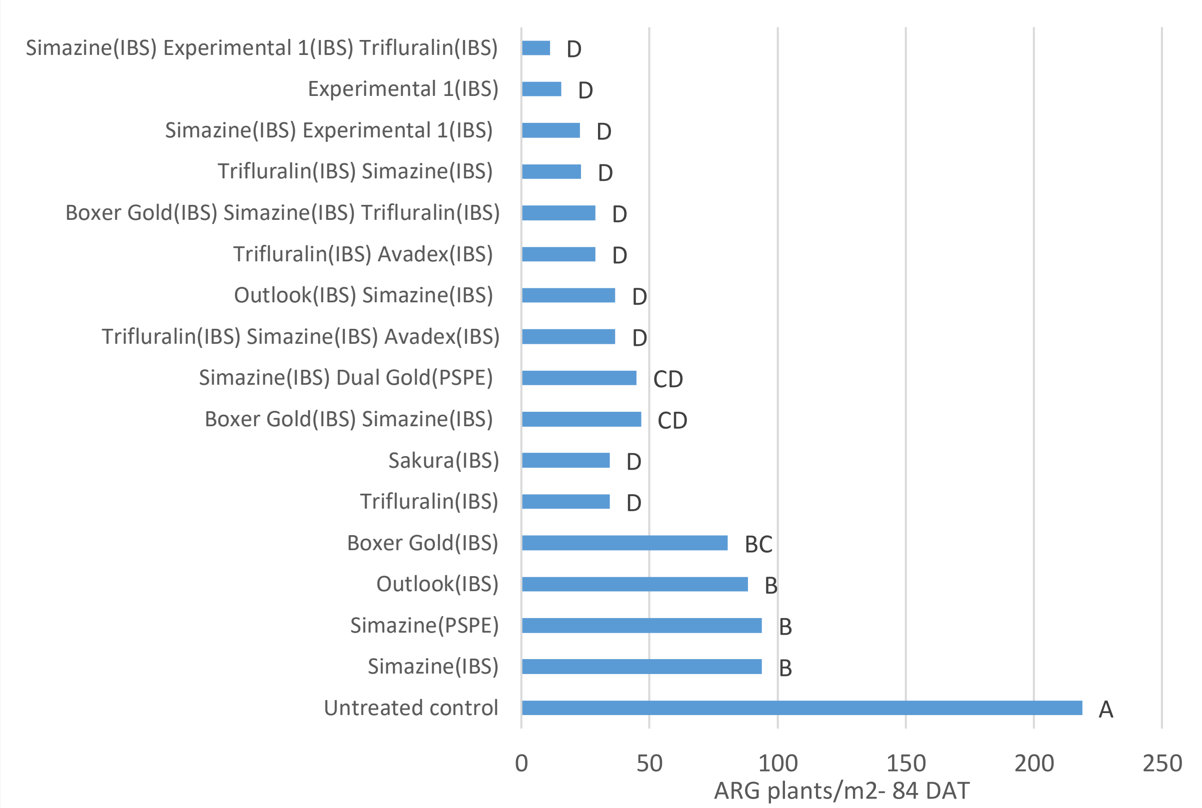

Figure 1. Annual ryegrass populations 84 DAT in response to various pre-emergent herbicide options

The use of simazine as a pre-emergent in lupins, probably the most common herbicide option practiced in the GOA region, performed poorly achieving around 60% reduction in ARG at 84 DAT. Subsequently, the surviving population (~95 ARG/m^2) went on to set over 300 seed heads/m^2.

Of the alternate single product options tested only trifluralin, Sakura® and Experimental 1 offered any improved control over the standard in simazine. The remaining tank mixes tested also out-performed simazine but were no better than the three options mentioned above but would likely offered a broader spectrum of control than just ARG as was dominant in this trial.

The tank mix of simazine, trifluralin and experimental 1 resulted in the best control achieved in this trial of ~95% reduction in ARG and deserves further investigation.

Conclusion

This trial has demonstrated that the use of pre-emergent herbicides can reduce ARG populations compared with no treatment. The trial has also demonstrated a number of options that are more effective than the commonly used pre-emergent herbicide, simazine, which in this trial achieved a very poor control level of only 60%. The best treatment tested in the trial achieved around 95% reduction in ARG.

Experimental 1 was the best performing single product approach and it was also part of the best overall treatment tested in the trial. This product could offer growers good value for ARG control if it is to be registered in lupins in the future as it has been suggested it will be.

This trial has also shown that the improved levels of control of ARG that has been demonstrated over that of common district practices will reduce the weed burdens placed on our key post emergent knockdown herbicides. This in turn will hopefully reduce the rate of development of resistance in those products but it is also likely to improve crop performance through less weed competition and fewer escapes.

In consideration of the use of alternatives growers and advisors should base their choices on more than the results of just this one trial. Growers should also take into account a number of other influences such as-

- What other weeds are present and the effectiveness of the alternatives are on these?
- What is the cost of these alternatives in comparison to each other?
- Any varietal differences in crop tolerances of the particular alternatives?
- Plant back or residue restrictions?
- Herbicide rotations and resistance management?
- The herbicide resistance status of the weeds you are targeting?

Acknowledgements

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