GOA Site Report

Pre-Emergent Herbicides Options for Annual Ryegrass Control in Field peas

Trail Code: GOWE02115-1

Year/Season: Winter 2015

Location: Narromine Station, 10 km North of Narromine

Collaborators: The Browning Family and Shannon Thomas

Keywords

Field peas, weeds, annual ryegrass pre-emergent, herbicides, Narromine, GOWE02115-1

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 field peas

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 or alternate in-crop options 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 population numbers 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 of ARG and this trial is a further continuation of that work.

This trial concentrates upon a number of various pre-emergent herbicide options and assess their potential to reduce ARG establishment. The options include a number of tank mixes, taking into account recent research, which has found that using tank mixes (at full rates) can "buy shots" and hence delay the onset of herbicide resistance. It has been found that farmers who used 2.5 herbicide

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

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 on average[2] (Evans, 2015).

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 field pea crops.

Methods

The trials used a small plot randomised complete block design with 3 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 sowing the crop. PSPE applications were applied within 12 hours of 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 was recorded for 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.

[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

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Table 1. Trial site details

Seeding date	9th June 2015
Variety and seeding rate	Yarrum @ 70 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	3:20 pm	19°C	6 km/h	W	48%
	Finish Time	3:55 pm	**Δt**	7	**% 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	9:15 am	10°C	5 km/h	SW	75%
	Finish Time	9:50 am	**Δt**	3	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 bar
	Equipment	ATV	**Speed**	7 km/h		

Table 3. Daily rainfall records pre and post treatment, Narromine BOM station[3] (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 prior to planting/pre-emergent application, site was very wet
- 42 mm within 10 days of herbicide application

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

Table 4. Treatment list

Treatment	Rate (mL/ha or g/ha)
Untreated control (UTC)	0
Metribuzin (PSPE)	380
Terbyne® (PSPE)	1000
Trifluralin (IBS)	1700
Sakura® (IBS)	118
Experimental 1 (IBS)[4]	1000
Boxer Gold® (IBS)	2500
Outlook®(IBS)	1000
Trifluralin(IBS) +Terbyne® (PSPE)	1700 + 1000
Trifluralin(IBS) + diuron (IBS)	1700 + 1100
Trifluralin(IBS) + metribuzin (PSPE)	1700 + 380
Trifluralin(IBS) + Avadex Xtra® (IBS)	1700 + 1600
Trifluralin (IBS) + Experimental 1 (IBS)	1700 + 1000
Trifluralin (IBS) + Experimental 1 (IBS) + Terbyne® (PSPE)	1700 + 1000 + 1000
Trifluralin (IBS) + Experimental 1 (IBS) + metribuzin (PSPE)	1700 + 1000 + 380
Metribuzin (PSPE) + Spinnaker® (PSPE)	380 + 34
Terbyne® (PSPE) + diuron (PSPE)	1000 + 830

Results

Crop establishment of the trial was reduced due to wet conditions at seeding with an average of 16 field pea plants/m^2 establishing with no measurable effect of the differing pre-emergent treatments.

At all three assessment dates metribuzin did not impact on the ARG population in comparison to the UTC, however, all other treatments did show a reduction in ARG numbers. Of the remainder of single product treatments, Terbyne® performed poorly but it was not statistically different to Boxer Gold® or Outlook®. Trifluralin, Sakura® and Experimental 1 performed better and was not statistically different to the best performing treatment tested in the trial.

Of the tank mix products tested - Terbyne® + diuron and metribuzin + Spinnaker® both performed equally poorly. The majority of tank mix options tested performed better but with no statistical difference between those treatments.

Panicle counts at 113 DAT tended to reflect the ARG populations present at 83 DAT as is detailed Table 5 below.

[4] Experimental 1 is a Group D herbicide which may in future become registered in Field peas

Table 5. ARG populations and panicle counts in response to various pre-emergent herbicide treatments - Narromine 2015.

	Treatment	ARG plant/m^2 49 DAT		ARG plant/m^2 83 DAT		ARG Panicle 113DAT	
1	Untreated control (UTC)	178	A	164	A	659	A
2	Metribuzin (PSPE)	157	AB	159	A	556	AB
3	Terbyne® (PSPE)	93	CD	79	B	317	CD
4	Trifluralin (IBS)	28	EFG	23	DEF	167	CDEF
5	Sakura® (IBS)	29	EFG	19	DEF	107	EF
6	Experimental 1 (IBS)	29	EFG	25	CDEF	107	EF
7	Boxer Gold® (IBS)	52	DEFG	49	BCDE	177	CDEF
8	Outlook®(IBS)	67	CDEF	56	BCD	153	DEF
9	Trifluralin(IBS) +Terbyne® (PSPE)	30	EFG	20	DEF	62	F
10	Trifluralin(IBS) + diuron (IBS)	18	EFG	11	EF	73	F
11	Trifluralin(IBS) + metribuzin (PSPE)	22	EFG	18	DEF	64	F
12	Trifluralin(IBS) + Avadex Xtra® (IBS)	25	EFG	29	CDEF	73	F
13	Trifluralin (IBS) + Experimental 1 (IBS)	11	FG	10	EF	30	F
14	Trifluralin (IBS) + Experimental 1 (IBS) + Terbyne® (PSPE)	6	G	4	F	16	F
15	Trifluralin (IBS) + Experimental 1 (IBS) + metribuzin (PSPE)	7	G	10	EF	25	F
16	Metribuzin (PSPE) + Spinnaker® (PSPE)	118	BC	82	B	291	CDE
17	Terbyne® (PSPE) + diuron (PSPE)	74	CDE	64	BC	369	BC
	LSD	56.5		40		204	

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 weed germinations and subsequently control of early ARG. Despite this though, there was still a dense population of ARG present in the UTC of 168 plants/m^2 (at 84 DAT). Wet conditions prior to planting resulted in a wetter than optimal planting condition, 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 treatments, this should have ensured good incorporation and activation of the herbicides but may have had the potential to cause significant crop damage, although none was visually 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 products in this trial is unknown. A sample population was left for testing but was inadvertently sprayed out before sampling.

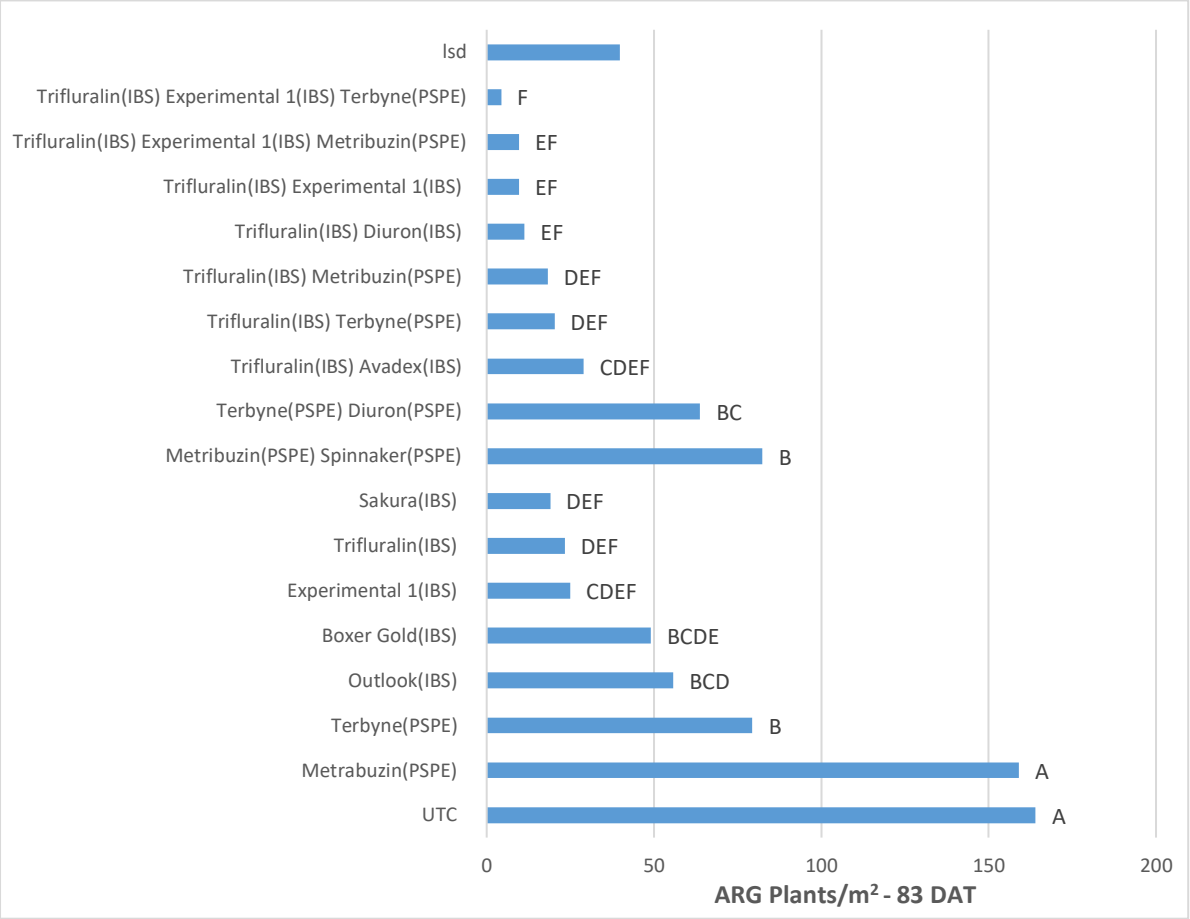

Figure 1. ARG populations 83 DAT in response to various pre-emergent herbicide options

In this trial all products except metribuzin, resulted in a reduction in the ARG population when compared to the UTC, however, a number of options resulted in only very marginal level of control. The common pre-emergent practice employed in Field Pea crops in the GOA region of Terbyne® or metribuzin performed poorly achieving around 50% or near 0% control respectively by 83 DAT. It should be noted that metribuzin is not registered for ARG control in field peas.

A number of other alternate single product options in Experimental 1, Sakura® and Trifluralin resulted in improved control over Terbyne® but was not significantly different to the best option tested in the trial.

In this trial many of the tank mixes tested did not necessarily result in improved levels of control but they could potentially offer a broader spectrum of weed control than would be achieved by the best single product strategies.

In terms of the mean level of control the top three performing options included Experimental 1 which also performed very well by itself. This may justify further investigation and if this product is registered in field peas in the future it could prove very useful to growers for the control of ARG.

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, Terbyne® or metribuzin, which in this trial achieved a very poor control levels. In contrast the best treatments tested in the trial achieved around 95% reduction in ARG.

Sakura® and trifluralin have shown in this trial to be worthy alternatives but a number of tank mix options tested could provide similar reduction in ARG but with a broader spectrum of control.

Experimental 1 also performed well alone or as part of a tank mix and is worthy of future investigations.

This trial has also shown that the improved levels of control of ARG that has been demonstrated over common district practices will reduce the weed burdens placed on our key post emergent knockdown herbicides. This in turn should reduce the rate of development of resistance in those products but it may also improve crop performance in the interim 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?

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