GOA Trial Site Report

Pre-Emergent Herbicides options for Annual Ryegrass control in Canola

Trail Code: GOWE02015-1

Year/Date/Season: Winter 2015

Location: Narromine Station, 10 km North of Narromine

Collaborators: The Browning family and Shannon Thomas

Keywords

GOWE02015-1, Annual Ryegrass, pre-emergent herbicides, resistance, clethodim, tank mixes, canola

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 canola

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.

In this trial there was no difference in the levels of ARG control provided when applying atrazine and clethodim together, or when clethodim was applied 7 days after the atrazine.

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 trial aims compare a range of pre-emergent options to reduce ARG establishment in canola.
- This trial also aimed to investigate if there is any advantage to applying clethodim post weed emergence in a separate pass to a post emergent application of atrazine.

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 used a tyne plot planter when sowing and PSPE applications were applied immediately after.

Table 1. Trial site details

Seeding date	9th June 2015
Variety and seeding rate	Hyola 559TT @ 2 kg/ha
Row Orientation	North South
Seedling equipment	DBS, knife point and press wheel, 275 mm tine spacing
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

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 recorded in this trial.

[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

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 2. Rainfall[3]

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
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

Table 3. Herbicide application details for IBS, PSPE and Post emergent treatments

IBS	**Date Applied**	9/06/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	2.40 pm	19^{0}C	6 km/h	WSW	48%
	Finish Time	3.20 pm	**Δt**	7	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 Bar
	Equipment	ATV	**Speed**		**Boom height**	50
PSPE	**Date Applied**	10/06/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	9.10 am	10^{0}C	4 km/h	SW	80%
	Finish Time	9.30 am	**Δt**	2.3	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 Bar
	Equipment	ATV	**Speed**	7 km/h	**Boom Height**	50
Post Emergent	**Date Applied**	7/7/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	2.25 pm	17.2^{0}C	3-6 km/h	SW	48%
	Finish Time	3.25 pm	**Δt**	4	**% Cloud**	0
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 Bar
	Equipment	Hand boom	**Speed**	7 km/h	**Boom Height**	50
Post emergent + 7 days	**Date Applied**	15/7/2015	**Temperature**	**Wind Velocity**	**Wind Direction**	**Humidity**
	Start Time	11.15 am	8^{0}C	4-6 km/h	W	NR
	Finish Time	11.20 am	**Δt**	NR	**% Cloud**	100
	Water Rate	100 L/ha	**Nozzle**	AIXR015	**Pressure**	3 Bar
	Equipment	Hand boom	**Speed**	7 km/h	**Boom Height**	50

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

Table 4. Treatments list

Treatment	Rate (mL/ha or g/ha)
Untreated Control (UTC)	n/a
Atrazine (IBS)	2200
Atrazine (PSPE)	2200
Atrazine (IBS) + atrazine (Post emergence)	1100 + 1100
Atrazine (Post emergence)	1100
Trifluralin (IBS)	3000
Stomp® (IBS)	2300
Terbyne (IBS)	1400
Propyzamide (IBS)	1000
Trifluralin (IBS) + Avadex Xtra® (IBS)	2000 + 1600
Trifluralin (IBS) + atrazine (IBS)	3000 + 2200
Trifluralin (IBS) + propyzamide (IBS)	1500 + 1000
Trifluralin(IBS) + propyzamide (IBS) + Atrazine (IBS)	1500 + 1000 + 2200
Propyzamide (IBS) + atrazine (IBS)	1000 + 2200
Atrazine + clethodim (Post emergence)	1100 + 375
Atrazine (Post emergence) fb. clethodim (Post emergence + 7 days)	1100 + 375
Experimental 1 (IBS)	Not reported

Results

There was no significant impact of any of the treatments on crop establishment with crop plant populations and average 10 plants/m^2.

At 84 days after treatment (DAT) atrazine either IBS, PSPE timings as the split application or post emergent application with or without clethodim or Terbyne did not significantly reduce the ARG populations compared to the UTC. The remainder of the treatments resulted in lower ARG populations than the UTC.

Propyzamide, Trifluralin, experimental 1 and Stomp® as single products all performed similarly as did the remaining tank mix options tested and all better than the treatments mentioned above.

There was no significant difference in the ARG populations regardless of whether the clethodim is included in the same pass as the atrazine or applied separately 7 days later. The results are detailed in **Table 5** below**Error! Reference source not found.**.

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

Treatment		ARG Plants/m^2 49 DAT	ARG Plants/m^2 84 DAT	ARG Panicles 112 DAT
1	Untreated Control (UTC)	177 A	129 A	582 A
2	Atrazine (IBS)	114 B	122 A	614 A
3	Atrazine (PSPE)	119 AB	125 A	439 AB
4	Atrazine (IBS) + Atrazine (Post emergence)	140 AB	108 AB	356 BCD
5	Atrazine (Post emergence)	87 BCD	110 AB	373 BC
6	Trifluralin (IBS)	18 E	23 CD	131 EF
7	Stomp (IBS)	42 CDE	59 BCD	232 CDE
8	Terbyne (IBS)	92 BC	99 AB	354 BCD
9	Propyzamide (IBS)	31 DE	29 CD	150 EF
10	Trifluralin (IBS) + Avadex Xtra®(IBS)	34 CDE	25 CD	83 EF
11	Trifluralin (IBS) + Atrazine (IBS)	18 E	20 CD	73 EF
12	Trifluralin (IBS) + Propyzamide (IBS)	12 E	17 D	59 EF
13	Trifluralin (IBS) + Propyzamide (IBS) + Atrazine (IBS)	14 E	11 D	42 F
14	Propyzamide (IBS) + Atrazine (IBS)	28 DE	24 CD	84 EF
15	Atrazine + Clethodim (Post emergence)	52 CDE	77 ABC	229 CDE
16	Atrazine (Post emergence) fb. Clethodim (Post emergence + 7 days)	55 CDE	54 BCD	184 DEF
17	Experimental 1 (IBS)	31 DE	32 CD	77 EF
	LSD	59	58	178

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 the seedbank retained more than enough to produce a dense population of ARG in the UTC of 129 plants/m^2 (at 84 DAT). The preceding weather resulted in wetter than optimal planting conditions, this may have limited the effectiveness of the incorporation for the IBS treatments as soil throw was sub-optimal. On the other hand heavy rainfall fell in the 10 days following the herbicide treatments which should have ensured good incorporation and activation of the herbicides.

The wet conditions before and after seeding of this trial appeared to have had a significant adverse effect on the crop establishment with a resultant plant population of only 10 plants/m^2 despite targeting 35 plants/m^2. As mentioned above, there was no evidence that there was an interaction with the treatments in-crop establishment but the low populations may not represent true paddock conditions and some herbicides may perform differently with the benefit of enhanced crop completion.

ARG from the trial area was previously tested for Verdict, Select, Achieve and Hussar resistance and showed strong resistance to all products except Select (only 5% survival). The population's resistance to other products including many of the pre-emergent herbicides in this trial is unknown.

Triazine tolerant canola is often grown by growers to utilise the increased weed control options offered by the ability to apply herbicides such as atrazine. In this trial the use atrazine did not offer any better control over that of the UTC.

However other products including Trifluralin, propyzamide and experimental 1 did reduce the ARG populations. In addition, a number of alternate tank mix options tested also achieved statistically the same level of control with the additional benefit of providing a broader spectrum of target weeds. Propyzamide was one of the most effective of the single herbicides used in this trial and it was also a component in the more effective tank mix options. This performance particularly in the tank mix situation could offer growers a very useful alternative.

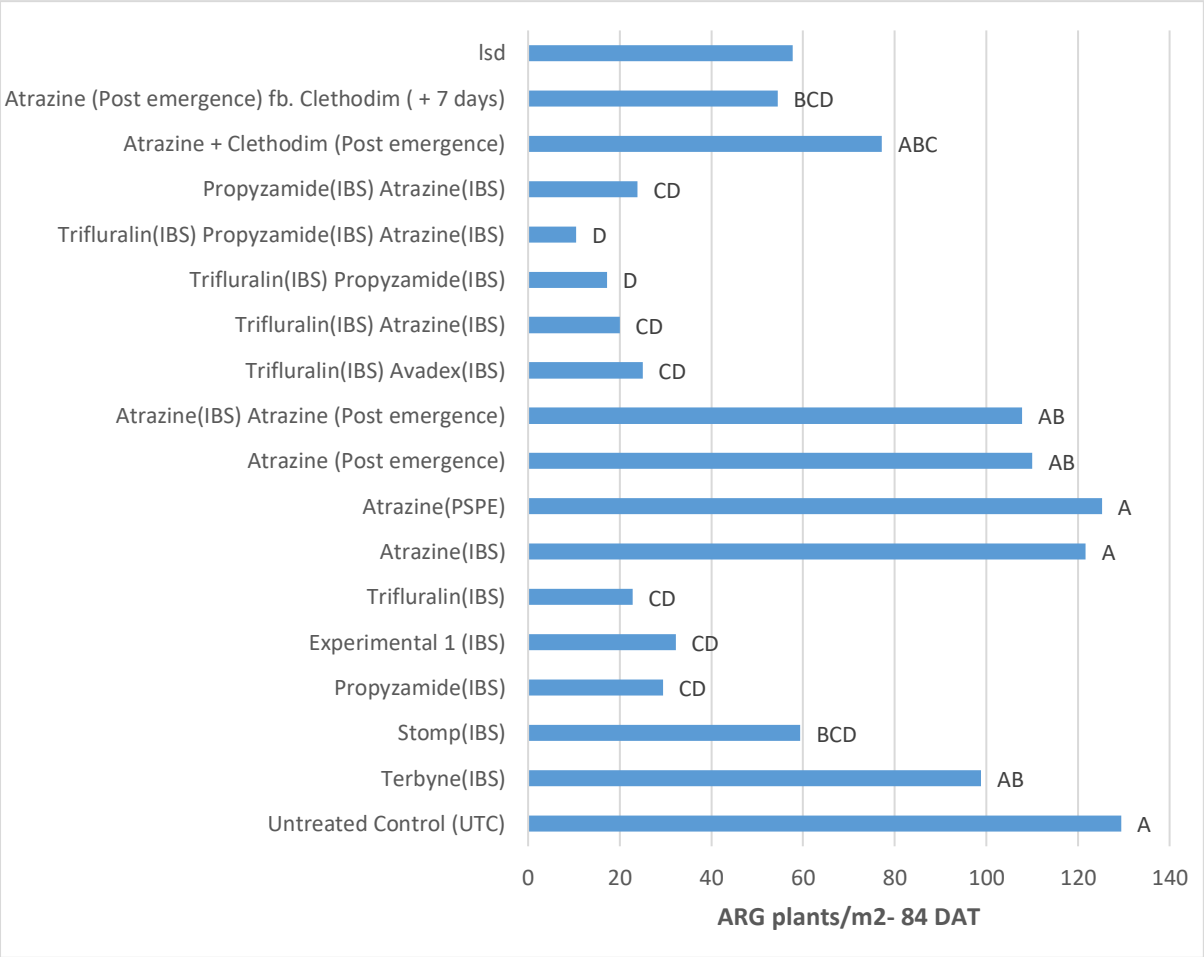

Figure 1. Annual Ryegrass populations 84 days after treatment in response to various herbicide options

The inclusion of clethodim in two 'standard practice' treatments decreased ARG population compared to the UTC. However, there was statistically no difference either including the clethodim in combination with the atrazine or applying separately seven days after the post emergent atrazine.

Conclusion

This trial has demonstrated that the use of pre-emergent herbicides can reduce ARG populations which in turn will reduce the 'pressure' growers would be applying for the development of resistance to clethodim when used to control these lower populations.

This trial has demonstrated that the commonly used herbicide atrazine arguably did not provide any level of ARG control. Alternatively, a number of alternate registered single chemistry options such as trifluralin or propyzamide were more effective and would not restrict growers to growing triazine tolerant varieties only.

The trial also identified a number of tank mix options that demonstrated robust levels of ARG control and would likely offer a broader spectrum of weed control than the single product options.

There appeared to be little influence on the final ARG control regardless of when the clethodim was applied- either in a tank mix or delayed for 7 days and applied in a separate pass.

In consideration of the use of alternative pre-emergent options growers and advisors should base their choices on more than the results of just this one trial and are encouraged only to use these options are part of a wider integrated weed control strategy.

Acknowledgements

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