

Better pre-emergent herbicides to reduce annual ryegrass in Chickpeas

Trial Code: GOWE02414-3
Date: Winter 2014
Location: "Eiram" Curban, 19km NW of Gilgandra, NSW
Collaborators: Thomas family

Background

Annual ryegrass (ARG) is currently developing herbicide resistance to many in-crop herbicides and in a lot of cases to multiple modes of action across the Orana Region¹. In many paddocks, most of the Group A 'Fop' herbicides are no longer effective nor are the common Group B herbicides such as Logran®. As a result, on many farms the ARG population levels are increasing through the cereal phase of crop rotations. Due to this, the aim has become to reduce grass weed numbers in the broadleaf phases with products such as clethodim², which has traditionally exhibited less resistance.

However, in the recent herbicide resistance survey undertaken by GOA in the Central West of NSW it was revealed 22% of ARG samples submitted demonstrated resistance to clethodim (and a number of other herbicides) and for many of these populations this leaves few effective alternative herbicide options. Therefore, the remaining effectiveness of this product must be protected to prolong its useful life and using it to control large dense populations of ARG may be exposing the product to excessive resistance selection pressure.

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 option in achieving this is to improve the efficacy of any pre-emergent herbicide options used.

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

This trial concentrates upon a number of various pre-emergent herbicide options and assesses 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 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 average³ (Evans, 2015).

However, it should be remembered that information gained through 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.

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

² Common trade names include Select, Status, Platinum

³ 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

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.

In particular, a number of triazine herbicides such as atrazine and Terbyne® are treatments in this trial, these can only be used on canola varieties that are bred with triazine tolerance, use on other varieties could cause severe crop damage.

Aim

- Compare a range of pre-emergent options and their effectiveness to reduce the populations of ARG in chickpeas
If other weeds were present in the trial, assessments were made for treatment effectiveness in control

Methods

The trials used a replicated small plot randomised complete block design with 3 replicates. The trials were established in growers' paddocks where known ARG populations were expected.

Herbicide treatments were applied ahead of growers sowing equipment by ATV mounted boom and incorporated by the growers' equipment at sowing. PSPE applications were applied as soon as possible after sowing.

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

Table 1. Trial site details

Sowing date	20 th May, 2014
Variety and seeding rate	PBA Hatrick @ 70 kg/ha
Seedling equipment	John Deere tine seeder fitted with knife point and press wheels, 12-inch spacing
Soil type	Grey vertisol
Paddock history	Wheat 2013, light stubble- full retention

Table 2. Herbicide treatment, application timing and rates applied

Treatment		Rate/ha (g/mL)
1	Untreated Control (UTC)	nil
2	Trifluralin (IBS)	1700
3	Trifluralin + simazine (IBS)	1700 + 1100
4	Trifluralin + Terbyne® (IBS)	1700 + 1000
5	Simazine (IBS)	1100
6	Trifluralin + Diuron (IBS)	1250 + 1100
7	Trifluralin + Avadex Xtra® (IBS)	1700 + 1600
8	Trifluralin (IBS) + Experimental 1 (PSPE) ⁴	1.700 + 1000
9	Simazine + diuron (IBS)	1100 + 1100
10	Terbyne® (IBS)	1000
11	Outlook® (IBS)	1000
12	Outlook® + simazine (IBS)	1000 + 1100
13	Simazine + trifluralin + Avadex Xtra® (IBS)	1100 + 1700 + 1600
14	Boxer Gold® (IBS)	2500
15	Boxer Gold® + trifluralin (IBS)	2500 + 800
16	Simazine + Balance® (PSPE)	1000 + 100
17	Trifluralin (IBS) + simazine (PSPE) + Experimental 1 (PSPE)	1700 + 1100 + 1000
18	Trifluralin (IBS) + simazine (PSPE) + Balance® (PSPE)	1700 + 1000 & 100

IBS- Incorporated by sowing, PSPE- post sowing pre-emergent

Table 3. Herbicide application details for IBS and PSPE treatments

IBS	Date Applied	19/05/2014	Temp	Wind vel.	Wind Dir.	Humidity
	Start time	11.00 a.m.	25°C	3-14 km/h	W	42.7%
	Finish Time	1.40 p.m.	Δt	8	% Cloud	0
	Water rate	100 L/ha	Nozzle	AIXR015	Pressure	3 bar
	Equipment	ATV	Speed km/hr	7		
PSPE	Date Applied	28/05/2014	Temp	Wind vel.	Wind Dir.	Humidity
	Start time	11.30 a.m.	23.7°C	3-11 km/h	NW	42%
	Finish Time	12.30 p.m.	Δt	8	% Cloud	5
	Water rate	100 L/ha	Nozzle	AITT015	Pressure	3 bar
	Equipment	ATV	Speed km/hr	7		

NB the paddock was sown early morning on the 20/5/14 and the PSPE was delayed until the 28/5/14- no rain had fallen since application and Chickpeas had not yet emerged at the time of spraying.

⁴ Experimental 1 is a Group D herbicide which may in future become registered in Chickpeas
GOWE02414-3 ARG PreEm Chickpeas - Curban.docx

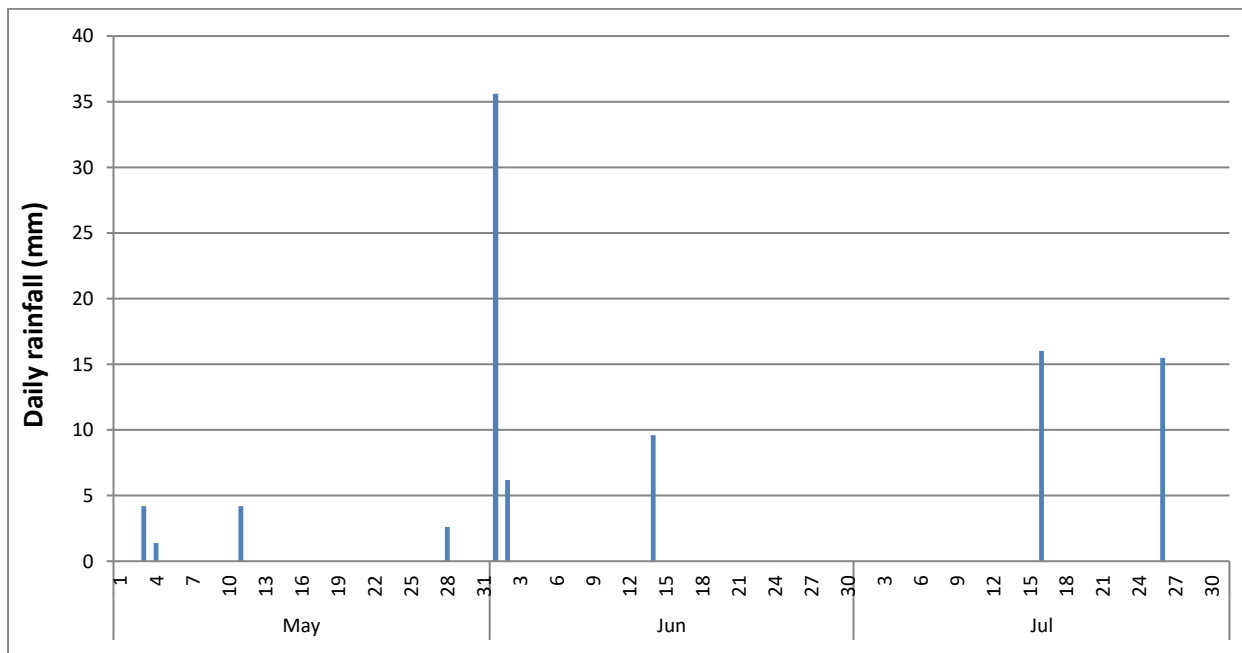


Figure 1. Daily rainfall from May till July at Curban BOM site, 2014

Results

There was no statistically significant impact on crop establishment by the different treatments compared to the UTC.

All treatments applied resulted in a significant reduction in ARG populations 50 days after sowing (DAS). This was reflected in the assessment made 86 DAS where the percentage control was significantly improved over the UTC.

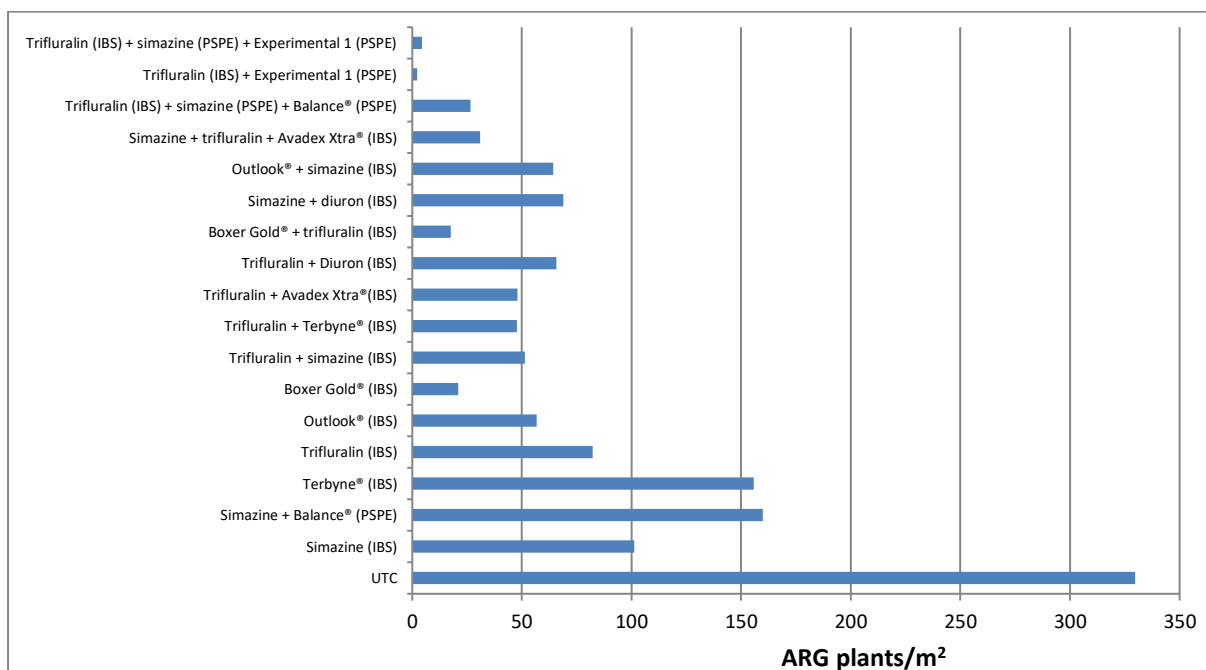


Figure 2. ARG populations 50 days after application in response to various pre-emergent herbicide treatments. LSD = 16

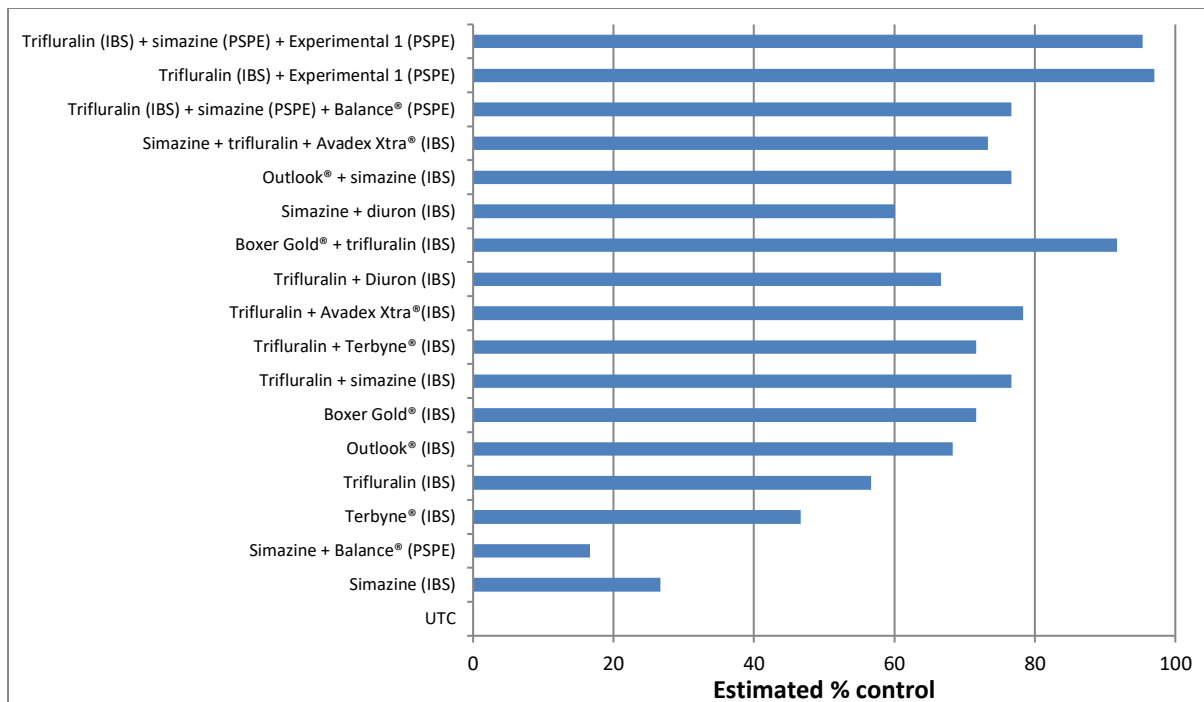


Figure 3. Estimated percentage control of ARG 86 days after application in response to various pre-emergent herbicide treatments. LSD = 16.22

Discussion

The commonly used or standard, pre-emergent herbicide program of simazine alone or in combination with Balance® in this trial reduced ARG populations from a very large population of over 300 plants/m² down to 100 and 160 plants/m² respectively when assessed at 50 DAS. The use of Terbyne® resulted in statistically similar outcomes at 50 DAS but estimated percent control at 86 DAS was better than both simazine with or without Balance®.

In comparison the other single product strategies approaches such as trifluralin, Boxer Gold® and Outlook® all offered better control of ARG than simazine with or without Balance®. Boxer Gold® was the best performing single product but it still only achieved an estimated 72% control at 86 DAS.

The remaining treatments which are combinations all performed better than the standard but there were differences between them as can be seen in both Figure 2 and

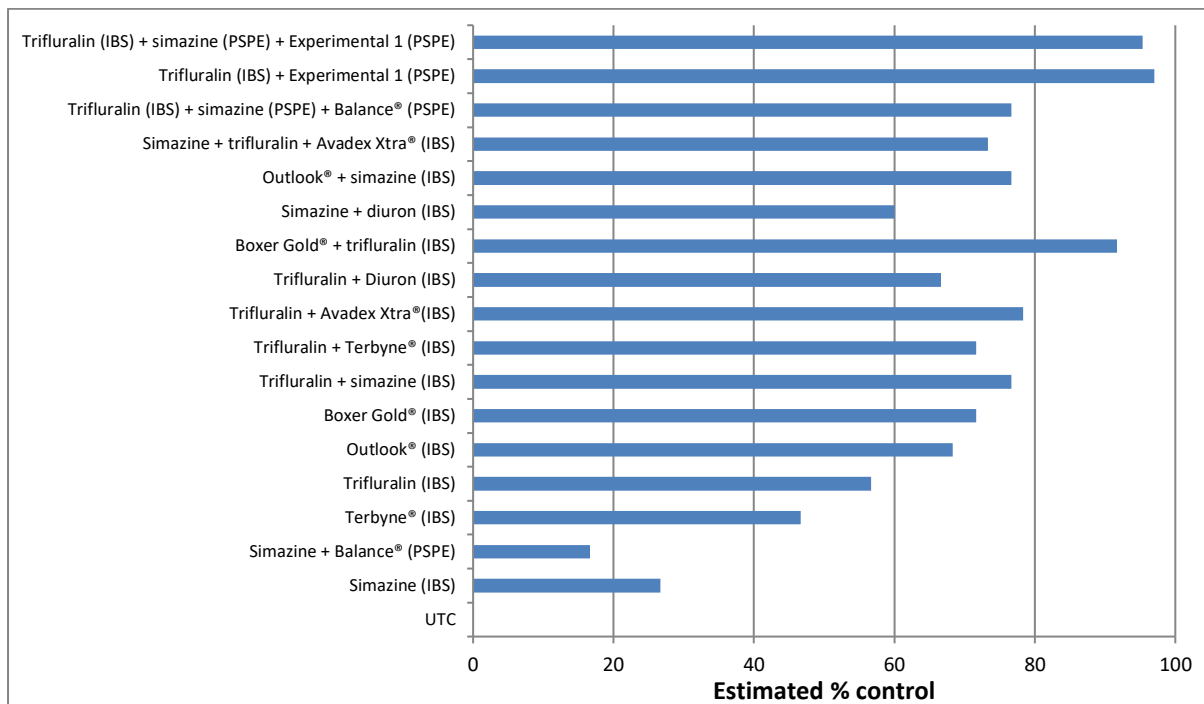


Figure 3.

It is worth noting that the addition of trifluralin to most products resulted in lower ARG numbers and improved control. The combination of trifluralin and Experimental 1 or trifluralin, simazine and Experimental 1 were the best performing treatments with estimated control of 97% and 95% respectively at 86 DAS. These options effectively reduced the untreated population of ARG of 330 plants/m², to only 2-4 plants/m².

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 in the development of resistance to clethodim.

This trial has also shown that the commonly used option of just simazine or simazine with Balance® only achieved control of 17-27%. This trial also exhibited that there are a number of other potential alternates that offer increased effectiveness in reducing ARG number. A number of alternate single pass options such as trifluralin or Boxer Gold® were more effective but with the later achieving the best control of only 72% control.

This trial also established the potential for improved control can be achieved through combining a number of products. The simple addition of trifluralin to many products improved their effectiveness and might be more economical in some instances.

However, the addition of Experimental 1 in a number of mixes showed the highest levels of control achieved in this trial that certainly warrant further investigation.

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 factors including;

- What other weeds are present and the effectiveness of the alternatives are on these?

GOA Trial Site Report

- 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

GOA would like to thank the Thomas family of Curban for their hosting of this trial.