GOA Site Report

Better pre-emergent herbicides to reduce annual ryegrass in Chickpeas

Trial Code: GOWE02414-2

Date: Winter 2014

Location: 'Long Plain' Narromine, 36 km SW Narromine NSW

Collaborators: The Tink 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 Region[1]. 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 clethodim[2], 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 average[3] (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

[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

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

- Compare a range of pre-emergent options and their effectiveness to reduce the populations of annual ryegrass in chickpeas.
- If other weeds are present in the trial assess the treatments for their effectiveness to control them

Methods

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

Seeding date	19th May 2014
Variety and seeding rate	PBA Hatrick @ 80 kg/ha
Seedling equipment	NDF disc seeder 15" spacing
Soil type	Red Clay loam
Paddock history	Wheat 2013, light stubble- fully retained

Table 2. Herbicide treatment, application timing and rates applied

Treatment	Rate (mL or g/ha)
Untreated Control (UTC)	n/a
Trifluralin (IBS)	1700
Trifluralin + simazine (IBS)	1700 + 1100
Trifluralin + Terbyne™ (IBS)	1700 + 1000
Simazine (IBS)	1100
Trifluralin + diuron (IBS)	1250 + 1100
Trifluralin + Avadex Xtra® (IBS)	1700 + 1600
Trifluralin + Experimental 1 (PSPE)[4]	1700 + 1000
Simazine + diuron (IBS)	1100 + 1100
Terbyne™ (IBS)	1000
Outlook® (IBS)	1000
Outlook® + simazine (IBS)	1000 + 1100
Simazine + trifluralin + Avadex Xtra® (IBS)	1100 + 1700 & 1600
Boxer Gold® (IBS)	2500
Boxer Gold® + trifluralin (IBS)	2500 + 800
Simazine + Balance® (PSPE)	1000 + 100
Trifluralin (IBS) + simazine (PSPE) + Experimental 1 (PSPE)	1700 + 1100 + 1000
Trifluralin (IBS) + simazine (PSPE) + Balance® (PSPE)	1700 + 1000 + 100

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

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

Table 3. Herbicide application details for IBS and PSPE treatments

IBS	**Date Applied**	16/05/2014	**Temp**	**Wind vel.**	**Wind Dir.**	**Humidity**
	Start time	4.15 p.m.	19°C	calm	-	30.5 %
	Finish Time	5.00 p.m.	**Δt**	6	**% Cloud**	5
	Water rate	100 L/ha	**Nozzle**	AITT015	**Pressure**	3 bar
	Equipment	ATV	**Speed km/h**	7		
PSPE	**Date Applied**	19/05/2014	**Temp**	**Wind vel.**	**Wind Dir.**	**Humidity**
	Start time	5.00 p.m.	25°C	calm	-	NR
	Finish Time	5.30 p.m.	**Δt**		**% Cloud**	
	Water rate	100 L/ha	**Nozzle**	AITT015	**Pressure**	3 bar
	Equipment	ATV	**Speed km/h**	7		

NB the paddock was sown early morning on the 17/5/14 and the PSPE was delayed until the 19/5/14- no rain had fallen since first application and no chickpeas had emerged at the time of spraying.

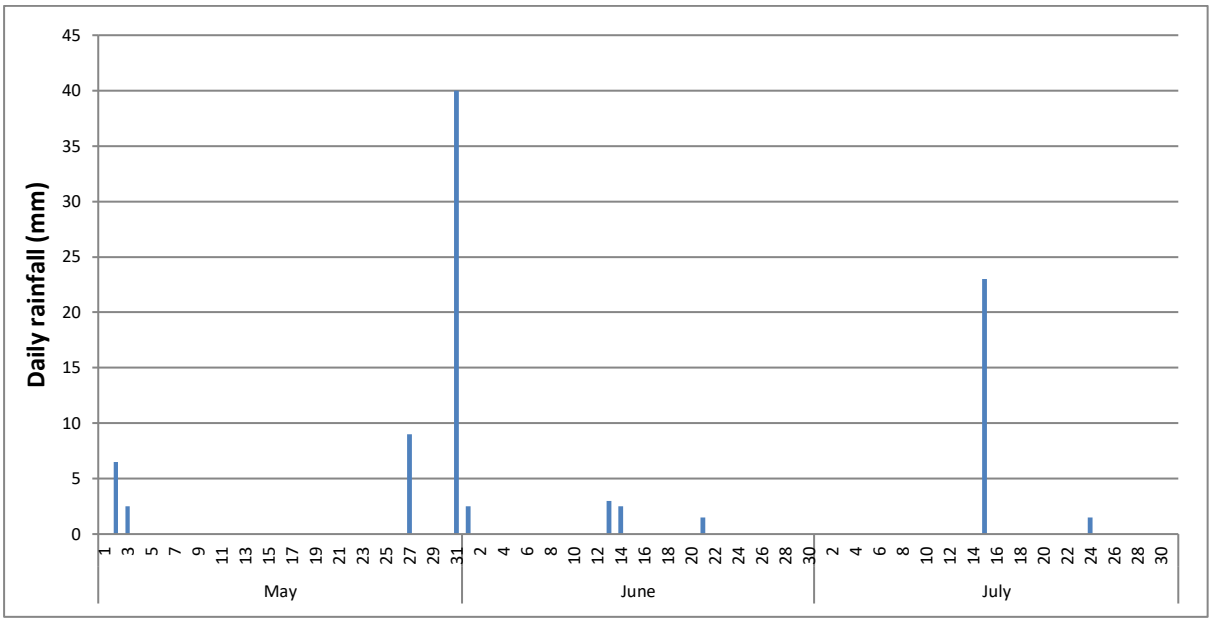

Figure 1. Daily rainfall from April till June at Narromine trial site, 2014

Results

There was no difference between any treatment for either the crop establishment or vigour rating 34 days after sowing (DAS).

All treatments except simazine + Balance® (PSPE) resulted in significantly lower ARG populations at the earliest assessment at 34 DAS (not shown). By 59 DAS (igure 2) all treatments resulted in statistically significantly lower ARG populations compared to the UTC. However, by 89 DAS (Figure 3) the treatments Trifluralin, Terbyne™, Boxer Gold® and Boxer Gold® + trifluralin showed the surviving weed population had recovered and had similar estimated weed biomass as the UTC.

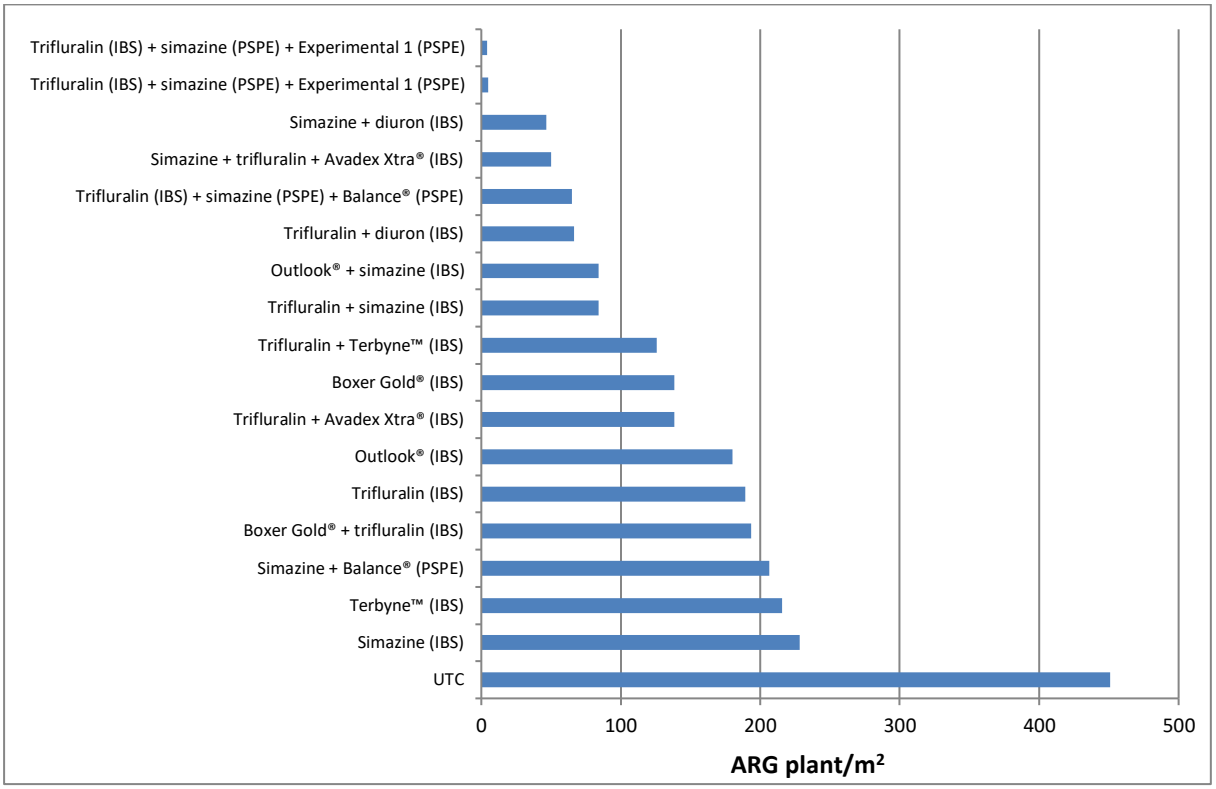

Figure 2. ARG populations 59 DAS in response to various pre-emergent herbicide treatments. LSD = 105

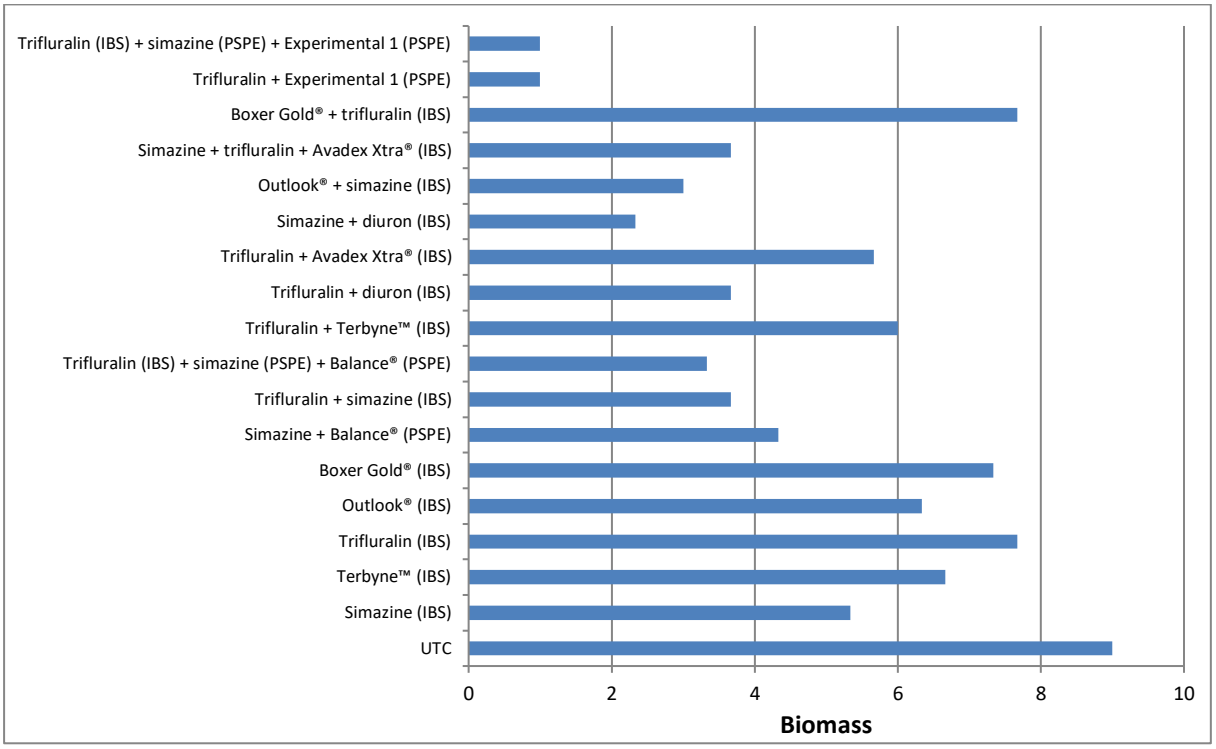

Figure 3. Estimated biomass of ARG 89 DAS on a scale of 1-10. (1 being negligible biomass and 10 being the maximum observed at the trial site) LSD = 2.33

Discussion

It should be noted that this trial was sown with an NDF disc seeder. Many of the tested pre-emergent's are both not registered for use with disc seeders and would not be expect to work well due to poor incorporation. A further consideration is that a disc system does not move as much herbicide from the plant row as a knife point and press wheel system. This could increase the risk of crop damage in some situations although minimal negative crop impact was observed in this trial.

In this trial the common district herbicide option of simazine + Balance® did not result in reduced ARG population as observed at 34 DAS compared to the UTC treatment. However, the treatment with simazine alone in this trial did result in lower ARG numbers. It can therefore be suspected that this is related to the application timing and incorporation of the simazine + Balance® treatment which was applied post sowing, pre-emergent compared to the simazine alone which was incorporated by sowing. It is suspected the mechanical, albeit limited with a disc seeder, incorporation may have advantaged the straight simazine treatment over that of the simazine + Balance® mix which required rainfall to allow incorporation and potentially activate the herbicide. This is possibly reinforced with the assessment at 89 DAS which showed similar level of control between the two options. The level of control achieved however was quite low at less than 50% control.

Terbyne™ was no more effective than simazine with or without Balance®, however, trifluralin, Outlook® or Boxer Gold® which seemed the most effective, resulted in reduced ARG populations at the earlier assessments though, these differences were not as evident at the later biomass assessment at 89 DAS.

A number of herbicide mixtures appear to offer improved earlier season control over that of the commonly used options of simazine or simazine and Balance®. Particularly, the tank mixes of trifluralin + Experimental 1 or trifluralin + simazine + Experimental 1 all of which resulted in good early season control which appears to have persisted through to the later assessments of 59 and 89 DAS. Both treatments reduced the ARG populations to less than 5 plant/m^2 at 59 DAS (or 99% control) which compares favourably against the ~450 plants/m^2 in the UTC.

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 populations.

This trial has demonstrated that the common practice of only simazine or simazine + Balance® only achieved ARG control of around 50%. This trial also showed that there a number other potential options that offer increased effectiveness in reducing ARG populations. A number of alternate single chemistry options such as trifluralin or Boxer Gold® were observed to be more effective in the later assessments achieving up to 70% control (though in this high ARG population pressure situation this result is less than ideal).

This trial also demonstrated the potential for improved control that can be achieved through combining a number of products. The simple addition of trifluralin to many products improved their effectiveness and may 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 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

GOA would like to thank the Tink family of Narromine for their hosting of this trial.