GOA Site Report

1 Alternate Milk Thistle Knock Down

Trail Code: GOAWE016151

Year/Date/Season: Summer 2015

Location: "Kurrajong Park" Coolah

1.1 Background

Common sowthistle or milk thistle is a becoming a significant weed in our farming systems for a number of reasons but might primarily include its adaption to a wide variety of growing environments, prolific seeding rate and its ability to germinate almost any time of the year. In addition, sow thistle will not readily germinate and emerge from depth so the adoption of zero or minimal tillage systems that allow seedbanks to increase at or near the soil surface may have also allowed the weed to increase in its prevalence.

Currently glyphosate is the most common, primary herbicide used to control milk thistle in non-crop or fallow situations but it also is commonly used in conjunction (tank mixes) with a number of other herbicides aiming at improved control.

However there are concerns with the recent identification of glyphosate resistance that controlling this weed may become increasingly difficult as glyphosate becomes ineffective placing the burden for weed control onto tank mix partners. There are also concerns that our current system is over reliant on glyphosate as the primary herbicide to control sow thistle and that if we need to identify more effective tank mix options which may reduce or slow the rate of resistance development.

This trial has been designed to investigate what herbicide options might be effective at controlling sow thistle as stand-alone products, that is those with the ability to offer high levels of control in their own right. These products may still be used in conjunction with glyphosate as a tank mix but as a tank mix partner they will be effective at controlling any glyphosate resistant sow thistle plants present.

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.

1.2 Aims

This project has the following main aims:

1. Investigate alternatives to glyphosate for the knockdown of milk thistle
2. Determine the effectiveness of a double knock herbicide application.

From these findings effective herbicide options may be implemented in one of two ways

- Where glyphosate resistance has been identified, what options may be effective
- Where resistance is not present the inclusion of alternate effective products at full rates in control strategies may help slow the development of resistance.

1.3 Methods

These trials were a replicated small split plot design. The main plot treatments are as listed in **Table 2** below and the split plot treatment was a double knock of paraquat at 2l/ha.

The trials were established in a commercial paddock were reasonable levels of milk thistle were present. The trial was established on the 13/2/2015 with application details listed below.

Table 1- Herbicide application details- Coolah 2015

Main plot treatments	**Date Applied**	13/02/2015	**Temp**	**Wind vel.**	**Wind Dir.**	**Humidity**
	Start time	9.30 am	29 ^{0} C	5 - 10 km/h	NNE	45.5%
	Finish Time	11.15 am	**Δt**	9.2	**% Cloud**	50%
	Water rate	100 l/ha	**Nozzle**	AIXR 015	**Pressure**	3 Bar
	Equipment	ATV	**Speed**	7 km/h		
Double knock treatment	**Date Applied**	4/03/2015	**Temp**	**Wind vel.**	**Wind Dir.**	**Humidity**
	Start time	9.00 am	20 ^{0} C	5 km/h	S	54%
	Finish Time	9.15 am	**Δt**	6	**% Cloud**	Nil
	Water rate	100 l/ha	**Nozzle**	LD015	**Pressure**	3 Bar
	Equipment	ATV	**Speed**	7 km/h		

Sow thistle present was close to flowering when the main treatments were applied, with plants about 0.9 to 1.3 m high, hence the boom was approximately 1.5 m of the ground.

Plant counts were conducted prior to application of the treatments to determine the density of milk thistles in the plots. Subsequently treatments were scored comparing the effectiveness of the treatments as compared to the untreated control (0) and complete control (9) on the 4/3, 13/3 and 26/3. Plant counts were also collected on the 26/3.

Table 2. Herbicides and rates applied as the main plot treatment, the split plot treatment was applied to half the plot area of 2 L/ha of paraquat

Herbicide Treatment	Rate (ml or g/ha)
UTC	Nil
Metsulfuron	5
Express	25
Oxyflourofen	37.5
Sharpen WG	26
Valor 500Wg	30
Precept	1000
Amicide Advance	1600
Grazon Extra	500
LVE Ester 680	800
Tordon Fallow Boss	300
Starane Advanced	600
Stinger + Starane Ad	14 + 600
Stinger	14
Paraquat	1600
Sprayseed	2400
Alliance	4000
Roundup DST	1600

1.4 Results

The sow thistle population at this site was quite variable across the trial area. Assessments and analysis were undertaken to try and account for this variability but it has resulted in a large CV (statistical variability) in the trial. However there is still a clear distinction in the relative effectiveness between treatments as detailed below.

The percentage kill of sow thistle after 41 days is shown in **Figure 1** below.

Only three products achieved over 80% control in the absence of the double knock shown as the blue bars- Alliance, paraquat and Sprayseed. The LV Ester 680 achieved around 70% control. All the remaining options achieved lower levels of control and were not significantly different to the UTC.

When a double knock of paraquat was applied the majority of treatments achieved 100% or close to-control. There was no significant difference between all the treatment and the UTC plus the double knock of paraquat except the LV Ester 680 which achieved 83% control.

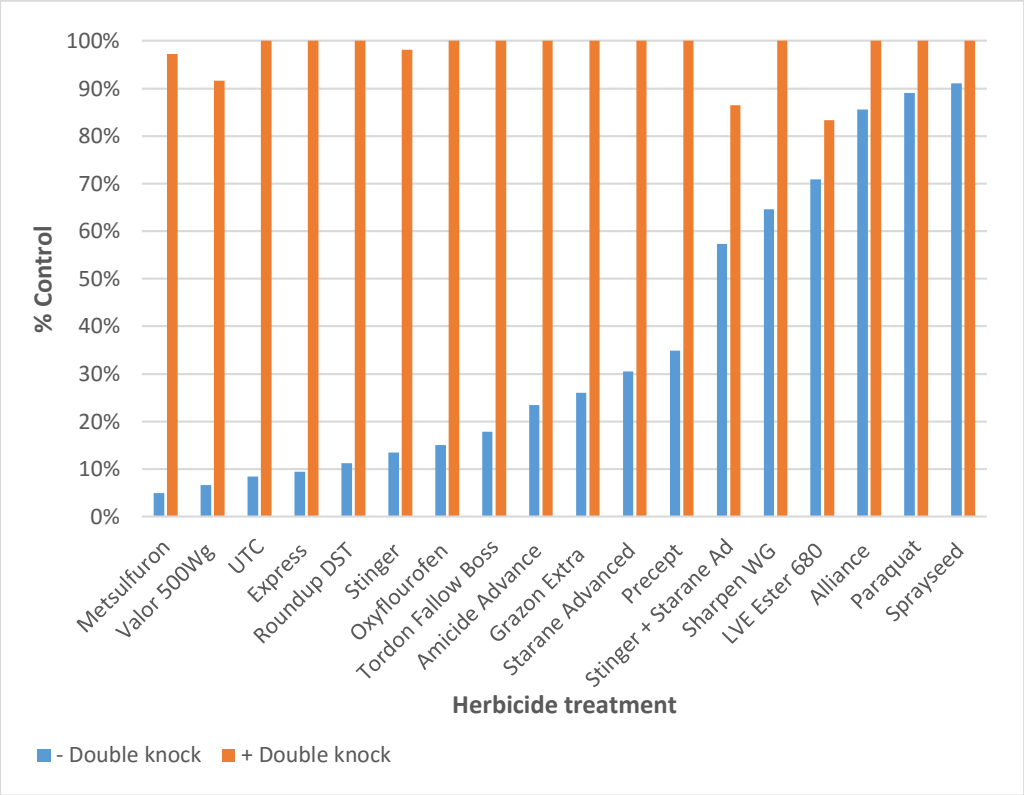

Figure 1. Sow thistle % control levels by various herbicide treatments with and without a double knock application paraquat 41 DAA.

1.5 Discussion

It should be acknowledged that the sow thistle present in this trial was large- elongating and approaching flowering in many cases and much larger than what should be ideally targeted in fallow applications. The performance of the options tested could have different outcomes if applied at growth stages different to those in this trial.

Only paraquat and Sprayseed achieved commercially acceptable level of control as single pass options achieving around 90% control. Alliance achieved slightly lower control at an average of 86% control although this was not statistically different to paraquat and Sprayseed. Alliance, a mix of paraquat and amitrole and Sprayseed, a mix of paraquat and diquat could suggested the paraquat component of both products may be responsible for the majority of the control offered by these options not so much the other two actives.

No other single pass option achieved greater than 80%, a level which commercially would be considered failure.

With the addition of the double knock treatment good levels of control were achieved even where the initial herbicide treatment was very poor with control levels as low as 10-20%. This suggests the second application was doing the majority of the knockdown, which is confirmed in the case of the double knock treatment applied over the UTC which received no initial treatment. In this case the control where the paraquat was applied as a double knock lifted control to 100%. This level of effectiveness is also reflected in the control of sow thistle in the single pass treatment with paraquat achieving 89% control.

It should be noted though the double knockdown application was applied much later than normally recommended at about 3 weeks after the initial treatment as opposed to ideally being about a week). And weeds were in the stem elongation to flowering stages. Paraquat or paraquat based herbicides in small plants in the rosette stage may behave differently.

It is unknown at this time as to the resistance status of the sow thistle at this site but the application of Round Up DST without a double knock provided no better control than the UTC. Where the double knock was applied 100% of plants were controlled.

Trial work by NGA[1] on sow thistle with known glyphosate resistance predictably found unsatisfactory control with glyphosate alone but this was on a population strongly suspected of resistance. However they did find that inclusion of tank mix partners such as Grazon and Tordon, with glyphosate applications improved control but these products did not provide as good as control when applied alone suggesting the glyphosate is still providing some value despite the presence of resistance.

1.6 Conclusion

A number of herbicides have proved in this trial to be effective alternates to control larger sow thistle plants. Sprayseed, Alliance and paraquat all achieved around 90% control as single pass options. However there was no other stand-alone herbicide option identified that would be considered commercially effective at controlling the larger sow thistle present at this site. It again should be noted that the performance of the options tested however may be different if applied to younger or smaller weeds.

Further research could be considered to investigate whether tank mixing alternate single pass options with or without glyphosate in known glyphosate tolerant populations to see if there is any synergies possible even when glyphosate should be ineffective as resistance is present.

The addition of a DK of paraquat increased the effectiveness of nearly all the first pass treatments but as discussed above this was mostly due to the effectiveness of paraquat alone and may have had little to do with the initial product choice.

It could be interpreted then that paraquat based options are the best alternate identified in this trial but as a contact herbicide close attention should be made to ensure good coverage and consideration if paraquat herbicides are going to be effective on other weeds present.

An alternate conclusion from this trial is that using paraquat based products as a double knock option could be very useful in controlling any glyphosate resistant sow thistle surviving early application of glyphosate based tank mixes targeted to control the other weeds present at spraying.

1.7 Acknowledgement

GOA would like to thank Paspaley Rural for hosting this trial at Kurrajong Park.

[1] Unpublished data