AN EVALUATION OF HERBICIDES FOR THE CONTROL OF POST-EMERGENT WEEDS IN COTTON USING SHIELDED SPRAYERS

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Abstract

Glyphosate is the single most commonly used herbicide applied through shielded sprayers for controlling post-emergent weeds. A number of weeds are becoming tolerant to Glyphosate, forcing farmers to increase rates in order to achieve acceptable commercial control. Using higher rates of Glyphosate increases the risk of crop damage and subsequent yield loss when drift occurs. A number of alternative herbicides were evaluated to determine the potential for their use through shielded sprayers. We evaluated weed efficacy and crop safety for cotton.

Wet seasonal conditions meant that the chemical treatments were delayed and consequently applied to large weeds. We noted that the shield designs we have available, are not well suited to large weeds. The shield limits coverage to approximately 80cm of the inter-row, meaning that herbicide efficacy in the whole inter-row area was variable. It also highlights the importance of using effective weed control options within the cotton row.

The result shows that the herbicides, BASTA® (Glufosinate) and PLEDGE®(Flumioxazin) may have a role in weed control through shield sprayers. In addition the desiccant and non-translocated herbicides HAMMER® (Carfentrazone), SPRAYSEED® (Paraquat/Diquat) and BROMICIDE®/BUCTRIL® (Bromoxynil) struggled to control large weeds, but may have a fit in early weed control.

Introduction

The management of post-emergent weeds in cotton is critical for maximising yields and minimising marketing penalties.

While products like STAPLE® can be used "over the top" for controlling small weeds within the cotton row, growers have relied heavily on cultivation for controlling weeds in the inter-row space. With the push for reduced-tillage across all cropping systems however, there has been an increase in the use of shielded sprayers for controlling weeds between the cotton rows. To date Glyphosate has been the most common chemical used within shields.

However Glyphosate has poor efficacy on certain weeds at normal rates of use, for example Cowvine (*Ipomea lonchophylla*). There is a need to find alternative chemistry to use within shielded sprayers. This will also help to minimise the risk that targeted weeds may develop resistance to Glyphosate. There is an additional need for accuracy in the set-up of the shielded sprayer in order to minimise the chance of crop

damage due to the higher rates of non-selective herbicides. This will also be critical for the successful adoption of new technologies such as Round-Up Ready™ cotton.

The challenge is to identify a range of chemicals and a suitable shield configuration that will allow growers to practice reduced tillage in cotton while ensuring:

(1) Herbicide efficacy on a range of weeds
(2) Minimal crop damage
(3) A decrease in the risk of developing resistant weeds.

Materials and Method

A replicated trial was conducted in an irrigated cotton block near Dalby, Queensland. The trial site received approximately 320mm of rain from mid October to mid December 2001. This meant that machinery could not be put into operation until late December, and by the time the treatments were applied, the weeds had reached maturity.

The target weed species were Caltrop or Yellowvine (*Tribulus terrestris*), Volunteer Mungbean (*Vigna radiata*) and Bathurst Burr (*Xanthium spinosum*).

The spraying equipment consisted of a modified Red Ball shielded sprayer. Two individual 50L tanks with separate electric pumps were attached to the tool bar to give different treatments on either side of the sprayer. The plot consisted of 4 rows 30m in length with 3 replicates. One of the rows in each plot included a wheel track and was not used in the assessment. The plots were separated along the rows by an untreated buffer (the nozzles were closed off). This also acted as a control check near each plot. Weeds were mature and the population variable. Each shield covered 80cm of the inter-row and was fitted with 3 Tee Jet even flat fan 8001 nozzles; one at the top of the shield and two at a 45° angle facing inwards from the top of the sides. A total application volume of 134L/ha was applied at 3 bar (300 Kpa) pressure. The tractor speed was 8 km/hr.

The treatments were applied on December 20, 2001. The crop was 50cm in height and at the time of spraying the temperature was 34°C and the relative humidity was 36%. Sub-soil moisture was very good with the surface dry. A variable cross wind varying from 3.5 to 7.7 km/hr was present from the North West with no cloud cover.

The assessment consisted of the percentage weed damage from the treatments when compared to nearby untreated control plots. Only the centre two rows of the plots were use for evaluation, and buffer areas were allowed at the start and end of each plot. Only those weeds with sufficient population throughout the trial area were recorded. The assessments were conducted at both 7 and 21 days after application.

Results & Discussion

Table 1: The percentage weed control from herbicides being evaluated for post-emergent use with shield sprayers in cotton

Treatments	% weed control (mean of 3 replicates)					
	Caltrop (*Tribulus terrestris*)		**Volunteer Mungbean** (*Vigna radiata*)		**Bathurst Burr** (*Xanthium spinosum*)	
	7 DAT	**21 DAT***	**7 DAT**	**21 DAT***	**7 DAT**	**21 DAT***
Round Up Max®1.8L/ha (registered >20cm crop height 670mL-1.3L/ha in shields)	100	100	73	60	80	85
Round Up Max® 1.8L/ha + Hammer® (Carfentrazone) 120mL/ha (not registered in cotton)	43	10	40	3	32	0
Basta® 4L/ha (not registered in cotton)	92	95	83	97	82	100
Bromicide®/Buctril®1.4L (not registered in cotton)	50	37	13	37	10	40
Pledge® 180g/ha + Hasten® 1% (not registered in cotton)	87	73	87	67	98	67
Sprayseed® 1.6L/ha (combination with Diquat not registered in shields)	100	87	75	60	87	50
LSD 5%	41	NS	26	NS	48	NS

DAT = Days After Treatment NS = Not significant at the 5% level (due to variability in efficacy)

* The following results include regrowth and should be used as a guide only. The results of survivors were too variable for analysis due to the regrowth occurring from incomplete coverage near the crop row.

From the results in Table 1 it is evident that the desiccant and non-translocated herbicides (Hammer®, Sprayseed® and Bromicide®/Buctril®) were not able to control large weeds. This was very obvious on species with vine-like growth habits, where branches were burnt off, but the plant continued to grow from the crown near the crop row. Getting complete coverage of large weeds using the current shield design was very difficult. It could be expected that if the target weeds had been smaller, these products would be a viable alternative to Glyphosate.

It appears as if the use of Hammer® under hot conditions (>30°C) tends to burn the leaf, reducing the translocation of Glyphosate. Hammer® is a new herbicide and we have little experience with it, therefore the result in the table is not a reflection of its potential ability. It is important therefore to understand the mode of action of each herbicide, and consider its suitability given the prevailing climactic conditions.

There was a limited population of Cowvine (*Ipomea lonchophylla*) within the trial area, but it was noted that both Basta® and Pledge® gave better control of this weed then Glyphosate.

The presence of crop damage was mostly limited to stopping and turning areas. Overall the middle section of the plot showed little crop damage, indicating that the shield was working effectively with the test products. This would suggest that alternative herbicides are available to help deal with a range of problem weeds in the inter-row area. Since many of these weeds often grow faster then the crop, a more detailed evaluation is required for herbicide management on young cotton.

Conclusion

Shielded sprayers should not be viewed as a stand alone method of weed control. Total paddock weed control relies on early treatments of small weeds within the row, with either a residual pre-emergent herbicide, an early post-emergent like Staple® or the use Round Up Ready™ crops. This is done in combination with shielded spraying of actively growing weeds in the inter-row space.

Cotton growers need to be able to use herbicides other then Glyphosate to ensure efficacy on a range of weeds. Products such as Basta® and Pledge® may have a role in controlling post-emergent weeds in cotton, when used in a shielded sprayer.

Shields need to be accurately configured to avoid crop damage, and ensure adequate coverage of weeds.

It is essential to have an understanding of the "mode of action" of any herbicide in determining its likely efficacy under a range of environmental conditions.

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