Improving summer weed control in dryland cropping systems through targeted research and extension

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Abstract

Summer weed control conserves soil moisture and nitrogen, and minimises the impact of Rhizoctonia in dryland winter cropping systems. Despite these quantifiable benefits, grain growers find summer weed control a difficult task due to stressed weeds and sub-optimal spraying conditions. Through the GRDC Agribusiness Extension program, a combination of field research, demonstration strips and utilisation of pre-existing industry knowledge was used to identify solutions to a number of summer weed control issues. The research component provided a focus for extension of this work and other established summer weed control guidelines to a wider audience of growers and advisors. Through this work, alternatives to 2,4-D Ester 800 were identified for common summer weed spectrums, solutions for dust minimisation were identified, cost effective herbicide mixes for marshmallow were refined and established guidelines for optimising summer weed control were reinforced.

Key words

Summer weed control, herbicide efficacy, spray application, research, extension

Introduction

Timely summer weed control in cropping regions conserves soil moisture and nutrients, prevents the build up of diseases such as Rhizoctonia prior to sowing the crop and prevents the build up of material that can block machinery during the sowing operation. These benefits translate into increases in yield and profit and are particularly beneficial in low to medium rainfall environments. Although the benefits are well documented, summer weed control is difficult to manage. Control by cultivation can lead to soil erosion and degradation of soil structure. Weed control failures with herbicides are common during summer, due to a combination of poor timeliness, difficult to control weed species, plants growing under stress and less than optimal spraying conditions (unsuitable delta T, high dust levels). The increased restriction on the use of ester-formulated herbicides and the recent escalation in glyphosate pricing has further reduced the choice of cost effective herbicides for summer weed control.

The GRDC funded Southern Agribusiness network provided the ideal platform to investigate low-cost strategies for summer weed control, as it allowed a conduit between several agribusiness organisations that would normally conduct their own summer weed control trials but rarely share the information. This project planned to build on that collective experience with a range of targeted research and extension activities aimed at improving summer weed control solutions.

Methods

In line with the objectives, the project focused on the five areas listed below using a combination of communication and field research activities:

- Low cost herbicide options and alternatives to 2,4-D Ester
- Difficult to control summer weeds: taming small flowered mallow (marshmallow)
- Optimising spray efficacy in summer: Dust reduction in wheel tracks
- Optimising spray efficacy in summer: Delta T red alert system
- Compilation of this and previous work to form summer weed management guidelines

Communication with the agribusiness community to establish project direction

One of the key aims of this project was to build on the collective experience and knowledge of the agribusiness community. Therefore, the opinions of a focus group of experienced agronomists and product manufacturers were gathered to form the outline of the initial experimental program. Furthermore, the Eureka Communication Network through Jon Lamb Communications was used to seek the input of 1600 consultants and agribusiness professionals.

Specifically, they were asked to:

- contribute ideas for treatments for low cost herbicide option field experiments
- complete a survey investigating methods for reducing dust problems when spraying
- contribute previous trial data and experience to establish summer weed management guidelines
- identify potential trial sites.

Field work

An experimental program consisting of replicated field trials was conducted. A demonstration program was conducted to complement the replicated trials. These sites were used to gather additional data for field walks.

Table 1: Details of replicated trials conducted during the project

Trial Name	Aim	Site Host & Location	Date Sprayed
Low cost herbicide options and alternatives to 2,4-D Ester.	To identify best bet low cost mixtures for common summer weeds including alternatives to 2,4-D Ester 800	Drumdale Pty Ltd, Banyena, Vic (Wimmera)	20/2/06
Difficult to control summer weeds: taming small flowered mallow (marshmallow) - 1.	To build on previous research to further refine herbicide combinations for the control of small flowered mallow	David Simpson, Berriwillock, Vic. (southern Mallee)	19/10/06
Difficult to control summer weeds: taming small flowered mallow (marshmallow) - 2. knockdowns adjuvants double knock	To compare herbicide combinations for efficacy against marshmallow To compare the effect of adjuvants against marshmallow To evaluate the 'double knock' approach for the control of marshmallow	Tullaree Pty Ltd, Gooroc, Vic (Wimmera)	12/4/07

The feasibility of using automatic weather stations coupled with SMS text messaging technology to alert spray operators to spraying conditions was also investigated (see Bormann et al. 2008).

Detailed methodology is presented in Stuchbery (2007).

Results

Detailed tables are presented in Stuchbery (2007).

Low cost herbicide options and alternatives to 2,4-D Ester

Both the demonstration and replicated trial indicated the value of robust application rates for summer weed control and in the case of heliotrope, highlighted the cost effectiveness of 1.5-2L/ha glyphosate.

Spray.Seed was considered effective but expensive for the control of heliotrope, but is a commonly recommended herbicide for use on stressed heliotrope.

Increasing the rate of phenoxy herbicide in the mix with glyphosate was detrimental to heliotrope control, which is consistent with industry experience. The manufacturers of 2,4-D Ester 800 suggest that 2,4-D Ester 800 should not exceed one third of the glyphosate rate. This converts to no more than 390ml/ha LV Ester 680 per 1L/ha glyphosate.

For paddy melon, 1.5L/ha glyphosate + 80ml/ha Garlon and 2L/ha glyphosate provided acceptable control, again illustrating the value of robust glyphosate rates and an appropriate spike depending on the target species.

Using robust rates of glyphosate and moderate rates of spike herbicides may be more cost effective than using a moderate glyphosate rate and increasing the spike rate.

Herbicide options for marshmallow control

The following conclusions are drawn from this project, commercial experience and previous research:

- Commercially acceptable control of marshmallow greater than 10cm diameter is difficult, therefore early control is essential.
- Ammonium sulphate must always be added to the herbicide mix regardless of water quality.
- Inclusion of a phenoxy herbicide (2,4-D Ester or Surpass) is essential and is better value for money than increasing the glyphosate rate or the Group G spike rate.
- Glyphosate 450 rates must be at least 1.5L/ha. There is marginal improvement in control at rates higher than this.
- Goal has slower initial activity than Hammer but plants treated with Hammer have a tendency to regrow.
- Spray.Seed with 2,4-D Ester can be effective on stressed marshmallow but there is a risk of regrowth if follow up rains occur.
- Spray.Seed applied as a double knock following glyphosate + ester improved control but the cost of this exercise must be considered.
- There was no benefit in applying a Group G herbicide with mineral oil in a separate application to glyphosate and 2,4-D Ester.
- 1.5L/ha Amine + 1% mineral oil shows promise for low cost marshmallow control in cases where the rest of the weed spectrum would be covered by this mix.
- Mixes containing Goal achieved more rapid brown out when either Fulvic Acid or vegetable oil derivatives was the adjuvant. Fulvic Acid should be investigated further as a low cost adjuvant when Goal is used as a spike.
- Mixes containing Hammer achieved more rapid brown out when either LI700 (soy phospholipid) or Supercharge (mineral oil based) was the adjuvant. Fulvic Acid and the vegetable oils performed poorly with Hammer.
- 1.5L/ha glyphosate + 400ml/ha LV Ester 600 + 75ml/ha Goal + 0.2% LI700 + 2% ammonium sulphate is a useful lower cost mix for good suppression of 10-50 cm diameter marshmallow and for good control of smaller marshmallow.

Dust reduction survey

The common findings from this survey were:

- Reduce speed
- Increase water volumes
- Use a medium to coarse droplet

- AI nozzles have proved effective for applying coarse droplets
- Spray early morning or at night, when dust is less likely and Delta T is optimum (2-10, preferably <8)
- Spray as soon as possible after rain events on young actively growing weeds
- Place extra nozzles either in front or behind wheels or both
- Use robust rates of herbicide and spikes or residuals where appropriate
- Add ammonium sulphate and either LI 700 or an oil
- Maximise stubble and ground cover
- Keep to previous tracks where possible
- Utilise guidance technology

Advancing the summer weed control message

The results from the surveys and field work were communicated to the agribusiness and grain grower community through a variety of sources. These are listed in Table 2.

The project has provided an opportunity to increase awareness and extend these messages to a wide audience including growers, agribusiness and private and public sector consultants. It also used a consultative approach in the design and implementation of the research and demonstration program to harness and extend the knowledge of others working in the industry.

Table 2: Communication and extension activities

Event	Location	Date	Estimated Attendance
John Stuchbery and Associates Client Update	Horsham	March 2006 March 2007	60 60
Ag Consulting Co Client Update	Ardrossan	April 2006	50
Birchip Cropping Group Field Day	Rupanyup	October 2006	300
Farm500 Discussion Groups	Nhill, Birchip, St Arnaud, Donald, Pyramid Hill	Several meetings 2006, 2007	70
Summer Weed Control Field Day	Dooen	February 2007	30
Summer Weed Control Training Day - Nufarm and Horsham Agritech Agronomists	Dooen	March 2007	10 agronomists
Victorian Independent Consultants Meeting	Swan Hill	January 2007	8 consulting firms
South Australian Independent Consultants Meeting	Adelaide	February 2007	10 consulting firms

Whilst the communication aspect of the project proved more difficult than first envisaged, it did encourage organisations to share information. The demonstration site was used as a training tool for both growers and advisors. One commercial advisor described the field day as one of the most useful days he had ever attended!

Conclusion

Through a combination of field research and consultation with industry and farmers, this project has further developed guidelines for summer weed control and then extended them to growers, agribusiness and private and public sector consultants. These guidelines cover herbicide application, appropriate spraying conditions, use of appropriate products and adjuvants, and utilising technology such as guidance and the new generation of nozzles to widen the application window. Where adopted, these guidelines will improve the effectiveness of summer weed control, resulting in increased production and improved returns for growers.

Whilst well-informed growers have received and acted upon summer weed control messages in recent years, there is still a considerable lack of understanding about the key messages, particularly that early timing is the most essential criteria for effective summer weed control. Extension activities need to continue to promote the key messages of early timing, appropriate product and adjuvant selection, spraying in appropriate conditions, travel speed, nozzle selection and coverage to further increase grower awareness and understanding.

References

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