HOW TO CONTROL WEEDS IN COTTON?

Nadeem Iqbal, Bhagirath S. Chauhan, Sudheesh Manalil and Steve Adkins
School of Agriculture and Food Sciences (SAFS), Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Gatton 4343, Australia

Introduction

Cotton (*Gossypium hirsutum L.*) is the most important commercial and fibre crop in the global market, covering an area of 2.5% of the world's arable land in over 100 countries. Weed are one of the most important biological constraints to the successful crop production and cause an estimated annual loss of $ 2.5 to $4.5 billion to Australian agriculture. Yield loss in cotton is in the range of 10-90% with an estimated opportunity production loss and on farm expenses of $173 million. Weeds can badly affect the growth, development, and yield of cotton crop by competing for space, light, water, and nutrients. Genetic modifications in crops have brought a significant revolution in the cotton industry and completely changed the weed management program to sole reliance on glyphosate. Such overuse of glyphosate has resulted in the evolution and development of glyphosate resistant (GR) weed populations. Currently, 37 GR weed species are recognized worldwide and this number is increasing on a daily basis. The present study is designed to address this burning issue.

Materials and Methods

The present study was carried out at the Gatton farm of the University of Queensland to evaluate the effects of different herbicides on weed control of GR cotton cultivar Roundup Ready 75 RRF during summer season of 2015–16 and 2016-17. Soil was a heavy loam with a pH of 7.48 and an organic matter content of 2.8 percent. The experiment was arranged in a randomised complete block design with three replications. Different treatments are given in Table. Irrigation was applied through a sprinkler system. First irrigation was applied right after planting and subsequent irrigations were adjusted according to the needs of the crop. Insects were controlled by using recommended insecticides. Weed density, weed biomass and seed cotton yield were recorded.

Table 1: Herbicides rates and timings used in the experiment

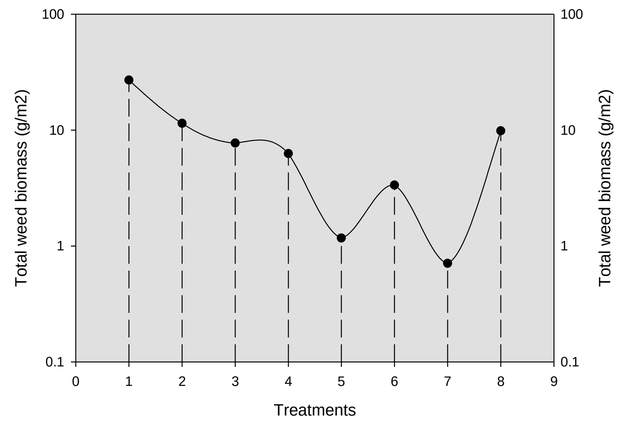
Herbicides	Trade names	Formulation	Application rate	Time of application
Glyphosate	Weedmaster DST	470 g ai L^{-1}	1034 g ai ha^{-1}	Post-emergent at 20 and 35 DAS
S-Metolachlor	Bouncer 960S	960 g ai L^{-1}	960 g ai ha^{-1}	Pre-emergent soil application
Pendimethalin	Rifle 440	440 g ai L^{-1}	1496 g ai ha^{-1}	Pre-emergent soil application
Haloxyfop	Verdict™ 520	520 g ai L^{-1}	78 g ai ha^{-1}	Post emergent at 20 DAS

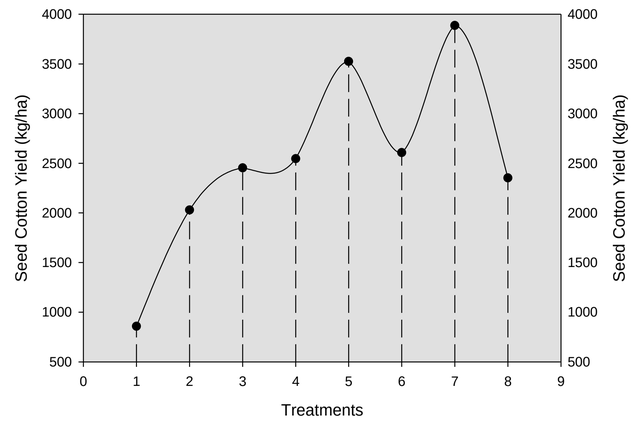
Table 2: Herbicides treatments

1	Weedy (Control)
2	Glyphosate applied once
3	Glyphosate applied twice
4	Glyphosate + metolachlor
5	Metolachlor
6	Glyphosate + pendimethalin
7	Pendimethalin
8	Glyphosate + haloxyfop

Results

Pre-emergence application of pendimethalin and metolachlor proved very effective in controlling all types of weeds and provided total weed biomass reduction of 97 and 96%, respectively, over control whereas glyphosate applied once and twice recorded weed biomass reduction of 58% and 71%, respectively and did not show any significant effect on the reduction of *Chloris virgata*. Seed cotton yield was also observed higher for pendimethalin and metolachlor. Pendimethalin and metolachlor treatments recorded an increase in seed cotton yield of 353 and 311%, respectively over the weedy control as compared to glyphosate applied once and twice (136 and 186%, respectively).





Weedy (control) treatment

Pendimethalin treatment

Conclusions

Results concluded that the pre-emergence application of pendimethalin and metolachlor provided more weed suppression throughout the growing season due to its residual soil effects. This was translated into more vigorous crop growth and development and ultimately higher cotton yields. In comparison, post-emergent applications of glyphosate either alone or in combination with other herbicides did not provide effective weed control and resulted in lower seed cotton yields. Glyphosate also showed poor efficacy on *Chloris virgata*.

Keeping in view these results, pre-emergence herbicides like pendimethalin and metolachlor should be included in the weed management program of glyphosate-tolerant cotton. In this way, pressure on the single reliance of glyphosate will decrease, which will help to slow the evolution of new glyphosate resistant populations.

References

Werth, J., D. Thornby, and S. Walker. 2011. Assessing weeds at risk of evolving glyphosate resistance in Australian sub-tropical glyphosate-resistant cotton systems. Crop and Pasture Science. 62:1002–1009.

Acknowledgements

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