Use of controlled traffic systems with auto-steer to enhance inter-row cropping and opportunities for introduction of non-chemical weed control systems.

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ABSTRACT

Controlled traffic systems and the use of +/- 2 cm auto-steer technology has paved the way for new weed management systems and opportunities for inter-cropping. Canola is considered a high-risk crop in low rainfall areas of Australia and the application of triazine or imidazoline herbicides on lighter textured soils in these low rainfall areas has significant plant-back implications. In 2004 an experiment was sown at Waikerie in the South Australian Mallee with triazine tolerant canola sown on alternate 28 cm rows to barley. Simazine herbicide was applied with shrouded sprayers over the canola row. Barley was the selected crop based on seasonal conditions. The inter-row canola was sprayed out with glyphosate in early spring. Crop establishment and barley grain yield of the inter-crop system was not significantly different from conventional sowing. The inter-cropping approach has been used in experiments sown in South Australia during 2005. Opportunities for use of inter-row cover crops and knife rolling technology will allow introduction of non-chemical weed control into a no-till and controlled traffic farming system. Comparison of the inter-row knife rolling system in contrast to the cover crop and knife rolling systems widely used in South America and its effectiveness compared to inter row tillage and shrouded chemical based weed control systems is discussed.

INTRODUCTION

There have been many technological advances in broad acre farming over the last decade. Reduced tillage systems have been a key part of this change, however the adoption of these changes for many farmers has not been altogether smooth. The issues of weed management in a no-till seeding system has continued to be a major issue for increased no-till adoption, particularly issues with increased dependence on herbicides as a major management strategy.

Controlled traffic systems and the use of +/- 2 cm auto-steer technology has paved the way for new weed management systems and opportunities for inter-cropping. Canola is considered a high-risk crop in low rainfall areas of Australia and the application of triazine or imidazoline herbicides on lighter textured soils in these low rainfall areas has significant plant-back implications.

METHODS

In 2004 an experiment was sown at Waikerie in the South Australian Mallee to look at ways of improving risk management of canola establishment in low rainfall environment using controlled traffic systems.

The principle was to give some options for sowing canola in a low rainfall environment without the problems associated with establishment failure. If the canola establishes properly and the season looks promising for a canola crop, then the barley would be sprayed out with glyphosate using a shrouded sprayer, retaining the canola for harvest. The canola has also been protected from wind erosion during establishment. If the canola establishment is poor due to dry conditions and the season looks poor, then the canola is sprayed out and the barley is kept and harvested. In this scenario, simazine has been sprayed over the TT canola rows only, so the barley can continue to grow during the current season with excellent inter-row weed control, and also plant-back issues due to herbicide residues can

be managed. The following years crop if sensitive to residual herbicide such as simazine, can be sown very close to the cereal barley stubble row using the same autosteer system.

This research used shrouded sprayers and +/- 2 cm autosteer mounted on a tractor to sow both canola and barley at the same time. The experiment was sown to barley or canola/barley on alternate 280 mm (11 inch) rows on the 30th July 2004. Simazine was sprayed at 1.18 kg/ha a.i. simazine over canola rows only on the 7 days later with a shrouded sprayer. Following very poor winter rains, the canola was sprayed out on the 21st September 2004 with Glyphosate at 1L/ha Roundup Powermax (540 g/l a.i. glyphosate) usine the same shrouded sprayer. This resulted with a barley row spacing of 563 mm (22 inches) on these plots. Harvest took place on the 25th November 2004

RESULTS

The resulting establishment and grain yield results for both systems were identical (Table 1). The grain yields were both very low due to the poor seasonal rainfall. Summer weeds were also suppressed in the plots sprayed with simazine post harvest.

Table 1. Alternate row cropping effects on barley establishment and grain production at Waikerie SA 2004.

	Plants/m^2	Yield (kg/ha)	Screenings (%)	Protein (%)
Barley 280 mm row spacing (11")	134.7	295	8.5	19.2
Barley sown with canola on alternate 563 mm row spacing (22")	135.9	308	8.0	18.5
LSD (P<0.05)	ns	ns	ns	0.2

RECENT WEED MANAGEMENT RESEARCH USING CONTROLLED TRAFFIC SYSTEMS

Following the successful autosteer research described above, SANTFA initiated further innovative weed management research using controlled traffic systems and autosteer. This research has been funded by the Australian Government Department of Agriculture Forestry & Fisheries, National Landcare Program through a Natural Resource Innovation Grant. The project 'Holistic use of chemical and non-chemical weed control methods in no-till farming systems' will demonstrate new ways of managing weeds in no-till farming, including non-chemical methods.

This project seeks to expand the methods of weed control to a more holistic approach to weed management which includes strategies of new and emerging IBS (incorporated by sowing) herbicides, more competitive crop varieties, cover cropping and the use of knife rolling technology which has been successfully adopted in Brazil in South America. Knife rolling is widely used in Brazil as a cost effective, non-chemical, non soil disturbing method of controlling weeds, often in combination with a cover crop (Derpsch, 2005). The US Department of Agriculture has published reports suggesting that this is a viable alternative method of weed control (Anon, 2002).

Recent developments in autosteer technology in Australia has meant that it is now feasible for farmers to use a combination of shrouded sprayers and/or non chemical knife rolling between the rows of the established crop. The use of cover cropping, non-chemical knife rolling and competitive crop technology in combination with more traditional chemical methods has created significant interest for established no-till farmers because of the advantages of better managing herbicide resistance. The

knife rolling trials of this project have been sown and managed using DGPS guidance and +/- 2cm auto steer systems and potentially other visual non-GPS row guidance systems. The trials incorporate treatments which have a cover crop sown every second row between the cereal row, including an indian mustard and saia oats.

These inter-row cover crops will be knife rolled down in late winter early spring before too much soil water is used and also provide effective non-chemical weed control on the inter-row. The following seasons crop will be sown with a disc seeder through the cover crop residue. Trials have been sown in 2005 on Yorke Peninsula, the Mid-North and Mallee regions of SA.

CONCLUSIONS

This research has demonstrated some very useful applications from the use of controlled traffic with +/-2 cm autosteer systems and the use of shrouded sprayers. The impact of wider plant row spacings and soil water competition from inter-row cover cropping is yet to be determined. Controlled traffic systems and the use of +/- 2 cm accuracy autosteer systems have given farmers the ability to significantly change their farming system to incorporate new weed management systems that will enable them to use pesticides in new ways with a higher degree of accuracy. This will enable farmers to potentially reduce the amount their dependence on pesticides or at the very least reduce pesticide costs. There will be significant issues for pesticide registration and label changes in the future as farmers and scientists begin to test the boundaries of what is possible with these systems.

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