

# The impact of Roundup Ready® canola on the Australian oilseed industry

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## ABSTRACT

Roundup Ready® canola provides farmers with a more flexible option for weed control in the canola phase of their crop rotation leading to improved sustainability and increased yield. The first limited commercial release of Roundup Ready canola in Australia during the 2008 season resulted in yield increases of 20% when Roundup Ready canola was compared with triazine tolerant canola and a 2% increase in oil content over all other herbicide tolerant systems. The level of weed control achieved using Roundup Ready canola was also rated as superior compared with other herbicide tolerant canola systems. These results mirror the Canadian experience with transgenic canola where higher yields and a more flexible and sustainable weed control system have led to rapid adoption of this technology. Uptake of Roundup Ready canola has the potential to increase the yield of canola, the area of canola grown in the rotation and provide benefits of supply consistency to the whole oilseeds industry in Australia.

**Key words:** Glyphosate, Herbicide Resistance, GMO.

## INTRODUCTION

In the Southern Australian cropping zone, one of the primary constraints to crop performance is the competition from weed species for light, nutrients and water. The use of an integrated weed management strategy to deliver a high level of weed control is vital to any long term sustainable cropping system. Canola is an important part of this strategy both for weed control and as a break crop from cereals in the cropping rotation. The move to reduced tillage systems has led to herbicides replacing cultivation for weed control in the cropping system (Norton and Roush, 2007) and herbicide tolerant canola has replaced conventional varieties in around 75% of the crop planted.

Although Roundup Ready canola was only available commercially in Australia for the first time in 2008, it has been grown successfully in Canada since 1995. In Canada the uptake of transgenic crops has been rapid with over 90% of the canola crop now being transgenic (O'Donovan et.al. 2006). A survey conducted by the Canola Council of Canada (2001) showed the key benefit and motivator for Canadian farmers adopting transgenic canola was efficient weed control and ease of herbicide resistance management. The ability to rotate between herbicide mode of action groups provided by both transgenic and other herbicide tolerant canola systems allows growers to reduce the selection pressure they put on a particular mode of action, improving herbicide resistance management. The survey also reported that Canadian growers found their transgenic systems more flexible, giving them the ability to control weeds in areas where a lack of options for effective weed control meant they had previously been unable to grow canola. Overall the adoption of transgenic canola by Canadian growers has resulted in an increase in canola production of 40% between 1996 and 2006 (Norton and Roush, 2007).

A survey of 92 Australian Roundup Ready canola growers was undertaken following the 2008 season to ascertain experiences with the technology and to rate the yields and level of weed control obtained with Roundup Ready canola when compared with other herbicide tolerant canola systems.

## RESULTS

The survey respondents (n= 92) reported large ranges in yield from 0.04 to 3 t/ha. The low yielding crops in this range were the result of growers harvesting frost damaged canola crops in some growing regions; the large range was common across the canola systems surveyed. The average yield of the Roundup Ready canola on farms where triazine tolerant canola was also grown (n=54) was 22% higher than the triazine tolerant yield (Fig 1), and on the farms were

both Roundup Ready canola and CLEARFIELD® canola were grown, (n=33) average Roundup Ready canola yield was 5% higher (Fig 2). There was on average a 2% higher oil content for Roundup Ready canola compared with both triazine tolerant and CLEARFIELD canola (Figs 1 and 2), with the oil content ranging from 30 – 49%.

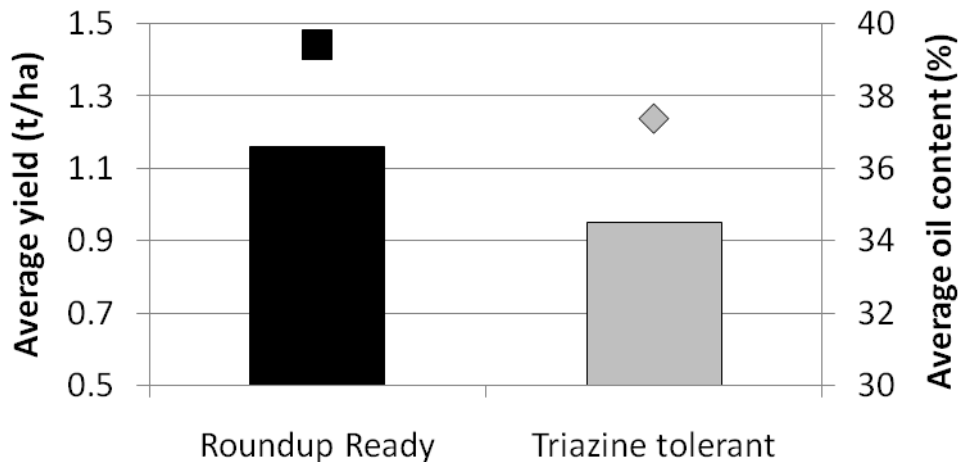


Fig. 1. Average yield and oil content of Roundup Ready and triazine tolerant canola from a survey of 2008 season Roundup Ready growers (N=54).

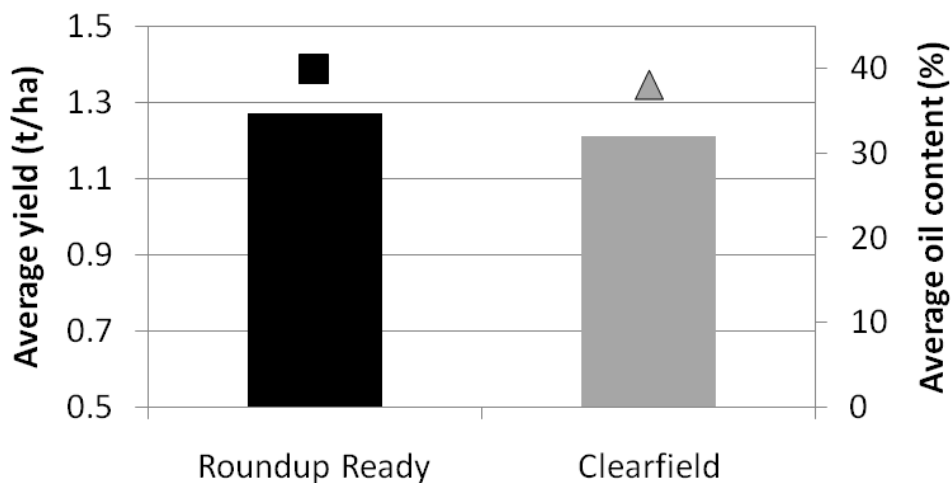


Fig. 2. Average yield and oil content of Roundup Ready and CLEARFIELD canola from a survey of 2008 season Roundup Ready growers (N=33).

Weediness, rated as percent coverage of weeds per meter square, of the canola paddock and level of weed control achieved was rated by the survey respondents. Despite a higher proportion of Roundup Ready canola being grown under a high weed burden situation (51% compared with 34% for triazine tolerant and 12% for CLEARFIELD) the level of weed control in Roundup Ready canola paddocks was rated as excellent by 93% of respondents (Fig 3).

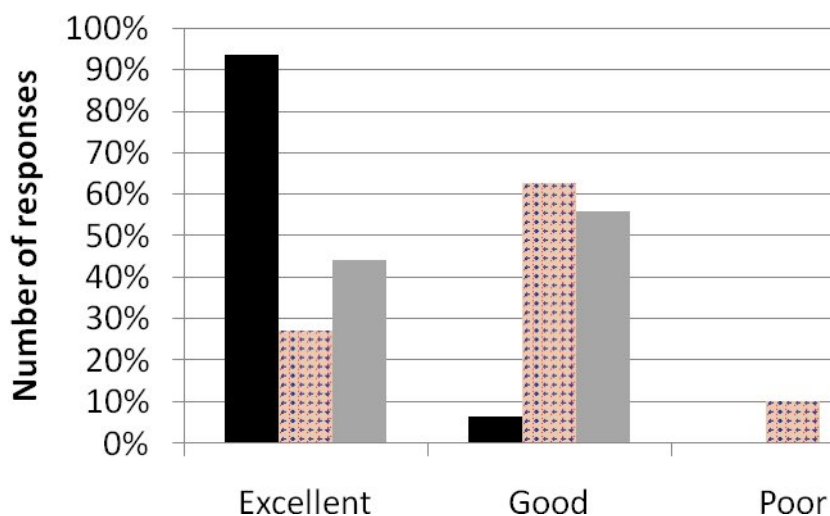


Fig. 3. Effectiveness of weed control in Roundup Ready (Black), triazine tolerant (Striped) and CLEARFIELD (Grey) herbicide tolerant systems (N=92) as rated by survey respondents.

### DISCUSSION

The 2008 limited commercial release of Roundup Ready canola delivered a number of benefits to growers and the Australian oilseed industry including up to 20% higher average yields than competitor herbicide resistant technologies, a 2% increase in oil content (on average) and levels of weed control that farmers have rated more favourably than competing herbicide tolerant canola systems. This corresponds with the experiences reported by Canadian growers where Roundup Ready canola now dominates the local market (Canola Council of Canada 2001, Phillips 2003). Since the introduction of transgenic canola in Canada in 1995 production has increased by 40%. It is expected that the introduction of GM canola in to the Australian market has the potential to have a similar impact on the Australian industry resulting in an increase in both the quantity and reliability of the supply of oil to the supply chain and a broader footprint for oilseeds in the crop rotation.

In addition to the weed control benefits of transgenic canola Canadians have also recognised risk management benefits including the ability to plant earlier and improved crop cleanliness (Phillips 2003). In Australia emergence date of canola has been identified as a limiting factor to canola yields (Lisson et.al. 2007) so the ability to plant earlier would be a major benefit in our environment. As Roundup Ready canola enables growers to plant into dry soil and control weeds after emergence, growers can plant before the break to maximise season length and utilise all available soil moisture. These benefits of herbicide tolerant systems can be difficult to quantify, however in Canada it has been concluded that the risk management benefit may actually outweigh the agronomic gains from transgenic herbicide tolerant technologies (Phillips 2003)

Holtzapffel et.al. (2007) suggested significant environmental benefits as a result of changing from the current Australian canola herbicide regimes to those recommended for Roundup Ready canola. Norton and Roush (2007), estimate that triazine use would decline by 632 tonnes if half of Australia's triazine tolerant canola and 40 per cent of conventional canola were replaced with GM canola thus illustrating the potential for environmental improvements in Australian canola production systems. Work conducted in Canada has shown a 50% reduction in herbicide active ingredient per unit area of crop with Roundup Ready technology. Additionally, as glyphosate (the active ingredient in Roundup) is tightly bound to the soil particle surface, experiments have shown that water passed through columns of Roundup treated soil contain no chemical residue (Phillips 2003) as opposed to the triazine chemicals that can stay active in the soil for longer periods of time (Norton and Roush 2007).

This lack of residual chemical will also benefit the crop rotation, Holtzapffel et.al. (2007) and Norton and Roush (2007) have suggested that yield increases in subsequent cereal crops, which currently can be adversely affected by triazine carry-over from canola crops, would be expected. This is supported by trial data from Monsanto (unpublished) which shows a 9% increase in wheat yield following Roundup Ready canola when compared with a triazine tolerant crop.

Roundup Ready canola provides benefits to the Australian oilseed industry from increased yield and oil content, flexibility in positioning canola in the rotation and through the ability to increase the amount of canola grown in the rotation due to improved weed control and the ability to sow dry in previously marginal areas. Through these benefits, Roundup Ready canola has the potential to provide greater stability for the Australian oilseeds industry. An experimental program is currently being undertaken to further quantify the benefits of Roundup Ready canola compared to other herbicide tolerant systems in the Australian environment.

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