

An adviser's view on GM canola

By John Stuchberry, Donald

better OILSEEDS

This review of the 2008 season experiences with GM canola has been compiled as part of the national *Better Oilseeds* project, an exciting initiative funded by the Grains Research and Development Corporation (GRDC) and the Australian Oilseeds Federation (AOF).

The *Better Oilseeds* project is addressing the urgent and critical need to lift the productivity of oilseed crops within Australia, specifically canola, sunflower and soybean, to ensure critical mass and consistency of production and to improve the quality of grain produced. The project began in 2006 and aims to increase the value of the Australian oilseeds industry through enhancing productivity and value.

A number of activities are encompassed within the project which includes practical on-farm demonstrations of pertinent agronomic issues for all three crops, field days and forums and grower case studies to share knowledge within the industry.

Watch for the release of further case study booklets – which will include technical information and case studies on sunflower and soybean growers from around Australia.

New GM canola booklet

The *Better Oilseeds* project has just published *GM Canola – Performances and experiences in 2008*. Information presented in the following articles is based on the many trial results, adviser comments and grower case studies presented in the 32 page booklet.

The booklet has been compiled by Felicity Pritchard, with help from Steve Marcroft, and edited by Don McCaffery, Trent Potter, Rosemary Richards, Maureen Cribb, Brondwen Maclean, Andreas Betzner and Juan Juttner. Contributing authors were Felicity Pritchard, Rohan Wardle, John Stuchbery, Kate Burke, Kirily Condon and Damian Jones.

The *Better Oilseeds* project is especially grateful to the GRDC and the AOF for funding. The compilers are also very grateful for the invaluable contribution of the many GM canola growers case-studied in the booklet.

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Commercial GM canola crops were grown in a range of climatic and physical environments across Victoria and southern NSW. A review of the challenging 2008 season has allowed us to identify and summarise the main strengths and weaknesses of the Roundup Ready system.

STRENGTHS

Grass control

The Roundup Ready system provided excellent control of grasses and of ryegrass resistant to selective herbicides. In cases where ryegrass was the main weed, two applications of Roundup Ready herbicide were required to maximise weed control.

Broadleaf weed control

In general, Roundup Ready herbicide had good efficacy on most weeds and the two application strategy generally provided the best overall weed control.

Dry sowing

The Roundup Ready system facilitates dry sowing or sowing on the break while still allowing for good in-crop weed control. Dry or early sowing makes the best use of the growing season rainfall and allows the crop to make the best use of the moisture available.



For the Roundup Ready canola system to be sustainable, management guidelines must be closely followed.

These factors have been critical to crop performance in the recent run of dry seasons and contributed to the good performance of the system in 2008.

Integrated weed management

The excellent grass control achieved with the Roundup Ready system means that this system will be a useful tool to incorporate into IWM programs targeting ryegrass that is resistant to selective herbicides. Using the Roundup Ready system in these situations will lead to a large reduction in ryegrass seed banks in one season.

Lack of herbicide residue

Lack of herbicide carryover to provide residual weed control will be an advantage in environments where herbicides applied to canola in the Clearfield and triazine tolerant systems can persist for long periods and damage crops in the following season.

WEAKNESSES

Timing of applications

The standard recommendation is to apply two applications of Roundup Ready herbicide at least two weeks apart and with the appearance of two new leaves between applications.

Roundup Ready herbicide can be applied up until the 6-leaf stage of the crop. Our experience was that the hybrids, in particular, reached the 6-leaf stage quickly

IN SUMMARY...

- Most growers were happy with their first experience with Roundup Ready canola.
- The system is very effective on grass weeds and can be used as part of an integrated weed management program.
- The system also facilitates dry and timely sowing.
- Returns are similar to the Clearfield system at equivalent yields.
- The lack of residual weed control and presence of weeds that are difficult to control with glyphosate, will limit the use of this system in some situations.
- If the system is misused it will increase the risk of developing resistance to glyphosate. So it is essential that advisers and growers adhere to management guidelines.

and regular monitoring was needed to ensure that the window was not missed. If two applications were planned, the first application had to be applied early so that sufficient time could elapse to apply the second dose while the crop was still at the correct growth stage.

There were cases where the first application was delayed and the crop was too advanced for the second application even though it would have been beneficial for weed control. There is also an issue with shading of small weeds if the crop is too advanced when herbicide is applied.

Lack of residual weed control

In contrast to the Clearfield and triazine tolerant canola systems, the Roundup Ready system does not provide control of late germinating weeds due to the lack of residual activity from the Roundup Ready herbicide. There were cases of late germinations of wild radish, toad rush, crassula, vetch and hogweed in commercial crops and trial strips.

It can be argued that a vigorous crop will compete with these weeds and that they have little impact on yield. But this is not desirable from a farm hygiene and weed management perspective if weeds such as

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AROUND THE 2008 GM CANOLA TRIALS

National Variety Trials: Forbes (Central West NSW) and Horsham (Victoria Wimmera)

- All Roundup Ready varieties produced yields not significantly different from the site mean yield.
- The highest yielding Roundup Ready varieties were not significantly different from the highest yielding TT and Clearfield varieties.
- A number of unreleased breeding lines were included in the trial and results suggest that there are promising breeding lines of Roundup Ready and Clearfield canola hybrids in the pipeline.

FarmLink canola systems trial: Wombat, southern NSW

- The best performing varieties were AV-Garnet and Hyola 502RR, but there was little difference between the two.

Irrigated variety trial: Kerang, Victoria

- Site mean yield was 3.54 t/ha
- AV-Garnet, Hyola 50, Hyola 502RR and 44C79 topped the trial.
- The top performing Clearfield and RR hybrids produced yields not significantly different from the two best conventional varieties.
- The TT varieties produced yields similar to the site mean, but the highest yielding TT variety yielded less than the two top varieties.

Better Canola demonstration: Rupanyup, Victoria (This was an unreplicated demonstration. As such yield data should be viewed with caution).

- Roundup Ready canola is a promising new tool for weed management with one open pollinated (OP) variety and three hybrids available to suit a range of growing environments. Choosing which herbicide tolerance system to use depends on:
 - Weed spectrum, presence of herbicide resistant weeds, herbicide group rotations, herbicide residue risks;
 - Variety suitability (maturity, blackleg resistance and oil %); and,
 - Cost of production.

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wild radish and vetch are allowed to set seed and populations build up. Also, weeds like hogweed can grow after the crop has matured, utilising moisture and nutrients, and can cause problems with seeding in the following season.

A side-benefit of the Clearfield and the triazine tolerant systems is that the chemicals persist and provide residual weed control into summer in some environments.

Tank mixes with Roundup Ready herbicide not registered

The lack of registration of tank mixes of other chemicals, such as clopyralid and insecticides with Roundup Ready herbicide means that these products should be applied in a separate operation. This causes logistical difficulties by putting extra demands on labour and the boom spray at a time of peak workload. Research is under-way for registration of tank mixes.

Efficacy on weeds

Roundup Ready herbicide worked well on most weeds, but can be weak on some weeds such as marshmallow and erodium. It is essential that these weeds are targeted when they are small or that an alternative system is considered if good control is not possible.

Glyphosate resistance

The incidence of resistance to glyphosate is on the rise and there is no doubt that this will be exacerbated if Roundup Ready technology is misused. It is essential that growers and advisers adhere to the guidelines outlined in the Roundup Ready technical manual and the Paddock Risk Assessment and Management Option Guide (PRAMOG) and adopt IWM practices to minimise this risk. ■

SOME FARMER CASE STUDIES

CASE STUDY 1

FARMERS

Peter and Alison Campbell, 'Avondale'.

LOCATION

Henty, NSW.

ENTERPRISES

Wheat, canola, triticale, lupins, 2800 self-replacing merino ewes, crossbred ewes for lamb production.

AVERAGE ANNUAL RAINFALL

550 mm.

Average GSR: Approx. 350 mm (Apr-Oct).
2008 GSR: 202 mm.

SOIL TYPE

Red brown earths and yellow podsolic soils.

SOIL pH

pH_{Ca} 4.7–5.5.

BACKGROUND

Peter has been farming since 1980, and started growing canola in the late 1980s, and now practices zero-till farming. Typical rotations are cropping phases of five to seven years, including canola, wheat, triticale, lupins and arrowleaf clover, and a pasture phase of three to five years. Annual ryegrass is the number one weed on the property. Other weed problems, such as capeweed and wild oats, are dependent on the year. On Peter's farm there is annual ryegrass with resistance to group A and B herbicides, although Select still works. Herbicide resistance management strategies used include hay cutting, silage production, double knock with disc seeder. The double knock is glyphosate pre-sowing, followed by paraquat (Gramox-one) before emergence, after sowing.

Peter's comments...

What did you gain from the RR canola training course?

I thought it was very good. It gave me a greater understanding of the technology and the genetics of resistance to herbicides. The main thing – that may not have been covered in detail in the accreditation course – was that I became more aware that you shouldn't use a Roundup Ready crop where there are high ryegrass numbers in the paddock.

How useful was the PRAMOG?

It was useful. It made sure I thought about the glyphosate resistance and how to tackle it and what extra steps to put in place. My paddocks were intermediate risk for glyphosate resistance. The PRAMOG stated that we could use Roundup Ready canola if we followed certain procedures, such as extra strategies for keeping ryegrass numbers low.

For us, it was using Spray.Seed as the knockdown for two years following the Roundup Ready crop. We could use trifluralin too, but under our zero-till system, it's pretty hard to use this herbicide.



Peter Campbell. (Photo: Kellie Penfold, Coretext)

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Why did you choose to grow RR canola?

We've been watching the Canadians and the Nuffield scholars have also reported that it's a great technology to use.

It also gave us an opportunity to move away from the residual triazine herbicides.

The TT trait is associated with low yields, especially in drier years.

Conventional varieties are difficult to grow with limited weed control options.

Varieties and area

Around 380 hectares of canola was grown in 2008, comprising around 250 hectares of Roundup Ready (GT61 and the hybrid 46Y20 (RR) and 130 hectares of Clearfield canola (46Y78).

The paddock histories varied – some paddocks were in lucerne in 2007, causing additional moisture deficit stress at the end of the 2008 season. The better yielding crops were on wheat stubble.

All crops were sown with a 1590 John Deere disc seeder with press wheels, at 2.2 kg/ha. The population of the Roundup Ready crops was around 52 plants/m². (The Clearfield hybrid population was lower at 30 plants/m² due to larger seed size). The crop was sown with a 19 cm row spacing and established well.

Weed control

No knockdowns were used. About half the Roundup Ready canola paddocks had two spray applications – around the 2-leaf and again at the 6-leaf stage. The other paddocks received one application – around the 2-leaf stage.

I think I should have put out a second clean-up spray on all paddocks. The paddocks with only one application did get a second germination of weeds, but this was only small. Those weeds didn't amount to much in the end.

Yields

The 46Y20 (RR) yields varied between paddocks from 0.65 tonnes per hectare on lucerne to 1.8 tonnes on wheat stubble. The GT61 yielded from 1.2 tonnes per hectare on pasture to 1.5 tonnes on wheat stubble. The 46Y78 yielded up to 1.3 tonnes in a dry paddock.

Although I didn't grow a TT variety, none of the TT varieties in the district yielded more than 1.0 tonnes per hectare, even though there were some good crops around.

Cost of production

A comparison of costs related to each herbicide tolerance system was made. The

Clearfield hybrid can equal the RR hybrid in costs under different conditions. The analysis indicated the TTs to be less risky financially to grow, but as the hybrids are expected to yield significantly more, they should be more profitable.

TO SUM UP

The Roundup Ready system gives us a wider choice of higher yielding varieties and it means we don't have to use atrazine. And having to use Select all the time for grass control when using the Clearfield hybrids, creates a potential problem even though the Intervix or OnDuty herbicides are good on wild oats and wild radish.

We now also have the potential to graze canola stubble because Roundup has a short withholding period.

There were some distribution and handling issues in 2008 due to limited delivery points, but these will abate as more farmers grow GM canola.

The upfront costs are also higher than the TT varieties exposing us to more financial risk – but on the flipside – the potential is there for higher yields.

We need to be very careful with our management so we don't get glyphosate resistant annual ryegrass.

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CASE STUDY 2

FARMER

John Sheehan, Farm Manager, Yalook Estate.

LOCATION

Ballan, Victoria.

ENTERPRISES

Wheat, barley, canola and prime lambs.

AVERAGE ANNUAL RAINFALL

483 mm, 1991–2008.

Average GSR: 355 mm, 1991–2008.

2008 GSR: 260 mm.

SOIL TYPE

Chocolate clay loam.

SOIL pH

pH_{Ca} 5.3.

BACKGROUND

Up until 10 years ago, the property was very much a grazing enterprise. Raised beds were introduced by Southern Farming Systems in 1998 with 400 hectares planted to crop. The business now crops more than 2800 hectares across southwest Victoria including more than 1000 ha of canola in 2008.

Typical rotations are wheat – canola – barley; or canola – winter wheat – spring wheat – canola.

Annual ryegrass is the problem weed and there is Group A and B resistance.

Herbicide resistance management strategies used include crop rotations and deferred sowing where possible, and the high use of pre-emergence herbicides.

John's comments...

What did you gain from the RR canola training course?

The need to be more aware of using alternative knockdowns.

Why did you choose to grow RR canola?

Ryegrass management.

Varieties and area

We grew 51 hectares of 46Y20 (RR) and three TT varieties – 560 hectares of Thunder TT; 200 hectares of ATR-Marlin; and, 200 hectares of ATR409.

Sowing system used

Sown with an airseeder using direct drill points, to a depth of five mm in the first week of June. We had very good establishment and vigour. Sown at 4 kg/ha, giving a population of 80–120 plants/m².

Weed control

Spray.Seed at 2.0 L/ha as a knockdown, then Roundup Ready herbicide at 0.9 kg/ha at the 4-leaf stage.

Grain yield

The RR hybrid 46Y20 yielded 1.5 tonnes per hectare, with 44 per cent oil. The ATR409 in the adjacent paddock produced a similar yield, but lower oil content (42 per cent). The TT variety ATR409 was the second crop out of the paddock, while the 46Y20 (RR) the tenth crop since pasture. The other two TT varieties did not yield as well (about 1.2 tonnes), but this was put down to a heavier soil type which was a disadvantage in the dry spring.

Gross margin

1.5 t/ha x \$590/t price =

\$885/ha gross income.

\$885/ha – \$396/ha variable costs =

\$489/ha gross margin.

TO SUM UP

The positive aspects of RR canola were the ease of management, that is, not too many options to get wrong. This technology offers a real weapon against ryegrass.

We did have some issues with the RR canola in 2008.

We had a small amount of drift (five to six metres) of glyphosate into a neighbouring lucerne field (on the same farm). Spray drift with all chemicals is a potential issue, but when using a knockdown herbicide near crops that have emerged, growers need to be very conscious of the possibility of drift. ■

SUMMARY OF GROWERS' VIEWS

Why grow GM canola?

The primary reason for planting Roundup Ready canola given by case study growers was for management of herbicide resistant ryegrass. It is seen as "another tool in the toolbox". Other reasons include interest in trying out a new technology, increased sowing time flexibility, improved yields, use of a more benign herbicide and better profitability.

Positive features of the technology

Growers have reported excellent weed control with the opportunity to rest selective herbicide groups. The simplicity of the system, particularly its ideal fit with no-till, is also a feature as is being able to use cheaper and safer herbicides. The vigour of the hybrid – this trait is not related to the RR trait – and higher gross margins also appealed to growers.

Some issues in 2008

The case studies showed that growers had few problems with the technology and expected that most of the issues experienced would be ironed out with increased adoption and with the release of newer, more elite varieties. There was also some concern about marketing and delivery. This largely reflected the small scale of production and the supply chain arrangements instituted for 2008 which required growers to deliver to nominated sites and resulted in a narrower choice of marketing options. These issues will be overcome as production expands.

The most common agronomic issues raised were:

- Variety performance and characteristics – the moratoria meant slowed variety development.
- Some growers missed the chance to apply a second RR herbicide application by the 6-leaf (last opportunity) stage. But the majority of those farmers intentionally opting for only one spray, were happy with the results.



John Sheehan. (Photo: Brad Collis, Coretext Communications)