

Overcoming resistant wild oats – a longer term approach

■ By Tony Cook and Bill Davidson, NSW DPI

WILD oats (*Avena spp.*) – sometimes referred to as black oats, is a major problem weed of Australia's winter dryland cropping systems. It is rated the second worst grass weed in Australia, behind annual ryegrass. Its distribution is widespread, commonly found in winter grain producing states. Infestations can cause significant yield losses in wheat and chickpeas, contaminate grain and host cereal diseases. In 2003, it was estimated wild oats cost Australian grain growers



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in excess of \$150 million every year in lost production, cost of control and contamination of grain. This figure is likely to have doubled to current annual losses of \$250–\$300 million.

Wild oats have always been present in winter cropping systems of the north-eastern grain belt, despite the regular application of highly effective herbicides. The discovery of resistant wild oats has now made the battle

against this weed more difficult. In addition, there are some populations exhibiting multiple resistance to all post-emergence herbicide groups commonly used in wheat (Group A, Group B and Group Z).

Much is known about successfully managing wild oats. This is due to the efforts of researchers many years ago and prior to the confirmation of herbicide resistance. But research by NSW DPI staff in recent years on herbicide resistant wild oats has complimented earlier work. The combination of this work has resulted in the following wild oat management rules of thumb.

Rules of thumb developed when no resistance was present (pre early 1990s)

- Rotate to a summer crop (where possible) to allow two winter fallows;
- Spray as late as possible in crop to control as many wild oats as possible;
- Use pre-emergence herbicides to reduce wild oat numbers and get yield benefits;
- Paddocks with highest wild oats numbers are sown last to allow knockdown treatment to kill as many wild oats as possible;
- Shallow cultivation will stimulate more wild oat seeds to germinate, reducing seed bank numbers; and,
- Use of crop competition can reduce impact of wild oats.

Rules of thumb developed when resistance was present (post early 1990s)

- Late spray of Mataven to reduce wild oat seed set in crop (susceptible populations);
- Grazing/forage/hay/manure crops are excellent options;
- Combinations of pre- and post-emergence herbicides are highly effective, assuming the post-emergent option still works;
- Alternative winter crop to cereals allows the use of other herbicide groups;
- Wide row crops can allow various inter-row management options;
- Selectively wipe wild oats with glyphosate in short crops;
- Grow GM crops – allow more herbicide options; and,
- If alternatives to wheat are not possible, then consider long fallowing.

All these rules of thumb are driven by a few simple principles – to prevent wild oat seed production and to drive down the seed bank. The rules are based on integrated weed management, using herbicide group rotation and/or non-chemical tactics.



(a)



(b)

Photo 1: Brown manuring oats (a) stopped wild oat seed production and (b) Roundup Ready canola resulted in very few small wild oat plants.

Long-term validation trial

The aim of this trial was to drive down wild oat seed banks over a four year period using a wide variety of wild oat management principles. Located at Edgeroi northern NSW, the trial consisted of two blocks with different crop rotations (Table 1). A resistance test confirmed the population was resistant to herbicide Groups A, B and Z (all the post-emergence options available for wild oat control in wheat).

Main findings

Block A 2008

All barley in-crop and pre-emergence treatments resulted in wild oat seed production ranging from 75 to 1260 seeds per m².



(a)



(b)

Photo 2: Ideal tactics to manage multiple resistant wild oats (a) sorghum rotation with two winter fallows and (b) wild oat plants ideally suited to wiping with glyphosate.

Although barley is a very competitive crop and effective pre-emergence treatments were used, it was not enough to prevent significant quantities of wild oat seed. The fallow treatment did not allow any wild oat seed to enter the seed bank.

Block A 2009

Wild oat seed set control was improved in canola compared to the previous year (barley). Improved control was a result of using atrazine (TT canola) and having wide row canola, allowing the use of paraquat between rows. Wild oat seed production ranged from four to 394 seeds per m². No wild oat seed was produced in the fallow and the brown manure (oats) plots (Photo 1a).

TABLE 1: Winter cropping options for each Block in the long term trial, Edgeroi NSW

Winter season	Block A (winter cropping)	Block B (summer or winter crops)
2008	Various in-crop (barley) treatments and one fallow	Fallow
2009	Canola (triazine tolerant and conventional), fallow and brown manure oats	Fallow
2010	Triazine tolerant and Roundup Ready canola	Wide row chickpeas (inter-row and wiper applications of glyphosate)
2011	Roundup Ready 2 canola	Wide row chickpeas (inter-row and wiper applications of glyphosate)

Note: Block A had six individual treatments for the winters of 2008 and 2009. In 2010 the block had two treatments.

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Block A 2010

Excellent control of wild oats was measured for both TT and Roundup Ready canola. As few as 0.2 (Roundup Ready canola) and 2.5 (TT canola) wild oat plants per m² were recorded in the canola plots. Wild oat plants in the Roundup Ready plots were very small (Photo 1b), due to late emergence and crop competition. They were estimated to produce less than one seed per m². Plants in the TT canola plots were much larger, and as much as 50 seeds per m² were produced.

Block A 2011

This area was sown to Roundup Ready 2 canola, which can be sprayed with glyphosate to more advanced canola than the commercially available Roundup Ready canola. Further reductions in wild oat seed banks are expected.

Block B 2008 and 2009

The starting wild oat density in this area was 110 plants per m². Sorghum was grown in 2008–09 as the summer crop. This area had very low wild oat plant numbers due to two successive winter fallows (Photo 2a).

Block B 2010

Wild oat density was 0.1 plant per m² at the establishment stage of the wide row chickpea crop (Photo 2b), a great reduction compared to the density in 2008. After targeted in-crop applications of glyphosate, only five wild oat plants were seen in the 0.25 hectare plot.

Block B 2011

This is currently sown to wide row chickpea crop to determine if treatments in wide row chickpeas can further reduce wild oat numbers.

To sum up

Multiple resistant wild oats can be successfully managed. There are various tactics available to use that could have a fit in any cropping system. Many of these changes require increased inputs and management. Although some of these changes require major changes to farming, which involves risk, the rewards can be worthwhile.

Continuously growing wheat and chickpea is likely to be a short term option if in-crop selective post-emergence options are limited. It is only a matter of time when all the remaining herbicides become ineffective. Some growers heavily reliant on wheat/chickpeas are already making some changes to combat wild oats.

For areas that allow summer cropping, it is recommended to take the opportunity to grow a summer crop. The use of two consecutive winter fallows reduced wild oat numbers to an extremely low level. It must be noted that fallows be kept weed-free so that no seed is returned to the seed bank.

Where summer cropping is not possible, there are still many control options.

Wide-row chickpeas can be grown when wild oat numbers are low and the strategy of using targeted applications of glyphosate should limit increases in weed numbers. Alternatively, Roundup Ready canola allows the use of glyphosate followed up with competition from canola.

Silage, hay, or grazing crops are other excellent alternatives, but must be managed at critical stages to prevent wild oat seed production. Long fallowing may be of use in areas with prolonged dry seasons and for those growers averse to making radical crop sequence changes. All these options have shown high levels of wild oat control.

Managing resistant wild oats is a complex issue that involves selection of crop, determining chemical and non-chemical tactics, undertaking resistance testing and understanding wild oat ecology. Multiple management options are available. Seek professional agronomic advice when making such changes. ■

Tough workout aids sprayer development

SHAUN Breen has what he calls his dream job – playing with the latest and best in self-propelled sprayers and getting paid for it. Shaun, 31, of Chepstowe, near Ballarat, Victoria, works as a contractor-cum-test pilot for GoldAcres, putting the factory's design theories to the test in real-world conditions.

Shaun joined GoldAcres in 2003 in the company's research and development area, after completing an apprenticeship as a fitter and turner and working for several years in maintenance and truck driving.

Four years ago, he decided to set up a part-time business of his own when he rebuilt a tow-behind sprayer with a 3000-litre tank and wide boom.

Shaun had the sprayer and a neighbour at Chepstowe, Tony Frost, had the tractor. So the pair got together to form Western Ag Contracting, offering spraying services of various kinds across western Victoria.

Tony is a full-time farmer, with a busy sheep and cropping enterprise, while Shaun also does some wheat farming, with smaller areas under ryegrass and oats.

Happy arrangement

As Shaun's contracting workload increased, he came to the happy arrangement with GoldAcres that he would continue his role in research and development with the company as his spraying bookings allowed.

In return, he undertook to test GoldAcres' latest equipment under tough field conditions, reporting back on aspects of the machines' performance he felt needed adjustment.

"These days, we have three self-propelled sprayers, one tow-behind unit and one ute sprayer," Shaun says.

"My current trial work is on the new Crop Cruiser Evolution 5236, so any developmental ideas GoldAcres wants to try are fitted to my machine. At the moment, I'm working on more boom development on the bi-fold mechanism.



Shaun Breen from Western Ag Spraying is self-contained. His ute load of spraying support equipment follows like a faithful dog. Shaun says the Crop Cruiser doesn't often get back to home base.