

Group A resistant wild oats – just the tip of the iceberg?

The issue

Wild oat populations, resistant to Group A herbicides, have been present at low levels in the northern grain region for at least 10 years. There is mounting concern that these problems are about to explode into far greater prominence.

In the 2006 winter season, a number of northern agronomists noted a large increase in situations where wild oats survived application of Group A herbicides. A number of samples of seed are currently being tested to confirm their resistance status. Spray failure does not automatically mean that the weed population is resistant to the herbicide. Adverse environmental conditions or poor application practices can also impact on the level of control.

The weed

Responses from a 2002 grower and agronomist survey (GRDC-funded project UQ138) reinforced the importance of wild oats as a key northern weed of both in-crop and fallow situations. Wild oats is an aggressive competitor that can smother winter crops when left unchecked and is capable of producing up to 20,000 seeds per m². The early maturity of wild oats can also cause management challenges with high numbers of seed 'shed' prior to the crop harvest. This impacts on seedbank management and survival.

Herbicides at risk

A range of in-crop selective grass herbicide options have been developed over the last three decades but by far the most consistent and effective have been products from the Group A herbicide family. These include winter cereal herbicides such as Wildcat[®], Topik[®], Achieve[®], Tristar[®] and Axial[®] together with broadleaf crop options such as Verdict[®], Targa[®] and Select[®].

Systems that drive herbicide resistance

The speed at which a weed population will develop resistance is driven by a number of factors:

- farming system (risk increases in monoculture systems)
- level of efficacy of the herbicide (increased risk with highly effective products)
- number of exposures to same herbicide group
- lack of use of alternative control measures
- continuous zero tillage
- size of weed population (risk increases with density of weeds)

In the case of wild oats in the north we have frequently 'ticked all the boxes'. Early development of Group A wild oats resistance often coincided with winter dominant

reduced tillage farming systems, e.g. continuous wheat or winter cereal plus winter broadleaf rotations, where Group A chemistry was the primary method of control of wild oats.

Crops most at risk

High levels of Group A resistance will obviously impact on weed management in any crop where that herbicide group can be used. Some alternative chemistry is available for wheat and barley but the options for winter broadleaf crops, particularly chickpeas, are few.

Chickpeas are an important crop in the northern region providing a non-cereal winter break together with other agronomic and marketing benefits. However it is a poor competitor and will encourage weed establishment and survival. When combined with the lack of chemical options, chickpeas are likely to be the most difficult crop to manage when Group A resistant wild oats are present.

A consultant's view

Paul Castor, Michael Castor and Associates, Goondiwindi found most surviving wild oat populations in 2006 were observed in crops of chickpeas.

Mr Castor attributed the observation to 'escapes' being more noticeable in such a short and open crop.

"At this stage we can't rule out environmental conditions or application, but spraying conditions in 2006 were generally frost free, with reasonable soil moisture and appeared to have been better than in most recent seasons," he said.

"Wild oats are a primary management issue for us and we try to use an integrated program to keep weed numbers low, to minimise the cost of control and to avoid the build-up of herbicide resistant populations.

"Crop rotations including summer cropping have been the linchpin of this management program, however a number of cultural methods are also promoted strongly."

These include the use of row spacings and plant populations in winter cereal crops that enhance the ability of the crop to compete with weeds.

Delaying sowing may also be suitable in some cases to maximize the proportion of the weed population that is being managed with pre-plant knockdown herbicides.

"Our rotation is often sorghum long fallowed to wheat, chickpeas, wheat and then long fallowed back to summer crop.

“We use knockdown herbicides and/or cultivation in the two winter fallows (before and after the summer crop).

“This generally eliminates the need for any wild oat control in the first winter cereal. Chickpeas frequently follow the first cereal and have nearly always required a Group A application.”

Mr Castor said the high level of control previously obtained means there was often no need for grass control in the second winter cereal.

This way Group A herbicides have only been used once or at most twice in a five year rotation.

“One area of concern is that excessively dry conditions during winter fallow periods can result in an incomplete germination of the wild oat population through this period and this can lead to a nagging population remaining for the following winter phase of the rotation.

“Group A herbicides are our only really practical and registered herbicide control option for grass weeds in chickpeas.

“If we lose this herbicide group in the north it would threaten the viability of our most important winter rotation crop.”

Mr Castor urged agronomists and growers to closely monitor the performance of herbicide applications in all crops to ensure that any spray failures are identified and appropriate management plans implemented before any resistant weed populations can seriously impact upon farm profitability.

Following his attendance at an Integrated Weed Management (IWM) workshop in Adelaide, Mr Castor is keen to explore the usefulness of a number of different herbicide groups, herbicide application methods and novel approaches to managing crop weeds.

The workshop was attended by key advisors and researchers from around the country, including WA and SA where resistant weed management programs are now well advanced.

A researcher's view

Andrew Storrie, NSW Department of Primary Industries (DPI) Weeds Agronomist has been warning northern growers about the threat of Group A resistance in wild oats for 12 years.

He said 2006 results did not surprise him and the important thing for farmers to remember was that it will only get worse if they fail to make some significant changes to rotation and management now.

We can't rely on other Modes of Action (MOA)

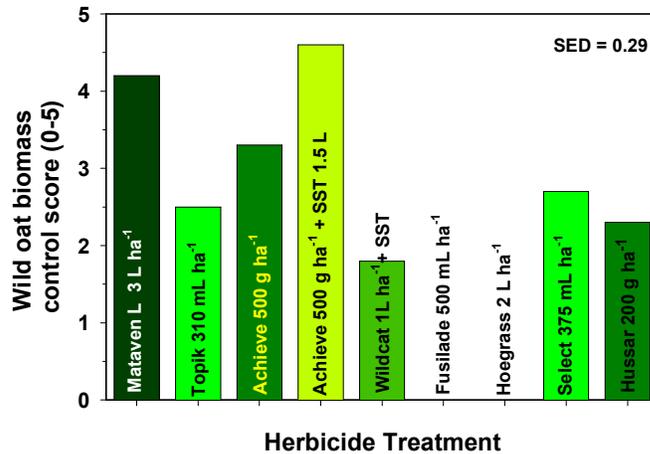
Currently there are at least nine populations of wild oats in NSW resistant to Mataven[®] 90 (Group K) and a number of populations strongly suspected of being resistant to iodosulfuron-methyl (Group B). At least one population is resistant to Groups A and K and likely B. The 'give me another MOA' approach is therefore short-term and a recipe for failure.

Are all Group A herbicides out?

Early on, if predominately 'fop' Group A herbicides have been used, the 'dim' herbicides will still be useful for one or two years. A herbicide resistance test is essential to see if there are any herbicides still working.

Figure 2 below shows a trial near Moree where 'dim' Group A herbicides were still active, and some other MOA's were effective. The two best treatments were Mataven[®] L as an early post application and Achieve[®] + selective spray-topping with Mataven[®] L. Wildcat[®] + Mataven[®] SST gave poor control because the Group A herbicide gave no control. Select[®] gave lower levels of control because it also killed the wheat and allowed a later germination of wild oats to establish.

Figure 1. Control of 'fop' resistant wild oats with a range of post emergent herbicides in wheat, Moree 2001.



Control score – 0 = nil control; 4 = 80%; 5 = 100%;

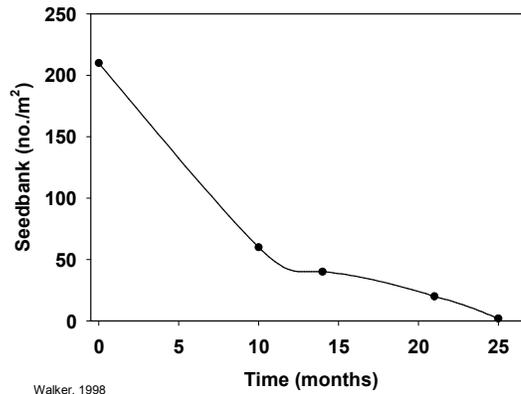
Caution should be used in interpreting the above results, because 'dim' Group A herbicides failed in this field in 2006. Therefore the ability to use a 'dim' instead of a 'fop' will only give a short-term reprieve.

The bottom line for managing herbicide resistance

Once a weed population has been driven to being predominantly resistant the ratio of resistant to susceptible weeds will not change. The only thing that can be changed is the total number of weeds, that is, the size of the seedbank. The only way to do this is to **stop all new seed being added to the soil seedbank.**

Research studies have shown that half the wild oat seed in the soil disappears every six months. Figure 3 shows that with no further additions of seed the wild oat seedbank can be reduced to very low numbers within two years under no-till conditions. Cultivation will bury seed and extend the life of the seedbank.

Figure 2. Reduction of Group A resistant wild oat seedbank with no further addition of seed, North Star.



Hit it hard and hit it early?

Farmers that have been caught out with large numbers of wild oats that have set seed in 2006 have some hard decisions to make, and they should have been made in September 2006.

Often the best, however sometimes the most difficult decision, is to spray-out the crop before seed set to prevent huge numbers of weed seeds entering the seedbank. The price of chickpeas in 2006 basically ruled out this option.

Work by Bill Roy and others in Western Australia showed that by “brown manuring” or cutting a crop for hay or silage, and totally preventing weed seed set actually gives an extended period of low weed numbers.

Doing this for two years drives the seedbank numbers so low that five years without spraying was possible, if crop competition was increased. This would mean weed control in the chickpea crop will be a minor issue.

To successfully maintain the sorghum-wheat-chickpea-wheat rotation, particularly with Group A herbicides starting to fail, the emphasis must shift from the chickpea crop to achieving total control in the cereal phase. Crop competition **MUST** be increased in the winter cereal crop! Options include:

- Mataven® alone
- Atlantis® followed by Mataven® as a selective spray-topping (SST) option. (NEVER a Group B herbicide alone, or resistance will be there before you know it)
- Trifluralin+/- Avadex® Xtra followed by Mataven® SST.
- Grow a feed wheat then bale it and spray paddock with a knockdown to prevent wild oat regrowth. This has the benefit of leaving some moisture behind for the following chickpea crop. The chickpeas should then be sown as late as possible to spray an extra weed flush with a knockdown.
- Use a pre-emergent herbicide in the chickpeas

- Cereal crop following chickpeas could be feed barley or the 90 day cultivar Unicorn. High protein wheat is also an option as long as row spacing is reduced and seed rate increased.

Validation and adoption

Richard Daniel, Northern Grower Alliance (NGA) chief executive officer believes a rapid change in management practices will be essential to avoid the complete loss of Group A herbicides.

“In the north many believed that with our summer rotations, our risk of Group A resistance development was quite low,” Mr Daniel said.

“Although resistant wild oat populations were certainly first seen where continuous winter cropping was practiced, it now appears that we are seeing the early signs of problems even where summer crop rotations have been implemented.

“The best value from the summer crop break will be when good growing conditions exist to promote high levels of wild oat germination during the two winter fallows.

“This way, knockdown chemicals or strategic cultivation can be employed to greatly reduce seedbanks and provide alternative control to the Group A herbicides.”

Mr Daniel said the run of recent dry winters may have reduced the ‘efficiency’ of this break.

“Too often the first signs of herbicide resistance are ignored and the penny only really drops when a complete spray failure occurs.

“The time to implement resistance management strategies is before resistance occurs not as a response to repeated spray failures, although for many growers resistance is now well established it is still essential we start thinking much more in integrated weed management terms.”

Figure 3 – Early signs of Group A herbicide resistance (LHS resistant, RHS susceptible)



Mr Daniel said it was clear that Group A resistance was going to be one of the key management issues for growers and advisers for the future.

He said NGA had a part to play in communication and extension of sensible management practices but also would be involved in identifying whether growers could better utilize products like Avadex® - Group E and Treflan® - Group D in farming systems.

“It is important that we don’t just shift the emphasis from Group A herbicides to another Group e.g. Group B’s in wheat.”

He said the industry needed to increase its focus to include a wide range of options, including:

- Crop/ pasture rotation that enables different chemistry and also cultivation to be utilised
- Maximize crop competition both within the crop (e.g. increased plant stands and narrower rows) and between crops (avoiding poorly competitive crops where weed burdens are high)
- Increased attention to hygiene issues
- Increased monitoring and management of escapes by selective spray topping in bread wheat
- Delayed planting for paddocks with higher weed burdens may be necessary
- Alternate management e.g. glyphosate via wick wipers where crop heights allow

- Strategic burning may also have a place incorporated with stubble disease management

“What is crystal clear is that we have to start changing our practices immediately,” he said.

“The longer we leave it, the bigger the problem and the more extreme the measures that will be necessary to try to manage it.

“You only have to look at the measures employed in WA for annual ryegrass and wild radish to realise it is essential to change now whilst we still have some chance.”

ENDS