Wild Oat Herbicide Resistance Survey

Background

Highly effective Group A chemistry herbicide options, in both winter cereal and broadleaf crops, have been the primary method of in-crop management of wild oats for more than two decades. However the overuse of these chemicals (often together with a continual winter crop rotation) has resulted in selection of increasing levels of Group A herbicide resistance. Of additional concern is the recent identification of wild oats with multiple herbicide resistance.

A previous survey of the Northern Grain Region was conducted in 2001 under a GRDC funded project (UQ138). Random samples were taken of wild oat populations shortly before harvest with Group A herbicide resistance detected in ~10% of samples.

Project aims

1. Provide a snap shot of the extent and pattern of herbicide resistance in wild oats in northern NSW in 2007
2. Provide a larger sampling basis to more accurately evaluate the extent of cross and multiple resistance in field populations
3. Heavily involve growers and agronomists to allow the opportunity for future case studies whilst also providing greater direct feedback and value to growers and advisers

Contents

Results in a nutshell

Overall resistance levels:

- *Wild oat samples were collected from high and low resistance risk situations*
- *More than 70% of high risk samples had resistance to cereal selective fop herbicides (Wildcat and Topik)*
- *Resistance to Verdict, Axial or Mataven was found in ~25% of high risk samples*
- *Lower level of resistance found to Atlantis and Select with only TriflurX plus Avadex Xtra completely effective on all populations*
- *More than 10% of low risk samples had resistance to cereal selective fop herbicides (Wildcat and Topik)*

Herbicide resistance patterns:

- *Broadly similar resistance patterns seen across all sampling regions*
- *Multiple herbicide resistance was very common in high risk samples with 55% of samples resistant to 3 or more herbicides*
- *Every population was controlled by at least 2 different post-emergent herbicides*
- ***High risk samples were generally collected from small patches within paddocks and fortunately not whole paddock 'blowouts'***

Overall:

- ***Herbicide resistant wild oats are an escalating issue across the northern region***
- ***No single product/ strategy will provide the solution***
- ***Need to incorporate other strategies eg summer crop rotations incorporating fallow knockdown herbicides, control spray survivors with a different approach, delayed sowing, grazing or even strategic cultivation may need to be considered***

Trial design

The survey involved 34 agronomists covering clients from Westmar in southern Qld to the southern Liverpool Plains and west to Walgett and Mungindi. A total of 100 wild oat populations were collected in late spring 2007 with 97 of these samples actually tested (poor seed viability in remaining 3 samples). Agronomists were asked to collect samples from two distinct situations:

1. **High risk** - paddocks where wild oats survived a commercial spray in 2007 or where previous management indicated a high risk of herbicide resistance eg poor previous herbicide performance or a long history of Group A usage
2. **Low risk** - paddocks where wild oats were not even sprayed in 2007 and where there was no expectation of herbicide resistance

Key point: Neither of these categories will indicate a **true random level** of herbicide resistance. The high risk samples were aimed at more accurately indicating level of cross resistance and worst case scenarios whilst the **low risk samples underestimate the random level** as they omit any high risk situations.

Samples were screened by Plant Science Consulting (Peter Boutsalis) in early 2008 using standard resistance testing methodology. One of the aims of this project was to investigate the level of cross or multiple resistance in northern wild oat populations. To achieve that aim, all wild oats samples were tested with a comprehensive range of 9 herbicides, representing five different herbicide mode of action groups.

The following tables detail the herbicides used, application timing together with product and adjuvant rates.

Herbicides evaluated and application timing

Product	Herbicide group (sub group)	Application timing
Triflur® X plus Avadex® Xtra	D E	Pre-emergent, directly on seed, then covered with 1 cm soil to simulate incorporation by sowing (IBS)
Wildcat®, Topik® and Verdict®	A (fop)	3 leaf stage
Axial®	A (den)	
Select®	A (dim)	
Atlantis®	B	
Mataven®	Z (formerly K)	Jointing to 1st node to simulate selective spray topping (SST)

Herbicide rates and adjuvants

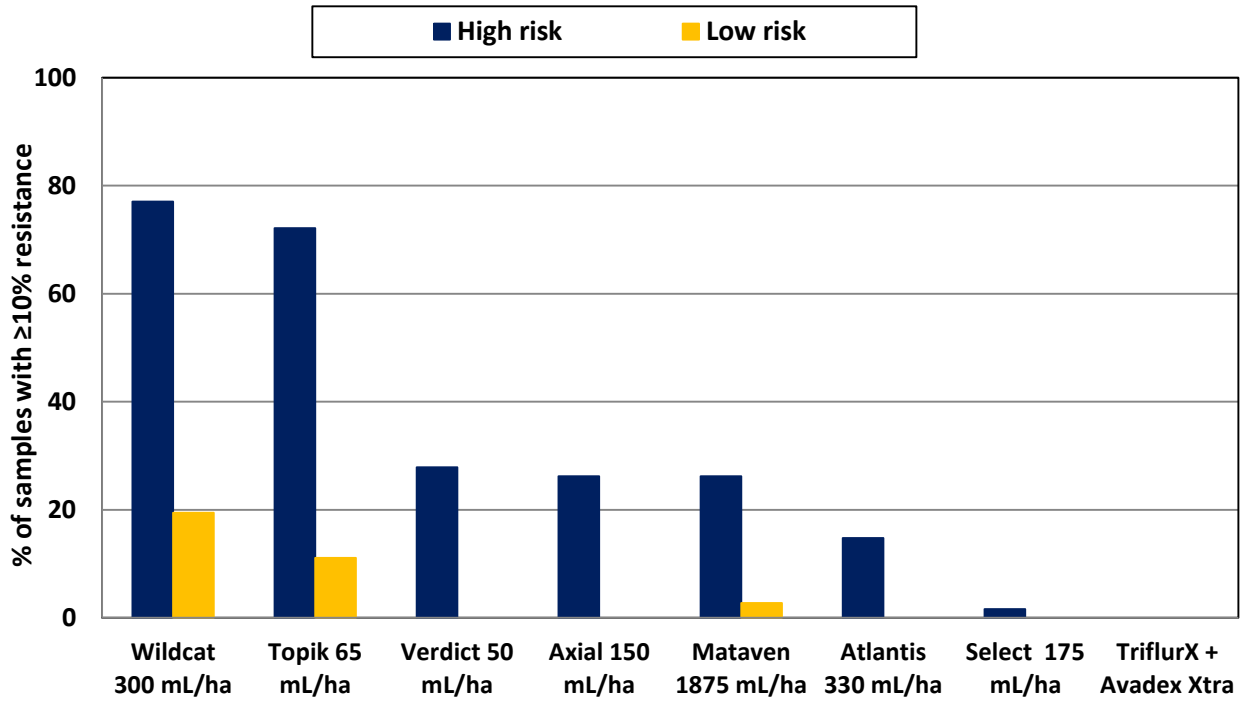
Product	Product rate (mL/ha)	Adjuvant rate
Triflur X plus Avadex Xtra	1000 + 1000	-
Wildcat	300	BS1000 0.25%
Topik	65	Hasten™ 0.5%
Verdict	50	Hasten 0.5%
Axial	150	Adigor® 0.5%
Select	175	Hasten 1.0%
Atlantis	330	Hasten 1.0%
Mataven	1875	Hasten 0.5%

Assessments

1. For all products other than Mataven, assessment of % plant survival was recorded ~4 weeks after spraying
2. For Mataven, % survival of plants producing viable seed was assessed once seed matured

Overall resistance patterns

The graph below shows the resistance levels detected when the samples were divided into the two risk categories. **For the purpose of this report, resistance was defined as where ≥10% of the test population survived the herbicide application** ie it does not include any samples where resistance was determined but at less than 10%.



Key messages – high risk samples

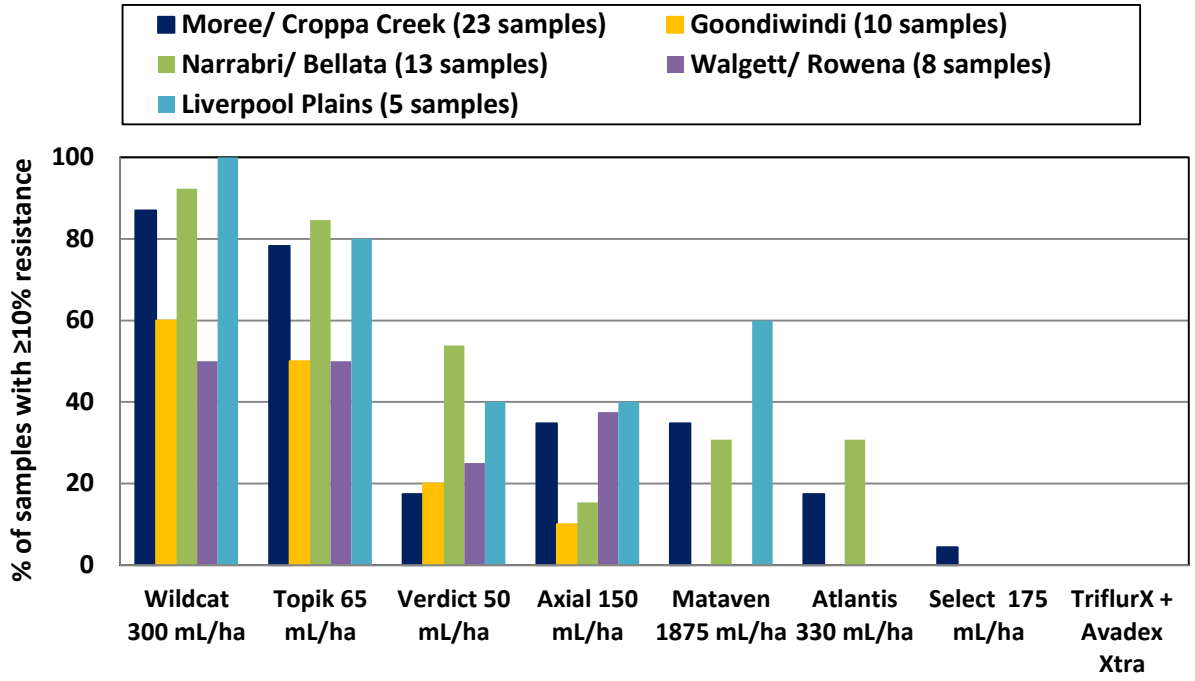
- Resistance to cereal selective fops (Wildcat and Topik) was found in ~70-80% of samples
- Concerning level of resistance to a range of alternative chemistries
- Pre emergence combination of TriflurX and Avadex Xtra provided 100% control of all populations. Although promising from a resistance viewpoint, this approach has practical limitations in achieving high levels of field control

Key messages – low risk samples

- As expected the frequency of resistance was much lower
- Resistance to cereal selective fops found in ~10-20% of samples
- Resistance to Mataven found in only one sample

Regional resistance patterns (high risk samples)

The graph below shows the resistance levels detected when the high risk samples were divided by region of collection.

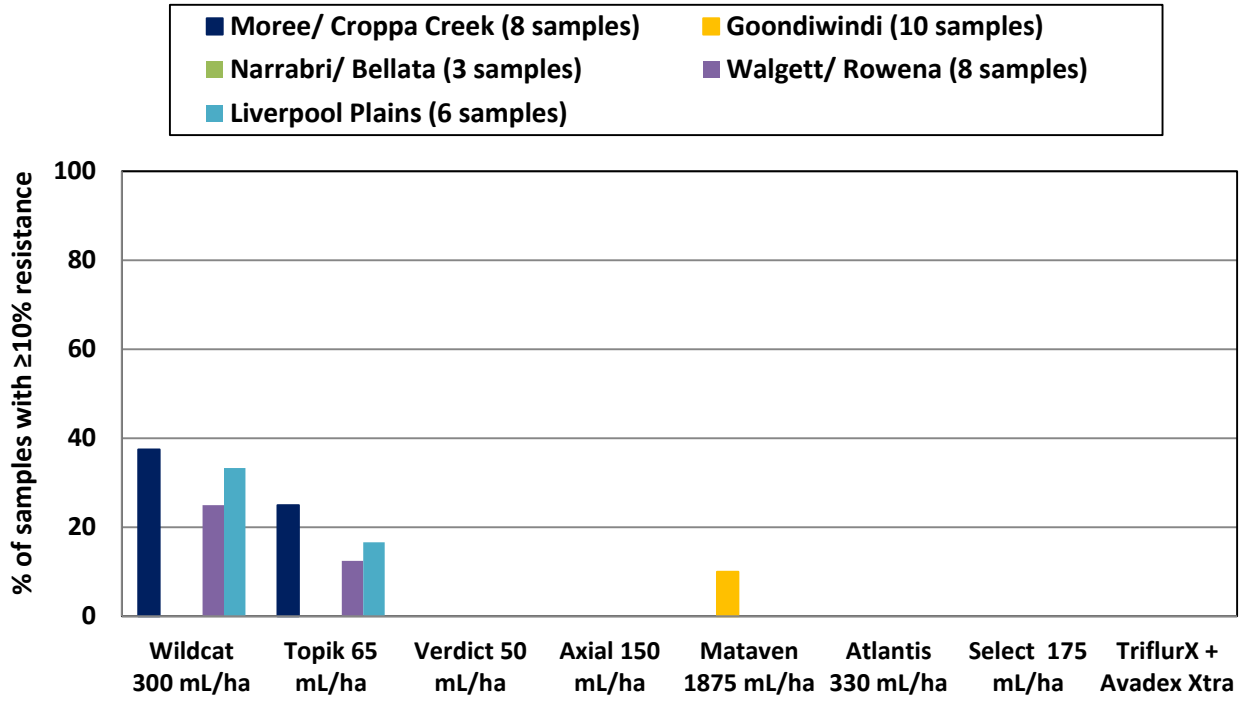


Key messages – high risk samples

- Broadly similar patterns of resistance profile across sampled regions
- Resistance to cereal selective fops was detected in 50-100% of high risk samples from all regions

Regional resistance patterns (low risk samples)

The graph below shows the resistance levels detected when the low risk samples were divided by region of collection.

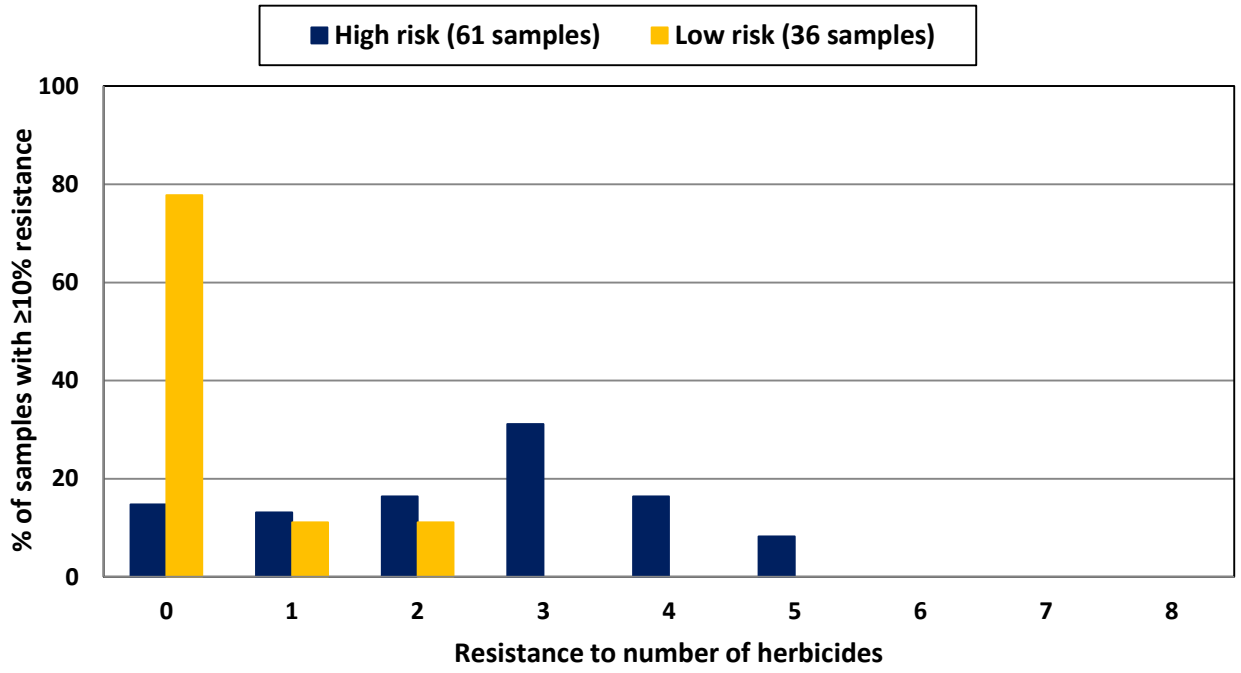


Key messages – low risk samples

- Sample numbers limited but patterns still generally similar across most regions
- Difficult to obtain low risk samples in Moree/ Croppa Creek and Narrabri/ Bellata regions

Multiple herbicide resistance patterns

The graph below shows the % of samples that were resistant to each number of herbicides eg nearly 80% of low risk samples were not resistant to any herbicide whilst greater than 30% of high risk samples were resistant to 3 different herbicides.



Key messages – multiple herbicide resistance

- Multiple herbicide resistance was very common in high risk samples
- 55% of high risk populations had resistance to 3 or more different herbicides
- 24% of high risk populations had resistance to 4 or 5 herbicides
- 22% of low risk populations had resistance to 1 or more herbicides

Acknowledgement

Thanks to Syngenta, Bayer CropScience and Nufarm for their financial assistance in supporting this work.