

Pre-Emergent Herbicides for Northern Wild Oat Management

Background

Wild oats are the key winter grass weed of the northern cropping region. For much of the last two decades they have been predominantly managed in-crop with highly effective Group A herbicides. In recent years however it has become clear that herbicide resistant wild oats are becoming a key threat to a sustainable northern farming system.

Resistant wild oats will of course pose management problems in any crop where these herbicides have previously been relied upon, but the threat appears greater to chickpea production. Why?

- Reduced crop competitiveness
- Generally produced on wide rows
- Only have Group A herbicides registered for post-emergent control

When coupled with the fact that chickpeas are the major northern, non-cereal, winter rotation crop, any threat to chickpea production area could have a major impact on the overall farming system.

Project aims

Pre-emergent active ingredients such as trifluralin (Group D) and tri-allate (Group E) have not been widely used in northern NSW for a range of reasons including the widespread adoption of reduced tillage, difficulty of effective incorporation, soil types and previously the range of highly effective post emergent chemicals available.



Pre-Emergent Wild Oat Control 2007 Complete Summary

In 2007, NGA established a series of small plot trials to evaluate the potential of these pre-emergent herbicides when 'incorporated by sowing' (IBS) in zero/minimum tillage systems. IBS involves the use of narrow point tynes, resulting in reduced soil disturbance, combined with generally higher herbicide rates. The three primary aims were:

1. Evaluate the crop safety and efficacy of mixtures of tri-allate and trifluralin for pre-emergent wild oats control under current no-till/minimum till farming systems
2. Identify the performance from each mixing partner alone
3. Evaluate crop safety and efficacy of diuron (Group C) under same conditions



*Wild oat control 19 DAP, Front trifluralin + tri-allate Rear Untreated, Edgeroi June 2007
NB poor control along plant line*

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Results in a nutshell

Crop safety:

- *Good crop safety from all products and rates tested in chickpea trials*
- *Acceptable crop safety in wheat, however with some concerns at high rates of trifluralin in narrow row cereal production systems*

Wild oat control:

- *Moderate to good levels of wild oat suppression from both trifluralin and tri-allate in all trials (~70% control from either product alone when used with IBS)*
- *No consistent difference in level of control between trifluralin and tri-allate*
- *No consistent rate response to either product*
- *Improved levels of wild oat suppression from mixtures of trifluralin and tri-allate (~80-90% control) with no consistent difference between rates*
- *Diuron provided low to moderate wild oat suppression (up to ~50% control)*

Yield impact:

- *At sites with low weed pressure (and low yield potential) there was no impact on yield from the pre-emergent herbicides*
- *Under extreme weed pressure, a mean yield increase of ~700 kg/ha was recorded in chickpeas*

Overall:

- ***Results were consistent and encouraging but the approach is NOT a silver bullet (will nearly always require a post-emergent clean up)***
- ***Escapes in 'stripe along plant line' will be key weakness***
- ***Similar results from trifluralin and tri-allate where 'incorporated by sowing'***
- ***No clear improvement in level of weed control by increasing either product rate when used alone or in mixture***



- *Mixtures of trifluralin and tri-allate should be considered where wild oat seed bank is large*
- *Narrow safety margin in wheat with high rate of trifluralin, particularly with shallow sowing and narrow row spacings*
- *In chickpeas, under extreme wild oats pressure, an average net benefit of \$310/ha was obtained (range \$242-373)*
- *May have better fit in zero/minimum tillage systems where seed bank is predominantly on soil surface*

*Although these pre-emergent chemicals will **NOT** by themselves be a solution to our problem, they may be a component of an overall package to manage wild oats more effectively.*



Triflur Xcel 1.45 L/ha + Avadex Xtra 1.6 L/ha



Untreated 19 DAP , Edgeroi June 2007



Trial design

NGA established three small plot trials to evaluate the potential of these pre-emergent herbicides. Two of the trials were conducted in chickpeas with the remaining site in wheat. Triflur Xcel[®] (trifluralin 500 g/L) and Avadex[®] Xtra (tri-allate 500 g/L) were both evaluated alone and in mixtures in all trials. Diuron 900DF (diuron 900 g/kg) was evaluated as a standalone option only in the two chickpea sites.

Application was in a total volume of 70 L/ha, using TT11002 nozzles at 200 kPa with a travel speed of 11 km/hr. Row widths were 50 cm in chickpeas, and 25 cm in the wheat trial. Incorporation by commercial planting at all sites was within 24 hours of application at sowing speeds of 10-11 km/hr. All sites had populations of wild oats with suspected or confirmed Group A resistance. There were three replicates in all trials.

The maximum registered rate of Triflur Xcel in chickpeas is 1.6 L/ha in Qld and 1.7 L/ha in NSW but is dependent on soil type. Triflur Xcel at 1.45 L/ha was used in both chickpea trials to compare to the same rate used in wheat. **A higher experimental rate (coded T2) was also applied to investigate whether any rate response was evident.**

The maximum registered rate of Avadex Xtra in chickpeas is 1.6 L/ha. This rate was used in both chickpea trials to compare to the same rate used in wheat. **A higher experimental rate (coded A2) was also applied to investigate whether any rate response was evident.** Four rates of mixtures were also applied. These were combinations of the two Triflur Xcel rates and the two Avadex Xtra rates.

Subsequent weed control in all trials was as per the commercial paddock. The pre-emergent approaches being tested are only likely to be effective as part of a weed management system rather than as a standalone herbicide option. The benefit of the approach is to dramatically reduce the emerged weed population and consequently reduce the pressure on resistance selection with post-emergent options.



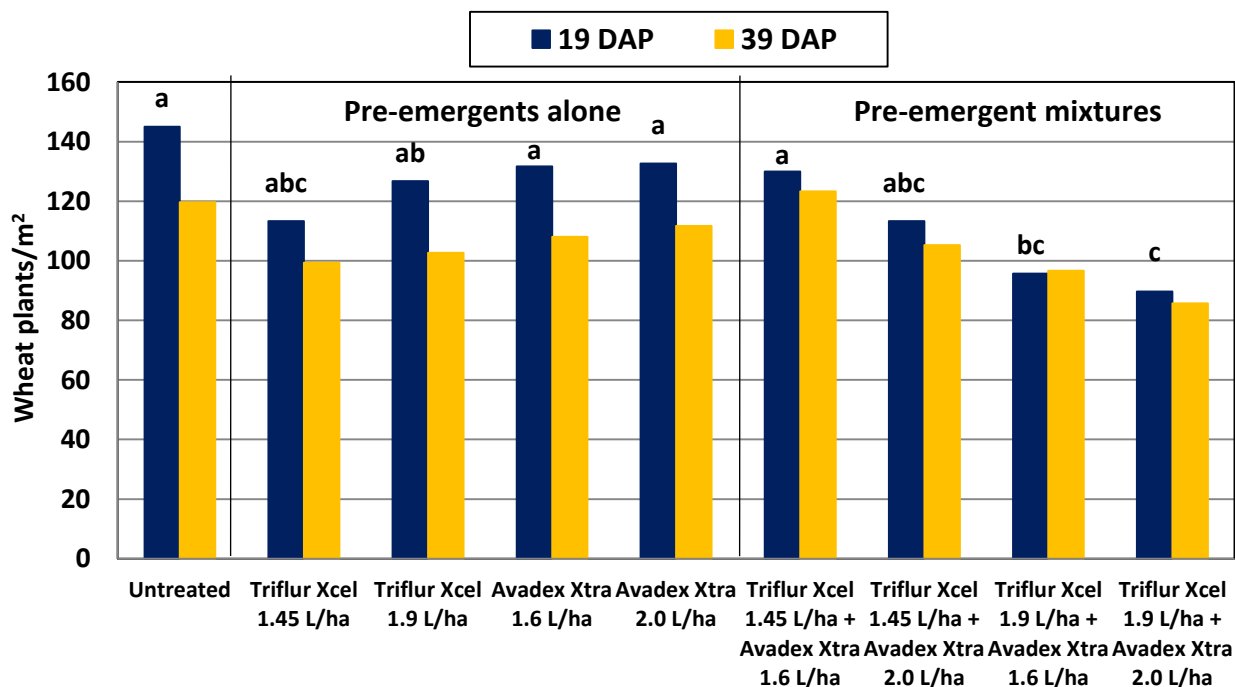
Assessments

1. **Crop safety**
 - a. **Crop establishment:** established plants in 2 x 2 m lengths of row
 - b. **Visual effect:** rating of crop discolouration or biomass reduction
2. **Wild oat control:** visual biomass reduction ratings, surviving plant counts and panicle counts in NGA0718
3. **Yield impact:** All plots were harvested by small plot header

Multi-trial summary

Crop safety

Wheat emergence NGA0717



Treatments sharing the same letter are not significantly different. LSD=32
DAP = days after planting

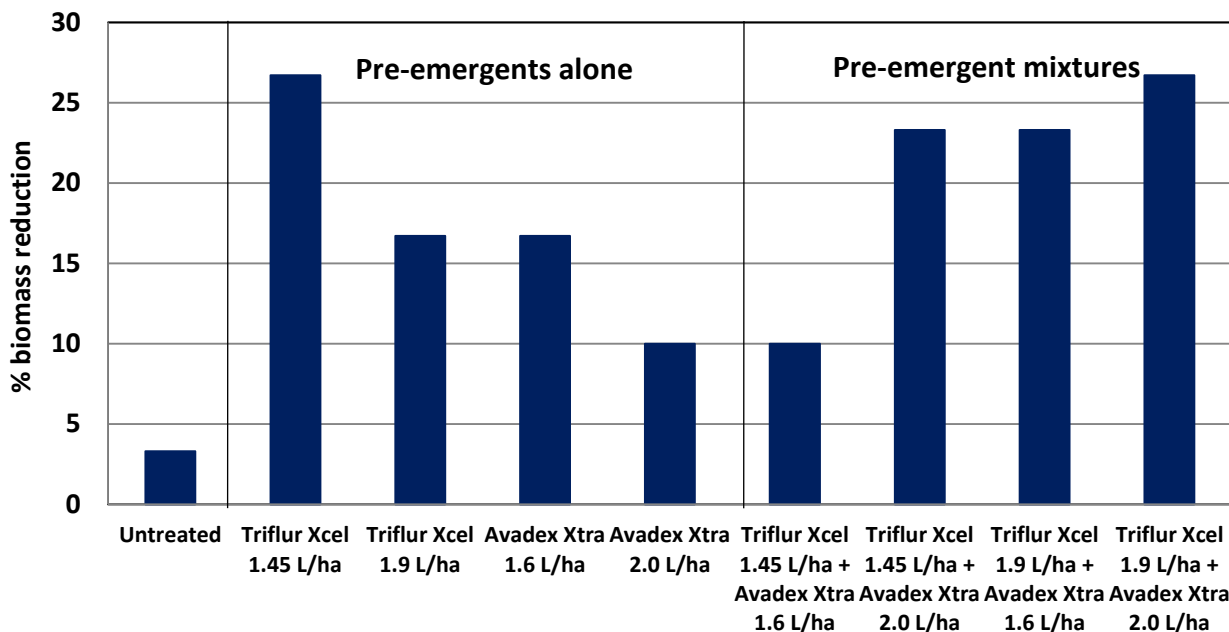


Pre-Emergent Wild Oat Control 2007 Complete Summary

Mixtures of Triflur Xcel at 1.9 L/ha together with either rate of Avadex Xtra significantly reduced wheat establishment counts at 19 DAP. There was no significant difference between any treatment in final establishment count at 39 DAP although similar trends to 19 DAP were still apparent.

No significant difference in chickpea establishment counts in either trial at 32-36 DAP. All herbicide treatments actually averaged higher establishment counts than the Untreated.

Wheat visual biomass reduction NGA0717 (39 DAP)



No significant difference between any treatment and the Untreated
DAP = days after planting

No discolouration was evident from any treatment in the wheat trial although a clear, though not significant, trend to reduced biomass from most herbicide treatments.

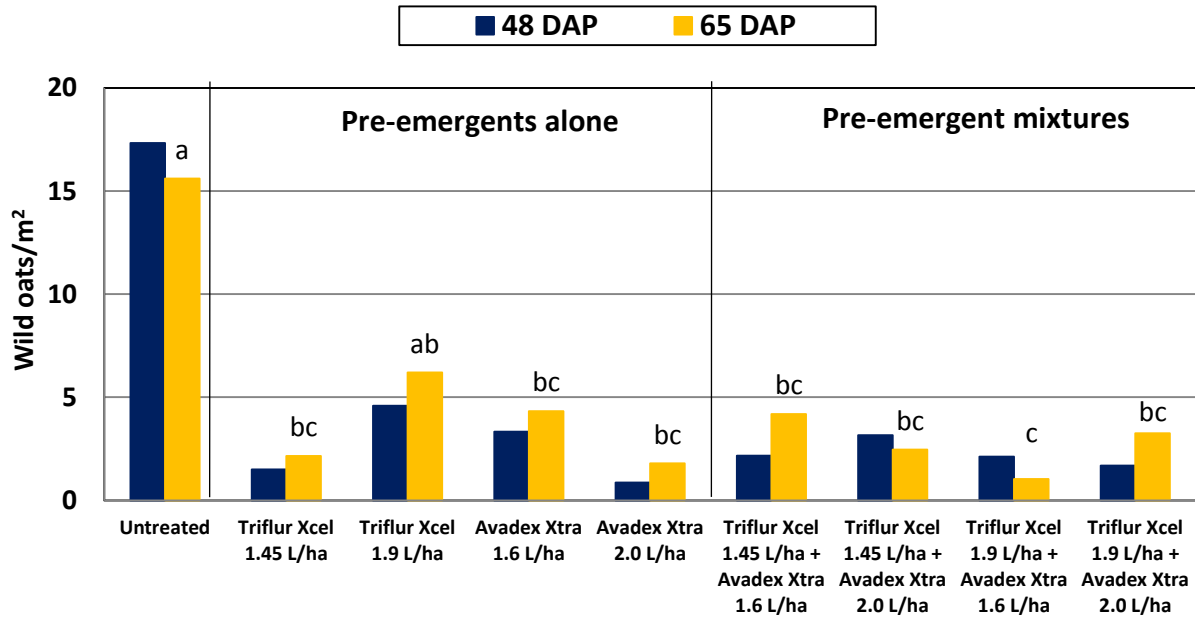
No biomass reduction or discolouration was evident in either chickpea trial at any assessment.

Key messages - crop safety

- **Trifluralin can cause establishment effects in winter cereals.** In the wheat trial there was a clear, although acceptable, impact on crop establishment . This was only significant in mixtures with the higher trifluralin rate. This may have been exaggerated by soil throw across the relatively narrow 25 cm row spacing.
- **Both products can reduce early crop biomass in wheat**
- **Good crop safety evident with all products and all rates in the two chickpea trials**

Wild oat control

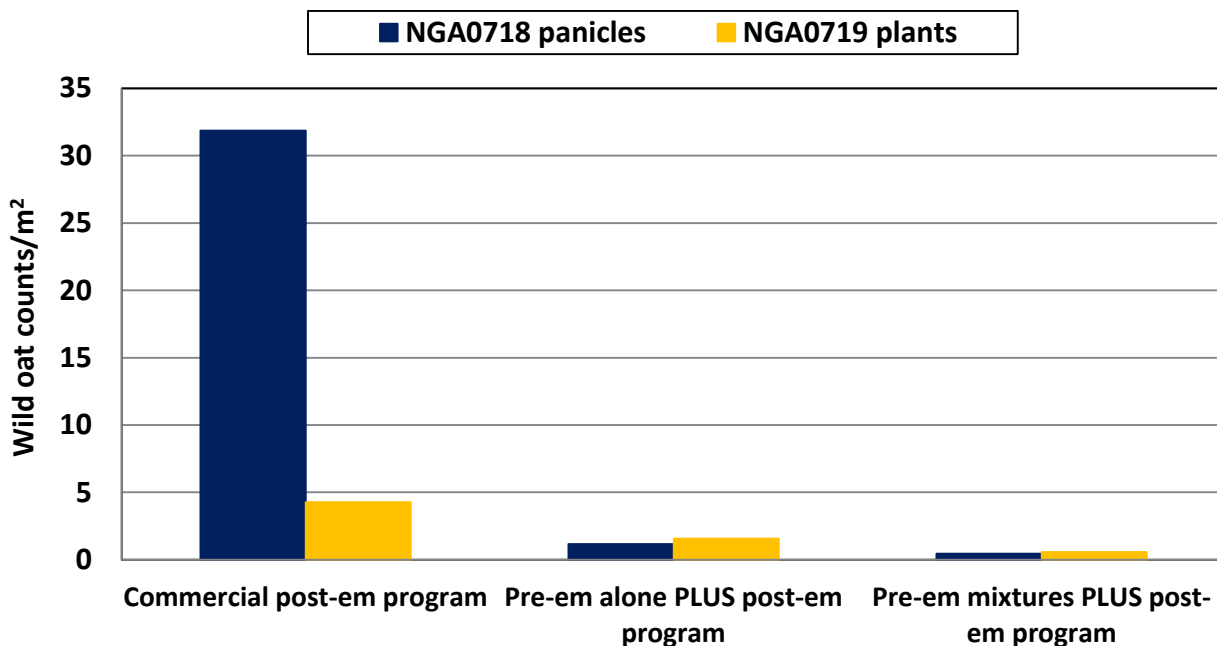
Wild oat counts in wheat (48 and 65 DAP)



Treatments sharing the same letter are not significantly different
DAP = days after planting, No LSD as means detransformed from log(x+1)



Wild oat counts in chickpeas (66 and 127 DAP)



Key messages – wild oat control

- No consistent difference in control between products when used with IBS
- No consistent rate response to either product in wheat or in chickpeas
- Trend to improved control from mixtures of trifluralin and tri-allate
- Useful options but will generally NOT provide standalone weed control

Yield impact

Key messages – yield impact

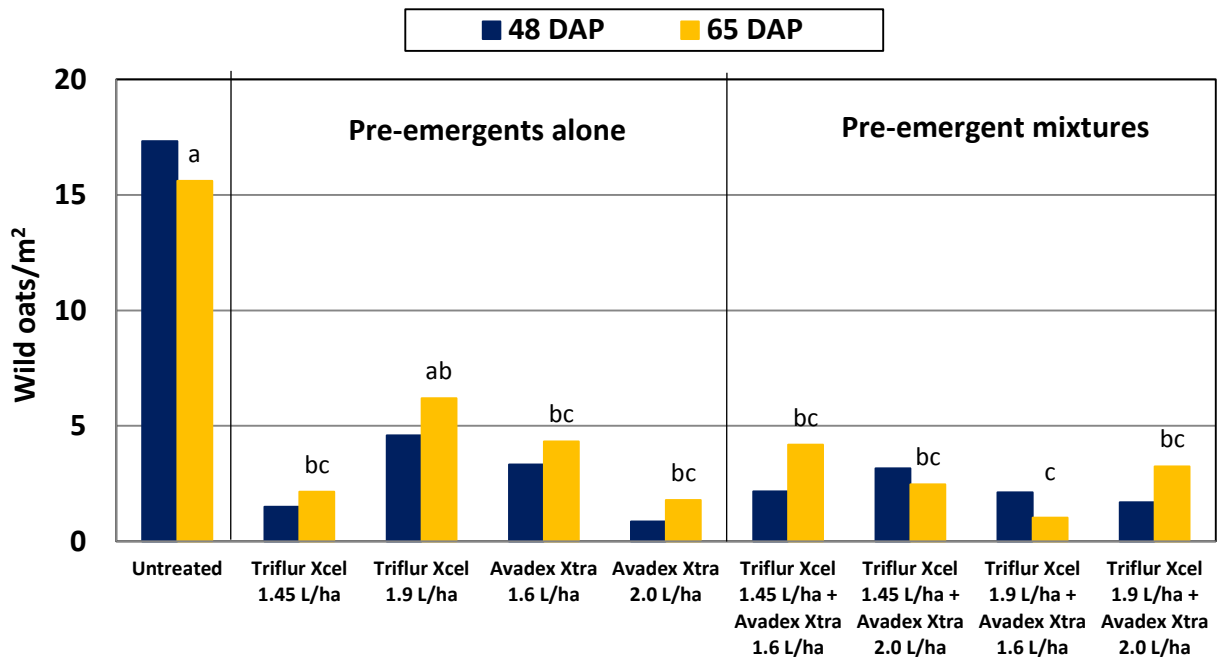
- Graphs of individual yield results on following pages
- No impact on yield at sites with low weed pressure or under low yielding conditions
- Large positive yield impact under extreme weed pressure in trial NGA0718

Individual trial results 2007

Trial number: NGA0717
Site: Biniguy district

Planting date: 26/05/2007
 Harvest date: 22/10/2007
 Crop: Wheat (Baxter)
 Row spacing: 25 cm
 Planting speed: 10 km/hr
 Commercial treatment: Atlantis 330 mL/ha
 Commercial application: 12/7/07 (47 DAP)

Wild oat control (48 and 65 DAP)

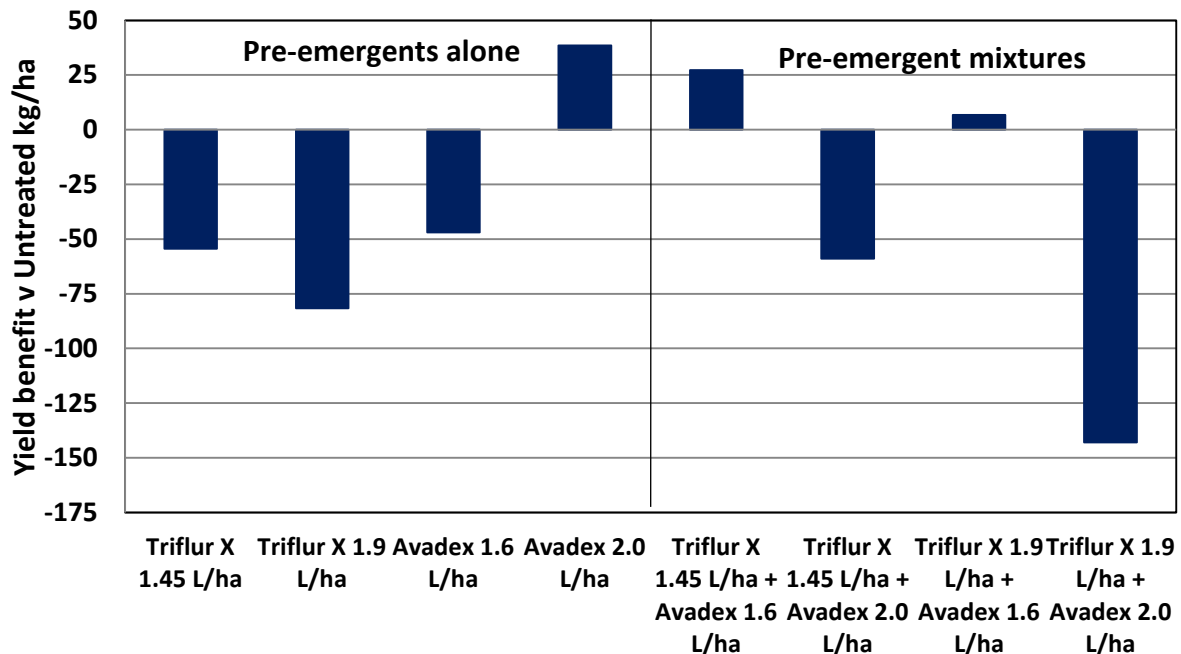


Treatments sharing the same letter are not significantly different
 DAP = days after planting, No LSD as means detransformed from log(x+1)

- Mean control with pre-emergents alone at ~77%
- Mean control with pre-emergent mixtures ~82%

Complete control was achieved from the Atlantis commercial spray with no evidence of surviving wild oats at harvest in any treatment.

Grain yield



Untreated yield=1060 kg/ha

No significant difference in yield between any herbicide treatment and the Untreated.
CV=13%

- No significant yield impact from any treatment compared to the Untreated

Key messages

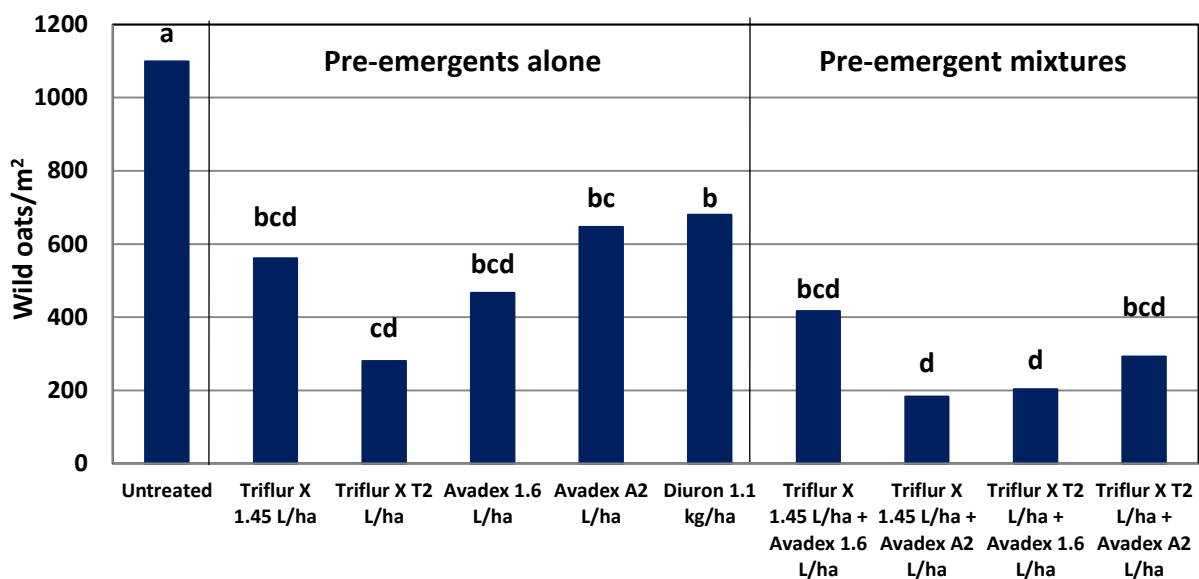
Pre-emergent herbicides provided ~80-85% control of wild oats, however complete control of the weed population was achieved with a post-emergent Group B herbicide. In this scenario:

- No consistent difference in level of control between Triflur Xcel and Avadex Xtra
- No consistent rate response to either herbicide
- No yield benefit in a very low yielding/ low weed pressure situation where complete control was still obtained with a post-emergent herbicide

Trial number: NGA0718
Site: Edgeroi district

Planting date: 29/05/2007
 Harvest date: 30/10/2007
 Crop: Chickpeas (Jimbour)
 Row spacing: 50 cm
 Planting speed: 11 km/hr
 Commercial treatments: a) Verdict 85 mL/ha b) Select 200 mL/ha
 Commercial applications: a) 14/7/07 (46 DAP) b) 8/8/07 (72 DAP)

Wild oat control (45 DAP)



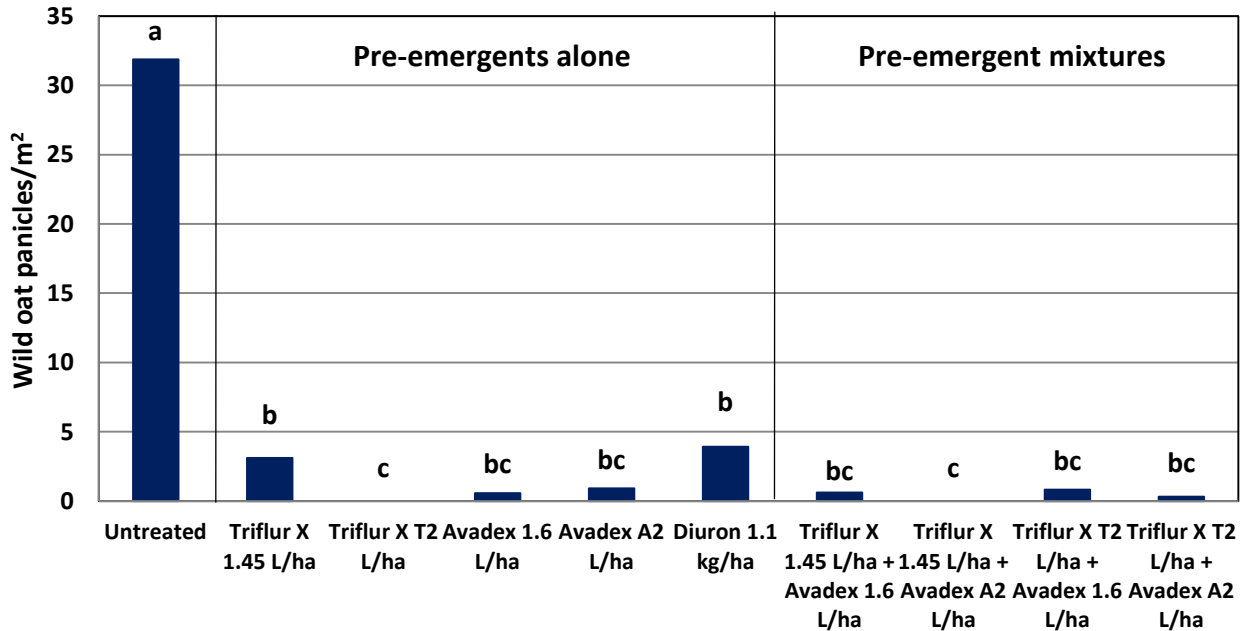
Treatments sharing the same letter are not significantly different

DAP = days after planting, LSD = 393

Triflur Xcel T2 and Avadex Xtra A2 are above label rates to investigate product rate response

- Mean control with pre-emergents alone ~55%
- Mean control with pre-emergent mixtures ~75%
- Mixtures trended to improved control

Wild oat control (127 DAP)



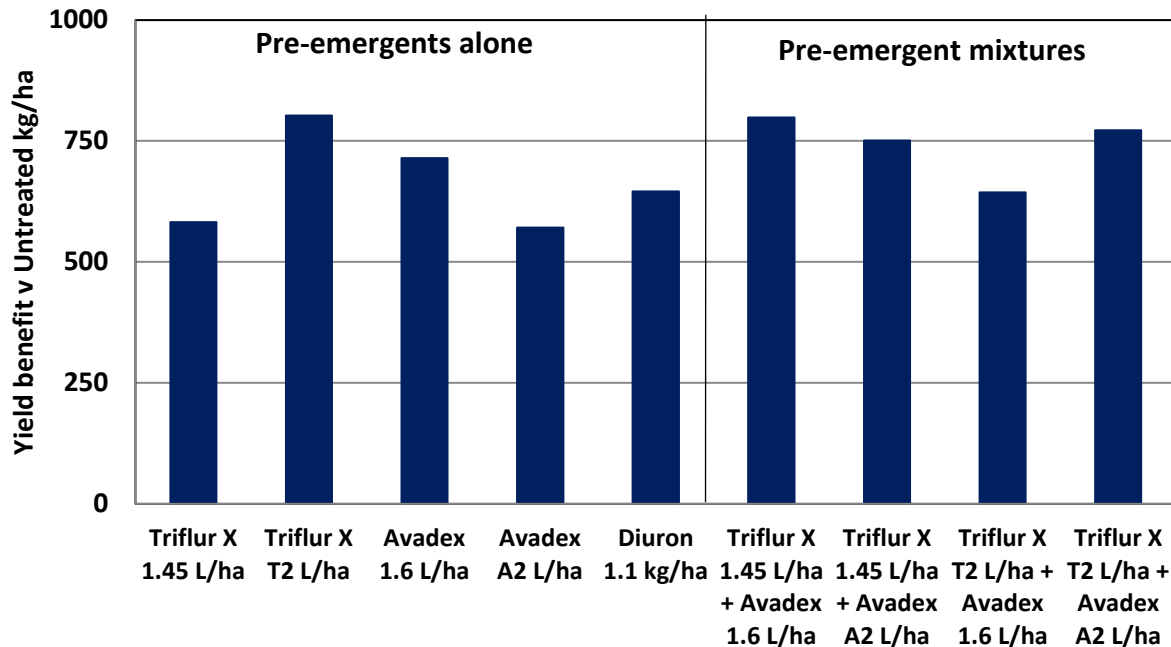
Treatments sharing the same letter are not significantly different

DAP = days after planting, No LSD as means detransformed from log(x+1)

Triflur Xcel T2 and Avadex Xtra A2 are above label rates to investigate product rate response

- Mean control with pre-emergents alone plus post-emergent program ~96%
- Mean control with pre-emergent mixtures plus post-emergent program ~99%
- Unacceptable level of control achieved with commercial program of Verdict followed by Select

Grain yield



Untreated yield=870 kg/ha

All herbicide treatment 'trended' to a significant increase in yield compared to the Untreated (p=0.10). No significant difference between any herbicide treatment. CV=19%

Triflur Xcel T2 and Avadex Xtra A2 are above label rates to investigate product rate response

- Mean yield benefit with pre-emergents alone in addition to post-emergent program ~670 kg/ha
- Mean yield benefit with pre-emergent mixtures in addition to post-emergent program ~740 kg/ha

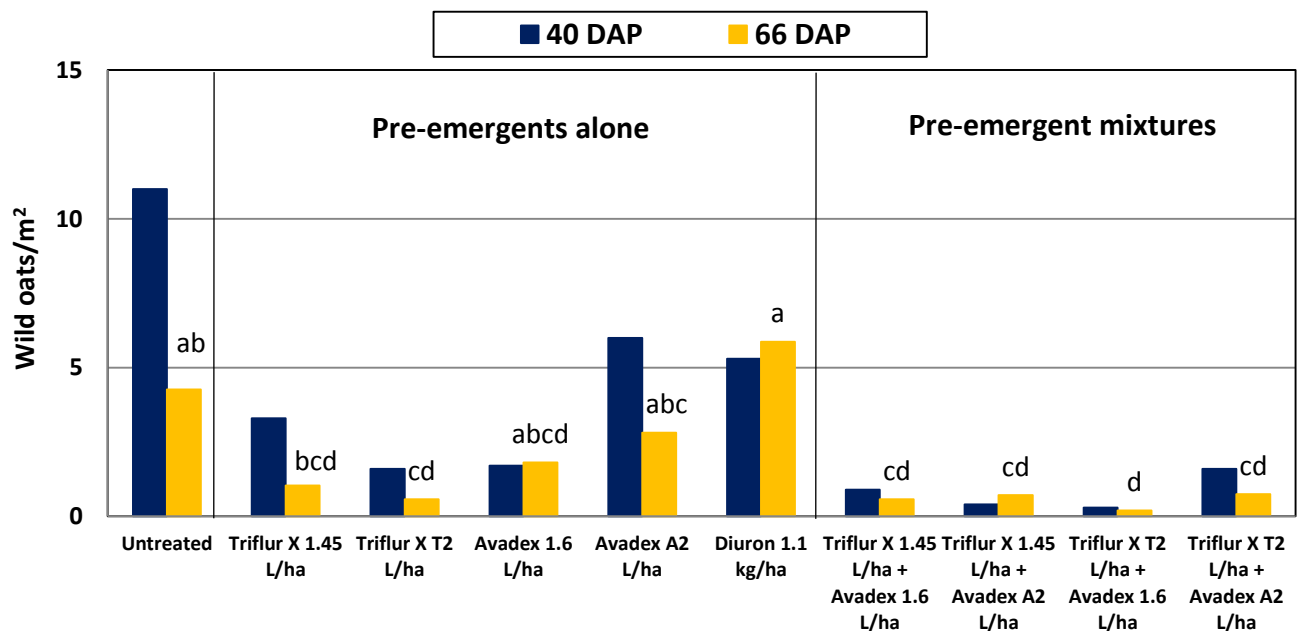
Key messages

Pre-emergent mixtures provided ~75% control of wild oats in a severe weed pressure situation. Clear benefits in final weed control were achieved by use of any of the pre-emergent options in addition to post-emergent strategy. In this scenario:

- No consistent difference in level of control between Triflur Xcel and Avadex Xtra
- No consistent rate response to either herbicide
- High yield benefit in a moderate yielding/ extreme weed pressure situation where complete control was NOT obtained with a two spray post-emergent herbicide program

Trial number: NGA0719
Site: Biniguy district
 Planting date: 25/05/2007
 Harvest date: 22/10/2007
 Crop: Chickpeas (Jimbour)
 Row spacing: 50 cm
 Planting speed: 10 km/hr
 Commercial treatment: Select 143 mL/ha + Verdict 15 mL/ha
 Commercial application: 17/7/07 (53 DAP)

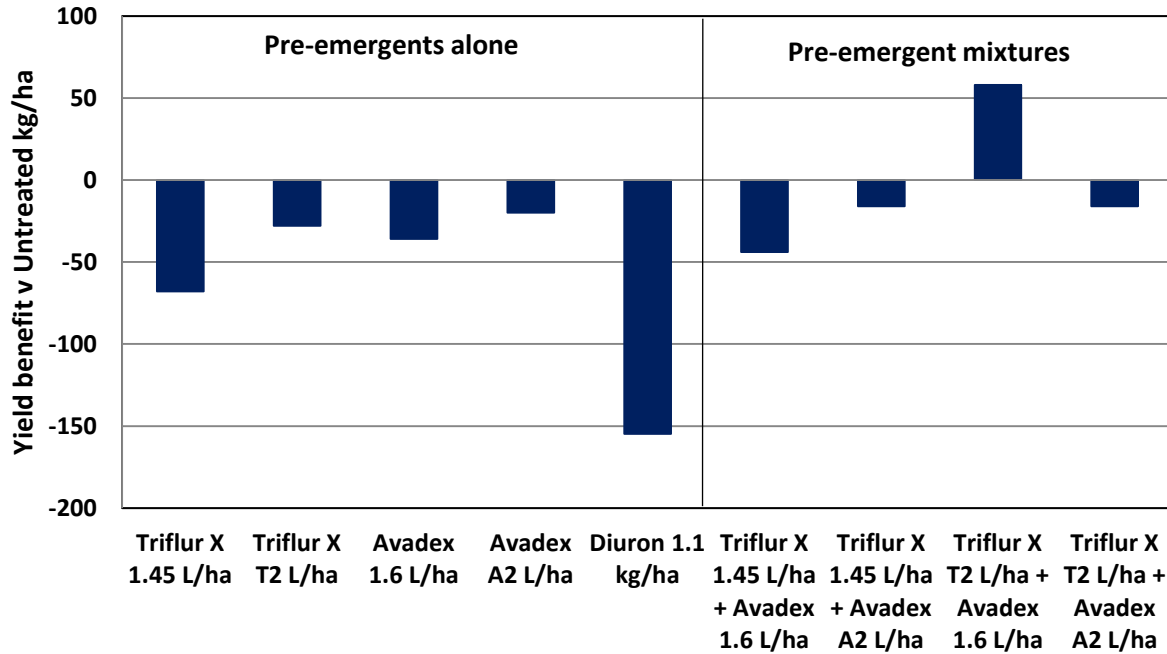
Wild oat control (40 and 66 DAP)



Treatments sharing the same letter are not significantly different (NB P=0.10)
 DAP = days after planting, No LSD as means detransformed from log(x+1)
 Triflur Xcel T2 and Avadex Xtra A2 are above label rates to investigate product rate response

- Mean control with pre-emergents alone plus post-emergent program ~63%
- Mean control with pre-emergent mixtures plus post-emergent program ~87%
- Clear trend to improved control with mixtures
- Marginal to unacceptable level of control achieved with commercial program of Select tank mixed with Verdict

Grain yield



Untreated yield=940 kg/ha

No significant difference in yield between any herbicide treatment and the Untreated.
CV=13%

Triflur Xcel T2 and Avadex Xtra A2 are above label rates to investigate product rate response

- No significant yield impact from any treatment compared to the Untreated

Key messages

Pre-emergent treatments alone or in mixture provided ~65-90% control of wild oats in a variable lower weed pressure situation. Clear benefits in final weed control were achieved by use of any of the pre-emergent mixtures, or the high rate of Triflur Xcel alone, in addition to a post-emergent strategy, that only provided marginal control. In this scenario:

- No consistent difference in level of control between Triflur Xcel and Avadex Xtra
- No consistent rate response to either herbicide
- No yield benefit in a low yielding/ low weed pressure situation