

# Controlling annual ryegrass (and other weeds) in fence lines to reduce glyphosate resistance development

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## Take Home Messages

- A two spray or double knock strategy (including cultivation or another non-herbicide treatment) is often required for complete control in fence lines with the first application early in the season followed by another one later in the season (after the seeding and post-harvest operations are over).
- Tank mixes of residual herbicides plus a knockdown give the best control for the first application.
- A single application of a mixture of Uragan® (bromacil) and paraquat early in the season gives excellent weed control in fence lines
- The addition of Alliance® (mixture of amitrole and paraquat) as the knockdown gives good broadleaf control
- Glyphosate can still be used BUT intensive monitoring and complete seed set is required to prevent resistance from developing

## Background/Aim

Fence lines can be a 'breeding' ground for glyphosate resistance evolution due to the lack of crop competition, its repeated usage and the often late applications when weeds are large and harder to control. Controlling weeds that grow on fence lines is important to prevent their move into cropping fields taking their resistance status with them.

For the past three years, the Northern and Esperance Advisor Groups (set up as part of the GRDC-funded herbicide resistance project) have looked at annual ryegrass and other weed control in fence lines for resistance management.

The aim of this work was to explore herbicide and application timing alternatives to control annual ryegrass and other weeds in fence lines and prevent the onset of resistance.

In 2012, the two Groups compared 13 herbicide treatments (applied as either single herbicides (glyphosate, paraquat, AmitroleT®, glufosinate or Alliance®) or as a mixture of a residual herbicide with paraquat) with glyphosate at two trial sites (Esperance and Dalwallinu).

- Tank mixes of residual herbicides plus either paraquat or Alliance gave the best control of annual ryegrass, wild radish and other grasses and broadleaf weeds.
- Applications of bromacil offered the best control at both locations but it was unregistered in 2012.
- The herbicide treatments were applied in August which tends to be a common time for many growers. In Western Australia in August however, the weeds are large and often harder to control.

In 2013, two earlier (but single) application times (May and early July) of a further range of herbicides were explored in four locations, Miling, Dandaragan, Geraldton and South Stirlings.

- Similarly, tank mixes of residual herbicides plus a knockdown gave the best control.
- None of the treatments gave complete control.

In 2014, the groups decided that two control timings were needed, once early in the year with a good residual and a knockdown, followed by another one later in the season (after the seeding and post-harvest operations are over). That way you set up the fence lines early in the season then kill them off later rather than having to spray big fat weeds in one pass. As Uragan® (bromacil) was now registered for fence lines (the only bromacil product registered for this use), it was included as a single application mixed with paraquat in the early timing. Cultivation and slashing were also included in some of the treatments. There were six trial sites at Northampton (NAG group), Buntine (Liebe Group), Doodlakine (Kellerberrin Grower Group), East Wagin (East Wagin Top Crop Group), Woogenellup (Stirlings to Coast Grower Group) and Esperance Downs Research Station, Gibson (SEPWA)

## Northampton Trial Details

<b>Plot size &amp; replication</b>	10m x 5m x 3 replication
<b>Soil type</b>	Gravel loam
<b>Herbicides application</b>	Various (T1 -26/05/14 , T2 - 18/06/14, T3 - 27/07/14, T4 - 06/08/14 for cultivation, 08/08/14 for spray)
<b>Water rate</b>	130 L/ha using 360 kpa pressure
<b>Ground speed</b>	12 kph
<b>Nozzle type</b>	Teejet AIXR11004 nozzles
<b>Weed Species</b>	Annual ryegrass, wild radish, capeweed, doublegee, clover, volunteer cereals

There are 4 treatment times;

T1 = May 26

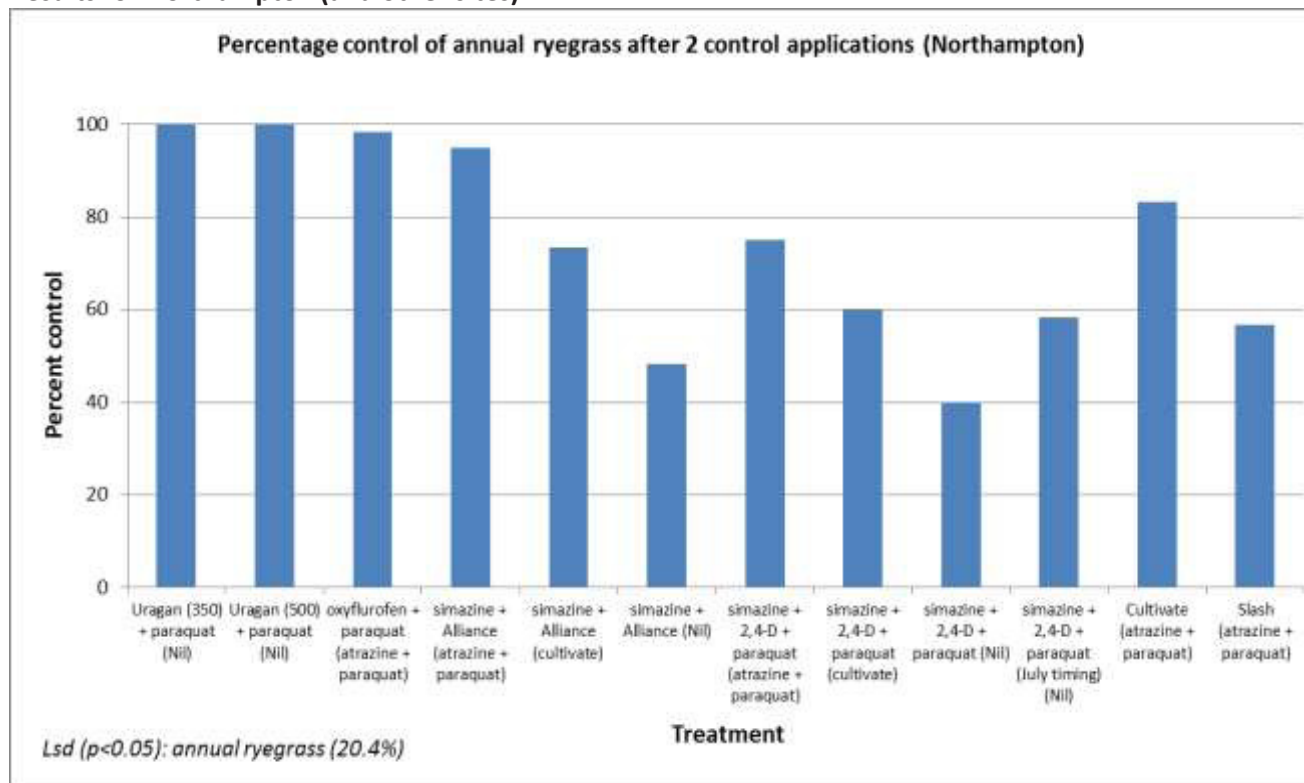
T2 = June 18

T3 = July 27

T4 = August 6 and 8 (cultivation and spray)

Treatment No	First application	Timing	Second application	Timing
1	simazine granules@ 4 kg/ha + Alliance® @ 4L/ha	T1	atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	T4
2	simazine granules@ 4 kg/ha + Alliance® @ 4L/ha	T1	cultivate	T4
3	simazine granules@ 4 kg/ha + Alliance® @ 4L/ha	T1	Nil	T4
4	simazine granules@ 4 kg/ha+ 2,4-D @ 700 mL/ha + paraquat 250@ 3.6 L/ha	T1	atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	T4
5	simazine granules @ 4 kg/ha+ 2,4-D @ 700 mL/ha + paraquat 250@ 3.6 L/ha	T1	cultivate	T4
6	simazine granules@ 4 kg/ha + 2,4-D @ 700 mL/ha + paraquat 250@ 3.6 L/ha	T1	Nil	T4
7	Uragan® (bromacil) @ 3.5 kg/ha + paraquat 250@ 3.6 L/ha	T1	Nil	T4
8	Uragan® (bromacil) @ 5 kg/ha + paraquat 250@ 3.6 L/ha	T1	Nil	Nil
9	Cavalier® (oxyfluorfen) @ 4 L/ha + paraquat 250@ 3.6 L/ha	T1	atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	T4
10	Slash	T3	atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	T4
11	simazine granules @ 4 kg/ha + 2,4-D @ 700 mL/ha + paraquat 250@ 3.6 L/ha (July timing)	T2	Nil	Nil
12	Cultivate	T2	atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	T4
13	Control	Nil	Nil	Nil

## Results for Northampton (and other sites)



**Figure 1:** Percentage control (compared to untreated) of annual ryegrass after application of 12 herbicide treatments at Northampton (NAG Group trial site 2014). (Note: second application in brackets)

- A single application of Uragan® (bromacil) plus paraquat in May (or June in Esperance) gave complete control of all weeds (annual ryegrass, wild radish, mallow, capeweed, turnip, clover, volunteer cereals) at all sites over both rates (350 and 500 kg/ha).
- Uragan is expensive (see Table 1) but only one application is needed to control all weeds (including summer weeds) for at least one year. As bromacil is highly residual, there is a risk of soil erosion where there is no vegetation to hold onto it and a risk to the crop if soil is blown onto it. It is toxic to trees so can only be used where there is no remnant vegetation. Adama™ are continuing trials in 2015 to investigate weed control at lower rates which will reduce the cost and the potential environmental hazards.
- At most locations an application of either simazine + Alliance® or simazine, 2,4-D and paraquat in May followed by a second application of atrazine and paraquat in August gave better than 95% control. The addition of Alliance gave slightly better control especially where there were broadleaf weeds (three years results). At Northampton however, the level of control for annual ryegrass was lower than expected. It is possible that there is developing triazine resistance in annual ryegrass on this site as most of the other weed species were controlled (this has not been tested as yet). Another possibility is that the soil microorganisms are breaking down the triazines quickly and reducing their residual activity. This is the subject of a new study at UWA, particularly for the northern wheatbelt soils.
- Delaying the application of the first spray reduced the control by 30% (10 to 30% across all sites).
- Slashing later in the season then spraying with atrazine and paraquat showed promise in the southern areas (80-98% control) where the season was later and there had been more rain. There was poor control (56-59%) in the northern trial sites.
- The use of cultivation as a control option did not generally work well in this series of trials except when used as the second control knock in August at Buntine.

**Table 1:** The cost of the herbicide treatments (\$/km based on a 3 m wide fence line)

<b>First treatment</b>	<b>Active ingredient</b>	<b>Cost (\$/km)</b>
simazine @ 4 kg/ha	simazine	8
paraquat 250@ 3.6 L/ha	paraquat	5
Alliance® @ 4 L/ha	amitrole and paraquat	20
atrazine granules@ 2.2 kg/ha	atrazine	8
2,4-D @ 700 mL/ha	2,4-D	1.20
Uragan @ 3.5 kg/ha+ paraquat (3.6 L/ha)	bromacil and paraquat	73
Uragan @ 5 kg/ha+ paraquat (3.6 L/ha)	bromacil and paraquat	103
simazine @ 4 kg/ha + 2,4-D @ 700 mL/ha paraquat (3.6 L/ha)	simazine and paraquat	14
simazine @ 4 kg/ha + Alliance® @ 4 L/ha	simazine, amitrole and paraquat	28
<b>Second treatment</b>		
atrazine granules@ 2.2 kg/ha + paraquat 250@ 3.6 L/ha	atrazine and paraquat	13

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