

Ryegrass control with pre-emergent herbicides in wheat

This trial is funded by the GRDC and is part of a collaborative project. It was conducted with Chris Preston, Gurjeet Gill and Sam Kleemann from the University of Adelaide.

Key findings

- Sakura alone or in combination with Avadex Xtra or Dual Gold provided the best pre-emergence ryegrass control (72 to 94%) in 2010.
- New pre-emergent herbicides like Boxer Gold or Sakura provide good control of trifluralin resistant annual ryegrass.
- Post-sowing pre-emergent herbicide applications provide significantly improved ryegrass control in the crop row, and also give longer residual control.
- Sakura significantly reduced the number of ryegrass heads produced.

Why do the trial?

There is an increasing frequency of trifluralin (Group D) resistant annual ryegrass across southern Australia. Pre-emergent herbicides play an important role in current cropping systems and so the evaluation of alternative groups and strategies is vital.

Regardless of herbicide efficacy a common paddock observation is the lack of annual ryegrass control within the crop row. In 2009 the ryegrass control trial clearly showed that pre-emergent herbicides applied after sowing and before emergence (PSPE) were the most effective for in-row ryegrass control.

This trial also aims to measure if the period of residual ryegrass control can be extended using PSPE treatments.

How was it done?

Plot size	1.4m x 10m	Fertiliser	32:10 (DAP/Urea) @ 80 kg/ha
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Seeding date	13 th May 2010	Variety	Catalina wheat @ 70 kg/ha
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The trial was a randomised complete block design with 3 replicates and 17 herbicide treatments (Table 1). Active ingredients of the herbicides used in the trial are listed in Table 2.

To ensure even ryegrass establishment across the trial site, ryegrass seed was broadcast at 25 kg/ha ahead of seeding and worked in with a shallow pass with the seeder prior to herbicide application. The ryegrass used was harvested from paddocks and is approximately 30% resistant to trifluralin.

The seeding equipment used was a knife-point press wheel system on 22.5cm (9") row spacings.

Pre-sowing herbicides were applied within 1 hour of sowing and incorporated by sowing (IBS), the post-sow pre-emergent (PSPE) herbicides were applied on the 25th May, 12 days after sowing. The site received 24mm of rainfall on the same day as the PSPE application.

Crop emergence was assessed by counting the number of emerged wheat seedlings along both sides of a 0.5 m rod at 3 random locations within each plot. Ryegrass was counted at 6 & 10 weeks after sowing (i.e. July & August) using a 0.1 square metre quadrat from within and between the crop rows from 4 random locations within each plot. Ryegrass head density was measured in September using 0.16 square metre quadrat placed at 4 random locations within each plot.

Table 1. Pre-emergent herbicides, rates & timings at Hart in 2010.

Herbicide treatments		Cost (\$/ha)
1	Nil (untreated control)	
2	Trifluralin 480 1.5 L/ha (IBS)	7.50
3	Avadex Xtra 3.0 L/ha (IBS)	30.0
4	Boxer Gold 2.5 L/ha (IBS)	34.0
5	Sakura 118 g/ha (IBS)	na
6	Outlook 1.0 L/ha (IBS)	na
7	Trifluralin 480 1.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	27.5
8	Trifluralin 480 1.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	37.5
9	Trifluralin 480 1.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Sakura 80g/ha (PSPE)	na
10	Trifluralin 480 1.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Boxer Gold 1.5 L/ha (PSPE)	48.0
11	Boxer Gold 2.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	54.0
12	Boxer Gold 1.5 L/ha (IBS) + Boxer Gold 1.0 L/ha (PSPE)	34.0
13	Boxer Gold 2.5 L/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	44.0
14	Sakura 80 g/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	na
15	Sakura 80 g/ha (IBS) + Sakura 38 g/ha (PSPE)	na
16	Sakura 118 g/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	na
17	Outlook 0.7 L/ha (IBS) + Outlook 0.3 L/ha (PSPE)	na

Table 2. Pre-emergent herbicides & their active ingredients at Hart in 2010.

Herbicide	Active ingredients	Herbicide group
Trifluralin 480	trifluralin 480 g/L	D
Avadex Xtra	tri-allate 500 g/L	J
Boxer Gold	Prosulfocarb 800 g/L + S - metolachlor 120 g/L	E+K
Sakura (BAY-191 850WG)	pyroxasulfone 850 g/kg	K
Outlook (Nul-1493)	dimethenamid-P	K
Dual Gold	S-metolachlor 960 g/L	K

Results

All herbicides with the exception of Outlook were safe on wheat with little or no reduction in wheat establishment under the knife-point press wheel system. Outlook reduced crop density by 70% of the untreated control (126 plants per square metre), and also early crop vigour. Outlook, an experimental herbicide developed by Nufarm, is highly soluble and will not be released for use in wheat due the potential for crop damage. It is safe on pulses and has been submitted for registration for this use.

All herbicide treatments reduced ryegrass emergence and averaged 79% total control in July (Table 3 or Figure 1). The combination of Sakura and Avadex Xtra IBS produced the greatest control (94%) while Trifluralin provided the lowest (59%) of the untreated control (385 plants per square metre).

Avadex Xtra (3.0L/ha), Sakura (118g/ha) or Outlook (1.0L/ha) applied alone IBS all provided less than 75% ryegrass control.

Of the IBS treatments Avadex Xtra mixed with Sakura, Boxer Gold or Trifluralin at sowing gave 94, 85 or 82% control respectively, in July. While for all the treatments the best control was produced by applying either Sakura (89%), Boxer Gold (91%) or Dual Gold (92%) post-sowing pre-emergence following a combination of Trifluralin and Avadex applied IBS. Across all the treatments, those containing a PSPE application gave 7% more control compared to all the IBS treatments alone.

Residual control of ryegrass

Control of ryegrass was maintained between July and August for most treatments with an exception for Boxer Gold (2.5L/ha IBS) and Outlook (1.0L/ha IBS). For both treatments control decreased by about 20% between July and August.

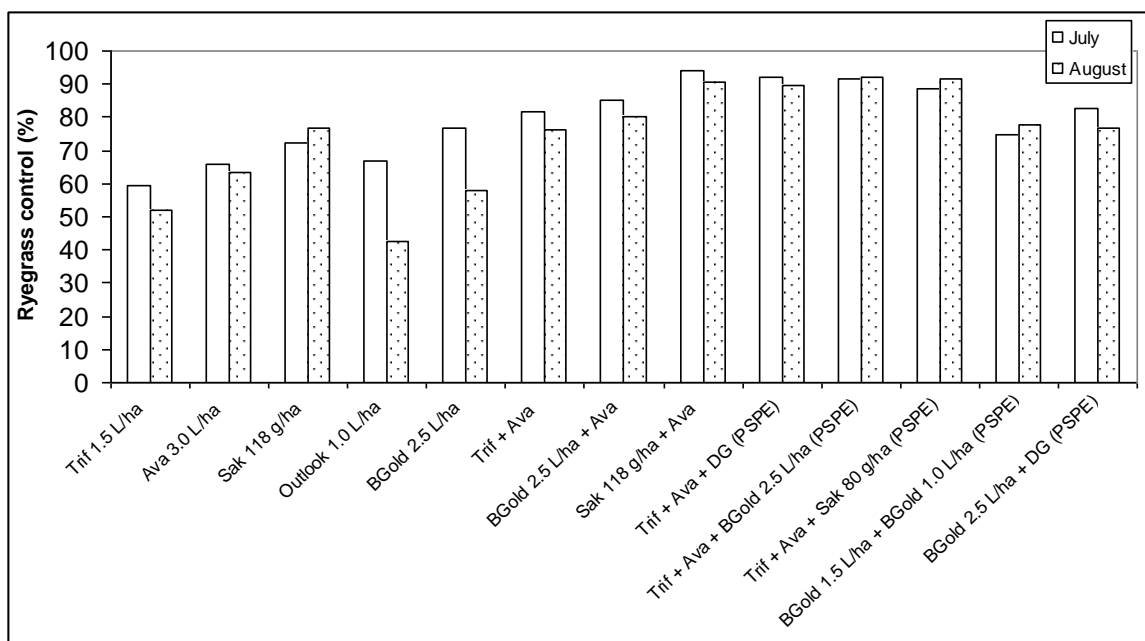


Figure 1. Effect of pre-emergent herbicide treatments on ryegrass emergence (% control) in July and August at Hart in 2010. (Trif = Trifluralin at 1.5L/ha, Ava = Avadex Xtra at 2.0L/ha, DG = Dual Gold at 0.5L/ha and BGold = Boxer Gold)

For the IBS only treatments total control decreased between July and August by 7%. Importantly treatments containing a PSPE application maintained the same level of control.

Treatments containing a PSPE application averaged 16% greater control in the crop row compared to IBS treatments, in July. By August this advantage was greater than 20%.

Ryegrass head density was measured in September to evaluate residual herbicide control. Sakura applied alone or in a mix provided high levels of control and was also able to significantly reduce head number (10 to 40 ryegrass heads per square metre) in comparison to the untreated (541 ryegrass heads per square metre). Some treatments which gave good levels of control in July were ineffective in limiting annual ryegrass seed set, including Boxer Gold and Avadex Xtra treatments. This could be due to the favourable and prolonged moist conditions over the growing season.

Controlling ryegrass in the crop row

Control in the crop inter-row was generally better (81%) compared to control in the crop row (71%), across all treatments. Single herbicides applied at sowing gave less control in the crop row (51%), compared to treatments containing two herbicides at sowing (84%). Trifluralin applied alone IBS showed the least crop row activity, achieving only 15% control.

Across all the IBS only treatments ryegrass control in the crop row was 16% lower compared to the inter-row. However, of the treatments containing a PSPE application the control in the crop row was similar to the inter-row, highlighting the increase in control from this strategy.

Conclusion

Boxer Gold and Sakura (to be available in 2012) provide effective alternatives for the control of trifluralin resistant ryegrass. However, use of these herbicides should be done so in conjunction with robust management strategies that use a diverse rotation of crops, herbicides and non-chemical strategies (i.e. seed catching) so as to prolong the life of existing and new chemical groups against annual ryegrass.

PSPE applications improved ryegrass control and had longer residual activity compared to IBS alone. Care needs to be taken with this application timing as it presents a higher risk to crop safety, depending on soil type and rainfall after application. IBS applications provide a more reliable and less risky option.

Some of the herbicide treatments contain unregistered pesticides and application rates. The results within this document do not constitute a recommendation for that particular use by the author or authors organisations.



Table 3. Effect of pre-emergent herbicide treatments on annual ryegrass emergence (% control) and head density at Hart in 2010. Density values are expressed as the number of ryegrass plants in either a square metre of crop furrow or inter-row (i.e. area between crop rows).

Herbicide treatment	July			August	September Ryegrass heads/sq m
	Inter-row	Crop row	Average	Average	
	Ryegrass plants per square metre (% control)				
Nil (untreated control)	596	174	385	325	541
Trifluralin 480 L/ha (IBS)	167 (72)	148 (15)	157 (59)	156 (52)	362
Avadex Xtra 3.0 L/ha (IBS)	170 (71)	93 (47)	132 (66)	119 (63)	235
Boxer Gold 2.5 L/ha (IBS)	115 (81)	63 (64)	89 (77)	136 (58)	196
Sakura 118 g/ha (IBS)	148 (75)	63 (64)	106 (72)	75 (77)	39
Outlook 1.0 L/ha (IBS)	200 (66)	56 (68)	128 (67)	186 (43)	325
Trifluralin 480 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	100 (83)	41 (76)	70 (82)	78 (76)	244
Trifluralin 480 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	44 (93)	15 (91)	30 (92)	33 (90)	110
Trifluralin 480 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Sakura 80g/ha (PSPE)	67 (89)	22 (87)	44 (89)	28 (91)	10
Trifluralin 480 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS) + Boxer Gold 1.5 L/ha (PSPE)	37 (94)	30 (83)	33 (91)	25 (92)	80
Boxer Gold 2.5 L/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	85 (86)	30 (83)	57 (85)	64 (80)	152
Boxer Gold 1.5 L/ha (IBS) + Boxer Gold 1.0 L/ha (PSPE)	148 (75)	48 (72)	98 (75)	72 (78)	128
Boxer Gold 2.5 L/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	96 (84)	37 (79)	67 (83)	75 (77)	79
Sakura 80 g/ha (IBS) + Avadex Xtra 2.0 L/ha (IBS)	30 (95)	15 (91)	22 (94)	31 (90)	31
Sakura 80 g/ha (IBS) + Sakura 38 g/ha (PSPE)	145 (76)	48 (72)	96 (75)	50 (85)	40
Sakura 118 g/ha (IBS) + Dual Gold 0.5 L/ha (PSPE)	82 (86)	30 (83)	56 (85)	53 (84)	31
Outlook 0.7 L/ha (IBS) + Outlook 0.3 L/ha (PSPE)	178 (70)	56 (68)	117 (70)	136 (58)	250
LSD (0.05)	80	45	48	60	58