New herbicides to control brome in cereals

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Waikerie, SA

Key messages:

- New mode of action (MOA) pre-emergence herbicides are available to control brome and ryegrass in cereals and others are in development.
- Trials conducted at Waikerie and Copeville in 2009 have shown very promising results.
- Ongoing heavy reliance on Group A, B and C herbicides to control brome in the Mallee is likely to lead to herbicide resistance.
- A proactive approach funded by GRDC has been to identify new mode of action herbicides so they can be incorporated into existing integrated weed management strategies to reduce the risk of herbicide resistance.

Aims:

- Identify alternatives to Group A or Group B herbicides to control brome in cereals in no-till Mallee farming.

Background:

Sustainable control of grass weeds is one of the major challenges to maintaining a successful cereal-based cropping rotation in the Mallee. If grass weeds are a problem, the lack of break crop options can lead to heavy reliance on just a few herbicide groups. Random testing conducted in the SA Mallee has shown increasing levels of herbicide resistant ryegrass to post-emergence and pre-emergence herbicides including trifluralin (Table 1).

Table 1. Percentage of randomly collected ryegrass populations collected (2007) from the SA Mallee with herbicide resistance.
Source: Peter Boutsalis, The University of Adelaide.

SA Mallee Region	Trifl	Hoe-grass	Glean	Achieve	Axial	Select
North	5	2	75	2	2	2
South	35	12	59	2	2	2

Brome is also a major issue in the SA and Vic Mallee. Some herbicide resistance in brome from the SA Mallee has been confirmed by commercial testing institutions. However unlike ryegrass, which can usually be controlled with a range of Group A herbicides such as Hoegrass, Achieve and Axial, there are no Group A herbicides that

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control brome in cereals. The only cereal-selective herbicides are sulfonylureas such as Atlantis & Monza which offer suppression or Clearfield herbicides in resistant cereal crops. Increased use of one MOA is likely to accelerate the onset of resistance in brome. This makes the management and availability of a diverse range of pre-emergence herbicides particularly important. This trial was aimed at testing new pre-emergence herbicide options in Mallee environments where brome is present.

About the trials:

Waikerie:

Trial sown at the MSF site in Waikerie SA on 10 June 2009 with Correll wheat @ 70 kg/ha, 50 kg/ha DAP+2% Zn and 35 kg/ha Urea.
Sowing implement: CSIRO plot seeder, narrow points, 22 cm row spacing, plots 2 m x 40 m long.
Pre-trial: Knockdown of 1.2 L/ha Roundup Powermax
Treatments: 7 treatments as outlined in Figure 1 in a randomised block design with 3 replicates.
Assessments: Two months after herbicide treatments were applied, biomass reduction was visually estimated - an important measure of herbicide efficacy and crop damage. Crop yield was also measured using a plot harvester.
Soil moisture at time of sowing and subsequent rainfall made the conditions for pre-emergence herbicide activation ideal. The brome species in this trial was *Bromus rigidus* (which is common throughout the SA Mallee) but was present at only patchy low densities. Ryegrass was not present at the site.

Copeville:

Trial sown near Copeville SA in July 2009 with Correll wheat.
Sowing implement: Knifepoints and presswheels, plots 4 m wide x 12 m long.
Treatments: 9 treatments as outlined in Table 2 & Figure 2 in a randomised block design with 4 replicates.
Assessments: Early crop vigour and three brome plant counts were made. Crop yield was also measured but the results were not available at time of reporting.
Soil moisture at time of sowing and subsequent rainfall made the conditions for pre-emergence herbicide activation ideal.
Brome species present was *Bromus rigidus*. Ryegrass was present at very low densities.

Results:

Waikerie: Most of the new MOA herbicides tested in the trial exhibited activity on brome similar to, or better than current standards such as trifluralin (Figure 1). Of particular interest is BAY-191 (registered as Sakura by BayerCropScience) which showed promising activity in this trial (and in other trials). Other features of this herbicide include its robust nature under a wide range of environmental conditions and its safety in cereals. No crop safety issues were observed with any herbicide apart from NUL-1493 which is not being registered in cereals. All treatments had similar crop yields, which reflects the low and patchy density of brome at this site.

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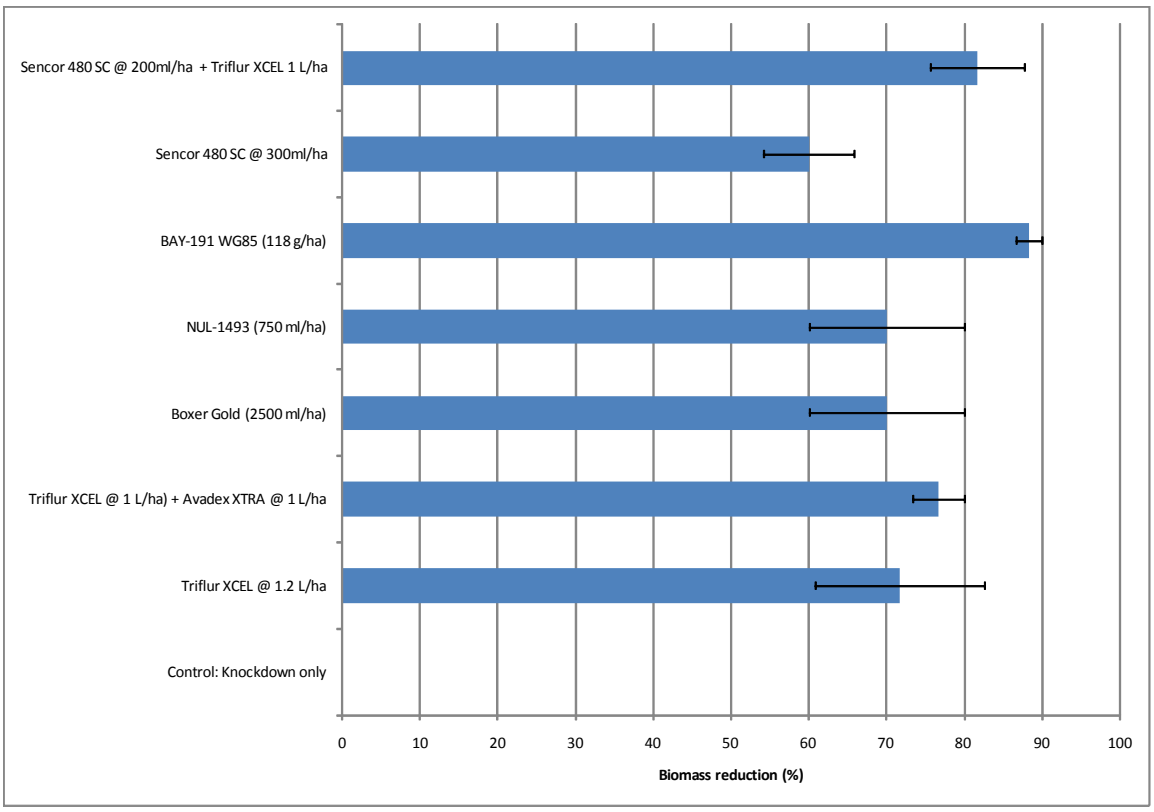

Figure 1. Percentage reduction of brome at Waikerie (visual estimation relative to unsprayed control). Assessment made 2 months after seeding on 12 August 2009.

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Copeville: Environmental conditions were highly favorable for herbicide activity (including 20 mm of rainfall within 7 days after sowing). This led to high levels of herbicide efficacy (Figure 2) but some early crop injury by all herbicides (Table 2). Newer herbicides showed good early suppression of brome grass. As brome grass germinated shortly after sowing but then continued to emerge as multiple cohorts over an extended period of time the length of residual control could also be tested. Sakura treatments exhibited the longest period of activity (Figure 2).

All Sakura treatments provided the greatest overall reduction in brome grass.

In this trial the addition of Avadex Xtra did not provide any extra control when used as a tank-mix partner, although in previous trials it has provided additional brome control.

Table 2. Crop stand count, vigour and biomass reduction in wheat cv. Correl for various soil applied herbicide treatments, Copeville, South Australia, 2009

No.	Product Name & Application Timing	Product rate (g ai/ha)	Stand Count (plants/m row) 20DAS	Crop Vigor (%UTC) 20DAS	Biomass reduction (%) 49DAS
1	TriflurX IBS	960	30	88.8 b	7.5 bc
2	TriflurX + Avadex Xtra IBS	720 + 500	25	85.0 bcd	5.0 c
3	Boxer Gold IBS	2300	23	81.3 cd	7.5 bc
4	Boxer Gold + Avadex Xtra IBS	2300 + 500	25	80.8 d	12.5 ab
5	NUL-1493 IBS	540	21	80.8 d	13.8 ab
6	NUL-1493 + Avadex Xtra	540 + 500	24	78.8 d	10.0 abc
7	Sakura IBS	100.3	25	83.8 bcd	7.5 bc
8	Sakura + Avadex Xtra IBS	100.3 + 500	24	88.8 b	10.0 abc
9	Sakura IBS fb Sakura PSPE	75.225 fb 25.075	28	88.3 bc	15.0 a
10	Untreated		24	100.0 a	0.0 d
***P*-value**			0.1947	0.0001	0.0001
CV (%)			16.85	6.00	28.5
LSD (5% level)			n.s.	7.45	n.a.

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
Mean descriptions are reported in transformed data units, and are not de-transformed.
DAS: Days after sowing. IBS: Incorporated by sowing using knife

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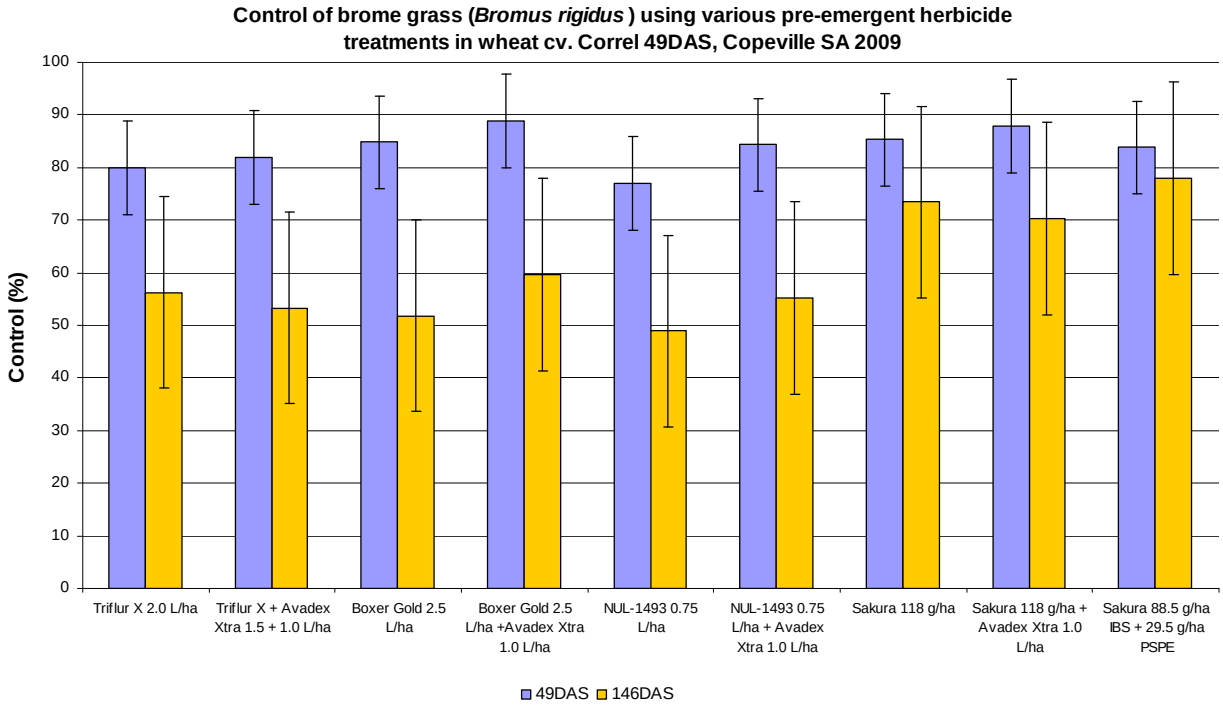

Figure 2. Percentage reduction of brome (based on weed counts) from the unsprayed control, 49 and 146 days after herbicide treatment.

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An important note is that no pre-emergence herbicide treatment on its own will be sufficient to maintain control of brome grass populations and other strategies also need to be used.

Future Directions:

The University of Adelaide's current GRDC weed management project has a significant component aimed at developing new and affordable herbicide mixtures and other options to control grass weeds in low rainfall regions. Integrated weed management workshops with Mallee growers are being conducted this year. In the Mallee, the project is linking with the MSF-CSIRO-GRDC Water Use Efficiency project to contribute options for sustaining water-use efficient cropping rotations.

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GRDC
Grains Research & Development Corporation

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