New uses of old herbicides for the control of barley grass in cereals

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Searching for answers

Location
Minnipa Agricultural Centre, paddock S1
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2017 Total: 281 mm
2017 GSR: 155 mm
Yield
Potential: 2.1 t/ha (B)
Actual: 0.8 t/ha (B)
Paddock History
2016: Mace wheat
2015: Gunyah peas
2014: Mace wheat
Soil Type
Red loam

Key messages

- **Potential of older herbicides from broadacre and horticultural industries to control barley grass in barley was evaluated in a field trial at Minnipa in 2017.**
- **Over-reliance on group B herbicides for post-emergent control of barley grass has already resulted in high incidence of resistance to SU herbicides, and resistance to imidazolinone herbicides is also likely to occur in the future.**
- **Extremely dry conditions at Minnipa at the start of the 2017 growing season were unsuitable for the activity of pre-emergent herbicides on barley grass. Even under these challenging conditions, an experimental herbicide (Experimental-1) at the high rate provided effective pre-emergent control of barley grass.**

Why do the trial?

Barley grass is becoming a more problematic weed in agriculture as a result of no-till cropping and the high dependence on cereals in the rotation. These practices have selected for increased dormancy in barley grass populations in continuously cropped fields in southern Australia (Fleet and Gill 2012). This dormancy is typically broken by cold stratification and such cold conditions are usually experienced after the start of winter. This means that barley grass now typically emerges after the crop has been sown. The later germination of barley grass means that growers typically use post-emergent herbicides to control it in broad-leaved crops. Unfortunately, there are few post-emergent herbicides available to control barley grass in cereal crops.

In cereals, only Group B herbicides can be used for post-emergent control of barley grass. This over-reliance on sulfonylurea herbicides has increased resistance in grass weeds in South Australia (SA) and Victoria (Peter Boutsalis, pers. comm.). Growers have responded by sowing Clearfield cereals and using imidazolinone herbicides to control these weeds. In recent years, resistance to the imidazolinone herbicides has been identified in brome grass in SA and Victoria and the problem could also develop in barley grass. There is an urgent need to identify alternative modes of actions for barley grass control in cereals.

A survey of existing herbicides identified few alternative modes of action for post-emergent use in cereals. Therefore, this study concentrated on several herbicide modes of action for pre-emergent control of barley grass. In addition, a post-emergent pot trial was also conducted. Feedback from potential registrants indicated that the ability to control annual ryegrass will be essential in developing a local registration of any new herbicides, so annual ryegrass was included in pot trials.

How was it done?

A field experiment was established at Minnipa, SA to investigate the control of barley grass and crop safety with various herbicide mixtures. Herbicides were applied pre-sowing on 26 May 2017 with three replicates. Barley cv. Spartacus was sown on the same day using a plot seeder set up with knife points and press wheels. Barley grass seed heads and barley crop heads were assessed on 19 October 2017.

At the Minnipa field trial, investigations were undertaken on Experimental-1, Experimental-2 and Experimental-3 alone and in mixtures for control of barley grass in barley (Table 1).

What happened?

Experimental-3 and their mixtures caused damage to barley and reduced the number of crop heads (Table 1). Experimental-2 caused severe bleaching of barley and reduced its plant density, which was consistent with previous field trials. The extremely dry growing conditions at Minnipa in 2017 are likely to have masked this damage. In contrast, Experimental-1, Sakura and Trifluralin were safe on barley.

Table 1. Barley heads and barley grass panicles following pre-emergent herbicide applications at Minnipa 2017. Barley heads in Nil were 171 head/m², barley grass panicles in Nil were 61 panicles/m².

Treatment	Barley heads (% nil)	Barley grass panicles (% nil)	Yield (t/ha)
Nil	100 ab	100 ab	0.89 ab
Sakura (118)	102 ab	73 b	0.86 ab
Trifluralin 480 (3.0)	95 ab	110 ab	0.90 ab
Trifluralin 480 (3.0) + Diuron 900 (500)	98 ab	82 b	0.91 ab
Sakura (118) + Trifluralin 480 (3.0)	81 bc	42 bc	0.80 b
Experimental-1 (2.0)	101 ab	58 bc	0.96 ab
Experimental-1 (4.0)	102 ab	26 c	1.07 a
Experimental-1 (2.0) + Trifluralin 480 (3.0)	91 b	71 b	0.89 ab
Experimental-2 (1.56)	83 bc	125 a	0.60 b
Experimental-2 (1.56) + Diuron 900 (500)	93 ab	80 b	0.58 b
Experimental-2 (1.56) + Trifluralin 480 (6.0)	79 bc	65 bc	0.70 b
Experimental-3 (4.0)	57 c	79 ab	0.44 c
Experimental-3 (4.0) + Diuron 900 (500)	51 c	94 ab	0.42 c
Experimental-3 (4.0) + Trifluralin 480 (3.0)	64 c	93 ab	0.51 c
Experimental-2 (1.56) + Trifluralin 480 (3.0)	90 b	71 b	0.65 b
Boxer Gold (1.5) + Trifluralin (1.5)	103 ab	120 ab	0.90 ab
Boxer Gold (2.5)	113 a	54 bc	0.92 ab
Experimental-1 (2.0) + Boxer Gold (1.5)	112 ab	64 bc	0.92 ab
Arcade (3.0)	87 b	96 ab	0.81 b
Experimental-1 (2.0) + Sakura (118)	90 b	80 b	0.82 b

Different letters in each column indicate treatments significantly different from each other (P<0.05). Note these herbicide treatments are for experimental purposes and may not be registered in barley.

Experimental-1 at the high rate provided the greatest reduction in barley grass seed set, with 74% reduction in panicles and was the only treatment to provide acceptable weed control. The next best treatment was Sakura + Trifluralin, only achieving 58% barley grass control. Experimental-1 at the lower rate (2 L/ha), on its own or with a mixing partner, was not very effective. In 2017, rainfall was decile 1 with GSR at Minnipa being more than 100 mm below the long-term average. Such dry conditions proved very difficult for pre-emergent herbicides to work effectively. These dry conditions also minimised crop yield increases in response to good weed control. Conditions in May and June were particularly dry and even proven barley grass herbicides like Sakura struggled to perform. It is of great promise that Experimental-1 at the high rate (4 L/ha) performed well in tough conditions. This treatment was also the best performer in field trials under more favourable conditions in 2016.

Barley yield was 0.89 t/ha in the nil. The best treatment and the only treatment significantly different to the control was Experimental-1 (4 L/ha) with barley grain yield of 1.07 t/ha. This treatment also provided the most effective barley grass control.

What does this mean?

This trial indicates Experimental-1 can provide consistently good control of barley grass in cereals. However, it will need to be used at its high rate or an effective mixing partner will be required. Both Experimental-2 and Experimental-3 were too damaging to the crop and had insufficient activity on barley grass.

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References

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