



Managing resistant brome grass through crop rotations and herbicides

Background

Brome grass resistance remains rare, as this species is self-pollinated, but resistance is an increasing threat to southern Australian farming systems due to the limited range of available herbicides. A population has been identified near Geraldton WA, resistant to both sulfonyl urea's and imidazolinone (IMI) herbicides (Group 2) but remaining susceptible to Group 1 herbicides. As a result of resistance, the population has reached a very high density. The trial aims to evaluate integrated weed management (IWM) strategies to control this resistant population, reducing seedbank replenishment and minimising yield losses. The study compares multiple rotation strategies over three years (2024-2026), including continuous wheat, herbicide diversification without IMI, IWM with high seeding rates and single or double-break crop rotation. The impact of different pre- and post-emergent herbicide combinations, high seeding rates, and fallow periods will be assessed to determine the most effective approach for sustainable management of herbicide-resistant brome grass.

Trial aim

To investigate the effect of crop rotation and herbicide options in controlling Group 2 resistant great brome grass.

Trial Treatments

2024

Location: Cape Burney

Agronomic details.

<i>Event</i>	<i>Date and details</i>
Sowing	23 May 2024: Wheat sown at 50 kg or 100 kg/ha (for high seeding rate), vetch at 40 kg/ha.
Fertiliser	23 May 2024: Macro Pro Extra at 130 kg/ha. 15 July 2024: Flexi-N at 100 L/ha.
Insecticide	23 May 2024: Chlorpyrifos 500 at 800 mL/ha, Bifenthrin 100EC at 100 mL/ha.
Herbicide	23 May 2024: Nufarm WeedMaster DST® at 2 L/ha. 23 May 2024: Application of all PRE herbicides in Table 1. 06 Jun 2024: Application of all post-emergent herbicides in Table 1.
Assessments	10 July 2024: Crop and weed count. 15 Oct 2024: Panicle counts of crop and brome grass.
Harvest	22 Nov 2024: Harvest.

Crop rotation strategies and herbicide programs for weed management over a three-year period (2024–2026).

Strategy	Crop and Herbicides		
	2024	2025	2026
Control	CL wheat Pre: Treflan® Post: Intervix®	CL wheat Pre: Treflan® Post: Intervix®	CL wheat Pre: Treflan® Post: Intervix®
Nil IMI, diverse herbicides	CL wheat Pre: Luximax®, Avadex® Xtra, Monza® Post: Mateno®	CL wheat Pre: Treflan®, Sakura®, Avadex® Xtra Post: Prosulfocarb 800	CL wheat Pre: Treflan®, Prosulfocarb 800, Avadex® Xtra, Monza® Post: Mateno®
IWM - Low IMI, diverse herbicides, high seeding rate, cereal only	CL wheat High seeding rate Pre: Treflan®, Sakura®, Avadex® Xtra	AX barley High seeding rate Pre: Treflan®, Avadex® Xtra Post: Quizalofop 200 EC	CL wheat High seeding rate Pre: Treflan®, Sakura®, Avadex® Xtra Post: Mateno®, Intervix®
IWM - Single break	Vetch Pre: Propyzamide 500 WG Post: Quizalofop 200 EC	CL Wheat High seeding rate Pre: Treflan®, Avadex® Xtra, Overwatch® Post: Prosulfocarb 800, Quizalofop 200 EC	AX barley High seeding rate Pre: Treflan® + Avadex® Xtra Post: Quizalofop 200 EC
IWM - Double break	Vetch Pre: Propyzamide 500 WG Post: Quizalofop 200 EC	GM canola Pre: Propyzamide 500 WG Post: Roundup® Ultra MAX	AX barley High seeding rate Pre: Treflan + Avadex® Xtra Post: QPE
Fallow	Fallow Post: Roundup® Ultra MAX	CL wheat Pre: Treflan®, Sakura®, Avadex® Xtra	AX barley Pre: Treflan®, Prosulfocarb 800, Avadex® Xtra Post: Quizalofop 200 EC

Trial Results

2024

The density of brome grass was high in the first year under wheat-based systems at 30 days after sowing, regardless of herbicide strategy (Table 1). There were 1,577 plants/m² in the IWM plan using diverse herbicide options with a high seeding rate and 2,980 plant/m² in continuous wheat receiving trifluralin at 960 g/ha and an IMI herbicide in the first year of this rotation. In contrast, the use of pre-emergent propyzamide (900g/ha) followed by quizalofop-p-ethyl (37g/ha) as post-emergent in vetch, the break crop, resulted in low brome grass density (28 plants/m²). The fallow treatment had 8,689 plants/m² initially (i.e. assessed prior to the mid-season glyphosate application).

By the end of the season, brome grass seed production was drastically reduced in vetch (2 panicles/m² and fallow after glyphosate application (0 panicles/m²). By comparison, both wheat-based systems failed to suppress seed production, with 162 and 576 panicles/m² in the wheat with IWM plan and continuous wheat with standard herbicide treatment, respectively.

Seed production of brome grass was highest in the wheat with standard herbicide treatments (12,039 seeds/m²), followed by wheat receiving diverse herbicides with low IMI (7,833 seeds/m²) and IWM with diverse herbicides and high seeding rate (3,347 seeds/m²), while the vetch as a break crop (4 seeds/m²) and fallow (0 seeds/m²) were the most effective in reducing seed output.

Crop yields reflected the clear advantage of break crops over wheat with vetch yielding 0.9 t/ha, out-performing all wheat-based treatments with a yield ranging from 0.05 to 0.16 t/ha across all herbicide treatments.

Table 1. The rotation strategy, crop and herbicide treatment in 2024, brome grass density, panicles, seed production and crop yield.

<i>Strategy</i>	<i>Crop and Herbicide treatment</i>	<i>Brome grass density (m²)</i>	<i>Brome grass panicles (m²)</i>	<i>Brome grass seeds (m²)</i>	<i>Crop yield (t/ha)</i>
Continuous wheat with standard herbicides	Wheat cv. Tomahawk CL Pre: Trifluralin Post: IMI	2980 b	576 d	12039 d	0.14 a
Nil IMI, diverse herbicides	Wheat cv. Tomahawk CL Pre: Cinmethylin, triallate, sulfosulfuron Post: Aclonifen + diflufenican + pyroxasulfone	1927 ab	162 b	3347 b	0.05 a
IWM - Low IMI, diverse herbicides, high seeding rate, cereal only	Wheat cv. Tomahawk CL High seeding rate Pre: Trifluralin, pyroxasulfone, triallate	1577 ab	375 c	7833 c	0.16 a
IWM – Single/double break	Vetch Pre: Propyzamide Post: Quizalofop-p-ethyl	28 a	2 a	4	0.9 b
Fallow	Fallow Post: Glyphosate	8689 c	0 a	0	0.0 a
P (LSD)		<0.001 (2124)	<0.001 (126)	<0.001 (2412)	<0.001 (0.26)

Conclusions and recommendations 2024

- The wheat-based system, even with diverse herbicide applications and IWM approaches, proved ineffective in controlling brome grass at such a high density.

- Herbicide applied in break crops (vetch), such as propyzamide followed by QPE 200, provided superior control of brome grass compared to those used in wheat, emphasizing the importance of strategic crop selection within rotation systems to enhance resistance management.
- The fallow system with glyphosate effectively prevented seed panicle production in this Group 2 resistant population, even under a heavy infestation (8,689 plants/m²). While fallow periods are an expensive option due to lack of revenue, they should be considered in scenarios with exceptionally high weed density.

Acknowledgments

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