Barley grass control in a pasture-wheat-canola rotation

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Key messages

- Three years of control reduced barley grass density from over 1000 plants/m^2 to 2-14 plants/m^2 across the whole site.
- The diverse rotation, including pasture and canola break crops, allowed a range of herbicides from different mode of actions.
- Two years of seed set prevention was not sufficient to remove the barley grass. The barley grass seedbank lasts at least 3-4 years.

Background

The growers in the northern WA wheat belt felt that barley grass could reduce crop yield by 30%-50%. In contrast, grower groups in the central or southern wheat belt thought that the yield impact from barley grass was only 0-20%. Project UA00156 indicated a large difference in height and competitive ability of different barley grass populations in WA.

Barley grass was most likely to be a major problem in pasture in this region, and a common response is use of Group 1 (A) herbicide to remove grass in pasture. However, given how easy it is to develop Group 1 (A) resistance, the group wanted to investigate other chemical and non-chemical options in pasture, as well as the impact of sowing rate and herbicides for barley grass control in crop.

Aim

The trial aimed to investigate slashing and spray topping in pasture in 2019, sowing rate and pre-emergent herbicides in wheat in 2020 and canola herbicide options in 2021.

Paddock Details

Location: Yandanooka (-29.2843, 115.6331), Soullier family
Rainfall
2019 Total: 237mm
2019 GSR (Apr-Oct): 233mm
2020 Total: 104mm
2020 GSR (Apr-Oct): 86mm
2021 Total: 433mm
2021 GSR (Apr-Oct): 361mm
Paddock history
2018: oats for hay
2017: pasture
Soil type: Red clay loam

Trial Details 2019

- Variety: Volunteer pasture
- Treatments

1. Spray top, early
2. Slash to prevent seed set
3. Spray top, late
4. Spray top, early and late

- Herbicide
  26 August 2019. Early spray top. Ester at 500mL/ha, glyphosate at 2L/ha, plus 0.2% wetter and 1% Amsul
  17 September 2019. Late spray top. Ester at 500 mL/ha, glyphosate at 2 L/ha, plus 0.2% wetter and 1% Amsul

17 September 2019. Slashing.

- Method and Measurements
  Plot size of 2.5m by 30m, 4 replications.
  26 August 2019. Assess barley grass density.
  17 September 2019. Assess barley grass density.
  17 October 2019. Collect barley grass panicles from outside the trial area to determine seed production.

Trial Details 2020

- Variety: Wheat cv. Chief
- Treatments
  1. Wheat 40kg/ha, TriflurX® 1.5L/ha
  2. Wheat 40kg/ha, TriflurX® 1.5L/ha + Monza® 25g/ha
  3. Wheat 120kg/ha, TriflurX® 1.5L/ha + Sakura® 118g/ha
  4. Wheat 120kg/ha, Luximax® 500mL/ha + Monza® 25g/ha
- Sowing rate: 40 or 120kg/ha, 22cm row spacing
- Sowing date: 30 April 2020
- Fertiliser
  30 April 2020. MAPSZC 50 kg/ha, Urea 30kg/ha
- Herbicide
  17 March 2020. Glyphosate 2L/ha and 2,4-D ester
  30 April 2020. Pre-emergent herbicides applied according to treatments
  25 August 2020. Spray.Seed 1.5L/ha over trial area
- Method and Measurements
  11 June 2020. Assess crop and barley grass density.
  11 September 2020. Assess crop and barley grass panicles. Collect 20 panicles per plot.

Trial Details 2021

- Variety: Canola cv. InVigor®
- Treatments

1. Two applications of Roundup Plantshield® 0.9kh/ha
2. TriflurX® 1.5L/ha, two applications of Roundup Plantshield® 0.9kh/ha
3. Two applications of Roundup Plantshield® 0.9kh/ha, QPE 250mL/ha 3-5 leaf
4. TriflurX® 1.5L/ha, two applications of Roundup Plantshield® 0.9kh/ha, QPE 250mL/ha 3-5 leaf

- Sowing rate: 2kg/ha, 22cm row spacing
- Sowing date: 16 April 2021
- Herbicide
  15 April 2021. TriflurX® 1.5L/ha
  14 May 2021 and 8 Jun 2021. Roundup Plantshield® 0.9kh/ha
- 14 June 2021. QPE 250mL/ha
- Method and Measurements
  30 June 2021. Assess crop and barley grass density.
  6 October 2021. Assess barley grass panicles. Collect 20 panicles per plot.
  19 October 2021. Harvest.

Results 2019

The barley grass at the start of the season were at a density of over 1000 plants/m^2 and were evenly distributed over the site. Prior to slashing or spray topping, there were 290 to 720 barley grass plants/m^2.

Both spray topping and slashing resulted in 100% control of barley grass seed heads. The dry conditions prevented regrowth, even after the early spray top. There was zero seed set across the whole trial.

Results 2020

The higher seeding rate increased initial crop density (Table 1). By August there was no difference in wheat tillers, due to a dry start to the season (with less than 10mm rainfall in March, April, May or July). There was an average of 123 wheat tillers/m^2 in September, with no significant difference due to seeding rate.

Barley grass density was relatively high across the trial, given that seed set was prevented in 2019. Barley grass density was lowest following TriflurX® and Sakura® but none of the pre-emergent herbicides offered full control, possibly due to the low rainfall at the start to the season. Panicles looked slightly lower in treatments with Monza®, but the difference was not significant (Table 1).

Due to poor crop growth, the trial was updated to include a brown manuring treatment, and Spray.Seed® was applied to the whole trial area to avoid excessive barley grass seed production. Panicles were still collected from each plot, but none of the seed were viable.

Table 1 Wheat and barley grass density and barley grass panicle number for each treatment. P and LSD values are included for separation of means. Note that barley grass data is back-transformed from a square root transformation.

Rotation	Wheat seeding rate	Herbicide	Crop density/ m^2	Barley grass density/m^2	Barley grass panicles/m^2
1	40kg/ha	TriflurX® 1.5L/ha	63	9.9	24
2	40kg/ha	TriflurX® 1.5L/ha + Monza® 25g/ha	62	9.7	12
3	120kg/ha	TriflurX® 1.5L/ha + Sakura® 118g/ha	100	2.8	43
4	120kg/ha	Luximax® 500mL/ha + Monza® 25g/ha	83	12.7	10
	P		0.09	0.045	0.413
	LSD		33.9	1.73	24.3

Results 2021

Barley grass density was lowest in the treatments with either TriflurX® or QPE with Roundup Plantshield®, compared to Roundup alone (Table 2). Barley grass panicle number was too low to show a significant difference between treatments, but barley grass seed production was reduced in the treatments with TriflurX® or QPE compared to Roundup Plantshield® alone.

The crop was healthy and highly competitive in 2021 due to high rainfall. The weed density was too low in all treatments to impact crop establishment or yield.

Table 2 Canola and barley grass density, barley grass panicle number, barley grass seed number and crop yield for each treatment. P and LSD values are included for separation of means. Note that barley grass panicle data is back-transformed from a square root transformation.

Rotation	Herbicide	Crop density/ m^2	Barley grass density/m^2	Barley grass panicles/m^2	Barley grass seeds/m^2	Crop yield (t/ha)
1	2 x Roundup	26	14.2	6.1	281	2.0
2	TriflurX®, 2 x Roundup	24	6.9	1.3	49	2.0
3	2 x Roundup, QPE	27	4.2	0.5	12	1.9
4	TriflurX®, 2 x Roundup, QPE	26	1.7	0	0	1.9
	P	0.860	0.004	0.114	0.045	0.522
	LSD	NS	5.56	NS	195.8	NS

Conclusions

- In the 2019 pasture, highly effective control prevented seed set in all treatments.
- In the 2020 wheat, the best initial control was from Sakura® and TriflurX®, but seed head production was slightly lower following treatments with Monza®. Brown manuring prevented seed set but is only profitable where crop growth is very poor and weed density is high.

- In the 2021 canola break-crop, a combination of herbicides from a range of different groups reduced barley grass to low density and prevented seed set in the high intensity rotation (TriflurX®, 2 x Roundup, QPE).
- Initial barley grass density was over 1000 plants/m^2 at the beginning of 2019, and two years of seed set prevention was not enough to remove the population. The barley grass seed bank lasts 3-4 years, and potentially longer if dry conditions or non-wetting sands prevent all seed from germinating.
- The break crops offered excellent control, and the opportunity to use herbicides from a wide range of modes of action.

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