Barley grass control in a wheat-barley-pasture rotation

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Key messages

- Differences in crop seeding rate were not apparent at the initial plant density assessment due to low initial rainfall and patchy emergence. Seeding rate had no impact on weed control or crop yield.
- Initial barley grass counts in 2020 indicate that seed production in 2019 was sufficient to increase barley grass density in 2020, even though herbicide application in 2019 ensured that barley grass density was low throughout the trial.
- Use of Intercept® herbicide reduced barley grass across the whole trial, with higher crop yield following Intercept® at 500 mL/ha compared to 375mL/ha.

Background

Barley grass is one of the major weeds in the southern region. Many southern growers think their barley grass is resistant to grass selective herbicides and may have developed late germination to avoid pre-seeding herbicides. In this area barley grass is a major problem in pastures, and often in break crops as well.

Aim

The trial aims to investigate pre-emergent herbicides in wheat in 2019, crop density and post-emergent herbicides in barley in 2020, and pre-emergent herbicides and grass selective herbicides in vetch in 2021.

Paddock Details

- **Location:** Esperance (-33.1888, 121.4697), Geoff & Maryann Harris
- **Rainfall**
  2019 Total: 197mm
  2019 GSR (April-Oct): 155mm
  2020 Total: 318mm
  2020 GSR (Apr-Oct): 183mm
- **Paddock history**
  2018: vetch pasture
  2017: barley
- **Soil type:** Loamy clay with kopi patches

Trial Details 2019

- Variety: Mace wheat
- Treatments

1. Treflan® at 2L/ha
2. Sakura® at 118g/ha
3. Treflan® at 2L/ha + Sakura® at 118g/ha
4. Luximax® at 500mL/ha

Note that the initial plans to include an autumn tickle were not possible, as the dry start to the season made the soil too hard to cultivate in autumn.

- Sowing rate: 65kg/ha, 30cm row spacing
- Sowing date: 14 June 2019
- Fertiliser

14 Jun 2019. DAPSZC at 80kg/ha, UAN at 50L/ha, zinc sulphate at 1L/ha, manganese sulphate at 1L/ha

- Insecticides/fungicides
  14 Jun 2019. Flutriafol® 250 at 300mL/ha
- Herbicide
  30 May 2019. Glyphosate 540 at 2L/ha
  3 Jun 2019. Gramoxone® 360 2L/ha + Sharpen® 17g/ha
  14 Jun 2019. Pre-emergent herbicides prior to seeding, according to treatments
- Harvest: 18 November 2019
- Method and Measurements
  Plots of 36m by 1400m, 4 replications.
  18 Jul 2019. Assess crop and barley grass density.
  3 Oct 2019. Barley grass panicle counts. Harvest 20 panicles per plot. Average seed number per panicle and panicle number/m^2 were used to determine barley grass seed/m^2.

Trial Details 2020

- Variety: Barley cv. Spartacus
- Treatments

1. Barley 40kg/ha, Intercept® at 375mL/ha
2. Barley 40kg/ha, Intercept® at 500mL/ha
3. Barley 65kg/ha, Intercept® at 375mL/ha
4. Barley 65kg/ha, Intercept® at 500mL/ha

- Sowing rate: 40 or 65kg/ha, 30cm row spacing
- Sowing date: 30 April 2020
- Fertiliser
  29 June 2020. Zn, Mn
  Flexi N 50L/ha
- Herbicide
  30 April 2020. Treflan® 2L/ha
  29 June 2020. Intercept® 375 or 500mL/ha
- Method and Measurements
  10 June 2020. Assess initial crop and barley grass density.
  24 September 2020. Assess barley grass panicle density. Collect 20 panicles per plot.
  18 November 2020. Harvest.

Results 2019

The Mace wheat had an average density of 114 plants/m^2, and was not significantly affected by treatments (Table 1).

The barley grass had an average density of 9 plants/m^2. There were more plants following Treflan® (12.9 plants/m^2) compared to Sakura® (6.5 plants/m^2), Sakura® + Treflan® (8 plants/m^2) and Luximax® (9.1 plants/m^2, Table 1), although plant density following Luximax® was not significantly lower than Treflan®. The barley grass panicles were not significantly different between treatments, but were slightly higher in the treatments without Sakura®. Barley grass seed production was lowest following Sakura® + Treflan® and Sakura® alone (136 and 189 seeds/m^2, Table 1).

Crop yield was low in all treatments, due to very low rainfall during the 2019 season (Table 1). However, yield was lowest in treatment 1 with Treflan® alone, probably due to the higher weed density.

Table 1 Crop and barley grass density, barley grass panicle and seed production and wheat yield for each treatment. P and LSD values are included for separation of means. Note that barley grass panicle and seed production means are back-transformed from a square root transformation.

Treatment	Wheat density/m^2	Barley grass density/m^2	Barley grass panicles/m^2	Barley grass seed/m^2	Wheat yield (kg/ha)
Treflan® at 2 L/ha	111	12.9	43.2	279	278
Sakura® at 118 g/ha	122	6.5	25.1	189	333
Treflan® at 2 L/ha + Sakura® at 118 g/ha	110	8.0	23.4	136	343
Luximax® at 500 mL/ha	114	9.1	44.6	346	314
P	0.058	0.033	0.098	0.036	0.029
LSD	8.86	4.41	NS	25.13	41.81

Results 2020

In 2020 there was no significant difference in initial crop density, as establishment was low and variable, due to dry conditions and soil variability (Table 2). Initial barley grass was uniform across the trial (with an average of 78 plants/m^2). In these seasonal conditions, with such a dry start, the pre-emergent application of Treflan® was unlikely to provide effective weed control. While there were significant differences in barley grass density and seed production in 2019, weeds in all 2019 treatments produced enough seed to renew the soil seed bank for emergence in 2020.

Intercept® herbicide provided excellent weed control across the trial, with an average of 3.7 barley grass panicles/m^2 and 58 seeds/m^2. While late cohorts of barley grass obscured the difference between low and high rates of Intercept® at the time of weed panicle assessment at anthesis, the difference in control by Intercept® herbicide was evident in the yield. There was 1.52t/ha barley grain yield following Intercept® at 375mL/ha and 1.82t/ha following Intercept® at 500mL/ha (P:0.05, LSD: 0.225). Yield at the low and high seeding rates (1.63 and 1.70t/ha respectively) were not significantly different, probably due to the dry start and low initial crop density.

Table 2 Crop and barley grass density, barley grass panicles, barley grass seed production and crop yield. P and LSD values are included for separation of means. Note that barley grass panicle and seed production data is back-transformed from a log transformation.

Treatment	Crop density/m^2	Barley grass density/m^2	Barley grass panicles/m^2	Barley grass seed/m^2	Crop yield (t/ha)
Barley 40kg/ha, Intercept® at 375mL/ha	57	83	4.7	56	1.3
Barley 40kg/ha, Intercept® at 500mL/ha	67	78	1.5	7	1.9
Barley 65kg/ha, Intercept® at 375mL/ha	62	72	3.5	40	1.7
Barley 65kg/ha, Intercept® at 500mL/ha	52	77	3.8	19	1.7
P	0.452	0.958	0.055	0.166	0.113
LSD	21.6	43.3	63.7	497	0.44

Conclusions

The greater crop yield, and visual assessment of the good barley grass control with a higher level of Intercept® highlight the value of this herbicide. The grower, who was using the trial to test the suitability of Clearfield™ barley to the enterprise, now has the confidence to plant 50% of the barley program to Clearfield™ barley cv. Spartacus in 2021.

However, this trial also highlights the problem with late cohorts of barley grass, and the limited options for controlling late cohorts. The GRDC project UA00156 ('Seed bank ecology') highlighted that it is common for barley grass to have delayed emergence compared to some other winter grass species (like great brome or annual ryegrass). The project further highlighted that, depending on seasonal conditions, barley grass emergence can continue in July and August. These late cohorts are not controlled by post emergent herbicides, and

harvest weed seed control may have limited practicality for barley grass, depending on shedding times.

This trial has shown that, in cereal crops, both pre-emergent and post-emergent herbicides can provide excellent weed control, but late emerging cohorts can replenish the seed bank. The pasture rotation in 2021 will offer a valuable opportunity to apply control measures later in the season (second application of grass selective herbicides) to reduce seed production of staggered cohorts.

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Extension

- Stubna S (2020) 'Phenomenal' change in trial. SEPWA Newsletter, Issue 103, August 2020.
- Stubna S (2020) A snapshot of herbicide resistance in barley grass populations locally and around the state. SEPWA Newsletter, Issue 104, October 2020.
- Stubna S (2020) Shielded sprayer opening doors to barley grass control in cereals, Issue 104, October 2020.
- Stubna S (2020) Clearfield technology introduced to the rotation for barley grass control. SEPWA Newsletter, Issue 105, December 2020.
- Stubna S (2020) Clearfield herbicide rotational implications. SEPWA Newsletter, Issue 105, December 2020.

Note that due to the pandemic and a spring outbreak of Russian wheat aphid, the planned field day visits to this site were cancelled. A field day presentation will be a priority for 2021.