Pre-emergent herbicides and high-density crop for barley grass control

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Key messages

- Triflur X® provided excellent control of barley grass over both years. In 2020 weed density was lower following Triflur X® at 3L/ha rather than 2L/ha.
- Intervix® provided excellent control in-crop in 2020, preventing panicle production.
- Increased seeding rate increased crop density and reduced barley grass density in 2021.

Background

Barley grass at high density reduces crop yield. However, GRDC project UA00156 (Seed bank ecology of emerging weeds) has highlighted that barley grass ecotypes in Western Australia are often short, and are likely to be highly sensitive to crop competition. Initial control with pre-emergent herbicides combined with high sowing rates in cereal crops may be sufficient to control this species.

Aim

The trial aims to investigate pre-emergent herbicide rate, high-density crop sowing and post emergent herbicide use in barley in 2020 and 2021. Note that separate fields were used for each year.

Paddock Details

- **Location:** Wickepin (-32.6817, 117.5500), Gary Lang
- **Rainfall**
  2020 Total: 274mm
  2020 GSR (Apr-Oct): 170mm
  2021 Total: 525mm
  2021 GSR (Apr-Oct): 424mm
- **Soil type** Sandy loam

Trial Details 2020

- Variety: Barley cv Spartacus
- Treatments
  Main plot treatments
  1. Triflur X® 2L/ha, no post-emergent herbicide
  2. Triflur X® 2L/ha, Intervix® post-emergent
  3. Triflur X® 3L/ha, no post-emergent herbicide
  4. Triflur X® 3L/ha, Intervix® post-emergent

  Subplot treatments
  1. Barley at 40kg/ha
  2. Barley at 80kg/ha
  3. Barley at 120kg/ha

- Sowing rate: 40, 80 or 120kg/ha, according to treatments, 30cm row spacing
- Sowing date: 3 June 2020
- Herbicide, fungicide and insecticide
  9 April 2020. Garlon® 0.1L/ha, 2,4-D ester 0.3L/ha, wetter 0.14L/ha, oil 0.35L/ha.
  21 May 2020. Glyphosate 450 CT 2L/ha.
  3 June 2020. Triflur X® 480 2 or 3L/ha, Gramoxone® 250 1.5L/ha, oil 0.35L/ha.

8 July 2020. Intervix® 0.375L/ha, Tilt 625 0.1L/ha, Alpha Forte 0.05L/ha, Hasten 0.4L/ha.

- Method and Measurements
  Plots of 12m by 200m, 3 replications.
  10 July 2020. Assess crop and barley grass density.
  12 August 2020. Assess barley grass density after Intervix®. Plants were assessed per ha, due to low weed density following Triflur X® (transect counts across each 36 m plot). The second weed assessment separated actively growing barley grass from those plants severely affected by Intervix®.
  18 September 2020. Assess barley grass panicles and collect 20 heads per plot.

Trial Details 2021

- Variety: Barley cv Maximus
- Treatments
  Main plot treatments
  1. Triflur X® 2L/ha, no post-emergent herbicide
  2. Triflur X® 2L/ha, Intervix® post-emergent
  3. Triflur X® 3L/ha, no post-emergent herbicide
  4. Triflur X® 3L/ha, Intervix® post-emergent

  Subplot treatments
  1. Barley at 40kg/ha
  2. Barley at 80kg/ha
  3. Barley at 120kg/ha

- Sowing rate: 40, 80 or 120kg/ha, according to treatments, 30cm row spacing
- Sowing date: 3 June 2021
- Herbicide, fungicide and insecticide
  25 March 2021. Ally® 3g/ha, Garlon® 0.08L/ha, glyphosate 450 1.5L/ha, 2,4-D ester 600 0.4L/ha, Enhance™ 0.3L/ha.
  2 June 2021. Glyphosate 450 2.6L/ha, Enhance™ 0.3L/ha.
  3 June 2021. Triflur X® 480 2 or 3L/ha, Gramoxone® 250 2L/ha, oil 0.35L/ha.
  Note that Intervix® could not be applied due to very wet conditions.
- Method and Measurements
  9 April 2021, 20 May 2021, 23 June 2021. Pre and post-seeding barley grass density. Crop density.
  12 September 2021. Assess barley grass panicles and collect 20 heads per plot.
- Harvest. Not applicable. A header fire interrupted measurement.

Results 2020

Initial barley grass density was low in all treatments, indicating that Triflur X® at either rate provided good control. The second weed assessment highlighted that there was lower barley grass density in plots with Triflur X® at 3L/ha rather than 2L/ha (Table 1). Those plots with Intervix® had very low density of actively growing plants (2-25 plants/ha, with no difference between the two treatments, Figure 1). Use of Intervix® prevented barley grass panicle and seed production. Barley grass panicles/seed were also significantly lower (at P: 0.1 not 0.05) following Triflur X® at 3L/ha rather than 2L/ha.

Table 1. Barley grass density following pre-emergent and in-crop herbicide treatments. P and LSD values are included for separation of means. Note that the barley grass density data is back-transformed from a cube root transformation, and the barley grass panicle data is back-transformed from a log_{10}+1 transformation.

Pre-emergent herbicide	In-crop herbicide	Barley grass density/ha	Barley grass panicles/ha	Barley grass seeds/ha
Triflur X® 2L/ha		3989	6917	38903
Triflur X® 2L/ha	**Intervix®**	2	0	0
Triflur X® 3L/ha		3695	467	1317
Triflur X® 3L/ha	**Intervix®**	25	0	0
P		0.002	0.067	0.059
LSD		57.8	1636	4334

Figure 1. Barley grass on 12 August 2020, following Intervix® (left) or no in-crop herbicide (right).

Crop density increased with increasing seeding rate, with 75, 119 and 135 plants/m^2 at a seeding rate of 40, 80 and 120kg/ha (P<0.001, LSD: 14.7). Herbicide treatment, or the interaction of herbicide and seeding rate did not affect crop density.

At the start of the season, there was a slight difference in barley grass density at the different seeding rates, with 1.8, 0.2 and 5 plants/ha at seeding rates of 40, 80 and 120kg/ha (P: 0.047, LSD: 3.7). Even though there were more plants in the high seeding rate treatments at the start of the season, by the end of the season there was no significant difference in barley grass panicle density between the three sowing rates (average of 73, 34 and 29/ha at 40, 80 and 120kg/ha, P: 0.703). Likewise, barley grass seed production averaged 185, 62 and 50 seeds/ha at 40, 80 and 120kg/ha, and again the difference was not significant (P: 0.573, Table 2).

Table 2. Barley grass seeds/ha at a crop seeding rate of 40, 80 and 120kg/ha, following Triflur X®, with or without Intervix®. Note that the effect of seeding rate and interaction between seeding rate and herbicide was not significant.

Herbicide treatment	Seeding rate		
	40kg/ha	80 kg/ha	120 kg/ha
Triflur X® 2L/ha	53702	47862	22908
Triflur X® 2L/ha + Intervix®	0	0	0
Triflur X® 3L/ha	21877	323	315
Triflur X® 3L/ha + Intervix®	0	0	0

Results 2021

As expected, crop density increased with seeding rate (94, 159 and 200 plants/m^2 at seeding rates of 40, 80 and 120kg/ha, P: 0.003, LSD: 34.4). Increasing crop density also reduced barley grass density (6.8, 2.3 and 2.5 barley grass/m^2, P: 0.015, LSD: 2.01). Triflur X® gave excellent initial barley grass control in all treatments, and the crop was not affected by pre-emergent herbicide.

Due to the very wet season, it was not possible to apply the Intervix® treatment, and barley grass cohorts emerged later in the season. As a result, by the end of the season there was no significant difference in panicle and seed number. However, there was a consistent trend of reduced barley grass panicles or seeds at increased sowing rate.

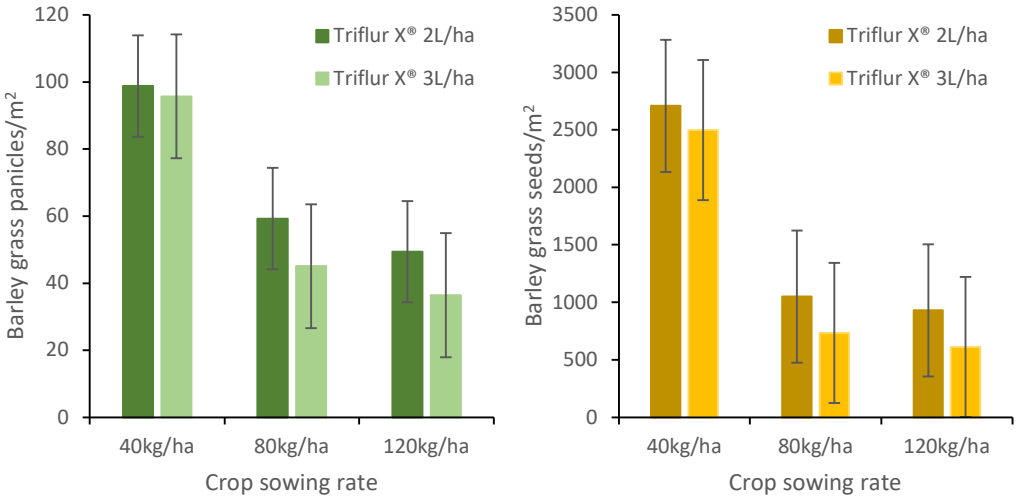

Figure 2. Barley grass panicles (left) and seeds at a crop seeding rate of 40, 80 and 120kg/ha, following Triflur X® at 2 or 3L/ha. Vertical bars indicate the standard error.

Conclusions

In both years, Triflur X® at 2 or 3L/ha provided good initial weed control, resulting in low barley grass density throughout the trial. In 2020, there were fewer actively growing barley grass plants where Triflur X® was applied at a higher rate, and panicle/seed production was significantly reduced. In 2021 there was no difference between the two different rates.

Intervix® provided excellent control in 2020, preventing barley grass seed production. Unfortunately, in 2021 it was not possible to apply Intervix®, due to the very high rainfall.

Increased seeding rate increased crop density. In both years, there was a consistent trend towards reduced panicles and seeds at higher sowing rates, but the interaction was not significant due to high variability in the data.

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