# Competitive Crops for Grass Weed Control - An Alternative Option

## Aim

To compare the competitive nature of wheat and barley sown at different row spacing and seeding rates on grass weed competition.

## Summary

Increased use of grass selective herbicides in many farming systems has caused increased selection pressure for herbicide resistance in grass weed populations such as annual ryegrass and brome grass. Work conducted by Bill Roy (Agricultural Consulting & Research Services Pty Ltd, York) with GRDC support demonstrates that managing herbicide resistance requires a diversified approach using a number of different tools. Manipulating canopy through seeding rates and row spacing is one of the options being explored by the BCG.

In these trials, it was clearly demonstrated that grass weed biomass can be significantly decreased by sowing wheat or barley on narrow rows (18 cm) as compared to wider rows (35 cm). Wheat yield and quality was maintained when sown on the narrow or wide rows, whilst barley yields were higher when sown on narrow (18 cm) compared to wide (35 cm) rows.

## Background

The dependence on grass selective herbicides in many of our farming systems, particularly those using reduced till/no till crop establishment systems, has resulted in an increased incidence of herbicide resistance, particularly to Group A herbicides. Group A resistant ryegrass is currently a major problem for most grain growers in North West Victoria, with almost completely resistant weed populations not that uncommon.

With many farmers facing the prospect of having no grass selective herbicides due to resistance, alternative management strategies need to be found and implemented. Growing crop canopies that compete heavily with grass weeds may be one way farmers can control weeds without the need to be completely dependent on chemical control methods. Work by other groups has demonstrated that wheat can be a strong competitor. This has proved a useful tool following reduction of ryegrass populations to relatively low levels. To strengthen the capacity of the wheat crop, seeding rates and row spacing have been manipulated to determine the most competitive and effective strategy without compromising yield or quality.

## Methods

Replicates: 4

Plot Size: 3m x 25m

Variety: Yitpi wheat, Sloop Vic barley (Birchip)
Yitpi Wheat, Gairdner Barley (Marnoo)

Sowing Date: 30th of May 2005 (Birchip)
1st of June 2005 (Marnoo)

Fertiliser: 50kg of Granulock 10Z (Birchip) at sowing
80kg of Urea (Marnoo) at sowing and 60kg of Granulock 10Z

Herbicide: Pre sowing Roundup 1.5L
Triflur X® 0.8L/ha IBS

Treatments: Trial conducted at Birchip and Marnoo (Table 1)

**Table 1:** Treatments, rates and timings

| Crop Type | Row Spacing | Sowing Density |
|---|---|---|
| Wheat | 18cm (7-inch) | 150 pl/m² |
| Wheat | 35cm (14-inch) | 150 pl/m² |
| Wheat | 18cm (7-inch) | 250pl/m² |
| Wheat | 35 cm (14-inch) | 250pl/m² |
| Barley | 18cm (7-inch) | 150pl/m² |
| Barley | 35cm (14 inch) | 150pl/m² |
| Barley | 18cm (7-inch) | 250pl/m² |
| Barley | 35cm (14-inch) | 250pl/m² |

## Results

*Wheat*

No significant difference between treatments in wheat at Birchip (Table 2). At Marnoo, there were no significant differences between the treatments for yield or protein, however there was a significant difference in screenings between the 18 cm and 35 cm row spacing treatment, with the narrow rows having higher screenings, but still below the acceptable levels.

**Table 2:** Birchip and Marnoo wheat results

| Row Spacing (cm) | Sowing Density (pl/m2) | Yield (t/ha) | Protein (%) | Screenings (%) | *Gross Income/ ha |
|---|---|---|---|---|---|
| **Birchip** | | | | | |
| 18 | 150 | 2.5 | 14.3 | 9.9 | 407 |
| 35 | 150 | 2.3 | 14.3 | 8.0 | 381 |
| 18 | 250 | 2.4 | 14.5 | 7.6 | 397 |
| 35 | 250 | 2.2 | 15.1 | 7.2 | 370 |
| **LSD: row spacing<br>sowing density** | | **0.15<br>NS** | **NS<br>NS** | **NS<br>NS** | |
| **CV %** | | **11.4** | **3.0** | **26.9** | |
| **Marnoo** | | | | | |
| 18 | 150 | 4.2 | 9.8 | 2.7 | 613 |
| 35 | 150 | 4.1 | 9.7 | 1.9 | 598 |
| 18 | 250 | 4.2 | 10 | 2.8 | 567 |
| 35 | 250 | 3.4 | 9.9 | 2.3 | 496 |
| **LSD: row spacing<br>sowing density** | | **0.1<br>0.1** | **NS<br>NS** | **0.8<br>NS** | |
| **CV %** | | **3.9** | **1.3** | **18.9** | |

*All prices based on ESR for Birchip and Marmalake plus golden rewards and five dollar premium for Yitpi wheat.

*Barley*

Barley yields were 10 to 20% higher at both Birchip and Marnoo when sown on the narrower row spacing of 18cm compared to 35cm (Table 3). Sowing density had no impact on yield or quality.

**Table 3:** Birchip and Marnoo Barley Results

| Row Spacing (cm) | Sowing Density (pl/m$^2$) | Yield (t/ha) | Protein (%) | Screenings (%) | Retention (%) | Gross Income/ ha |
|---|---|---|---|---|---|---|
| **Birchip** | | | | | | |
| 18 | 150 | 2.7 | 12.9 | 3.6 | 79.9 | 351 |
| 35 | 150 | 2.2 | 13.5 | 4.2 | 72.5 | 286 |
| 18 | 250 | 2.7 | 12.9 | 3.4 | 79.2 | 351 |
| 35 | 250 | 2.2 | 13.7 | 4.9 | 70.7 | 286 |
| **LSD: row spacing**<br>**sowing density** | | **0.32**<br>**NS** | **NS**<br>**NS** | **NS**<br>**NS** | **NS**<br>**NS** | |
| **CV %** | | **11.4** | **3.0** | **26.9** | **7.6** | |
| **Marnoo** | | | | | | |
| 18 | 150 | 4.4 | 9.8 | 1.6 | 87.4 | 660 |
| 35 | 150 | 4.1 | 9.7 | 1.9 | 87 | 615 |
| 18 | 250 | 4.5 | 9.2 | 2.7 | 82.9 | 675 |
| 35 | 250 | 4.2 | 10 | 2.5 | 84.4 | 630 |
| **LSD: row spacing**<br>**sowing density** | | **0.2**<br>**NS** | **1.1**<br>**NS** | **1.1**<br>**NS** | **NS**<br>**NS** | |
| **CV %** | | **3.9** | **0.6** | **30.4** | **3.7** | |

All feed barley (Birchip) was priced at $130 cash, while all malting quality barley (Marnoo) was priced at $150 cash.

Grass weed dry matter cuts were taken at the Birchip site only (Table 4). There was a significantly higher level of grass weeds present in the wheat and barley when sown on wide rows compared to narrower rows. The effect of sowing rate was not significant.

There were too few grass weeds at Marnoo to do dry matter cuts.

**Table 4:** Weed Dry Matter measurements

| Treatment | Wheat (kg/ha) | Barley (kg/ha) |
|---|---|---|
| 18 cm 150pl/$m^2$ | 32 | 6 |
| 35 cm 150pl/$m^2$ | 54 | 42 |
| 18 cm 250pl/$m^2$ | 12 | 7 |
| 35 cm 250pl/$m^2$ | 38 | 22 |
| **Significant difference** | **P<0.05** | **P<0.05** |
| **LSD:** | **26 S** | **18 S** |

## Interpretation

At both Birchip and Marnoo there was no impact of row spacing or sowing rate on either wheat yield or quality. However, for barley the yield sown with narrower row spacing was significantly higher compared to the wider row spacing sowing.

The most significant result of this trial was at Birchip where there was a high population of grass weeds (ryegrass, wild oats and brome grass). The narrower row sowing resulted in a significant reduction in weed biomass. Seeding rate made no difference on the weed population. Grass weed suppression can be achieved with narrow row spacing (18 cm vs 35cm) whilst maintaining yield and quality.

At Marnoo, the weed populations were very low and no dry matter measurements of weeds were made at this site.

## Commercial Practice

Group A herbicide resistance will continue to be a problem for a broad acre farmers. Ryegrass in many paddocks is now fully resistant to Group A herbicides, and an increasing number of wild oat populations are now also resistant to these herbicides. Brome grass is a continuing problem and it is expected to see an increase in herbicide resistance in this species of grass.

When grasses have developed resistance to herbicides then only non chemical means can help reduce numbers. BCG trials over a number of years have demonstrated that wide row spacing resulted in less weed competition and higher weed levels. In trials undertaken in 2005, narrow row sowing (18 cm) resulted in much less weed competition compared to wide row spacing (35 cm). For wheat, yield and quality were maintained when sown on 18 or 35 cm row spacing, whereas for barley the yield at the narrower row spacing was significantly higher compared to the wide row spacing.

Previous BCG work has shown barley quality can be sensitive to sowing rate but it does not appear that quality is affected when row spacing is altered to produce a competitive crop. Therefore, those on 14-inch cannot compensate for low plants per meter square by increasing sowing rate.

Similar wheat trials (with Silverstar) conducted by the BCG in 1998, showed that yield decreased significantly as row spacing increased from 18 cm to 35 cm. Ryegrass seed head counts also doubled as row spacing increased from 18 cm to 35 cm. In those trials the sowing rate also significantly reduced ryegrass seed head numbers.

BCG recognise that 18 cm row spacing creates some problems, for example managing stubble, however the principle of narrow row spacing producing a more competitive crop against weed populations as opposed to wider rows still remains.