3.3.2 Barley Row Spacing and Agronomy Trial (Phosphorus Trial) - Inverleigh, Vic

Location:
Inverleigh Research Site.

Funding:
This was a GRDC funded trial through the National Barley Agronomy Project.

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Background/Aim:
The barley row spacing trial has the overall objective of defining the benefits of wide row spacing for residue flow and inter-row crop establishment versus the potential reduction in yield and quality for high rainfall cropping zones of southern Australia.

The individual objectives within the trial are as follows:

- To determine how phosphorus rates can be used to optimize canopy management, apply to wider row spacing (300mm compared to 200mm) for both dry matter production, yield and grain quality outcomes.
- To establish whether the interaction between row spacing and phosphorus rate differs between lower and higher rainfall scenarios.

Take home messages:

- Row Spacing: The 200mm row spacing yielded 0.30 t/ha significantly higher then the 300mm row spacing irrespective of phosphorus rate and variety choice. When considered with phosphorus rates the 200mm row spacing yields decrease and 300mm row spacing yields increase with the increasing input of phosphorus. This trend was more significant in Commander compared to other varieties. Although the crop yield decreased as row spacing increased, wider rows have other agronomic benefits in the grain production system.
- Phosphorus Rate: The phosphorus rates were found not to have any significant affect on grain yield, quality or biomass production, irrespective of row spacing or variety choice. However, as the phosphorus rate increased, yields in the 200mm row spacing decreased and yields in the 300mm row spacing increased. This response was greater in Commander compared to other barley varieties.
- Variety: VB0432 was the highest yielding variety with 4.55 t/ha, the average variety yield of the trial was 4.32 t/ha irrespective of row spacing or phosphorus rate. Commander had the best grain quality with the largest retention and reduced screenings, although all varieties were classified as feed. The interaction between variety, row spacing and phosphorus rate suggest that crop management must be tailored to suit the variety to optimise the yield potential using variety specific agronomy.

Treatments:

Row Spacing
200mm (8 inch)
300mm (12 inch)

Varieties
Gairdner
Capstan
Commander
VBO432

Phosphorus Rate
(in addition to 100 kg MAP applied at sowing - 21.9% P)
Nil Phosphorus
15 kg P/ha
30 kg P/ha

Results and discussion:
Dry matter production was assessed at flowering and crop maturity to determine if phosphorus rate had an effect on the crop biomass. No significant difference in biomass was observed at either growth stage.

The 200mm row spacing was found to significantly increase yield by 0.30 t/ha when compared to 300mm row spacing, irrespective of phosphorus rate and variety choice (Table 1). The interaction between row spacing, phosphorus rate and variety choice identifies that not all varieties can be managed the same.

Where no phosphorus was applied (Figure 2) all varieties had higher yields at the 200mm row spacing compared to the 300mm row spacing. On average the yield advantage to the 200mm row spacing was 0.46 t/ha. Capstan demonstrated the greatest yield difference (0.67 t/ha) between row spacing's when no phosphorus was applied.

When 15 kg P/ha is applied (Figure 3) there is less of a yield difference (on average 0.14 t/ha) between row spacing's when Gairdner, Capstan and VB0432 are used. Overall a yield advantage of 0.31 t/ha was achieved by the 200mm row spacing. Commander demonstrated a greater response (0.81 t/ha) to phosphorus in the 200mm row spacing compared to the 300mm row spacing when compared to the other three varieties. Capstan demonstrated no significant yield difference between row spacing when 15 kg P/ha was applied.

When 30 kg P/ha was applied (Figure 4) an average yield advantage of 0.12 t/ha was achieved by the 200mm row spacing. As the phosphorus rate increased the 200mm row spacing yields decreased and the 300mm row spacing yields increased irrespective of variety. Capstan was the clearest example of this trend, where a yield advantage of 0.50 t/ha was achieved by the 300mm row spacing.

The 200mm row spacing had a yield advantage of 0.30 t/ha over the 300mm row spacing irrespective of phosphorus rate and variety choice. As discussed earlier, the yield advantage of the 200mm row spacing is reduced as the phosphorus rate increases, irrespective of variety choice. There was no significant difference in quality due to row spacing irrespective of phosphorus rate or variety choice.

The average yield of the varieties was 4.32 t/ha irrespective of row spacing and phosphorus rate. VB0432 was the significantly highest yielding variety with 4.55 t/ha. Commander had the best grain quality with the highest retention and lowest screenings, although all varieties were graded as feed. The key to each variety optimizing its yield potential in a commercial environment is to manage the agronomy specific to the variety.

There was no significant difference in grain yield and quality due to phosphorus rate, irrespective of row spacing and variety choice. Figures 2, 3 and 4 illustrated that when the phosphorus rate increased yields in the 200mm row spacing decreased and yields in the 300mm row spacing increased. This interaction between agronomic management and variety choice is important to understand to gain the best out of the production system.

Figure 1: Effect of Phosphorus Rate on Dry Matter Production - means of 2 row widths and 4 varieties.

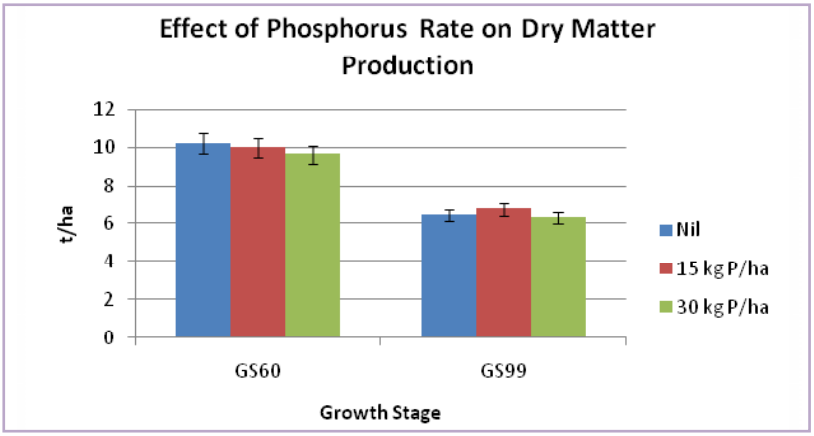

Figure 2: Effect of Row Spacing on Variety Yield (No Phosphorus).

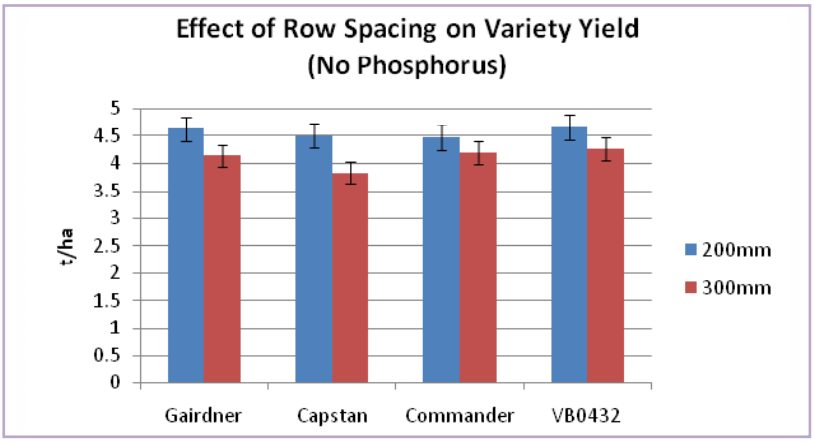

Figure 3: Effect of Row Spacing on Variety Yield (15 kg P/ha).

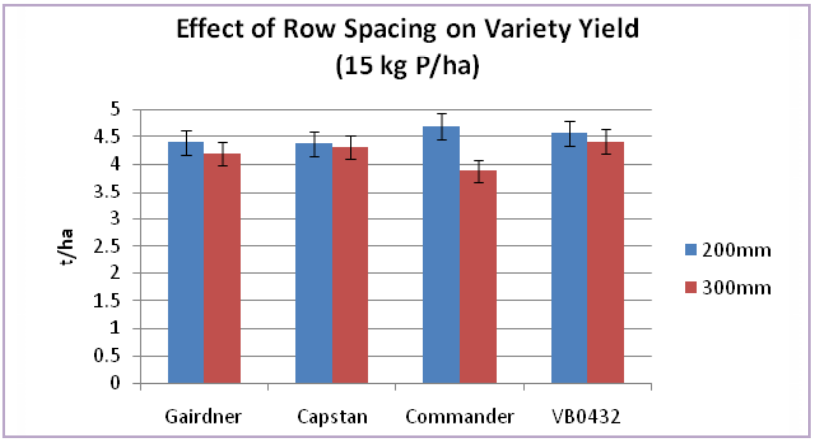

Figure 4: Effect of Row Spacing on Variety Yield (30 kg P/ha).

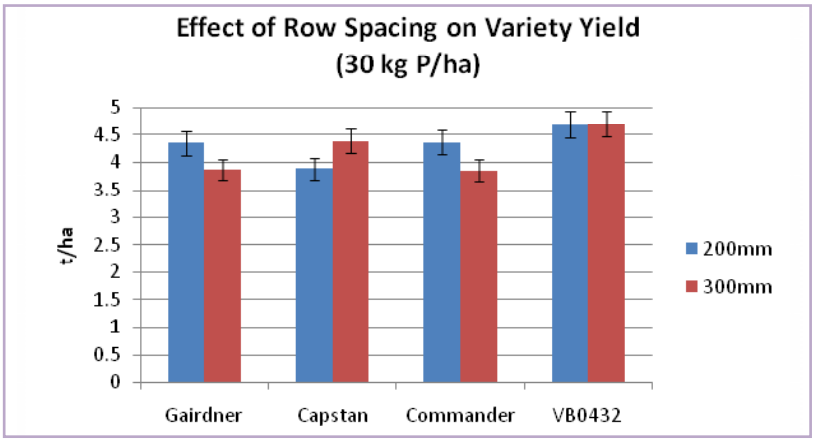

Table 1: Grain yield and quality analysis, including protein, test weight, retention & screenings, corrected to 12.5% moisture.

	Yield (t/ha)	Sig. Diff.	Protein (%)	Test Weight (kg/hl)	Retention (%)	Screenings (%)
Row Spacing						
200mm (8 inch)	4.47	a	11.8	61.2	48.4	14.1
300mm (12 inch)	4.17	b	11.8	61.9	51.5	12.8
Prob (F)	**0.018**		**0.947***	**0.348***	**0.102***	**0.064**
LSD (0.05)	**0.20**		**0.77**	**2.01**	**4.20**	**1.40**
Variety						
Gairdner	4.26	b	11.6	63.4	49.5	12.9
Capstan	4.22	b	12.7	58.1	28.8	20.7
Commander	4.25	b	11.2	62.4	64.9	8.6
VB0432	4.55	a	11.9	62.3	56.5	11.8
Prob (F)	**0.001**		**0.001**	**0.001**	**0.001**	**0.001**
LSD (0.05)	**0.12**		**0.49**	**1.23**	**9.50**	**3.80**
Phosphorus Rate						
Nil	4.34	a	11.9	61.6	50.2	13.9
15 kg P/ha	4.36	a	11.8	61.5	50.3	12.9
30 kg P/ha	4.27	a	11.9	61.6	49.3	13.7
Prob (F)	**0.715***		**0.924***	**0.799***	**0.943***	**0.684***
LSD (0.05)	**0.27**		**0.35**	**0.53**	**8.00**	**2.70**

[1] Consideration needs to be taken for yields, as plots represent 72.5% of arable area and thus should be calculated using this percentage for comparison to local and commercial results.
[2]Means followed by the same letter do not significantly differ (P=0.10, LSD).
[3]Quality parameterisation is based on 2009-2010 NACMA Barley Standards and should be used as a guide only. Testing was undertaken at Riordan Grains, Inverleigh Office.
*These parameters are not statistically significant at the p=0.05 level.

Summary:
Limited difference was observed between each treatment when analysed as individuals. VB0432 was the highest yielding variety with 4.55 t/ha, and the 200mm row spacing out yielded the 300mm row spacing by 0.30 t/ha. The interactions between these agronomic factors allow us to optimise the production system to suit individual varieties.

As the phosphorus rate increased the 200mm row spacing yields decreased and the 300mm row spacing yields increased irrespective of variety. Capstan was the clearest example of this trend, where a yield advantage of 0.50 t/ha was achieved by the 300mm row spacing compared to the 200mm row spacing. This suggests that variety specific agronomy can be used to optimise the grain yield potential of individual varieties within a commercial environment.

Figure 1. Jon Midwood talking to members at the barley plots at the Inverleigh site.