Barley agronomy – common knowledge or progressive practice?

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Key messages

- Sowing mid to late maturing barley varieties in May was pivotal when optimising yield in this trial. May sown varieties yielded 0.6 t/ha more on average over their June sown counterparts.
- Sowing with a lower seeding rate reduced yield and increased protein concentration, with the optimum plant population being 180 pl/m^2.
- Navigator had the lowest grain protein at 12.8% when sown at TOS 1 with 180 plants/m^2
- Navigator had the highest grain protein at 14.7% when sown at TOS 2 with 120 plants/m^2
- Navigator had the highest yield of all varieties, at 5.84 t/ha, when sown at TOS 1 with 180 plants/m^2

Background

This trial was grown as part of the GRDC "Southern Barley Agronomy" project whose objectives are to improve grower productivity and industry sustainability through the successful adoption of improved barley cultivars. This will be achieved through the development of improved agronomy practices and packages for new and current varietal releases and by aligning production with market and industry requirements.

Traditionally, sowing of mid to late maturity barley varieties in May is common practice in the Western Districts, which typically occurs after sowing other long season wheat first. This trial compares two sowing dates, the first in May and the second just over three weeks later in June and the effect time of sowing has on grain yield and quality for a range of commonly grown varieties in a given season. The trial also looks at whether we should increase sowing rate to compensate for the reduced tiller numbers that will be produced from later sowing.

Method

The trial was located at the Inverleigh research site on a duplex soil consisting of sandy loam over heavy sodic clay. Following peas from 2013, five barley varieties were sown at two different timings; 27 May and 18 June using a cone seeder on 180 mm row spacings using knifepoints and press wheels. All plots received a knockdown and Boxer Gold, incorporated by sowing, at their respective sowing dates. The seed was treated with Hombre to guard against disease and insect pressure through the early crop development. Twenty different treatments were included in the trial design which consisted of three factors:

- Time of sowing
- Sowing rate
- Variety choice

Five commonly grown barley varieties were selected: Navigator, Gairdner, Oxford, Westminster, and GrangeR. The two sowing rates of 180 pl/m^2 and 120 pl/m^2 were selected to represent a standard sowing rate and two-thirds of the standard rate.

Results and Discussion

The very dry conditions during the spring of 2014 had an overriding effect on the result of this trial. The prospect of low retentions and high screenings percentages however did not eventuate in this trial, with all varieties maintaining an acceptable standard to make malting specifications. The main constraint to achieving malting quality proved to be keeping the grain protein low enough.

In a water limited finish, like the one seen in the 2014 growing season, we see a reduction in yield potential which the reduces its effect in diluting the grain protein sufficiently, especially if starting soil nitrogen levels are high or in crop applications of nitrogen have been applied at too high a rate, appropriate for the season. This is demonstrated in Table 1; the high protein levels were strongly influenced by the 83kg N/ha legacy from the previous year's pea crop, along with the 100 kg/ha of MAP at sowing and 150 kg/ha of urea applied at GS30. Nitrogen management was especially difficult to judge in 2014 when only a minority of the seasonal prediction models got the outlook correct.

Table 1. The influence of the time of sowing showing yield and grain quality across all five different barley varieties (Navigator, Gairdner, Oxford, Westminster, and GrangeR).

Time of sowing	Yield (t/ha)	Test weight (kg/hl)	Protein (%)	Retention (%)	Screenings (%)
27/5/14	4.93 a	65.3 a	13.6 b	82.9 a	4.9 b
18/6/14	4.33 b	65.8 a	14.1 a	78.8 a	6.5 a

Means followed by the same letter do not significantly differ (p=0.05).

In all varieties, except the GrangeR, sowing in late May results in significantly (p=0.05) greater yields in comparison to the mid June timing as demonstrated in Figure 1. The barley variety Navigator produced the largest yield gap between the two sowing dates of 1.34 t/ha. Sowing 22 days apart resulted in a potential yield loss of over 61 kg/ha a day or nearly 0.5 t/ha for every weeks delay with this variety.

In a year that didn't lend itself to high levels of foliar disease because of the dry spring there were no observable disease burdens that stood out in any variety over the others.

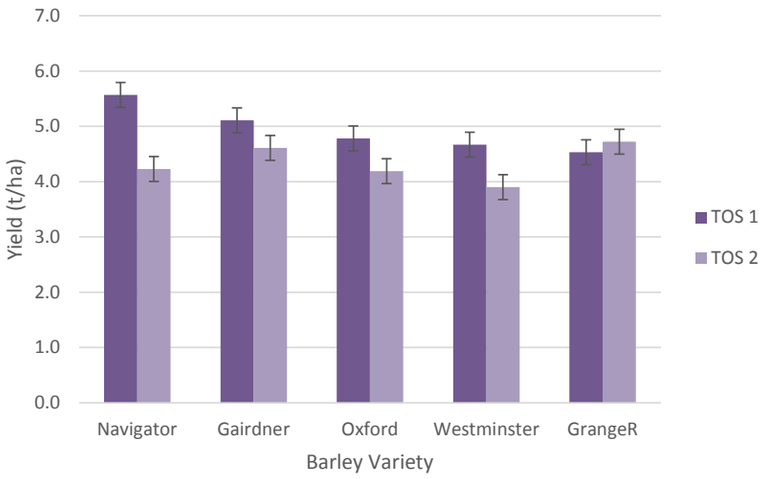

Figure 1. Comparison yield between varieties at different times of sowing. Yields are averages showing standard error LSD (p=0.05).

The 'optimum seeding rate' has been an age-old question for barley growers and in our high rainfall environment we have even more reason to challenge this question. Our high yield potential means that we should be encouraging high numbers of heads/m^2, but our springs can be unreliable and this could lead to poor grain quality if we get the decision wrong.

In this trial we used a target population of 180 pl/m^2 as conventional practice compared to reducing it to 120pl/m^2 and then also trialled these rates at two sowing dates, across five varieties. Table 2 shows the influence of this factor whereby sowing at 120pl/m^2 significantly (p=0.05) reduced yield, reduced the average test weight value below the specification standard for malting. Although the protein levels at both sowing rates were quite high, the levels in the lower sowing rate were significantly higher on average than the standard rate, probably due to lower grain yields not diluting the grain protein.

Table 2. The influence of plant population on yield and grain quality across all five different barley varieties (Navigator, Gairdner, Oxford, Westminster, and GrangeR).

Target plant population	Yield (t/ha)	Test weight (kg/hl)	Protein (%)	Retention (%)	Screenings (%)
120 pl/m^2	4.39 b	64.9 b	14.0 a	81.5 a	6.1 a
180 pl/m^2	4.87 a	66.2 a	13.6 b	80.2 a	5.3 b

Means followed by the same letter do not significantly differ (p=0.05).

Commercial application

Some interesting research in WA has been carried out looking into specific barley variety management. The findings are:

- Varieties differ in their response to management inputs, especially for the important grain receival traits test weight and screenings.
- Varieties do not appear to differ greatly in their grain yield response to N fertiliser or seeding rate, but do differ in their grain yield sensitivity to date of seeding.

Table 3: Likelihood of barley varieties differing in their reaction to a delay in the seeding date or an increase in the rate of N applied or an increase in the seeding rate.

Variety interaction with	Time of Sowing	N applied	Seeding Rate
Plant height (cm)	50% chance	Occasionally	Rarely
Grain yield (t/ha)	50% chance	Occasionally	Rarely
Average grain weight	Often	Occasionally	50% chance
Hectolitre weight (kg/hl)	Often	50% chance	Occasionally
Screenings (% < 2.5 mm)	Often	50% chance	50% chance
Grain protein (%)	50% chance	Occasionally	Occasionally

(2013 WA Crop Updates)

Rarely	(interaction < 20% of trials)	Occasionally	(20 – 40% trials)
50% chance	(40 – 60% trials)	Often	(60 - 80% trials)

Based on this data we can see that varieties can differ in their grain yield response to delayed seeding, but more importantly their grain quality is more sensitive. Variety interactions for screenings occurred the highest amount in the trial work. So what were the interactions in our trial to sowing date and screenings and to sowing rate and screenings?

In both cases all varieties bar one have either negatively increased their screenings as a result of delayed sowing with 2 varieties at or close to the 7% maximum screenings level for Malt1 or reduced their screenings level as a result of higher plants populations. There are lessons to take out of this in terms of growers commercial applications to how they manage specific barley varieties.

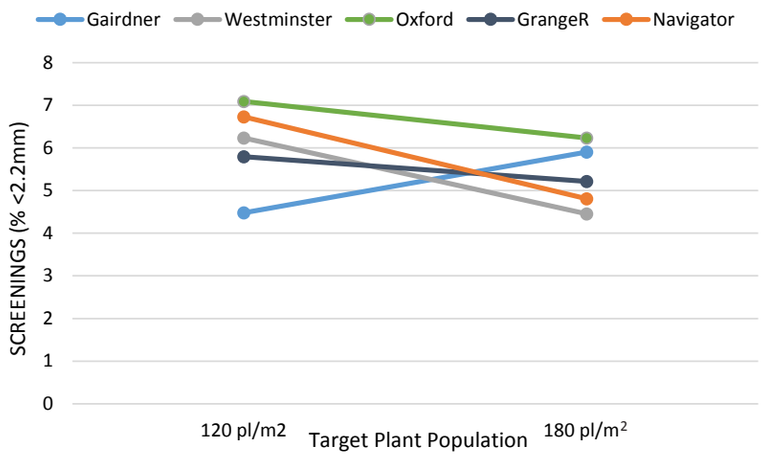

Figure 2. Differences in the screenings (% < 2.5 mm) response of 5 varieties to delayed seeding.

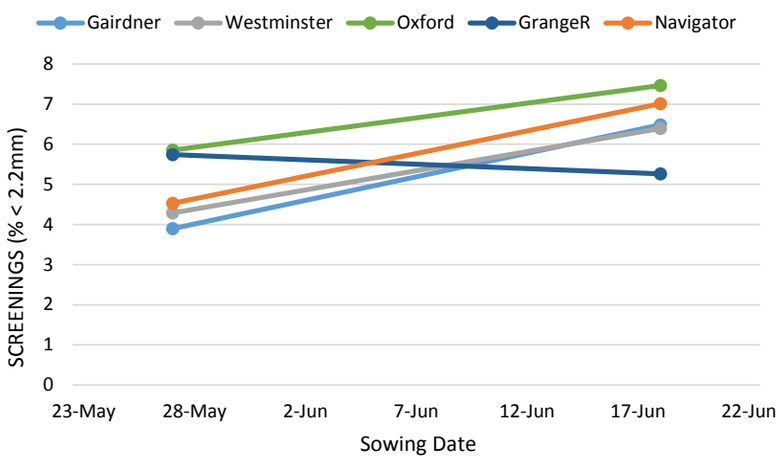

Figure 3. Differences in the screenings (% < 2.5 mm) response of 5 varieties to different sowing rate.

References

2013 WA Crop Updates (GRDC) Sensitivity of Barley Varieties to Crop Management
Blakely Paynter, Andrea Hills, Raj Malik and Amelia McLarty, DAFWA

Acknowledgements

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