



Barley yield and quality trial

The aim of this trial was to investigate the effects of seeding rates (plant density) on grain yield and quality in four barley varieties at three locations (Berriwillock, Birchip and Rupanyup)

Summary of trial

Unlike wheat, higher seeding rates in malt barley may have a detrimental impact on grain yield and quality. This is particularly the case for Schooner (lower yields) and Vic Sloop (higher screenings).

The exception to this rule may be Gairdner. Higher plant densities had no impact on yield or grain quality so increasing seeding rates in this variety may be a management tool available to compensate for its poor early vigour.

Why it was conducted:

Wheat and barley crops should be managed differently. BCG research has proved that increasing seeding rates in wheat results in stable or increased yields, lower screenings and better crop competition against weeds. Past research conducted by the BCG has shown malt barley to produce unacceptably high screening levels when seeding rates are increased. This trial was established to determine the optimum plant densities of recently released malt barley lines especially Vic Sloop and Gairdner.

How it was conducted:

Trials were established at Berriwillock, Birchip and Rupanyup during the 2002 season to investigate the effect of seeding rates on barley yield and quality.

At each site 4 barley varieties were sown – Schooner, Gairdner, Vic Sloop and Barque. For each variety four plant densities were targeted: 100, 150, 200 and 250 plants/m².

All treatments were pre-drilled with Urea (Berriwillock and Birchip at 40kg/ha and Rupanyup 70kg/ha) and sown with 80kg Mallee Mix 1. Sowing occurred on the 21st May, 24th May and 17th June at Berriwillock, Birchip and Rupanyup respectively.

Throughout the season critical crop development stages were monitored (plant, tiller and head densities) and yield, screenings and protein were recorded at harvest.

Trials were conducted using a replicated randomised block design.

Results of the trial:

No results were obtained from Berriwillock and Rupanyup as the crops failed due to drought. At the Birchip site the average grain yield of all treatments was 0.9t/ha.

Crop development

As expected seeding rate had a significant effect on the plant density achieved ($P<0.001$). On average the target plant densities of 100, 150, 200 and 250 plants/m² achieved 103, 138, 164 and 190 plants/m² respectively (LSD 5%=11). Barley variety had no effect on plant density. This was expected as target plant densities were based on 1000-grain weights and germination results of each variety.

Shoots per squared metre increased significantly with plant density ($P<0.01$). Higher the seeding rate the greater the number of shoots/ m². At 100, 150, 200 and 250 plants/ m² the number of shoots/ m² were 815, 908, 993 and 1011 respectively (LSD 5%=120). The number of shoots per plant decreased significantly ($P<0.001$) as the plant density increased. At 100, 150, 200 and 250 plants/ m² the number of shoots/ plant were 8, 6.6, 6.1 and 5.3 respectively (LSD 5%=0.7).

Tiller mortality was very high for all treatments due to drought conditions (average tiller mortality of 72 %) and seeding rate had no significant effect. Seeding rate did not significantly effect heads/m² - tiller mortality due to drought stress dominated.

Table 1: The influence of seeding rate on grain yield, protein and screenings in four barley varieties – Schooner, Gairdner, Vic Sloop and Barque

Variety	Plant density (plts/m ²)	Yield (t/ha)	Protein (%)	Screen (%)
Schooner	100	1.0	17.7	63
Schooner	150	0.92	18.6	69
Schooner	200	0.60	19.1	77
Schooner	250	0.74	18.5	72
Schooner average	-	P<0.05, LSD=0.26	NS	NS
Gairdner	100	1.08	16.4	63.5
Gairdner	150	1.03	16.6	62
Gairdner	200	1.00	17.4	69.5
Gairdner	250	1.12	16.4	61.2
Gairdner average	-	NS	NS	NS
Vic Sloop	100	0.86	17.8	44
Vic Sloop	150	1.01	17.6	47
Vic Sloop	200	0.68	18.5	59
Vic Sloop	250	0.71	18.5	59
Vic Sloop average	-	NS	NS	P<0.05, LSD=12
Barque	100	1.14	17.1	47
Barque	150	1.00	17.0	40
Barque	200	1.00	17.2	41
Barque	250	0.74	18.1	49
Barque average	-	NS	NS	NS

Yield

Seeding rate had a significant effect on crop yield in Schooner barley ($P<0.05$). As plant density increased grain yields declined. For all other varieties tested seeding rate had no significant effect on yield. The fact that higher seeding rates did not lead to a yield penalty in Gairdner, Vic Sloop and Barque is an important result.

Grain protein

Grain protein was not significantly effected by seeding rate in ant of the four varieties tested the varieties. Owing to the tough seasonal conditions grain protein levels were exceptionally high averaging 17.7 % and falling well outside the malting barley delivery standards of 9 – 12.8 %.

Screenings

Seeding rate had a significant impact on grain size and screenings in Vic Sloop ($P < 0.05$) with higher plant densities resulting in higher levels of screenings. For the varieties Schooner, Gairdner and Barque increased seeding rates had no impact on screenings. As with grain protein the seasonal conditions results in exceptionally screening levels with all treatments failing to achieve the delivery specification for malt barley (Malt 1 30% and Malt 3 42%).

Interpretation:

The crop development results were not unexpected. Higher seeding rates resulted in higher plant densities that in turn resulted in higher shoot numbers per squared metre. Plant density did however significantly impacted on the number of shoots per plant ie. the greater the number of plants per squared metre the less shoots each plant produced. This result was anticipated for both wheat and barley but was not seen in the wheat trial. Tiller mortality rates were very high (72% on average) owing to the dry season and this resulted in lower head numbers than expected.

Seeding rate in this trial did not influence yield except for the variety Schooner that displayed lower yields at higher plant densities. This is an important result for several reasons. Firstly, it indicates that for Schooner seeding rates can not be increased above conventional rates to capture competitive crop benefits without suffering a yield penalty, and secondly, for the variety Gairdner seeding rates can be increased to compensate for it characteristic poor early vigour without incurring a yield penalty.

Previous research conducted by the BCG has clearly shown that increased seeding rates in malting barley will result in higher levels of screenings. This habit was displayed for the variety Vic Sloop in this trial but not in the other varieties tested.

Seeding rate had no influence on grain protein in this trial.

Commercial practise:

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