Barley Agronomy in the HRZ-Variety Specific Agronomic Package for Planet, Westminster and Maltstar

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Key messages

- Early sown Planet with a plant population of 200 pl/m2 was the highest yielding treatment.
- Increased plant populations were not shown to significantly increase yields.
- Early sowing times showed a significantly higher yield results (p=0.05) however this result could be influenced by frost events.

Key words: Barley, Agronomy, Varieties, TOS, Nitrogen, PGRS, Phenology, Frost

BACKGROUND

With there being limited barley varieties suited to the High Rainfall Zone (HRZ), it is important that there are agronomy packages available that suit each variety to maximise production and profitability. GRDC projects such as DAN0017 Barley Agronomy Project are helping to build a strong database of knowledge for targeted variety management, which will give advisors and growers confidence to try new varieties as they come to the table. In 2017 as a part of the Barley Agronomy Project SFS ran three trials across the Inverleigh, Westmere and Hamilton trial sites to provide a complete view of barley performance across the South West region. This trial was designed to give some knowledge around appropriate times of sowing and plant populations for the new varieties; Planet and Maltstar, when compared against district variety Westminster. Frost events in early November did do some damage, and there was an interaction between time of sowing and the amount of frost effect within the trial.

METHOD

The Variety Specific Agronomy Package (VSAP) trial at Westmere was a three-way factorial trial investigating the relationship between time of sowing, plant density and variety. Three varieties were trialled, Planet, Westminster and Maltstar at two times of sowing. The early sowing was on May 2nd 2017, while later sowing was on May 16th 2017 with 100 kg/ha of flutriafol treated MAP at both timings. The early sowing was originally intended for mid-late April, however large rainfall events at this time meant that ground was not able to be trafficked until early May. Plant populations tested were 200 plants per m2 and 300 plants per m2. Nitrogen was applied in season at GS31 for each time of sowing at 110 kg/ha. The trial received standard herbicide and fungicide applications. In season assessments included establishment counts, NDVI readings, disease scores, lodging scores, head counts, yield and grain quality data.

RESULTS AND DISCUSSION

Variety Effects

Table 1. Variety yield with factors combined

Variety	Yield
Planet	7.6 a
Westminster	6.8 b
Maltstar	6.5 b
LSD (*p*=0.05)	**0.4**
CV %	**12.6**
***p*-value**	**0.0001**

Means followed by the same letter do not significantly differ (LSD (p=0.05) =0.4 t/ha)

Planet was the highest yielding variety over all in this trial, continuing its strong performance as seen in the SFS variety trials. This variety also had a significantly higher retention and significantly lower screenings result compared to Westminster and Maltstar and would have been delivered as F3 grade grain. This low grading was due to low test weight, which was a common theme across barley crops in the region due to frost events that occurred at early grain fill in November 2017.

When all factors were combined, the treatment with the highest yield was early sown Planet with a plant population of 200 pl/m2, which is consistent with results discussed in following sections.

There were no significant differences in the incidence or severity of disease between the three varieties, and lodging was not perceived to be an issue this season either, with low scores across all three varieties.

Time of sowing

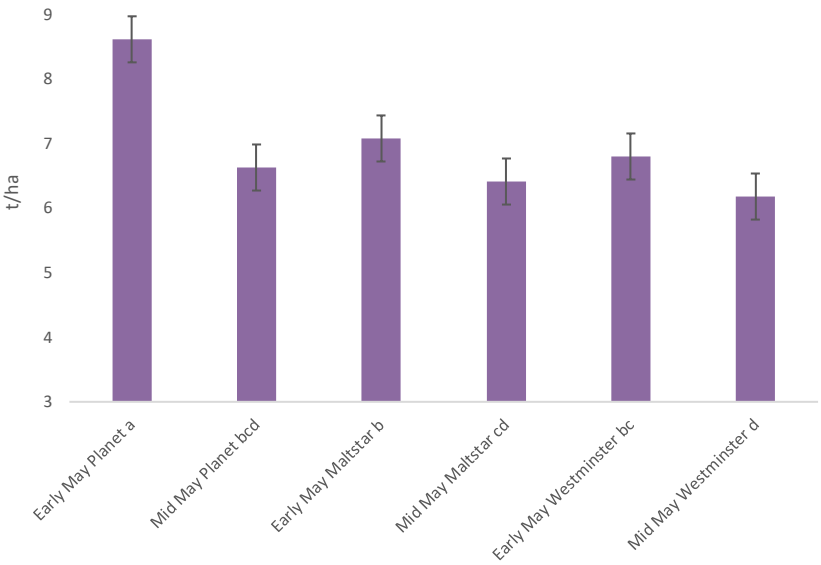
Earlier sowing at the beginning of May created a significant yield increase when effects from all varieties were combined (table 1). Similarly when all grain parameters are examined (table 2) significant differences are observed. Further to this when time of sowing and variety effects were combined, all varieties showed a significantly higher yield at early May sowing (Figure 1). While mid-late May is traditionally a more popular time for sowing barley in south west Victoria, perhaps earlier sowing dates for barley should be more seriously considered in autumn sowing programmes.

While this increased yield result was not repeated in a similar trial at the Westmere site in 2016 (see link in references), trial data from a similar time of sowing trial at Inverleigh in 2014 showed a significant yield increase from sowing barley in early May as opposed to the end of May. In that year yield increases were not so large as they were in this season, with the yield increase per/ha equating to 0.5 tonnes. Although it should be noted that no significant frost events were experienced at key flowering or grain fill times for barley in that season.

Table 2. Effect of time of sowing on yield and grain quality across all varieties

Time of Sowing	Yield (t/ha)	Testweight (kg/hl)	Retention (%)	Protein (%)
Early	7.5 a	56 a	75 a	11.5 b
Late	6.4 b	52 b	64 b	12.3 a
LSD (*p*=0.05)	0.42	1.8	3.1	0.44
CV %	12.5	7.0	7.2	2.8
p-value	0.0005	0.001	0.0001	0.0036

Means followed by the same letter do not significantly differ (LSD (*p*=0.05) =0.42 t/ha)



A possible influencing factor upon the increased yield at the early time of sowing is the frost events that occurred in early November. Time of sowing one was consistently more mature throughout the season than the second time of sowing and was slightly more advanced in early November when the frosts occurred. Figure 2 shows the phenology of each variety through the months of September, October and November against the minimum temperatures of the frost events.

Figure 1. Interaction of variety and time of sowing on yield

Means followed by different letters are not significantly different when (LSD(*p*=0.05)=0.62 t/ha). Error bars represent the standard error of the mean

	September				October				November	
Week	1	2	3	4	1	2	3	4	1	2
Planet TOS 1										
Planet TOS 2										
Westminster TOS 1										
Westminster TOS 2										
Maltstar TOS 1										
Maltstar TOS 2										
Growth stage	GS32 <	GS40<	GS50<		GS59<	GS61<	GS70<	GS80<	GS85<	GS87
Frost event min temp						0.0°C			-0.4°C -2.5°C -2°C -1.9°C	

Figure 2. Maturity map of each variety at different times of sowing with frost temperatures and timings.

As can be seen in figure 2, early sown varieties were more advanced in dough development when frost events occurred in the first week of November, giving them a higher chance of avoiding significant damage compared to the later time of sowing. A light frost event was recorded in early October when time of sowing one varieties were mid-late flowering, however the effect of this appears to be very minimal.

The grain quality results shown in table 2 again point to a higher level of damage in the second time of sowing. A significantly higher retention in time of sowing one meant that harvested grains overall were more plump, while the high screenings percentage in time of sowing two show that many grains were pinched from frost and fell through the top sieve, reducing the overall quality and therefore grade of the sample.

Table 2. Effect of plant population on yield, head counts, lodging and disease across all varieties

Plant Population	Yield (t/ha)	Establishment Count (pl/m2)	Lodging (Incidence out of 10)	Disease (Incidence out of 10)	Head Counts (pl/m2)
200 pl/m2	6.9 a	206 a	0.9 a	3.9 a	448 a
300 pl/m2	7.0 a	238 b	0.8 a	3.9 a	473 b

Means followed by the same letter do not significantly differ (LSD (p=0.05) =0.23 t/ha)

Considering these results, there may be a fit for early sown barley in the rotation as a means of reducing frost risk, whilst not compromising on yield. While there has been concerns over earlier sowing throwing varieties outside of malting specifications, the results from this trial do not support this. Earlier sowing dates equated to proteins that fell within malting specs, while later times of sowing did not. Again, if this is due to frost effects, then the benefits of early sowing for risk reduction speak for themselves.

Plant Population

There were no significant differences in yield between the two plant populations tested, and plant population did not have a significant effect upon lodging or upon disease. Establishment counts were significantly higher in treatments with 300 pl/m2 as were head counts. This poses the question, do more plants really equate to higher yields? Barley does not have the genetic disposition where the amount of grain rows can be increased with favourable conditions as in wheat, so it is thought that to increase yield barley would need more plants per square meter.

When these yield results were compared with results from the early sown SFS barley variety trial at Westmere, data showed that all three varieties yielded less overall in the VSAP trial with plant populations of 200 and 300 pl/m2, compared to the 160 pl/m2 that were used in the variety trials. While these results are not significant, there is a strong suggestion that less plants perhaps equate to more yield. One reason being that valuable nutrients that would usually be put into more grain and heavier grain in a lower plant population are instead taken up as extra biomass energy in a higher plant population.

ADDITIONAL INFORMATION

In 2017 a similar VSAP trial was run at the Campbell Town SFS trial site in Tasmania containing Planet and Westminster. This trial was funded by Seedforce and is a complement to the trials that have been run as a part of the Barley Agronomy Project in SW Victoria. A report on this trial is available in the SFS Tasmania Trial Results Book and will also be accessible through the SFS website.

CONCLUSION

Earlier sowing times of barley in late April to early May were shown to increase yield and could be used as a tool to mitigate a late frost risk across the cropping rotation, as early sown varieties were less affected than later sown. Increased plant populations did not have a significant effect upon yield.

REFERENCES

http://www.sfs.org.au/trial-result-pdfs/Trial_Results_2016_VIC/5.3%20Barley%20agronomy%20time%20of%20sowing%20and%20pgrs.pdf