2.2.2 Barley variety trial - Dunkeld, Vic

Location:
Dunkeld Research Site.

Funding:
This was an SFS Dunkeld Branch funded trial.

Researchers:
Toby Campbell, Sam Cockayne, Gary Sheppard, Ben O'Connor, Jon Midwood & Rohan Wardle - all SFS.

Author:
Toby Campbell, SFS.

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Background/Aim:
New barley varieties, especially those targeting malting specification, need to be tested over several years before they will be considered in the domestic or export malting or brewing markets. This trial evaluates a number of varieties that are either commercially available or close to commercial release that may be suitable for the growing conditions of southern Victoria. This trial also incorporates a fungicide programme in order to identify the susceptibility and yield penalty (if any) for not using fungicides in these varieties. Management of trial inputs are based on the season and aim to gain the best margin per hectare.

Take home messages:
- The average yield for the barley variety trial at Dunkeld was 6.53t/ha.
- The highest yield was achieved by Westminster (7.52 t/ha) followed by cv. 4262 (7.40 t/ha) and Fleet (7.20 t/ha)
- Gairdner and Baudin were the lowest yielding varieties achieving 5.16 and 5.23 t/ha
- Provisional Malt varieties Westminster, 4262 and Oxford topped the gross margin results with high yields, good retention and low screenings.
- Leaf Scald pressure was very high with all varieties showing some susceptibility where no fungicide was used.

Trial information:
Trial design consisted of a replicated randomised block design using 3 repetitions treated with foliar fungicide and leaving 1 repetition untreated, to demonstrate local disease pressure and varietal susceptibility. Plot lengths were 14 metres long and 1.45m wide. The year started very dry but over the winter months we experienced average to above average rainfall and an average spring. A hot start to November brought an end to the growing season, as such, rainfall after 20th November was not considered as contributing to the yield results this season.

Rainfall:

Avg. Annual:	597.8mm, Hamilton Airport 1991-2009
Avg. G.S.R.	466.5mm, Hamilton Airport 1991-2009
2009 Total:	562.4mm, Hamilton Airport 2009
2009 G.S.R.	April – October = 447.2mm[1]
	(Hamilton Airport; 41.6mm below average)

For the purposes of this trial, any rainfall after 20th November has not been included in GSR due to the extremely hot weather preceding this effectively ending the growing season.

[1] Yield Potential: 1/3 of Dec 2008(109mm), Jan 2009 (4.6mm) & Feb (0.4mm) with monthly totals above 20mm + ½ March (29mm) rainfall when total above 20mm + ((April – November 20th rainfall) – 124mm*) x 20kg/mm/ha. In total December-March adjusted rainfall to stored soil water = 50.8mm, plus April-November 20th = 447.2mm, minus evaporation factor of 124mm* => 374mm. Therefore, for Dunkeld, the Barley Variety Trial water limited yield should be 7.48t/ha, or 374mm x 20kg/mm/ha.
*Kirkagaard 2009, Evaporation intercept adjustment for a clay loam.

Paddock History:
2007: Canola, 2008: Wheat

Soil Type: Sandy clay

Soil Nutrients:
N = 42.1mg/kg (0-10cm) + 13.6mg/kg (10-60cm)
P = 32mg/kg (Colwell, 0-60)
K = 0.28 Meq/100g (0-60cm)
S = 29.4mg/kg(0-60cm)
pH ($CaCl^2$) = 5.0 (0-60cm).

Treatment list:
11 barley varieties. Measurements included yield and grain quality components, including protein, test weight, retention and screenings and resulting classification.

Tillage type:
This trial was seeded with the SFS cone seeder on 17.125 cm (6 ¾ inch) row spacing using 2.5cm knifepoints and Janke high V press wheels.

Sowing rate:
Seeding rate based on seed size with a desire to establish 160 plants/m^2

Sowing date: 21st May 2009

Harvest Date: 15th December 2009

Fertiliser:
100kg/ha MAP at sowing, Urea at 90kg/ha at GS 31-32 (1/09/09)

Fungicides: 15/9 Prosaro @ 150ml/ha + Hasten @ 1%

Herbicides:
- 21/5/09 Roundup Pmax @ 2.0l/ha + Triflur @ 1.2l/ha + Striker @ 200ml/ha + Surpass @ 500ml/ha
- 28/5/09 Dual Gold @ 250ml/ha + Diuron @ 500ml/ha
- 16/7/09 Axial @ 300ml/ha + Precept @ 1.0l/ha & Lontrel @ 250ml/ha & Adigor @500ml/ha

Pests & Diseases:
Leaf Scald pressure in 2009 was very high with susceptible varieties suffering large yield losses where no fungicide was used, up to 30% in some cases. All varieties showed some susceptibility, further emphasising the necessity of using foliar fungicides as part of a crop protection package.

Results and discussion:
The 2009 Barley Variety trial at Dunkeld displayed some interesting results from a good rainfall year with a sudden hot finish and high leaf scald pressure. This season pushed many varieties close to feed classification but also displayed the robust performance some varieties are capable of. The key points that need to be taken from this trial are that older malting varieties such as Gairdner (5.16 t/ha) and Baudin (5.23 t/ha) did not match the performance of newer varieties pending malting accreditation such as Westminster (7.52 t/ha), Oxford (6.94 t/ha) and the un-named lines GS4262 (7.40 t/ha) and GS1234 (6.68 t/ha). Not only were the older varieties out performed in yield but also in every other quality assessment and thus the gross margin assessment also shows them up. Gairdner yielded 5.16 t/ha and also suffered from low retention at 48% and high screenings at 14.7% thus coming dead last in terms of yield and gross margin. Gairdner was closely followed by Baudin that yielded 5.23 t/ha had 38.7% retention and screenings of 11.9%. Fairview also performed poorly with a yield of 5.98 t/ha, 40.4% retention and screenings of 10.7%.

Table 1: Grain yield, corrected to 12.5% moisture, sprayed with fungicide and compared to unsprayed check. A WUE calculation is included.

Variety	[1]Yield t/ha	[2]Sig. Diff.	% of site mean	[3]WUE % of 7.48 t/ha	[4]Quality Classification Potential	[5]Untreated Check (t/ha)	[5]Untreated Yield Loss (t/ha)
Westminster	7.52	a	115.2	100.6	Provisional Malt	5.7	1.8
4262	7.40	ab	113.3	98.9	Provisional Malt	5.5	1.9
Fleet	7.20	abc	110.3	96.3	Feed	5.9	1.3
Oxford	6.96	bcd	106.6	93.1	Provisional Malt	5.9	1.1
1234	6.68	cd	102.3	89.3	Provisional Malt	5.1	1.6
Capstan	6.60	d	101.1	88.3	Feed	5.4	1.2
5092	6.60	d	101.1	88.3	Feed	5.3	1.4
Commander	6.54	d	100.1	87.4	Malt	4.7	1.8
Fairview	5.98	e	91.6	79.9	Provisional Malt	4.5	1.5
Baudin	5.23	f	80.1	69.9	Malt	3.9	1.4
Gairdner	5.16	f	79.0	69.0	Malt	4.1	1.1
Mean	**6.53**					**5.1**	
LSD P=0.05	**0.54**						
CV	**4.81**						
Trt Prob (F)	**0.0001**						

[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=0.05, LSD).
[3]Water Use Efficiency percentages are calculated based on the water limited potential yield of barley at Dunkeld for the 2009 growing season; being 374mm x 20kg/mm/ha, or 7.48t/ha.
[4]Quality Classification Potential taken from 2009-2010 NACMA Barley Standards and should be used as a guide only.
[5] Untreated check not statistically significant due to one treatment only.

It does not appear that varietal length of season is a major factor in relation to yield in this trial, even with the sudden hot finish to the year. Most varieties trialled fit into the mid to long season bracket and thus any seasonal difference cannot be ascertained, also stored soil moisture may have been enough to finish most varieties. Disease resistance and fungicide application appear to be the major factors in both yield and quality specifications. The use of a fungicide at GS33 to protect the flag-1 and flag-2 leaves displayed an average 22% yield benefit over no fungicide. Given the high scald pressure and the difficulty in controlling scald once it is in crop, ideally a two fungicide program would be preferred and in this instance most likely would have seen further yield and quality benefits. Varietal disease resistance is obviously still very important and in this instance with only one fungicide treatment, would be a contributing factor as to the performance of the higher yielding varieties over those with lower yields. A feed variety that should be mentioned is Fleet (7.20 t/ha), overall it was third in yield but because of its feed classification it came 6th on gross margin analysis. Another variety worthy of mention is Commander (6.45 t/ha) which, whilst it came 8th in overall yield, it achieved 5th in the gross margin analysis due to malting accreditation. Given that Commander already has malting accreditation, unlike many of the other new varieties, this variety is worthy of further assessment.

Table 2: Grain quality analysis, including protein, test weight, retention & screenings that contributes to final economic analysis of variety performance on a GM/ha basis (using standard inputs across all treatments of $450/ha).

Variety	[1]Yield t/ha	[2]Protein %	[2]Test Weight kg/hl	[2]Retention	[2]Screenings below 2.0mm	[2]Resultant Quality Classification	[3]GM $/ha	[3]GM Rank	Yield Rank
Westminster	7.52	11.35	69.33	81.1	3.4	Prov. Malt	1092	1	1
4262	7.40	10.09	67.16	89.4	2.7	Prov. Malt	1066	2	2
Oxford	6.96	10.22	67.2	70.4	6.9	Prov. Malt	977	3	4
1234	6.68	11.88	66.85	73.2	5.7	Prov. Malt	919	4	5
Commander	6.54	10.05	66.66	76.4	7.0	Malt	890	5	8
Fleet	7.20	11.56	65.76	74.3	5.5	Feed	630	6	3
Capstan	6.60	12.12	65.35	43.2	15.3	Feed	540	7	6
5092	6.60	12.15	59.55	20.3	34.9	Feed	540	8	7
Fairview	5.98	11.86	68.58	40.4	10.7	Feed	447	9	9
Baudin	5.23	11.06	65.8	38.7	11.9	Feed	335	10	10
Gairdner	5.16	11.40	66.4	48.2	14.7	Feed	324	11	11
Mean	**6.53**	**11.25**	**66.24**	**59.62**	**10.78**				
LSD (P=0.05)	**0.5355**	**1.133**	**1.887**	**13.62**	**6.05**				
CV	**4.81**	**6.89**	**1.96**	**15.43**	**38.08**				
Trt Pr (F)	**0.0001**	**0.0021**	**0.0001**	**0.0001**	**0.0001**				

[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]Quality parameterisation is based on 2009-2010 NACMA Barley Standards and should be used as a guide only. Testing undertaken at Riordan Grains, Inverleigh Office.
[3]Prices for grain were taken as a spot price on the day of harvest and supplied by Riordan Grains; Malt price taken as GA1 price $205/t and F1 $150/t. Provisional Malting Varieties were priced at malt prices if they achieved the required quality standards.

Summary:
The 2009 barley variety trial displayed that the current popular malt varieties are susceptible to leaf scald and that they can be soundly outperformed in all areas by some of the newer varieties pending malting accreditation. Some key points to remember are that the top three yielding varieties with no significant difference between them were: Westminster, 4262 and Fleet; Westminster and 4262 are varieties pending malting accreditation and Fleet is a feed variety. The worst yielding varieties with no significant difference between them were: Baudin and Gairdner, both current malting varieties. In the gross margin analysis the top three performers in descending order were: Westminster, 4262 and Oxford, while the bottom three gross margin performers were Fairview, Baudin and Gairdner. The highest yielding current malt variety was Commander, which also achieved the highest gross margin of the current malt varieties. The highest yielding of the three feed varieties was Fleet, significantly higher than Capstan and 5092. 5092 suffered from very low retention and very high screenings. Fleet also achieved the highest gross margin of the feed varieties and also the highest gross margin of all malting varieties that were downgraded to feed quality. This trial also displayed the need for a complete fungicide program, even in new varieties, as all varieties suffered significant yield loss due to leaf scald where left untreated.