Barley variety trials

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Key Outcomes

- Commander looks to be a replacement for Gairdner in the higher rainfall areas.
- Disease control needs to be good to maximize grain yield and quality.
- Oxford may have potential in higher rainfall areas but needs to be further evaluated for yield and also whether it will get malting quality.

Trial Objectives: To assess the range of barley varieties available
Trial Duration: 2007-2008
Location: Various. **Farmer Cooperator:** Kim Makin, Ross Lutt, Kraig Johnson, Martin and Kirsty Flower, Hartley Hocking, James and Chris Gilbertson

Soil Type: Various.
Paddock History: 2006- 2008, Various

Monthly Rainfall:

Rain	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Total
Keith, 2009	0	0	19	53	15	49	106	58	58	20	55	19	453
Sherwood, 2009	0	2	11	59	16	38	77	67	74	22	46	23	434
Wolseley, 2009	1	0	30	37	16	33	86	74	73	25	55	23	452
Frances, 2009	2	4	25	30	20	51	110	81	68	32	45	21	489
Conmurra, 2009	3	0	31	59	28	98	124	108	111	52	46	30	688
Millicent, 2009	8	0	49	52	53	66	175	132	116	35	61	28	775

Water Use Efficiency:
Yield Limiting Factors: Early finish
Plot Size: Plots 8 m long by 8 rows at 15 cm row spacing.
Replicates: 3.

Treatments

All trials were sown with small plot equipment and managed as per usual agronomic treatment. All sites were sprayed with fungicides to control disease. Grain yield was determined by machine harvest.

Trial Results

Table 1: Upper South East barley variety trials in 2009 and long term

	SOUTH EAST				
	2009 (t/ha)		Long Term average across sites		
Variety	Bordertown	Keith	t/ha	as % sites average	# trials
Barque	-	-	3.70	102	18
Baudin	95	108	3.62	100	18
Buloke	105	94	3.83	106	14
Commander	117	108	3.98	110	18
Finniss	88	94	3.34	92	12
Flagship	108	101	3.75	104	18
Fleet	115	114	4.01	111	14
Gairdner	91	103	3.69	102	20
Hannan	95	104	3.81	105	6
Hindmarsh	114	104	4.03	112	8
Keel	96	98	3.74	104	20
Lockyer	117	104	4.00	111	8
Maritime	89	91	3.70	102	16
Oxford	98	116			
Schooner	83	92	3.52	97	20
Sloop	101	103	3.63	100	20
Sloop SA	92	87	3.60	100	20
Vlamingh	-	-	3.68	102	16
Yarra	105	108	3.79	105	
Site av. yield t/ha	4.87	5.49	3.62		
LSD (%)	17	11			
Date Sown	20 May	21 May			
Soil type	CL	CL			
A-O Rain (2009)mm	344	359			
pH_w	7.1	8.1			
Site Stress Factors	s	ht			

Table 2. Conmurra barley variety trial 2009

entry	kg/ha	% site mean
Fleet	5283	113
GS5092	5176	111
Lockyer	5140	110
Roe	5087	109
Commander	5024	108
Maritime	5021	108
Barque	5016	108
Buloke	4983	107
Keel	4873	105
VB0432	4866	104
Capstan	4856	104
Oxford	4840	104
Vlamingh	4821	103
Yarra	4757	102
WI4262	4586	98
Baudin	4508	97
Westminster	4498	97
Gairdner	4495	96
SloopVIC	4467	96
GS1234	4443	95
Sloop	4404	95
Hannan	4349	93
Hindmarsh	4156	89
SloopSA	4132	89
Schooner	4131	89
Flagship	3993	86
Torrens	3978	85
Site mean	4662	
CV%	3.98	
lsd(0.05)	324.7	

The feed barley, Hindmarsh, which has topped the grain yields in barley trials for the past three consecutive years, was soundly beaten across 2009 National Variety Trials (NVT) in South Australia. In only its second year of NVT evaluation, Oxford was the leading commercial variety on average, although jockeying with several other varieties for top ranking within regions. The 20 National Barley Variety Trials, which are managed by SARDI with funding from GRDC, tested 26 commercial varieties and 21 advanced breeding lines from breeding programs operating throughout Australia.

While only one trial was deemed invalid, due to variable yields stemming from rhizoctonia damage, the remaining trials produced an average grain yield of 3.63 t/ha, 46% above the average 2.48 t/ha produced in 2008. Reflecting the seasonal conditions within regions, site yields ranged from 1.79 t/ha at Lameroo in the Southern Mallee, to 5.49 t/ha at Keith in the South East.

Coupled with improved grain yields, there was also an improvement in overall grain quality within 2009 trials. Across all sites, grain protein declined from 14.4 per cent in 2008 to 11.6 per cent in 2009. Average test weights were similar at 68 kg/hl while grain size improved, with screenings declining from 17.8 per cent to 5.5 per cent and retentions rising from 40.5 to 77.2 per cent. These characteristics coupled with some weather damage were able to provide good data for discriminating varieties.

Mild and wet spring conditions across much of SA in 2009 contrasted the previous three seasons and were ideal for mid to later maturing varieties to reach potential. Leaf and root diseases such as leaf rust, net form net blotch, rhizoctonia and isolated leaf scald affected yields within some trials while incidences of frost, heat and rain damage late in the season generally did not impact on trials results.

Table 3. Conmurra barley variety trial 2009, quality data

entry	Hectolitre wt	1000 grain wt	Screenings	Protein
GS5092	64.0	42.70	1.67	8.5
Vlamingh	68.4	42.86	0.10	8.8
Sloop	67.0	44.82	0.00	9.2
Barque	66.0	48.64	0.18	9.1
SloopVIC	67.1	46.44	0.30	9.4
VB0432	67.1	42.48	0.00	9.2
Flagship	68.0	45.86	0.31	9.0
Commander	66.2	44.22	0.75	8.5
SloopSA	66.8	44.96	0.13	9.4
Keel	67.2	45.42	1.13	8.9
Schooner	68.0	41.48	0.80	9.6
Buloke	66.4	43.80	0.00	8.5
Capstan	64.8	41.88	1.56	9.0
Lockyer	66.5	48.54	0.02	8.1
Roe	67.4	43.96	0.00	9.2
Westminster	66.5	43.26	0.00	9.4
Torrens	73.1	40.16	1.53	10.0
Hindmarsh	67.3	40.78	0.80	9.5
Fleet	65.3	53.16	0.17	8.6
GS1234	65.9	40.46	0.81	8.5
Gairdner	66.8	45.82	1.14	8.7
Maritime	66.5	47.20	0.00	9.4
Yarra	66.0	45.40	0.36	9.4
WI4262	64.5	42.36	0.00	8.5
Baudin	68.1	44.18	0.21	9.1
Oxford	65.1	38.24	1.14	8.5
Hannan	68.2	41.80	0.93	9.3

Across all NVT sites, Oxford, Lockyer, Fleet and Yarra were the leading varieties respectively with less than 1.5 per cent grain yield separating them. The leading variety, Oxford was more than 22% above Schooner and SloopSA which yielded similarly. With the exception of Fleet the leading varieties were all mid to late maturing and had not featured highly in previous years. The new mid to late maturing malt variety, Commander was ranked fifth, 17 per cent above Schooner while Buloke and Flagship averaged 11 and 9 per cent above, respectively. The early maturing feed varieties, Hindmarsh and Keel which had dominated trials in previous years were 15 and 6 percent above Schooner respectively.

The highest yielding variety, Oxford, developed by Nickersons and PlantTech is late maturing has good resistance to leaf rust, leaf scald and powdery mildew but lacks CCN resistance and is susceptible to spot form net blotch. Its combination of maturity and disease resistance was an advantage in many regions in 2009, particularly the Yorke Peninsula where several sites were affected by leaf rust. With late maturity, Oxford may be an option for areas like the South East although further evaluation is needed. While currently a feed variety, Oxford is undergoing malting quality evaluation with final results due in 2012.

Table 4. Frances barley variety trial 2009

entry	kg/ha	% site mean
Capstan	6377	123
Vlamingh	5909	114
Baudin	5881	114
Hannan	5825	113
Oxford	5742	111
VB0432	5741	111
Gairdner	5659	109
Commander	5549	107
Keel	5507	106
Barque	5487	106
Fleet	5486	106
SloopVIC	5455	105
Yarra	5276	102
GS1234	5260	102
Schooner	5049	98
WI4262	4994	96
Westminster	4977	96
Roe	4909	95
Buloke	4837	93
SloopSA	4797	93
Sloop	4747	92
Maritime	4706	91
GS5092	4658	90
Lockyer	4607	89
Hindmarsh	4465	86
Flagship	4050	78
Torrens	3912	76
Site mean	5180	
CV%	7.82	
lsd(0.05)	701	

The second ranked variety, Lockyer, performed similarly to Oxford across regions, yielding well in all regions but closer to par on central and western Eyre. Lockyer is a feed quality, semi-dwarf, mid to late season variety developed by DAFWA and commercialised by COGGO Seeds. Lacking CCN resistance and with intermediate levels of foliar disease resistance and lower long term average yields than Fleet and Hindmarsh in all districts, Lockyer is unlikely to have a role in South Australia.

Just trailing Lockyer was another feed quality variety, Fleet, which has now performed well over a range of seasons, included the previous three dry years. Developed by the SA Barley Improvement Program, Fleet is similar to Barque in maturity, performs well across a range of soils including light sandy soils and has an excellent spectrum of disease resistances including CCN resistance. Fleet is a good option for all districts, and across several years of NVT, has produced a similar average test weight to Keel with less than half the amount of screenings. Fleet is also suitable for stubble situations and deeper sowing, having a long coleoptile.

Table 5. Frances barley variety trial 2009, quality data

entry	Hectolitre wt	1000 grain wt	Screenings	Protein
Schooner	70.05	41.8	0	10.8
Vlamingh	70.84	42.7	0.0	10.5
SloopVIC	68.76	45.3	0.3	10.6
Fleet	66.30	53.6	0.2	10.1
WI4262	65.44	38.6	0.8	9.9
Yarra	68.93	45.5	0.0	9.7
Lockyer	66.94	42.9	0.0	10.1
VB0432	68.71	41.3	1.0	10.3
GS5092	61.69	38.2	5.4	10.2
Gairdner	68.33	42.7	1.0	10.3
Westminster	67.36	41.5	0.8	10.6
Baudin	68.83	41.5	0.3	10.3
Keel	69.30	47.3	0.0	11
Flagship	68.33	44.3	1.9	10.8
Torrens	74.97	39.4	0.0	12.3
Hindmarsh	69.05	39.0	2.2	11.5
Buloke	68.39	45.4	2.0	10.8
Capstan	64.67	40.3	2.2	9.6
Oxford	65.91	36.9	1.2	9.6
SloopSA	68.81	46.4	0.0	10.4
Sloop	68.25	43.9	0.0	10.5
Roe	69.66	44.5	0.0	11
Hannan	69.92	41.8	0.5	10.8
Commander	68.86	46.6	0.0	9.4
GS1234	66.53	38.1	0.7	10.5
Maritime	67.09	46.9	0.1	10.6
Barque	68.83	50.4	0.0	10.8

Yarra, a moderately late maturing feed quality variety developed by VicDPI, has previously done well in longer seasons and on Yorke Peninsula where its leaf rust resistance is an asset. This was again the case in 2009 but with modest early vigour, moderate susceptibility to the net blotches and high susceptibility to leaf scald and black point, interest in Yarra will be limited to only leaf rust prone situations.

The highest yielding malting quality variety, Commander performed well in 2009 NVT with seasonal conditions well suited to its mid to later maturity. Commander averaged 17 per cent above Schooner and SloopSA performing consistently in all districts but particularly later districts. In previous seasons, Commander has been less impressive under tight finishing conditions but this was not seen in 2009 trials. Commander has CCN resistance and only modest foliar disease resistance and therefore should not be grown on barley stubble. However it has excellent grain plumpness, low screenings and high retentions albeit with slightly lower test weights and grain protein. These yield and grain characteristics will ensure that Commander is one of the most profitable varieties to grow in most districts, with a greater likely-hood of achieving malt grain quality.

Commander has quality suitable for domestic and some export brewing markets, and segregations are being established in all regions, including Eyre Peninsula for the 2010 harvest which should encourage wide interest in this new variety.

Table 6. Millicent barley variety trial 2009

entry	kg/ha	% site mean
Commander	8174	125
Roe	7581	116
Capstan	7554	115
Barque	7411	113
Yarra	7290	111
Sloop	7281	111
WI4446	7233	111
Fleet	7077	108
GS5092	6972	107
Baudin	6926	106
Vlamingh	6838	104
Keel	6820	104
WI3925	6817	104
SloopSA	6812	104
Oxford	6800	104
SloopVIC	6693	102
Lockyer	6671	102
VB0613	6584	101
Maritime	6569	100
VB0432	6411	98
WI4262	6375	97
Hannan	6352	97
Buloke	6101	93
Westminster	6101	93
Schooner	6095	93
Gairdner	6010	92
Flagship	5690	87
GS1234	5472	84
Hindmarsh	5369	82
Torrens	5313	81
WI3930	5186	79
WI4432	4985	76
Site mean	6549	
CV%	9.542	
lsd(0.05)	1352	

Having been evaluated since 2006 over three dry seasons, with outstanding results, the new feed variety Hindmarsh was far less impressive in the contrasting conditions of 2009. A short coleoptile and poorer establishment were implicated in some farmer experiences in 2009. However, trailing Fleet for the first time by an average of 6.5 per cent, Hindmarsh struggled in NVT sites with light sandy soils. Some results could be attributed to its susceptibilities to spot form net blotch and leaf rust, and early maturity which was not able to capitalise on the late rains. Despite this, Hindmarsh still led Keel by 9 per cent and Schooner and Sloop SA by 15 per cent and remains a good feed variety option for most districts although its short height may preclude it from drier areas. Hindmarsh is currently undergoing malt quality evaluation but it will be early 2011 before the outcome of accreditation is finalised.

Table 7. Millicent barley variety trial 2009, quality data

entry	Hectolitre wt	1000 grain wt	Screenings	Protein
Commander	71.84	50.2	0.1	11.8
VB0432	72.29	46.9	0.4	12.8
GS1234	71.75	46.4	0.3	13.3
Westminster	73.67	52.86	0.0	12.5
Hannan	72.21	46.22	0.6	13.1
GS5092	69.05	47.98	1.5	11.5
VB0613	72.88	47.9	0.2	13.1
Hindmarsh	70.26	39.68	6.9	14.1
SloopSA	70.98	49.2	0.7	12.9
WI4446	72.09	49.52	0.7	12.6
Torrens	78.30	42.58	2.3	15.1
Flagship	73.07	48.8	0.3	13
Capstan	71.33	44.98	2.5	12.7
WI3930	79.96	42.12	5.7	13.6
Buloke	73.22	50.3	1.8	11.4
Vlamingh	73.27	43.72	0.0	12
Lockyer	72.97	50.52	0.0	12.7
Schooner	72.58	46.76	1.5	13.1
Roe	72.48	46.54	1.7	12.7
WI3925	78.21	46.7	1.8	14.8
Barque	71.98	53.14	0.4	13
Yarra	74.14	51.76	0.1	13.3
SloopVIC	70.28	51.48	0.8	13.1
Gairdner	70.44	47.08	3.8	12.8
WI4262	71.05	41.58	1.2	12
Sloop	72.01	48.72	1.1	12.8
Maritime	70.47	46.98	2.1	13.1
Fleet	71.78	58.54	0.9	12.7
Baudin	72.91	46.02	0.1	12.6
Oxford	70.53	41.54	0.5	11.5
WI4432	70.98	48.22	0.6	12.6
Keel	69.18	45.06	7.5	12.3

Yielding similarly overall, and 7 to 8 per cent below Commander, were the malt varieties Buloke and Flagship. With mid to late maturity, Buloke was expected to dominate over the earlier flowering Flagship in 2009. Over the longer term, there is little separating these varieties with Flagship offering CCN resistance and much better spot form net blotch resistance, while Buloke lacks CCN resistance but has better leaf scald resistance and slightly higher yield potential. Both varieties have excellent malting quality suited to export markets with Buloke slightly lower in test weight than Schooner. Greater boron toxicity symptoms, leaf necrosis and susceptibility to sprouting have curbed interest in Flagship on farm but market demand is strong and rewards are high for those who persist with Flagship. Notwithstanding, Flagship should be harvested without delay once the crop is mature and windrowing may exacerbate the sprouting risk with this variety.

Keel and perhaps Maritime, with their relatively early maturity were not expected to perform well in 2009. However Maritime produced good results, consistent with previous years while Keel was well down and averaged 9 per cent below Hindmarsh. The widespread occurrence of a new strain of net form net blotch virulent on Maritime did not affect yields within NVT sites but does spell a doubtful future for this popular variety with unsurpassed physical grain quality.

Conclusion and into the paddock

Choose the appropriate variety by looking at potential grain yield, quality and also disease resistance. Commander looks to be a good option for a malting type but disease needs to be controlled carefully. The new variety Oxford performed well considering its late maturity but needs more evaluation.

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