



QUALITY WHEAT CRC PROJECT REPORT

Program 1: New Wheats & Breeding Aids

Test Baking Results for Flour Samples Received from the University of Sydney, Plant Breeding Institute, Narrabri

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TECHNICAL DEVELOPMENT
APPLIED RESEARCH

REPORT

**TEST BAKING RESULTS FOR FLOUR SAMPLES RECEIVED BY THE UNIVERSITY
OF SYDNEY, PLANT BREEDING INSTITUTE, NARRABRI**

MARCH 1999

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SUMMARY

Flour samples of the advance breeding lines (98/99 season) from Narrabri soft wheat breeding program were test baked and compared to four control varieties and an Arnott standard sample. These samples were chosen based on yield trial, conducted in both dry and irrigated conditions, and test bake results obtained in 1998. Wheat samples were milled by Bunge Defiance, Toowoomba and test baked by Arnott's using a small scale test bake procedure to assess biscuit quality.

All the test samples produced better test bake results with respect to packet length and biscuit texture when compared with the Arnott standard. Five out of thirteen test samples had lower or similar checking rate to the Arnott standard. Six test varieties had similar packet length to baked dough weight ratio (PL:BDW) when compared to the control samples.

Three test varieties have been chosen to conduct large scale factory trials. These test varieties were chosen based on agronomic, milling and test baking results over three growing seasons. Milling of these wheats is expected end of April with factory trials being conducted as soon as possible. Results from factory trials will confirm which variety/s will be progress through to the commercialisation stage.

SAMPLE DETAILS AND METHODS

Samples

The flour Samples received for testing were:

- 13 advance line varieties
- 4 control varieties (Sunstate, Tincurrin, Tatiara and Bowie)
- Arnotts standard

Methods

Wheat was milled and the flour protein content and rheological assessment of flour was conducted by Bunge Defiance Toowoomba Mill. The quantity of the advance line varieties and controls received allowed for only one test bake. Two samples of each control (except Bowie) were received from different growing sites.

Biscuit doughs were mixed to a constant temperature of 43°C, using a semi commercial hard-sweet formulation with the water addition varied according to water absorption. Power consumption was recorded during the mix and used to determine the peak power, peak bandwidth, and final consistency. The doughs were rested for 30 minutes in an esky, sheeted through pilot scale sheeting rolls and cut using commercial biscuit cutters. Biscuits were baked in a constant temperature fan forced oven.

The baked weight, packet length and dimensions of 20 biscuits were recorded and the hardness was tested using a biscuit texture meter.

RESULTS AND DISCUSSIONS

The rheological, mixing and test baking results were summarised in Appendix 1

Protein Content and Physical Dough Characterisation

The protein levels for all test samples ranged from 8.7% (Arnott standard and Tincurrin, 981-79) to 11.3% (Sunstate, 981-78). All the test varieties had the protein levels higher than that specified in the Arnott Specification for soft flour except the control variety, Tincurrin (981-79).

The extensibility ranged from 16.8cm (971-3) to 26.5cm (Tatiara, 982-80). The maximum resistance (Rmax) ranged from 95BU (971-60) to 275BU (971-3). No Rmax information was available for control varieties. Two test varieties (971-60 and 971-59) had the Rmax values below and one (971-3) above the Arnott Specification.

The water absorption levels ranged from 52% (Tincurrin, 981-79) to 60.5% (Sunstate, 982-78). All the advance line and control varieties (except Sunstate, 982-78) had the water absorption levels within the Arnott Specification.

Dough Mixing and Sheeting Properties

The control varieties Sunstate, Tatiara and Bowie from two sites had relatively shorter mixing time and higher peak power, whilst the test varieties 971-2, 971-3, 971-6 and 971-35; and control variety Tincurrin had longer mixing time and relatively lower peak power when compared with the Arnott standard. General speaking, dough mixed with longer mixing time and lower peak power produced dough with weaker properties than those with shorter mixing time and higher peak power, and hence performed better in sheeting and baking processes (*e.g.* easy to sheet and produced dough pieces with less spring back).

Biscuit Texture and Dimension

All of the advance line varieties had a PL:BDW higher than the Arnott standard, but slightly lower than the two Tatiara controls. Of these, nine varieties also had acceptable checking rate. All the test varieties produced biscuit with more friable (softer) texture than the Arnott standard and the Tatiara controls.

Two Sunstate controls produced biscuits with very high checking rate (most likely due to the hard grain texture and high flour protein content).

All the test varieties showed poorer biscuit circularity compared with the Arnott standard. The relatively high protein level of this season's flour samples may account for the poor biscuit dimension since the flour with high protein level could produce dough with relatively strong/elastic dough properties, and as consequences, more spring back would be resulted from the sheeting process.

In general, dough mixing and baking properties of test varieties received from 98/99 season were better than or similar to the previous season with respect to the final dough consistency, biscuit texture and PL:BDW ratio.

Table 1 is a summary of how the thirteen test varieties performed in previous test bakes. All produced products with better quality attributes than the Arnott standards.

Table 1

Sample No.	97 Planting Non Irrigated T baked: 2/98	98 Planting Irrigated T baked: 11/98	98 LS planting T.Baked 2/99	Comments
LS198-2	***	***	**	
LS198-3	Not tested	**	***	
LS198-4	**	**	*	98 LS planting - high checking
LS198-5	Not tested	**	**	
LS198-6	*	*	**	
LS198-12	***	***	***	
LS198-7	**	**	***	
LS198-8	*	***	***	
LS198-9	*	**	**	
LS198-13	***	***	**	
LS198-10	***	***	**	
LS198-11	*	*	*	98 and 98 LS planting - hard text.
LS198-14	*	*	*	97 Planting - hard text, high checking poor circularity. 98 LS - high checking

*** Excellent ** Very Good * Good

CONCLUSIONS & RECOMMENDATIONS

The test baking results showed that all the advance line samples performed better than the Arnott standard with respect to PL:BDW and biscuit texture. Nine of the thirteen test lines had the checking rate lower than or similar to the Arnotts standard and the control varieties Tincurrin and Tatiara.

Based on agronomic, milling and test baking results over three growing seasons (and after discussions with L.O'Brien), it has been decided that samples LS198-4, LS198-6 and LS198-7 will be trialed in an Arnott's manufacturing plant. Milling of these wheats is expected end of April with factory trials being conducted as soon as possible. Results from factory trials will confirm which variety/s will be progress through to the commercialisation stage.

There are several other test varieties that performed very well in test baking over the last three growing seasons. These are samples LS198-2, LS198-3, LS198-12, LS198-8, LS198-13 & LS198-10. It is recommended that these varieties be reviewed to determine if their agronomic and milling characteristics are also of high quality and determine if they should be planted for factory assessment next year.

APPENDIX 1

PBI-Narrabri Sample No.	Arnott Std	LSI 98-2	LSI 98-3	LSI 98-4	LSI 98-5	LSI 98-6	LSI 98-7	LSI 98-8	LSI 98-9	LSI 98-10
Flour type/CBY, NBI code#		971-2	971-3	971-4	971-6	971-7	971-35	971-36	971-56	971-60
Defiance No.		4652	4653	4654	4655	4656	4657	4658	4659	4660
Flour protein content (%)	8.7	9.2	9.1	9.4	9.0	9.0	9.2	9.4	9.7	9.5
Extension (cm)	17.3	21.2	16.8	21.8	22.4	22.0	20.2	22.3	21.0	26.0
Rmax (BU)	135	200	275	235	210	230	180	160	210	95
% Water Absorption	58.1	55.8	54.8	54.6	52.6	54.3	54.2	56	56.2	55.1
Water addition (g)	108	106	104	102	100	101	98	100	103	98
Mixing Time (sec)	271.20	294	275	257	277	258	292	260	260	254
Time to Peak (sec)	162.13	147.41	156.67	151.85	158.89	165.93	167.04	165.56	162.22	166.30
Peak Power (W)	545.59	531.76	523.53	540.00	525.88	535.29	524.71	531.76	537.65	525.88
Peak Bandwidth (W)	77.06	60	60	71.76	75.29	70.59	69.41	61.18	70.59	70.59
Total work (kJ)	98.09	101.8	94.78	88.66	96	88.45	102.9	89.98	88.71	85.55
Final Consistency (W)	37.35	31.76	38.82	35.29	36.47	49.41	35.29	36.47	24.71	36.47
Raw Dough Weight (g) 20bisc	139.26	134.4	140.5	147.5	142.3	140	135.4	138.1	141.4	137.9
Dough Thickness (mm)	2.84	2.82	2.79	3.08	2.97	2.94	2.75	2.81	2.9	2.84
Baked Dough Wgt (g) 20 bisc	108.0577	103.6375	109.6265	116.4143	110.9056	109.5737	105.4237	107.9842	110.7159	108.1995
Packet Length (mm) 20bisc	125.80	127.5	136.5	140.5	137.5	133.5	130	130	135	138
PL:BDW	1.16	1.2302	1.2451	1.2069	1.2398	1.2184	1.2331	1.2039	1.2193	1.2754
Hardness - Saw Time (sec)	58.75	48	47	52	47	53	50	48	45	46
Hardness - TPB test Force (g)	2674.27	2683.20	2590.48	2689.34	n.a.	2783.51	2325.14	2477.76	2719.98	2907.20
Hardness - TPB test Area (gs)	996.73	1076.14	915.04	926.48	n.a.	998.30	835.74	865.08	1030.53	1042.90
Biscuit Circularity	1.0149	1.0255	1.0202	1.0294	1.0202	1.0276	1.0224	1.0234	1.0295	1.0307
Checking (Count/percent)	2.00	0	4	13	11	2	0	2	5	4

APPENDIX1

PBI-Narrabri Sample No.	LSI 98-11	LSI 98-12	LSI 98-13	LSI 98-14	Sunstate	Tincurrin	Tatiara	Bowie	Sunstate	Tincurrin	Tatiara
Flour type/CBY, NBI code#	971-68	971-31	971-59	971-15	981-78	981-79	981-80	981-81	982-78	982-79	982-80
Defiance Sample No.	4661	4662	4663	4664	4702	4703	4704	4705	4706	4707	4708
Flour protein content (%)	9.2	9.2	9.8	9.4	11.3	8.7	10.3	10.4	11.1	9.2	10.3
Extension (cm)	21.6	19.4	22.6	16.4	26.4	17.2	24.0	21.9	24.7	18.8	26.5
Rmax (BU)	225	130	110	140							
% Water Absorption	56.1	54.6	54.7	57.9	58.9	52	54.7	56.3	60.5	54.2	54
Water addition (g)	102	100	100	104	115	95	100	102	112	98	100
Mixing Time (sec)	239	268	254	260	252	280	242	246	233	271	259
Time to Peak (sec)	162.22	159.26	157.78	157.78	167.78	170.37	152.59	155.56	164.44	n.a.	159.26
Peak Power (W)	556.47	529.41	555.29	554.12	587.06	505.88	588.24	585.88	631.76	n.a.	577.65
Peak Bandwidth (W)	70.59	76.47	70.59	64.71	61.18	68.24	94.12	82.35	80.00	n.a.	70.59
Total work (kJ)	82.79	91.62	88.9	90.36	90.16	95.81	86.46	89.22	86.43	95.97	93.12
Final Consistency (W)	47.06	44.71	37.65	36.47	35.29	37.65	48.24	47.06	41.18	n.a.	43.53
Raw Dough Weight (g) 20bisc	145.1	136.4	139.5	140.5	148.1	142.3	142.5	144.2	146.7	144.7	138.3
Dough Thickness (mm)	3.08	2.81	2.87	2.95	3.06	3.03	2.89	3.06	3.17	2.97	2.92
Baked Dough Wgt (g) 20 bisc	113.977	107.0111	109.2682	110.5197	114.1867	111.799	111.5003	112.7556	113.8656	113.2742	107.8571
Packet Length (mm) 20bisc	139	135.5	139	137	144	140.5	142.5	142	143	140.5	140
PL:BDW	1.2195	1.2662	1.2721	1.2396	1.2611	1.2567	1.2780	1.2594	1.2559	1.2404	1.2980
Hardness - Saw Time (sec)	n.a.	46	44	n.a.	n.a.	44	55	n.a.	n.a.	46	57
Hardness - TPB test Force (g)	3220.64	2349.61	2893.38	2909.03	4052.41	2719.61	2801.23	n.a.	3162.35	2665.70	3220.47
Hardness - TPB test Area (gs)	1392.08	748.48	979.10	1435.88	1740.27	995.16	1011.83	n.a.	1640.35	939.58	1291.59
Biscuit Circularity	1.0328	1.0224	1.0244	1.0175	1.0217	1.0224	1.0371	1.0330	1.0335	1.0307	1.0350
Checking (Count/percent)	17	7	2	17	18	3	11	20	19	7	7