Quality of Western Canadian Wheat Exports

Cargo Shipments • February 1 to July 31, 1998

Introduction

This bulletin reports quality data for cargoes of all classes of western Canadian wheat exported by ship from February 1, 1998, to July 31, 1998. Two types of information are presented:

- Distribution tables for moisture content, test weight and other grade determining factors assessed during grading of individual cargoes by Industry Services, Canadian Grain Commission, at time of vessel loading.
- Quality data (wheat and flour characteristics, milling, end-use quality) for weighted composite samples that represent all cargoes of a given grade (and protein segregate where appropriate) exported during the six-month period. For Canada Western Red Spring wheat, composites representing Atlantic and Pacific shipments are prepared and tested. For the other wheat classes, only one series of composites represents all cargoes (Atlantic and Pacific) exported from Canada during the period.

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Canada Western Red Spring wheat

Canada Western Red Spring (CWRS) wheat is well known for its excellent milling and baking quality. Three milling grades are available, the top two of which are further segregated according to protein content. Guaranteed minimum protein content is reported on a 13.5% moisture basis.

Higher protein CWRS wheat is highly suitable for blending and for the production of high volume pan breads. It is also commonly used alone or in blends with softer wheats for the production of hearth breads, steamed breads, noodles, flat breads and common wheat pasta.

To qualify for the milling grades in this class, wheat must be a registered variety—a variety equal in quality to the statutory standard, Neepawa. Varietal standards and registration ensure that a high degree of uniformity in quality is maintained in export shipments.

Table 1 • Moisture content, test weight and other grade determining factors*
Atlantic export cargoes of Canada Western Red Spring wheat
Third and fourth quarters 1997–98

	No. 1 CWRS					
	Guaranteed minimum protein content					
	14.5	14.0	13.5	12.5	12.0	11.5
Number of cargoes	21	6	16	7	1	5
Thousands of tonnes	148	40	115	97	25	47
Moisture content, %						
Weighted mean	13.4	13.4	13.4	13.1	13.0	12.8
Standard deviation	0.39	0.32	0.27	0.30	–	0.13
Minimum	11.9	13.0	13.0	12.7	13.0	12.7
Maximum	13.9	13.8	14.0	13.4	13.0	13.0
Test weight, kg/hl						
Weighted mean	80.6	80.9	81.0	82.5	83.5	83.2
Standard deviation	0.74	0.67	0.53	0.52	–	0.42
Minimum	79.2	80.2	80.3	81.8	83.5	82.6
Maximum	81.5	81.9	82.1	83.2	83.5	83.6
Wheats of other classes, %						
Weighted mean	0.23	0.32	0.30	0.37	0.30	0.36
Cereal grains other than wheat, %						
Weighted mean	0.15	0.18	0.19	0.17	0.15	0.17

	No. 2 CWRS							No. 3 CWRS
	Guaranteed minimum protein content							
	15.0	14.5	14.0	13.5	13.0	12.0	11.5	
Number of cargoes	4	16	11	14	5	1	1	1
Thousands of tonnes	22	134	134	166	85	25	8	19
Moisture content, %								
Weighted mean	13.5	13.5	13.5	13.5	13.2	12.9	13.1	13.4
Standard deviation	0.06	0.33	0.25	0.21	0.23	–	–	–
Minimum	13.4	12.9	13.1	13.1	12.9	12.9	13.1	13.4
Maximum	13.5	14.0	13.9	13.9	13.4	12.9	13.1	13.4
Test weight, kg/hl								
Weighted mean	79.0	79.7	80.1	80.7	81.8	81.4	82.9	81.0
Standard deviation	0.81	0.79	0.58	0.71	0.66	–	–	–
Minimum	77.6	78.4	79.3	79.4	80.6	81.4	82.9	81.0
Maximum	79.5	81.5	81.1	81.6	82.3	81.4	82.9	81.0
Wheats of other classes, %								
Weighted mean	0.25	0.32	0.42	0.47	0.47	0.60	0.90	0.80
Cereal grains other than wheat, %								
Weighted mean	0.21	0.24	0.31	0.31	0.21	0.11	0.33	0.36

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 2 • No. 1 Canada Western Red Spring wheat
Atlantic export cargo composites
Third and fourth quarters 1997–98

	No. 1 CWRS					
	Guaranteed minimum protein content					
Quality parameter*	14.5	14.0	13.5	12.5	12.0	11.5
Wheat						
Weight per 1000 kernels, g	28.7	29.4	30.4	30.9	31.1	31.1
Protein content, %	15.0	14.3	14.0	12.8	12.5	12.0
Protein content, % (dry matter basis)	17.3	16.5	16.2	14.8	14.5	13.9
Ash content, %	1.71	1.58	1.56	1.52	1.55	1.54
α-amylase activity, units/g	5.0	7.5	5.5	6.0	6.5	6.5
Falling number, s	405	375	385	380	370	375
PSI	54	54	53	52	51	50
Milling						
Flour yield						
Clean wheat basis, %	75.8	75.7	76.0	76.1	76.3	75.8
0.50% ash basis, %	75.3	75.2	76.0	76.6	76.8	75.3
Flour						
Protein content, %	14.3	13.6	13.1	12.0	11.7	11.2
Wet gluten content, %	38.4	36.5	34.6	31.6	30.1	29.6
Ash content, %	0.51	0.51	0.50	0.49	0.49	0.51
Grade colour	-0.8	-0.8	-1.2	-1.7	-1.6	-1.8
AGTRON colour, %	63	62	65	70	69	71
Starch damage, %	6.1	6.3	6.6	6.6	7.1	7.5
α-amylase activity, units/g	1.5	2.0	2.5	2.0	2.5	2.5
Amylograph peak viscosity, BU	680	635	590	620	570	555
Maltose value, g/100 g	2.1	2.2	2.3	2.3	2.6	2.7
Farinogram						
Absorption, %	65.1	64.9	64.3	63.5	64.2	64.5
Development time, min	6.0	5.75	5.5	4.75	4.25	3.5
Mixing tolerance index, BU	35	30	25	30	25	25
Stability, min	8.5	8.5	9.5	8.5	8.5	8.0
Extensogram						
Length, cm	23	21	21	20	18	20
Height at 5 cm, BU	285	285	290	305	290	295
Maximum height, BU	480	505	485	520	455	485
Area, cm^2	150	145	140	140	115	130
Alveogram						
Length, mm	134	125	122	101	89	79
P (height x 1.1), mm	90	92	94	102	118	130
W, x 10^{-4} joules	394	371	364	350	347	355
Baking (Canadian Short Process Baking Test)						
Absorption, %	69	69	68	67	66	68
Mixing energy, W–h/kg	14.0	14.6	13.1	10.7	12.0	10.8
Mixing time, min	10.1	10.7	9.6	9.0	10.8	10.7
Loaf volume, cm^3/100 g flour	1065	1075	1060	1035	995	1005

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 3 • No. 2 Canada Western Red Spring wheat
Atlantic export cargo composites
Third and fourth quarters 1997–98

	No. 2 CWRS						
	Guaranteed minimum protein content						
Quality parameter*	15.0	14.5	14.0	13.5	13.0	12.0	11.5
Wheat							
Weight per 1000 kernels, g	27.4	30.1	31.4	30.2	31.0	30.9	31.3
Protein content, %	15.3	14.8	14.3	13.9	13.6	12.7	11.9
Protein content, % (dry matter basis)	17.7	17.1	16.5	16.1	15.7	14.7	13.8
Ash content, %	1.80	1.74	1.63	1.61	1.57	1.58	1.56
α-amylase activity, units/g	5.5	6.0	7.0	7.5	7.5	7.0	9.0
Falling number, s	400	400	380	370	375	380	365
PSI	55	54	54	54	52	52	52
Milling							
Flour yield							
Clean wheat basis, %	76.2	76.1	76.1	75.5	75.6	75.6	75.7
0.50% ash basis, %	73.2	73.6	74.6	75.0	75.1	75.1	74.7
Flour							
Protein content, %	14.6	14.4	13.7	13.2	12.7	11.9	11.1
Wet gluten content, %	40.1	39.7	36.5	35.2	33.4	31.6	28.8
Ash content, %	0.56	0.55	0.53	0.51	0.51	0.51	0.52
Grade colour	0.1	-0.1	-0.4	-0.9	-1.3	-1.6	-1.7
AGTRON colour, %	56	57	60	63	66	68	69
Starch damage, %	6.0	6.5	6.5	6.9	7.2	7.5	7.5
α-amylase activity, units/g	2.0	2.0	2.5	2.5	2.0	2.0	2.0
Amylograph peak viscosity, BU	730	675	565	535	595	570	560
Maltose value, g/100 g	2.0	2.2	2.3	2.3	2.4	2.4	2.5
Farinogram							
Absorption, %	64.3	66.0	65.0	64.8	65.1	64.7	64.0
Development time, min	5.25	5.25	5.25	5.25	5.25	4.25	3.5
Mixing tolerance index, BU	40	30	35	30	30	30	30
Stability, min	7.0	8.5	8.5	8.5	9.0	8.5	8.0
Extensogram							
Length, cm	24	24	23	22	21	21	21
Height at 5 cm, BU	230	230	245	260	280	280	270
Maximum height, BU	360	380	405	430	470	465	430
Area, cm^2	125	130	130	130	135	135	120
Alveogram							
Length, mm	159	125	121	122	103	84	75
P (height x 1.1), mm	72	85	89	93	103	112	118
W, x 10^{-4} joules	351	351	343	363	341	337	311
Baking (Canadian Short Process Baking Test)							
Absorption, %	68	70	69	69	69	68	66
Mixing energy, W–h/kg	13.5	13.7	13.7	13.3	12.8	14.2	13.8
Mixing time, min	9.5	9.7	9.7	10.3	9.7	11.2	11.0
Loaf volume, cm^3/100 g flour	1095	1075	1040	1065	1035	1025	1000

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 4 • No. 3 Canada Western Red Spring wheat
Atlantic export cargo composite
Third and fourth quarters 1997–98

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	31.3
Protein content, %	12.3
Protein content, % (dry matter basis)	14.2
Ash content, %	1.55
α-amylase activity, units/g	18.0
Falling number, s	335
PSI	52
Milling	
Flour yield	
Clean wheat basis, %	75.8
0.50% ash basis, %	74.3
Flour	
Protein content, %	11.5
Wet gluten content, %	29.4
Ash content, %	0.53
Grade colour	-1.1
AGTRON colour, %	66
Starch damage, %	7.5
α-amylase activity, units/g	7.5
Amylograph peak viscosity, BU	255
Maltose value, g/100 g	2.9
Farinogram	
Absorption, %	64.1
Development time, min	4.0
Mixing tolerance index, BU	25
Stability, min	7.5
Extensogram	
Length, cm	19
Height at 5 cm, BU	300
Maximum height, BU	480
Area, cm^2	125
Alveogram	
Length, mm	77
P (height x 1.1), mm	119
W, x 10^{-4} joules	370
Baking (Canadian Short Process Baking Test)	
Absorption, %	67
Mixing energy, W–h/kg	13.7
Mixing time, min	11.5
Loaf volume, cm^3/100 g flour	1030

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 5 • Moisture content, test weight and other grade determining factors*
Pacific export cargoes of Canada Western Red Spring wheat
Third and fourth quarters 1997–98

	No. 1 CWRS						
	Guaranteed minimum protein content						
	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Number of cargoes	1	2	9	37	16	5	2
Thousands of tonnes	13	33	141	687	290	105	44
Moisture content, %							
Weighted mean	13.2	13.1	12.9	12.7	12.8	12.7	12.5
Standard deviation	–	–	0.36	0.28	0.26	0.23	0.07
Minimum	13.2	13.1	12.4	12.1	12.4	12.4	12.5
Maximum	13.2	13.1	13.4	13.3	13.4	13.0	12.6
Test weight, kg/hl							
Weighted mean	80.8	80.8	81.4	81.5	82.1	82.4	82.8
Standard deviation	–	0.35	0.28	0.41	0.36	0.23	0.07
Minimum	80.8	80.5	80.8	80.5	81.2	82.2	82.8
Maximum	80.8	81.0	81.7	82.4	82.6	82.7	82.9
Wheats of other classes, %							
Weighted mean	0.10	0.27	0.35	0.35	0.40	0.38	0.45
Cereal grains other than wheat, %							
Weighted mean	0.14	0.21	0.17	0.17	0.18	0.19	0.15

	No. 2 CWRS							No. 3 CWRS
	Guaranteed minimum protein content							
	14.5	14.0	13.5	13.0	12.5	12.0	11.5	
Number of cargoes	7	4	39	9	54	2	12	10
Thousands of tonnes	51	39	411	247	971	12	141	112
Moisture content, %								
Weighted mean	13.1	13.4	13.3	13.2	13.1	13.3	12.8	13.6
Standard deviation	0.52	0.10	0.27	0.22	0.29	0.28	0.41	0.15
Minimum	12.4	13.3	12.6	12.9	12.4	13.1	12.2	13.4
Maximum	13.9	13.5	13.7	13.6	13.7	13.5	13.7	13.9
Test weight, kg/hl								
Weighted mean	79.6	80.4	80.7	81.1	81.3	80.7	82.2	79.5
Standard deviation	0.36	0.57	0.54	0.42	0.64	0.07	0.63	0.34
Minimum	79.3	79.7	79.2	80.4	79.6	80.7	80.7	78.9
Maximum	80.2	80.9	81.5	81.8	82.8	80.8	82.9	80.1
Wheats of other classes, %								
Weighted mean	0.42	0.50	0.34	0.44	0.52	0.35	0.58	1.29
Cereal grains other than wheat, %								
Weighted mean	0.26	0.28	0.32	0.31	0.32	0.38	0.26	0.57

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 6 • No. 1 Canada Western Red Spring wheat
Pacific export cargo composites
Third and fourth quarters 1997–98

	No. 1 CWRS						
	Guaranteed minimum protein content						
Quality parameter*	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Weight per 1000 kernels, g	29.7	29.6	30.8	31.2	31.6	31.2	32.0
Protein content, %	15.1	14.3	13.7	13.6	12.7	12.3	11.7
Protein content, % (dry matter basis)	17.5	16.5	15.8	15.7	14.7	14.2	13.5
Ash content, %	1.51	1.55	1.52	1.51	1.49	1.51	1.48
α-amylase activity, units/g	9.0	7.0	6.5	5.5	6.5	7.0	7.0
Falling number, s	365	375	375	385	370	365	370
PSI	54	54	53	52	51	51	50
Flour yield							
Clean wheat basis, %	75.3	75.8	75.7	76.1	76.6	76.3	76.4
0.50% ash basis, %	75.3	76.3	75.7	76.1	76.1	75.8	76.4
Protein content, %	14.3	13.7	12.9	12.7	12.0	11.5	10.9
Wet gluten content, %	38.7	36.5	34.4	34.0	31.1	30.0	28.0
Ash content, %	0.50	0.49	0.50	0.50	0.51	0.51	0.50
Grade colour	-0.7	-1.2	-1.2	-1.2	-1.2	-1.4	-1.5
AGTRON colour, %	63	66	67	68	67	68	69
Starch damage, %	6.4	6.4	6.8	6.7	7.1	7.6	7.7
α-amylase activity, units/g	3.0	2.5	2.5	2.0	2.0	3.0	3.5
Amylograph peak viscosity, BU	495	585	560	535	525	495	460
Maltose value, g/100 g	2.2	2.2	2.3	2.3	2.5	2.7	2.8
Absorption, %	65.7	64.8	64.8	64.6	65.0	65.1	65.0
Development time, min	5.5	5.75	5.0	4.75	4.75	3.75	3.0
Mixing tolerance index, BU	30	30	25	30	30	30	30
Stability, min	9.0	10.0	9.0	8.0	8.0	7.5	6.5
Length, cm	22	21	21	22	20	20	20
Height at 5 cm, BU	275	280	270	275	280	285	265
Maximum height, BU	440	480	460	460	440	420	415
Area, cm^2	135	150	130	140	125	120	115
Length, mm	136	128	107	107	96	89	72
P (height x 1.1), mm	97	98	105	103	107	121	127
W, x 10^{-4} joules	414	394	360	360	350	360	318
Absorption, %	70	69	69	69	68	69	67
Mixing energy, W–h/kg	12.8	12.3	11.4	11.4	10.7	9.8	12.6
Mixing time, min	9.6	9.4	9.0	9.2	9.2	9.7	10.6
Loaf volume, cm^3/100 g flour	1075	1120	1060	1055	995	915	955

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 7 • No. 2 Canada Western Red Spring wheat
Pacific export cargo composites
Third and fourth quarters 1997–98

	No. 2 CWRS						
	Guaranteed minimum protein content						
Quality parameter*	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Wheat							
Weight per 1000 kernels, g	30.5	30.7	32.6	31.9	31.8	30.8	32.0
Protein content, %	14.8	14.1	13.5	13.1	12.7	12.1	11.6
Protein content, % (dry matter basis)	17.1	16.3	15.6	15.1	14.7	14.0	13.4
Ash content, %	1.62	1.62	1.59	1.56	1.54	1.51	1.49
α-amylase activity, units/g	7.0	7.0	9.0	6.5	6.0	7.0	7.0
Falling number, s	385	380	350	375	370	365	370
PSI	55	54	54	53	53	51	51
Milling							
Flour yield							
Clean wheat basis, %	76.0	75.9	75.9	75.4	75.9	76.0	75.9
0.50% ash basis, %	75.0	75.9	75.9	75.9	76.4	77.0	76.9
Flour							
Protein content, %	14.1	13.4	12.9	12.6	12.0	11.6	11.0
Wet gluten content, %	38.1	36.0	34.3	32.9	31.4	29.6	27.5
Ash content, %	0.52	0.50	0.50	0.49	0.49	0.48	0.48
Grade colour	-0.6	-0.7	-0.8	-1.1	-1.2	-2.0	-1.8
AGTRON colour, %	62	62	65	67	67	70	70
Starch damage, %	6.6	6.8	6.7	7.0	7.0	7.6	7.7
α-amylase activity, units/g	3.0	2.5	3.5	3.5	3.0	3.0	2.5
Amylograph peak viscosity, BU	530	540	440	460	470	510	580
Maltose value, g/100 g	2.2	2.3	2.4	2.4	2.4	2.6	2.6
Farinogram							
Absorption, %	65.5	65.3	65.2	64.9	64.3	64.3	63.8
Development time, min	5.5	5.0	5.0	4.75	4.5	4.25	4.0
Mixing tolerance index, BU	30	30	30	30	25	30	30
Stability, min	8.5	8.0	8.5	9.0	8.5	8.0	7.5
Extensogram							
Length, cm	22	21	22	22	21	21	19
Height at 5 cm, BU	265	255	260	260	280	300	275
Maximum height, BU	440	425	450	430	455	485	445
Area, cm^2	135	125	140	135	135	135	120
Alveogram							
Length, mm	135	125	113	105	115	82	79
P (height x 1.1), mm	91	98	94	107	105	123	123
W, x 10^{-4} joules	373	387	362	353	339	347	334
Baking (Canadian Short Process Baking Test)							
Absorption, %	70	69	69	69	68	68	68
Mixing energy, W–h/kg	13.8	12.6	13.1	11.8	11.5	11.3	10.2
Mixing time, min	10.5	9.1	10.1	9.5	9.6	10.4	10.2
Loaf volume, cm^3/100 g flour	1080	1090	1050	1090	1030	1030	1005

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 8 • No. 3 Canada Western Red Spring wheat
Pacific export cargo composite
Third and fourth quarters 1997–98

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	33.8
Protein content, %	12.6
Protein content, % (dry matter basis)	14.6
Ash content, %	1.56
α-amylase activity, units/g	30.5
Falling number, s	285
PSI	55
Milling	
Flour yield	
Clean wheat basis, %	75.4
0.50% ash basis, %	74.9
Flour	
Protein content, %	11.8
Wet gluten content, %	30.7
Ash content, %	0.51
Grade colour	-0.7
AGTRON colour, %	63
Starch damage, %	6.8
α-amylase activity, units/g	9.0
Amylograph peak viscosity, BU	230
Maltose value, g/100 g	2.6
Farinogram	
Absorption, %	64.6
Development time, min	4.75
Mixing tolerance index, BU	30
Stability, min	8.0
Extensogram	
Length, cm	20
Height at 5 cm, BU	275
Maximum height, BU	460
Area, cm^2	125
Alveogram	
Length, mm	95
P (height x 1.1), mm	107
W, x 10^{-4} joules	358
Baking (Canadian Short Process Baking Test)	
Absorption, %	69
Mixing energy, W–h/kg	12.5
Mixing time, min	10.2
Loaf volume, cm^3/100 g flour	1025

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Western Amber Durum wheat

Canada has an international reputation as a reliable supplier of high quality durum wheat, furnishing about two thirds of the world's exports in recent years. The attributes of Canadian durum that attract demand are reliability of supply, cleanliness, uniformity and consistency within and between shipments, and excellent end-product quality.

Canada has a strong commitment to quality throughout its grain system. This extends to strict varietal control to protect the inherent quality of all grades of amber durum wheat and to strict adherence to wheat grade standards. The requirement that only durum varieties of high intrinsic quality are registered is a cornerstone of the Canadian grading system.

Currently, the predominant variety of Canada Western Amber Durum wheat is Kyle.

Table 9 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Amber Durum wheat
Third and fourth quarters 1997–98

	No. 1 CWAD	No. 2 CWAD	No. 3 CWAD
Number of cargoes	63	71	24
Thousands of tonnes	753	954	170
Moisture content, %			
Weighted mean	12.1	12.3	12.9
Standard deviation	0.36	0.54	0.39
Minimum	10.9	11.1	12.0
Maximum	12.9	13.1	13.4
Test weight, kg/hl			
Weighted mean	82.8	82.1	81.1
Standard deviation	0.88	0.56	0.47
Minimum	81.1	80.6	80.0
Maximum	88.0	83.2	81.7
Hard vitreous kernels, %			
Weighted mean	79	74	62
Wheats of other classes, %			
Weighted mean	0.89	1.29	2.10
Cereal grains other than wheat, %			
Weighted mean	0.20	0.29	0.47

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 10 • Canada Western Amber Durum wheat
Export cargo composites
Third and fourth quarters 1997–98

Quality parameter*	No. 1 CWAD	No. 2 CWAD	No. 3 CWAD
Wheat			
Weight per 1000 kernels, g	41.0	42.3	42.0
Protein content, %	12.2	12.2	12.2
Protein content, % (dry matter basis)	14.1	14.1	14.1
SDS sedimentation, ml	40	40	40
Ash content, %	1.49	1.53	1.59
Yellow pigment content, ppm	7.8	7.7	7.7
Falling number, s	420	405	300
α-amylase activity, units/g	5.0	6.0	23.0
Milling yield, %	74.5	74.4	74.4
Semolina yield, %	66.9	66.1	65.3
PSI	37.7	37.7	37.9
Semolina			
Protein content, %	11.1	11.1	11.1
Wet gluten content, %	28.5	28.8	28.8
Dry gluten content, %	10.4	10.3	10.4
Ash content, %	0.64	0.64	0.66
Yellow pigment content, ppm	7.1	7.0	6.8
AGTRON colour, %	79	79	75
Minolta colour:			
L* (L)	88.4 85.4	88.8 85.9	88.8 85.9
a* (a)	-3.4 -3.3	-3.5 -3.4	-3.3 -3.2
b* (b)	32.4 22.4	32.4 22.5	31.5 21.9
Speck count per 50 cm²	15	27	30
Falling number, s	540	485	395
α-amylase activity, units/g	2.0	3.0	9.3
Spaghetti			
Dried at 70°C			
Minolta colour:			
L* (L)	80.0 75.3	80.0 75.2	79.2 74.4
a* (a)	0.4 0.3	0.5 0.4	1.0 0.9
b* (b)	65.1 34.2	65.8 34.4	63.5 33.5
Cooking quality, CQP	36	33	28

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.

Canada Western Extra Strong wheat

Canada Western Extra Strong (CWES) wheat is a red spring wheat. The most widely grown cultivar is Glenlea.

Flour milled from this wheat is characterized by very strong gluten. Dough made from CWES wheat flour cannot be properly developed at the normal farinograph speed of 63 rpm and must be tested at the higher speed of 90 rpm to obtain a true mixing peak.

The strong physical dough properties of CWES wheat make it ideal for blending and for specialty products in which very high gluten strength is needed.

Two milling grades have been established for this class.

Table 11 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Extra Strong wheat
Third and fourth quarters 1997–98

	No. 1 CWES	No. 2 CWES
Number of cargoes	12	8
Thousands of tonnes	95	101
Moisture content, %		
Weighted mean	13.7	13.0
Standard deviation	0.38	0.69
Minimum	12.9	12.3
Maximum	14.2	14.1
Test weight, kg/hl		
Weighted mean	80.2	80.2
Standard deviation	0.77	0.73
Minimum	78.5	79.1
Maximum	81.7	81.7
Wheats of other classes, %		
Weighted mean	1.00	1.50
Cereal grains other than wheat, %		
Weighted mean	0.28	0.47

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 12 • Canada Western Extra Strong wheat
Export cargo composites
Third and fourth quarters 1997–98

Quality parameter*	No. 1 CWES	No. 2 CWES
Wheat		
Weight per 1000 kernels, g	41.3	39.4
Protein content, %	12.6	12.1
Protein content, % (dry matter basis)	14.6	14.0
Ash content, %	1.49	1.49
α-amylase activity, units/g	16.0	14.0
Falling number, s	340	345
Flour yield, %	76.8	76.3
PSI	48	49
Flour		
Protein content, %	11.9	11.4
Wet gluten content, %	26.6	25.3
Ash content, %	0.59	0.57
Grade colour	-0.5	-0.5
AGTRON colour, %	57	60
Starch damage, %	8.4	8.3
α-amylase activity, units/g	6.5	4.5
Amylograph peak viscosity, BU	270	370
Maltose value, g/100 g	3.2	3.1
Farinogram		
Absorption, %	62.8	63.0
Development time (90 rpm), min	8.0	6.5
Extensogram		
Length, cm	23	24
Height at 5 cm, BU	360	350
Maximum height, BU	645	630
Area, cm^2	205	215
Alveogram		
Length, mm	67	81
P (height x 1.1), mm	116	119
W, x 10^{-4} joules	356	340
Baking (Remix-to-Peak Baking Test)		
Absorption, %	65	64
Remix time, min	4.4	4.1
Loaf volume, cm^3/100 g flour	895	900

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Prairie Spring Red wheat

Canada Prairie Spring Red (CPSR) wheat, used alone or in blends, has quality characteristics suitable for the production of various types of hearth breads, flat breads, noodles and related products. The most commonly grown varieties eligible for milling grades of CPSR are AC Taber and Biggar.

Table 13 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Prairie Spring Red wheat
Third and fourth quarters 1997–98

	No. 2 CPSR
Number of cargoes	16
Thousands of tonnes	155
Moisture content, %	
Weighted mean	12.9
Standard deviation	0.41
Minimum	12.4
Maximum	13.7
Test weight, kg/hl	
Weighted mean	81.0
Standard deviation	0.48
Minimum	79.6
Maximum	81.6
Wheats of other classes, %	
Weighted mean	2.17
Cereal grains other than wheat, %	
Weighted mean	0.50

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 14 • Canada Prairie Spring Red wheat
Export cargo composites
Third and fourth quarters 1997–98

Quality parameter*	No. 2 CPSR
Wheat	
Weight per 1000 kernels, g	39.4
Protein content, %	11.2
Protein content, % (dry matter basis)	12.9
Ash content, %	1.42
α-amylase activity, units/g	14.0
Falling number, s	310
Flour yield, %	76.1
PSI	59
Flour	
Protein content, %	10.2
Wet gluten content, %	26.3
Ash content, %	0.49
Grade colour	-1.1
AGTRON colour, %	65
Starch damage, %	6.3
α-amylase activity, units/g	3.5
Amylograph peak viscosity, BU	375
Maltose value, g/100 g	2.2
Farinogram	
Absorption, %	60.2
Development time, min	4.75
Mixing tolerance index, BU	50
Stability, min	7.0
Extensogram	
Length, cm	20
Height at 5 cm, BU	275
Maximum height, BU	455
Area, cm^2	125
Alveogram	
Length, mm	108
P (height x 1.1), mm	76
W, x 10^{-4} joules	271
Baking (Remix-to-Peak Baking Test)	
Absorption, %	60
Remix time, min	2.1
Loaf volume, cm^3/100 g flour	740

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Western Red Winter wheat

Canada Western Red Winter (CWRW) wheat is a hard wheat exhibiting excellent milling quality. It is available in two milling grades. Flour produced from high grade CWRW wheat performs well in the production of hearth breads (such as French-style bread) and certain types of noodles, and is also suitable for the production of various types of flat bread, steamed bread and related products.

Production of CWRW wheat is concentrated in the southern region of the province of Alberta where milder winters reduce the incidence of winter kill.

Current varieties eligible for the milling grades of CWRW are Norstar, AC Readymade and CDC Kestral.

Table 15 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Red Winter wheat
Third and fourth quarters 1997–98

	No. 1 CWRW	No. 2 CWRW
Number of cargoes	1	2
Thousands of tonnes	8	10
Moisture content, %		
Weighted mean	12.2	12.6
Standard deviation	0.00	0.42
Minimum	12.2	12.3
Maximum	12.2	12.9
Test weight, kg/hl		
Weighted mean	82.8	82.7
Standard deviation	–	0.14
Minimum	82.8	82.6
Maximum	82.8	82.8
Wheats of other classes, %		
Weighted mean	0.90	0.82
Cereal grains other than wheat, %		
Weighted mean	0.17	0.22

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 16 • Canada Western Red Winter wheat
Export cargo composite
Third and fourth quarters 1997–98

Quality parameter*	No. 1 CWRW	No. 2 CWRW
Wheat		
Weight per 1000 kernels, g	32.5	32.9
Protein content, %	11.6	11.1
Protein content, % (dry matter basis)	13.4	12.8
Ash content, %	1.45	1.44
α-amylase activity, units/g	18.0	8.5
Falling number, s	315	360
Flour yield, %	76.6	76.7
PSI	56	55
Flour		
Protein content, %	10.7	10.4
Wet gluten content, %	28.3	27.7
Ash content, %	0.47	0.48
Grade colour	-1.2	-1.2
AGTRON colour, %	66	66
Starch damage, %	6.6	6.5
α-amylase activity, units/g	7.5	4.0
Amylograph peak viscosity, BU	195	335
Maltose value, g/100 g	2.8	2.4
Farinogram		
Absorption, %	61.0	59.7
Development time, min	4.25	3.75
Mixing tolerance index, BU	45	35
Stability, min	6.5	6.5
Extensogram		
Length, cm	20	20
Height at 5 cm, BU	250	250
Maximum height, BU	395	395
Area, cm^2	105	105
Alveogram		
Length, mm	106	113
P (height x 1.1), mm	82	73
W, x 10^{-4} joules	302	275
Baking (Remix-to-Peak Baking Test)		
Absorption, %	59	59
Remix time, min	2.0	2.1
Loaf volume, cm^3/100 g flour	740	740

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Prairie Spring White wheat

Canada Prairie Spring White (CPSW) wheat, used alone or in blends, has the quality characteristics suitable for the production of various types of flat breads, noodles, chapatis, crackers and similar products. The most commonly grown varieties eligible for milling grades of CPSW are AC Karma and Genesis.

Table 17 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Prairie Spring White wheat
Third and fourth quarters 1997–98

	No. 1 CPSW	No. 2 CPSW
Number of cargoes	2	13
Thousands of tonnes	29	221
Moisture content, %		
Weighted mean	13.2	12.9
Standard deviation	0.28	0.43
Minimum	13.1	12.2
Maximum	13.5	13.9
Test weight, kg/hl		
Weighted mean	81.7	81.7
Standard deviation	0.49	0.52
Minimum	81.5	80.6
Maximum	82.2	82.2
Wheats of other classes, %		
Weighted mean	2.42	1.97
Cereal grains other than wheat, %		
Weighted mean	0.22	0.33

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 18 • Canada Prairie Spring White wheat
Export cargo composites
Third and fourth quarters 1997–98

Quality parameter*	No. 1 CPSW	No. 2 CPSW
Wheat		
Weight per 1000 kernels, g	35.3	35.7
Protein content, %	11.6	11.4
Protein content, % (dry matter basis)	13.4	13.2
Ash content, %	1.42	1.40
α-amylase activity, units/g	8.0	7.0
Falling number, s	380	380
Flour yield, %	77.5	75.4
PSI	60	60
Flour		
Protein content, %	10.6	10.3
Wet gluten content, %	29.8	28.5
Ash content, %	0.50	0.50
Grade colour	-1.9	-1.8
AGTRON colour, %	71	71
Starch damage, %	5.5	5.5
α-amylase activity, units/g	2.0	3.0
Amylograph peak viscosity, BU	595	570
Maltose value, g/100 g	2.0	1.9
Farinogram		
Absorption, %	60.3	59.7
Development time, min	3.0	3.25
Mixing tolerance index, BU	60	55
Stability, min	3.5	4.0
Extensogram		
Length, cm	22	22
Height at 5 cm, BU	190	220
Maximum height, BU	255	320
Area, cm^2	90	100
Alveogram		
Length, mm	136	105
P (height x 1.1), mm	59	63
W, x 10^{-4} joules	202	182
Baking (Remix-to-Peak Baking Test)		
Absorption, %	57	55
Remix time, min	1.1	1.3
Loaf volume, cm^3/100 g flour	660	610

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Western Soft White Spring wheat

Canada Western Soft White Spring (CWSWS) wheat is a lower protein, soft wheat with weak dough properties. Flour milled from this wheat is suitable for producing cookies, cakes, biscuits and related products. Alone or in blends with stronger wheat, CWSWS wheat can also be used to produce crackers, flat breads, steamed breads and certain types of noodles.

Most CWSWS wheat is grown under irrigation to maximize yield and minimize protein content.

Table 19 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Soft White Spring wheat
Third and fourth quarters 1997–98

	No. 1 CWSWS	No. 2 CWSWS
Number of cargoes	1	6
Thousands of tonnes	9	51
Moisture content, %		
Weighted mean	11.4	11.7
Standard deviation	–	0.12
Minimum	11.4	11.5
Maximum	11.4	11.8
Test weight, kg/hl		
Weighted mean	82.1	82.4
Standard deviation	–	0.54
Minimum	82.1	81.4
Maximum	82.1	82.9
Wheats of other classes, %		
Weighted mean	1.25	1.49
Cereal grains other than wheat, %		
Weighted mean	0.62	0.16

* Canadian Grain Commission Industry Services data for official loading samples tested at time of loading

Table 20 • Canada Western Soft White Spring wheat
Export cargo composite
Third and fourth quarters 1997–98

Quality parameter*	No. 1 CWSWS	No. 2 CWSWS
Wheat		
Weight per 1000 kernels, g	37.8	38.4
Protein content, %	10.4	10.5
Protein content, % (dry matter basis)	12.0	12.1
Ash content, %	1.47	1.40
α-amylase activity, units/g	7.5	9.0
Falling number, s	355	340
Flour yield, %	77.6	78.3
PSI	68	68
Flour		
Protein content, %	9.5	9.5
Wet gluten content, %	27.1	26.2
Ash content, %	0.53	0.54
Grade colour	-0.3	-0.3
AGTRON colour, %	60	60
Starch damage, %	3.0	3.1
α-amylase activity, units/g	3.0	3.0
Amylograph peak viscosity, BU	330	335
Maltose value, g/100 g	1.3	1.3
AWRC, %	65.0	67.3
Farinogram		
Absorption, %	54.0	54.1
Development time, min	1.25	1.25
Mixing tolerance index, BU	190	185
Stability, min	1.5	1.5
Alveogram		
Length, mm	90	85
P (height x 1.1), mm	20	20
W, x 10^{-4} joules	33	34
Cookie Test		
Spread, mm	82.3	81.7
Ratio (spread/thickness)	8.7	8.2

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods and definitions

At the Grain Research Laboratory (GRL), unless otherwise specified,

- Analytical results for wheat are reported at 13.5% moisture content.
- Analytical results for flour and semolina are reported at 14.0% moisture content.
- AACC methods cited are from *The American Association of Cereal Chemists (AACC): Approved Methods of the Association*, Ninth Edition, 1995.
- ICC methods cited are those of the International Association for Cereal Science And Technology.

AGTRON colour

The AGTRON colour of flour and durum wheat semolina is determined using AACC Method 14-30. An AGTRON direct reading reflectance spectrophotometer is used.

Alveogram

ICC Standard Method No. 121 is followed, using the constant pressure Chopin Alveograph Model MA82.

α-Amylase activity

The α-amylase activity of wheat and flour is determined by the method of Kruger and Tipples (1981), *Cereal Chemistry* 58:271–274.

Amylograph peak viscosity

Sixty-five grams of flour and 450 ml of distilled water are used with the Brabender Amylograph and the pin stirrer. Other details are as in AACC Method 22-10. Peak viscosity is reported in Brabender units.

Ash content

To determine wheat and flour ash content, AACC Method 8-01 is used.

AWRC (Alkaline Water Retention Capacity)

AWRC (Alkaline Water Retention Capacity) is determined using AACC Method 56-10.

Canadian Short Process Baking Test

The Canadian Short Process Baking Test is carried out as described by Preston et al. (1982), *Canadian Institute of Food Science and Technology Journal* 15:29–36. For this test and for the Sponge-and-Dough Baking Test, loaves are produced from 200 g of flour in baking pans with cross-sectional dimensions similar to those of Canadian commercial baking pans. Loaf volume is reported for each 100 g of flour.

Cereal grains other than wheat

Cereal grains other than wheat in wheat are rye, barley, oats, triticale, oat groats and wild oat groats. The percentage of other cereal grains present is determined by handpicking from a subsample of at least 250 g from each incremental sample. After a cargo has been loaded, the weighted average of the results is calculated. The amount of other cereal grains found is reported as a percentage by weight without reference to moisture content.

Cookie Test

The Cookie Test is performed according to AACC Method 10-50 D.

Crop year

The Canadian crop year begins on August 1 and ends July 31 the following year.

- First quarter, August 1 to October 31
- Second quarter, November 1 to January 31
- Third quarter, February 1 to April 30
- Fourth quarter, May 1 to July 31

Dockage

Dockage is material that can be removed by approved cleaning equipment. Canadian cargoes must be free of dockage, unless the buyer agrees in writing to accept grain containing dockage.

Dry gluten content

Dry gluten content is determined according to the Glutomatic System Operation manual.

Extensogram

Doughs are made from 300 g flour, 6 g salt, and distilled water equal to Farinograph absorption less 2.0% (for example, 65.0% reduced to 63.0%). The adjustment in Farinograph absorption is to compensate both for the salt and for the substitution of the large stainless steel Farinograph bowl. Doughs are mixed for one minute and rested for five minutes. Mixing continues until the curve is centred about the 500 Brabender Unit line. Curves are drawn for duplicate doughs at 45 and at 135 minutes, although doughs are rounded and shaped at 90 minutes. Average curves for 45 and 135 minutes are reproduced, but measurements are reported only for the 135-minute curve. Length is in centimetres, height is in Brabender units, and area is in square centimetres. The extensigraph is set so that 100 Brabender units equal a 100-g load.

Falling number

The falling number is determined on a 7-g sample of ground wheat or semolina by AACC Method 56-81B. A 300-g sample of wheat is ground in a Falling Number Laboratory Mill 3100 according to ICC Standard Method No. 107.

Farinogram

Fifty grams of flour are mixed in a small stainless steel farinograph bowl at 63 rpm for 15 minutes with enough distilled water to give a maximum dough consistency centred about the 500 Brabender Unit line.

- Farinograph absorption is the amount of water that must be added to flour to give the required consistency. It is reported as a percent.
- Dough development time is the time required for the curve to reach its maximum height.
- Mixing tolerance index (MTI) is the difference, in Brabender units, between the top of the curve at the peak and the top of the curve measured 5 min after the peak is reached.
- Stability is defined as the difference in time, to the nearest half minute, between the point at which the top of the curve first intercepts the 500-BU line (arrival time) and the point at which the top of the curve leaves the 500-BU line (departure time).

For CWES, Farinograph absorption is determined at 63 rpm and dough development time is measured at 90 rpm. For additional details, see the *Farinograph Handbook*, AACC, 1960.

Flour yield

Wheat is cleaned, scoured and tempered overnight to optimum moisture as described by Dexter and Tipples (1987), *Milling* 180(7):16, 18–20. All millings at the GRL are performed in rooms with environmental control maintained at 21°C and at 60% relative humidity.

- Common wheat is milled on an Allis-Chalmers laboratory mill using the GRL sifter flow as described by Black et al. (1980), *Cereal Foods World* 25:757–760. Flour yield is expressed as a percentage of cleaned wheat on a constant moisture basis. For CWRS wheat, flour yield also is expressed at a constant ash content of 0.50%, as described by Dexter and Tipples (1989), *Milling* 182(8):9–11. The procedure for pilot milling is described by Fajardo et al. (1995), *Cereal Chemistry* 72:291–298.
- Durum wheat is milled on a four stand Allis-Chalmers mill in conjunction with a laboratory purifier as described by Black (1966), *Cereal Science Today* 11:533–534, 542. The mill flow is described by Dexter et al. (1990), *Cereal Chemistry* 67:405–412. Semolina is defined as having less than 1% pass through a 149-micron sieve. Semolina yield and milling yield (which includes semolina and flour combined) are reported as a percentage of the cleaned wheat on a constant moisture basis.

Grade colour

A colour index is obtained by the procedure of Kent-Jones, et al. (1956), *Chemistry & Industry (London)* 1490–1493. The procedure uses the automated Satake Series IV Colour Grader, which gives the relative reflectance of a flour-water slurry. Results are standardized to the Satake International Units—the lower the number, the brighter the colour.

Hard vitreous kernels (HVK)

Determination of hard vitreous kernels (HVK) is made according to Memorandum No. 95-5 of Industry Services, Canadian Grain Commission. A sieved 25-g sample is examined externally for the natural translucency associated with hardness. Bleached kernels may be cut transversely to determine vitreousness.

Incremental sample

As vessels are loaded at terminal and transfer elevators, a series of samples is taken at specific intervals by a mechanical grain sampler. These are called incremental samples.

Maltose value

Maltose value is determined according to AACC Method 22-16.

Moisture content (flour)

To determine the moisture content of flour, a 10-g sample is heated for one hour in a semi-automatic Brabender oven at 130°C.

Moisture content (wheat)

Industry Services determines the moisture content of wheat on individual cargoes, and the Grain Research Laboratory determines the moisture content of wheat on grade composites using the Model 919 moisture meter calibrated against the AACC method 44-15A subsection 2-stage (130°C air-oven).

Protein content (N x 5.7)

Protein content of the composite samples is determined by Combustion Nitrogen Analysis (CNA). Protein content (total nitrogen) is determined on a LECO Model FP-428 Dumas CNA analyzer calibrated with EDTA. Samples are ground on a UDY Cyclone Sample Mill fitted with a 1.0-mm screen. A 250-mg sample is analyzed as received (it is not dried before analysis). Moisture is determined by the AACC Method No. 44-15A (Single stage air oven).

The CGC previously used the Kjeldahl method, but switched to CNA on August 1, 1996, after evaluating the method for two years.The CNA method is becoming the world standard for protein determination. The method is

- More environmentally acceptable because it uses no corrosive or potentially toxic chemicals
- Safer because it does not use hot liquids
- More economical to install and to use because it requires no drainage or fume exhaust
- More precise than the Kjeldahl method
- Suitable for sample sizes of up to 300 mg, which can be used with today's instruments, and which create less sampling error than the samples of only a few milligrams used with older instruments

The Dumas test extracts about 2% more nitrogen than the Kjeldahl test.Consequently, the results for any given wheat sample may be higher by 0.2–0.3 percentage units. The difference between CNA and Kjeldahl results increases with increasing protein content.

PSI (particle size index)

PSI is a measure of the hardness of a wheat kernel. AACC Method No. 55-30 is modified by using a UDY Cyclone Sample Mill fitted with a feed rate regulator and a 1.0-mm screen. A 10-g sample from 22 g of ground, blended wheat is sieved in a US Standard 200-mesh sieve for 10 minutes in a Ro-tap sieve shaker. The weight of throughs X 10 is recorded as the PSI.

Remix-to-Peak Baking Test

The Remix-to-Peak Baking Test is a modification of the Remix Baking Test of Irvine and McMullan (1960), *Cereal Chemistry* 37:603–613, as described in detail by Kilborn and Tipples (1981), *Cereal Foods World* 26:624–628. Dough is mixed to peak consistency at the second mixing stage.

Sampling cargoes

As vessels are loaded at terminal and transfer elevators, a series of samples is taken at specific intervals by a mechanical grain sampler. Canadian grain is cleaned to export specification at terminal elevators before it is shipped. Canadian cargoes must be free of dockage, unless the buyer agrees in writing to accept grain containing dockage.

1. Each sample, referred to as an incremental sample, represents the grain loaded during the interval. Incremental samples are analyzed for commercial cleanliness, visual quality, total foreign material, and non-visual criteria such as test weight, moisture and protein content.
2. An official loading record for the cargo is generated from the data for all incremental samples taken.
3. Representative samples are taken for each grain and grade loaded to a vessel. These representative samples are combined to achieve a weighted average composite sample.
   - One subsample is kept by Industry Services as the official loading sample for the shipment.
   - A second subsample is sent to the GRL for compositing of weighted grade average samples on which milling, baking and analytical tests are performed.
4. Vessel shipments of No. 1 and No. 2 CWRS wheat are further segregated by guaranteed level of protein content. Each individual sample representing the grain and protein level loaded into a vessel during a prescribed time interval is thoroughly mixed and tested for protein content at the port using near-infrared spectroscopy. The protein result is verified by the CNA procedure. These samples are used by the GRL to prepare the weighted composite samples used for the publication of quality data.

SDS sedimentation values

SDS sedimentation values are determined by the method of Axford and Redman (1979), *Cereal Chemistry* 56:582, using 3% SDS.

Semolina colour

A small metal container is filled with durum wheat semolina and covered with a low reflectance glass plate. Lightness (L*), redness (a*) and yellowness (b*), and Hunter lab L a b data are determined using the tristimulus method, with a Minolta CM 525i spectrophotometer (CIE 2° Standard Observer D65).

Spaghetti

Spaghetti is processed from semolina on a Demaco laboratory-scale continuous extrusion press as described by Matsuo et al. (1978), *Cereal Chemistry* 55:744-753, and dried at 70°C as described by Dexter et al. (1981), *Journal of Food Science* 46:1741-1746.

Spaghetti colour

Whole strands of spaghetti are mounted on white cardboard for colour measurements. Lightness (L*), redness (a*) and yellowness (b*), and Hunter lab L, a, b data are determined using the tristimulus method, with a Minolta CM 525i spectrophotometer

Spaghetti cooking quality

Spaghetti cooking quality is determined as described by Dexter and Matsuo (1977), *Canadian Journal of Plant Science* 57:717–727.

Speck count

Speck count is determined as described by Dexter and Matsuo (1982), *Cereal Chemistry* 59:63-69.

Sponge-and-Dough Baking Test

The Sponge-and-Dough Baking Test is based on a 4.5-hour 70% sponge system as described by Kilborn and Preston (1981), *Cereal Chemistry* 58:198–201.

Starch damage, %

Starch damage is determined using AACC Method 76-31 Damaged Starch: Spectrophotometric Method. Starch damage is expressed as as a percentage of flour weight. The method is also referred to as the MegaZyme method. Conversion factors for alternate methods are

AACC 76-30A = 1.5662 * MegaZyme - 0.338

Farrand = 6.6092 * MegaZyme - 11.972

Test weight

Test weight is determined using the Schopper Chondrometer equipped with the one litre container. The weight in grams of the measured litre of wheat is divided by 10. The result is reported without reference to the moisture content.

Weight per 1000 kernels

Broken kernels and foreign material are handpicked from a sample to create a cleaned sample. The number of kernels in a 10-g subsample of the cleaned sample is then counted using an electronic seed counter.

Wet gluten content

ICC Standard Method No. 137 is followed using the Glutomatic System Type 2200 with metal sieves.

Note: When the GRL changed from the Theby Gluten washer, which was no longer available, to the Glutomatic in 1988, the buffer composition (salt, phosphate, pH 6.7) was maintained and dough mixing time was set at 30 seconds when testing common wheat flours. Under these conditions results were comparable to those obtained previously over many years using the Theby machine.

Effective August 1, 1996, we decided to change to exactly the conditions specified in ICC Standard Method No. 137 (20 seconds dough mixing time; salt-phosphate buffer pH 5.95) for common wheat flours. Results obtained using this changed procedure are significantly lower; for example, by up to 5 percentage units for CWRS.

No changes have been made to the wet gluten procedure used for durum wheat semolina.

Wheats of other classes

Wheats of other classes refers to all classes or types of wheat other than the predominant class. The percentage of wheat of other classes present is determined by hand-picking from a subsample of at least 25 g of each increment sample. After a cargo has been loaded, the weighted average of the results is calculated. without reference to moisture content.

W-h/kg

Watt-hours per kilogram. This is a measure of mixing energy used in the Canadian Short Process Baking Test.

Yellow pigment content

Yellow pigment content of durum wheat and semolina is determined using AACC Method 14-50.

Zeleny sedimentation

Zeleny sedimentation is determined according to AACC Method 56-60 for flour. Results are reported in millilitres.