Quality of western Canadian wheat exports

Cargo shipments • February 1 to July 31, 1999

Introduction

This bulletin reports quality data for cargoes of all classes of western Canadian wheat exported by ship from February 1 to July 31, 1999. 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 and No. 1 and 2 Canada Western Amber Durum wheat, composites representing Atlantic and Pacific shipments are prepared and tested. For the other wheat classes and No. 3 Canada Western Amber Durum wheat, 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 1998-99

	No. 1 CWRS		No. 2 CWRS	
	Guaranteed minimum protein content			
	14.5	13.5	14.5	13.5
Number of cargoes	10	19	12	2
Thousands of tonnes	72	126	181	44
Moisture content, %				
Weighted mean	13.0	12.4	12.9	12.7
Standard deviation	0.73	0.29	0.29	0.07
Minimum	11.8	11.6	12.4	12.6
Maximum	14.0	12.7	13.5	12.7
Test weight, kg/hl				
Weighted mean	81.0	81.9	80.9	82.0
Standard deviation	0.64	0.77	0.53	0.07
Minimum	80.4	80.7	79.9	81.9
Maximum	82.2	83.4	81.7	82.0
Wheats of other classes, %				
Weighted mean	0.25	0.42	0.56	0.40
Cereal grains other than wheat, %				
Weighted mean	0.16	0.18	0.29	0.30

* 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 1998–99

	No. 1 CWRS	
	Guaranteed minimum protein content	
Quality parameter*	14.5	13.5
Wheat		
Weight per 1000 kernels, g	30.5	31.7
Protein content, %	14.7	13.7
Protein content, % (dry matter basis)	17.0	15.8
Ash content, %	1.68	1.63
α-amylase activity, units/g	4.0	3.0
Falling number, s	430	415
PSI	55	53
Milling		
Flour yield		
Clean wheat basis, %	75.5	75.7
0.50% ash basis, %	74.5	75.7
Flour		
Protein content, %	14.1	13.1
Wet gluten content, %	38.5	35.4
Ash content, %	0.52	0.50
Grade colour	-0.7	-1.4
AGTRON colour, %	61	68
Starch damage, %	6.7	7.0
α-amylase activity, units/g	2.0	1.0
Amylograph peak viscosity, BU	745	760
Maltose value, g/100 g	2.1	2.2
Farinogram		
Absorption, %	65.2	64.6
Development time, min	5.75	5.0
Mixing tolerance index, BU	30	25
Stability, min	10.0	9.5
Extensogram		
Length, cm	22	22
Height at 5 cm, BU	315	320
Maximum height, BU	580	590
Area, cm^2	175	170
Alveogram		
Length, mm	131	116
P (height x 1.1), mm	95	106
W, x 10^{-4} joules	367	412
Baking (Canadian short process baking test)		
Absorption, %	70	69
Mixing energy, W–h/kg	17.6	18.1
Mixing time, min	11.8	12.4
Loaf volume, cm^3/100 g flour	1135	1065

* 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 1998–99

	No. 2 CWRS	
	Guaranteed minimum protein content	
Quality parameter*	14.5	13.5
Wheat		
Weight per 1000 kernels, g	28.8	29.5
Protein content, %	14.6	13.6
Protein content, % (dry matter basis)	16.9	15.7
Ash content, %	1.74	1.64
α-amylase activity, units/g	5.0	5.0
Falling number, s	405	415
PSI	55	53
Milling		
Flour yield		
Clean wheat basis, %	75.8	75.7
0.50% ash basis, %	74.3	75.2
Flour		
Protein content, %	14.0	13.0
Wet gluten content, %	39.1	35.7
Ash content, %	0.53	0.51
Grade colour	-0.4	-0.9
AGTRON colour, %	65	66
Starch damage, %	6.5	6.9
α-amylase activity, units/g	3.0	2.5
Amylograph peak viscosity, BU	635	680
Maltose value, g/100 g	2.1	2.2
Farinogram		
Absorption, %	65.6	65.0
Development time, min	5.5	5.25
Mixing tolerance index, BU	35	25
Stability, min	8.5	9.5
Extensogram		
Length, cm	22	22
Height at 5 cm, BU	290	300
Maximum height, BU	505	555
Area, cm^2	155	160
Alveogram		
Length, mm	130	110
P (height x 1.1), mm	99	102
W, x 10^{-4} joules	399	381
Baking (Canadian short process baking test)		
Absorption, %	69	69
Mixing energy, W–h/kg	16.1	14.5
Mixing time, min	10.3	10.2
Loaf volume, cm^3/100 g flour	1100	1135

* 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 1998–99

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	
Protein content, %	
Protein content, % (dry matter basis)	
Ash content, %	
α-amylase activity, units/g	
Falling number, s	
PSI	
Milling	
Flour yield	
Clean wheat basis, %	
0.50% ash basis, %	
Flour	
Protein content, %	
Wet gluten content, %	
Ash content, %	
Grade colour	
AGTRON colour, %	
Starch damage, %	
α-amylase activity, units/g	
Amylograph peak viscosity, BU	
Maltose value, g/100 g	
Farinogram	
Absorption, %	
Development time, min	
Mixing tolerance index, BU	
Stability, min	
Extensogram	
Length, cm	
Height at 5 cm, BU	
Maximum height, BU	
Area, cm^2	
Alveogram	
Length, mm	
P (height x 1.1), mm	
W, x 10^{-4} joules	
Baking (Canadian short process baking test)	
Absorption, %	
Mixing energy, W–h/kg	
Mixing time, min	
Loaf volume, cm^3/100 g flour	

NO CARGOES SHIPPED

* 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 1998–99

	No. 1 CWRS				No. 2 CWRS		
	Guaranteed minimum protein content						
	14.5	13.5	12.5	11.5	14.5	13.5	12.5
Number of cargoes	20	61	4	3	7	20	2
Thousands of tonnes	247	918	60	14	112	331	15
Moisture content, %							
Weighted mean	12.5	12.0	11.5	11.6	12.3	12.1	11.7
Standard deviation	0.33	0.41	0.24	0.66	0.42	0.38	0.21
Minimum	11.9	11.0	11.3	10.5	11.3	11.4	11.6
Maximum	13.3	12.8	11.8	11.8	12.5	12.9	11.9
Test weight, kg/hl							
Weighted mean	81.2	81.8	82.7	83.4	80.5	81.7	82.2
Standard deviation	0.42	0.44	0.75	0.55	0.58	0.49	0.21
Minimum	80.4	80.8	81.6	82.7	79.8	80.8	82.0
Maximum	81.7	82.8	83.4	83.7	81.5	82.8	82.3
Wheats of other classes, %							
Weighted mean	0.47	0.32	0.42	0.39	0.53	0.50	1.01
Cereal grains other than wheat, %							
Weighted mean	0.21	0.19	0.19	0.19	0.32	0.34	0.28

* 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 1998–99

	No. 1 CWRS			
	Guaranteed minimum protein content			
Quality parameter*	14.5	13.5	12.5	11.5
Wheat				
Weight per 1000 kernels, g	32.5	32.1	31.8	30.3
Protein content, %	14.6	13.9	12.8	11.9
Protein content, % (dry matter basis)	16.9	16.1	14.7	13.8
Ash content, %	1.64	1.64	1.63	1.71
α-amylase activity, units/g	3.5	3.5	4.0	4.0
Falling number, s	425	405	410	395
PSI	56	52	53	51
Milling				
Flour yield				
Clean wheat basis, %	75.6	75.6	75.2	75.2
0.50% ash basis, %	74.6	75.1	74.7	74.7
Flour				
Protein content, %	14.2	13.4	12.1	11.2
Wet gluten content, %	38.7	35.9	32.5	29.4
Ash content, %	0.52	0.51	0.51	0.51
Grade colour	-1.0	-1.2	-1.8	-1.8
AGTRON colour, %	68	69	74	73
Starch damage, %	6.4	6.8	7.2	7.6
α-amylase activity, units/g	1.5	1.5	1.0	1.5
Amylograph peak viscosity, BU	730	725	735	725
Maltose value, g/100 g	2.0	2.2	2.4	2.5
Farinogram				
Absorption, %	65.4	65.5	64.4	64.4
Development time, min	5.75	5.25	4.25	3.5
Mixing tolerance index, BU	20	20	25	30
Stability, min	10.0	10.0	8.5	6.5
Extensogram				
Length, cm	22	21	19	20
Height at 5 cm, BU	330	360	350	350
Maximum height, BU	575	635	580	590
Area, cm^2	170	185	150	155
Alveogram				
Length, mm	134	111	102	81
P (height x 1.1), mm	92	112	120	131
W, x 10^{-4} joules	415	421	407	373
Baking (Canadian short process baking test)				
Absorption, %	69	70	69	68
Mixing energy, W–h/kg	15.8	13.0	13.1	13.9
Mixing time, min	10.4	9.2	10.0	11.3
Loaf volume, cm^3/100 g flour	1160	1115	1105	1005

* 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 1998–99

	No. 2 CWRS		
	Guaranteed minimum protein content		
Quality parameter*	14.5	13.5	12.5
Wheat			
Weight per 1000 kernels, g	31.2	32.3	30.5
Protein content, %	14.8	13.8	12.7
Protein content, % (dry matter basis)	17.1	16.0	14.6
Ash content, %	1.66	1.65	1.65
α-amylase activity, units/g	4.5	4.0	4.0
Falling number, s	420	400	390
PSI	55	54	52
Milling			
Flour yield			
Clean wheat basis, %	75.6	75.5	75.3
0.50% ash basis, %	76.1	75.0	74.8
Flour			
Protein content, %	14.2	13.1	12.2
Wet gluten content, %	39.2	36.4	32.3
Ash content, %	0.49	0.51	0.51
Grade colour	-1.2	-1.4	-1.7
AGTRON colour, %	67	71	71
Starch damage, %	6.5	6.9	7.0
α-amylase activity, units/g	2.0	1.5	1.5
Amylograph peak viscosity, BU	695	685	685
Maltose value, g/100 g	2.0	2.2	2.3
Farinogram			
Absorption, %	65.7	65.3	64.1
Development time, min	6.0	5.25	3.75
Mixing tolerance index, BU	25	20	25
Stability, min	10.0	10.5	8.0
Extensogram			
Length, cm	21	21	21
Height at 5 cm, BU	340	315	325
Maximum height, BU	625	570	590
Area, cm^2	175	160	160
Alveogram			
Length, mm	135	118	102
P (height x 1.1), mm	99	110	112
W, x 10^{-4} joules	413	420	373
Baking (Canadian short process baking test)			
Absorption, %	70	69	68
Mixing energy, W–h/kg	13.8	14.1	14.7
Mixing time, min	9.7	9.8	10.7
Loaf volume, cm^3/100 g flour	1135	1160	1035

* 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 composites
Third and fourth quarters 1998–99

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	
Protein content, %	
Protein content, % (dry matter basis)	
Ash content, %	
α-amylase activity, units/g	
Falling number, s	
PSI	
Milling	
Flour yield	
Clean wheat basis, %	
0.50% ash basis, %	
Flour	
Protein content, %	
Wet gluten content, %	
Ash content, %	
Grade colour	
AGTRON colour, %	
Starch damage, %	
α-amylase activity, units/g	
Amylograph peak viscosity, BU	
Maltose value, g/100 g	
Farinogram	
Absorption, %	
Development time, min	
Mixing tolerance index, BU	
Stability, min	
Extensogram	
Length, cm	
Height at 5 cm, BU	
Maximum height, BU	
Area, cm^2	
Alveogram	
Length, mm	
P (height x 1.1), mm	
W, x 10^{-4} joules	
Baking (Canadian short process baking test)	
Absorption, %	
Mixing energy, W–h/kg	
Mixing time, min	
Loaf volume, cm^3/100 g flour	

NO CARGOES SHIPPED

* 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 1998–99

	No. 1 CWAD		No. 2 CWAD		
	Atlantic	Pacific	Atlantic	Pacific	No. 3 CWAD
Number of cargoes	34	17	29	27	13
Thousands of tonnes	535	265	396	396	151
Moisture content, %					
Weighted mean	11.5	10.6	11.6	10.8	12.0
Standard deviation	0.16	0.20	0.25	0.31	0.33
Minimum	11.2	10.1	11.2	10.4	11.2
Maximum	12.0	10.9	12.1	11.4	12.4
Test weight, kg/hl					
Weighted mean	82.5	82.7	82.3	82.4	81.3
Standard deviation	0.57	0.51	0.58	0.59	0.76
Minimum	80.8	81.9	80.7	81.3	80.0
Maximum	83.2	83.5	83.0	83.2	82.5
Hard vitreous kernels, %					
Weighted mean	83.6	84	72.5	80	65
Wheats of other classes, %					
Weighted mean	0.99	0.78	1.31	1.01	1.85
Cereal grains other than wheat, %					
Weighted mean	0.21	0.24	0.31	0.36	0.38

* 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 1998–99

Quality parameter*	No. 1 CWAD		No. 2 CWAD		
	Atlantic	Pacific	Atlantic	Pacific	No. 3 CWAD
Wheat					
Weight per 1000 kernels, g	39.4	40.3	40.3	40.8	40.6
Protein content, %	12.1	12.1	12.0	12.3	12.3
Protein content, % (dry matter basis)	14.0	14.0	13.9	14.2	14.2
SDS sedimentation, ml	34	34	31	33	34
Ash content, %	1.62	1.64	1.63	1.63	1.69
Yellow pigment content, ppm	8.0	8.2	8.1	8.1	7.9
Falling number, s	435	435	415	430	375
α-amylase activity, units/g	3.0	4.5	7.5	4.5	22.5
Milling yield, %	75.3	75.7	74.4	75.3	75.2
Semolina yield, %	66.8	67.1	65.8	66.7	65.9
PSI	37	38	38	37	39
Semolina					
Protein content, %	11.2	11.3	11.2	11.3	11.5
Wet gluten content, %	25.9	24.6	24.1	24.5	26.4
Dry gluten content, %	10.2	10.3	10.1	10.3	10.4
Ash content, %	0.69	0.70	0.69	0.68	0.72
Yellow pigment content, ppm	7.7	7.9	7.5	7.6	7.2
AGTRON colour, %	77	75	75	78	69
Minolta colour:					
L* (L)	87.4 (84.5)	87.4 (84.3)	87.6 (84.8)	87.3 (84.2)	87.3 (84.5)
a* (a)	-2.8 (-2.5)	-2.7 (-2.5)	-2.8 (-2.6)	-2.8 (-2.6)	-2.6 (-2.5)
b* (b)	31.4 (24.8)	31.3 (24.6)	30.9 (24.3)	31.6 (24.9)	30.5 (24.4)
Speck count per 50 cm^2	24	24	28	27	30
Falling number, s	525	535	510	535	460
α-amylase activity, units/g	1.0	0.5	3.0	1.0	6.0
Spaghetti					
Dried at 70°C					
Minolta colour:					
L* (L)	72.4 (77.5)	71.6 (76.8)	72.4 (77.5)	72.6 (77.7)	70.7 (76.0)
a* (a)	3.7 (4.0)	4.1 (4.4)	3.6 (3.9)	3.5 (3.8)	4.7 (5.0)
b* (b)	38.1 (64.4)	37.7 (64.1)	37.8 (63.4)	38.3 (64.8)	36.6 (61.5)
Cooking quality, CQP	N/A	N/A	N/A	N/A	N/A

* 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 1998–99

	No. 1 CWES	No. 2 CWES
Number of cargoes	10	9
Thousands of tonnes	73	102
Moisture content, %		
Weighted mean	12.7	11.7
Standard deviation	0.47	0.70
Minimum	12.1	11.2
Maximum	13.9	13.2
Test weight, kg/hl		
Weighted mean	80.5	81.2
Standard deviation	0.84	0.81
Minimum	79.6	79.4
Maximum	82.3	81.6
Wheats of other classes, %		
Weighted mean	1.09	1.57
Cereal grains other than wheat, %		
Weighted mean	0.31	0.45

* 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 1998–99

Quality parameter*	No. 1 CWES	No. 2 CWES
Wheat		
Weight per 1000 kernels, g	41.1	42.9
Protein content, %	12.8	12.5
Protein content, % (dry matter basis)	14.8	14.5
Ash content, %	1.64	1.59
α-amylase activity, units/g	8.0	9.0
Falling number, s	380	360
Flour yield, %	75.7	75.9
PSI	49	49
Flour		
Protein content, %	12.3	12.1
Wet gluten content, %	30.3	30.1
Ash content, %	0.57	0.57
Grade colour	-0.4	-0.4
AGTRON colour, %	61	63
Starch damage, %	7.6	7.6
α-amylase activity, units/g	3.0	3.0
Amylograph peak viscosity, BU	520	550
Maltose value, g/100 g	2.7	2.8
Farinogram		
Absorption, %	63.0	63.1
Development time (90 rpm), min	7.5	7.0
Extensogram		
Length, cm	24	24
Height at 5 cm, BU	370	375
Maximum height, BU	690	710
Area, cm^2	225	235
Alveogram		
Length, mm	101	98
P (height x 1.1), mm	128	124
W, x 10^{-4} joules	505	477
Baking (remix-to-peak baking test)		
Absorption, %	67	66
Remix time, min	4.9	4.8
Loaf volume, cm^3/100 g flour	945	920

* 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 1998–99

	No. 2 CPSR
Number of cargoes	16
Thousands of tonnes	146
Moisture content, %	
Weighted mean	12.2
Standard deviation	0.47
Minimum	11.6
Maximum	13.3
Test weight, kg/hl	
Weighted mean	81.9
Standard deviation	0.78
Minimum	79.7
Maximum	82.5
Wheats of other classes, %	
Weighted mean	1.13
Cereal grains other than wheat, %	
Weighted mean	0.49

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

Table 14 • Canada Prairie Spring Red wheat
Export cargo composite
Third and fourth quarters 1998–99

Quality parameter*	No. 2 CPSR
Wheat	
Weight per 1000 kernels, g	38.8
Protein content, %	12.0
Protein content, % (dry matter basis)	13.9
Ash content, %	1.57
α-amylase activity, units/g	3.0
Falling number, s	400
Flour yield, %	76.2
PSI	57
Flour	
Protein content, %	11.1
Wet gluten content, %	30.4
Ash content, %	0.47
Grade colour	-1.2
AGTRON colour, %	67
Starch damage, %	5.9
α-amylase activity, units/g	1.0
Amylograph peak viscosity, BU	780
Maltose value, g/100 g	1.9
Farinogram	
Absorption, %	61.1
Development time, min	4.75
Mixing tolerance index, BU	45
Stability, min	6.0
Extensogram	
Length, cm	22
Height at 5 cm, BU	290
Maximum height, BU	510
Area, cm^2	155
Alveogram	
Length, mm	120
P (height x 1.1), mm	75
W, x 10^{-4} joules	278
Baking (remix-to-peak baking test)	
Absorption, %	60
Remix time, min	2.1
Loaf volume, cm^3/100 g flour	775

* 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.

The most commonly grown varieties for milling grades of CWRW are CDC Kestral and CDC Clair.

Table 15 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Red Winter wheat
Third and fourth quarters 1998–99

	No. 2 CWRW
Number of cargoes	3
Thousands of tonnes	18
Moisture content, %	
Weighted mean	12.0
Standard deviation	1.04
Minimum	10.8
Maximum	12.8
Test weight, kg/hl	
Weighted mean	81.8
Standard deviation	0.35
Minimum	81.5
Maximum	82.2
Wheats of other classes, %	
Weighted mean	1.94
Cereal grains other than wheat, %	
Weighted mean	0.43

* 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 1998–99

Quality parameter*	No. 2 CWRW
Wheat	
Weight per 1000 kernels, g	32.9
Protein content, %	10.7
Protein content, % (dry matter basis)	12.4
Ash content, %	1.56
α-amylase activity, units/g	9.5
Falling number, s	355
Flour yield, %	76.2
PSI	59
Flour	
Protein content, %	9.9
Wet gluten content, %	27.5
Ash content, %	0.45
Grade colour	-1.5
AGTRON colour, %	73
Starch damage, %	5.3
α-amylase activity, units/g	3.5
Amylograph peak viscosity, BU	520
Maltose value, g/100 g	2.0
Farinogram	
Absorption, %	58.2
Development time, min	3.75
Mixing tolerance index, BU	45
Stability, min	6.5
Extensogram	
Length, cm	22
Height at 5 cm, BU	250
Maximum height, BU	385
Area, cm^2	115
Alveogram	
Length, mm	127
P (height x 1.1), mm	63
W, x 10^{-4} joules	235
Baking (remix-to-peak baking test)	
Absorption, %	58
Remix time, min	2.2
Loaf volume, cm^3/100 g flour	775

* 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 1998–99

	No. 1 CPSW	No. 2 CPSW
Number of cargoes	5	9
Thousands of tonnes	72	94
Moisture content, %		
Weighted mean	12.2	12.2
Standard deviation	0.43	0.32
Minimum	11.8	11.9
Maximum	13.0	12.9
Test weight, kg/hl		
Weighted mean	81.9	81.5
Standard deviation	0.29	0.78
Minimum	81.6	79.7
Maximum	82.3	82.4
Wheats of other classes, %		
Weighted mean	2.19	2.61
Cereal grains other than wheat, %		
Weighted mean	0.28	0.34

* 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 1998–99

Quality parameter*	No. 1 CPSW	No. 2 CPSW
Wheat		
Weight per 1000 kernels, g	34.2	33.0
Protein content, %	11.6	11.4
Protein content, % (dry matter basis)	13.4	13.2
Ash content, %	1.56	1.55
α-amylase activity, units/g	5.0	6.0
Falling number, s	405	390
Flour yield, %	76.0	76.2
PSI	59	59
Flour		
Protein content, %	10.6	10.6
Wet gluten content, %	30.9	30.7
Ash content, %	0.49	0.51
Grade colour	-2.0	-1.8
AGTRON colour, %	77	75
Starch damage, %	5.5	5.2
α-amylase activity, units/g	2.5	2.5
Amylograph peak viscosity, BU	700	665
Maltose value, g/100 g	1.9	1.9
Farinogram		
Absorption, %	60.4	60.2
Development time, min	3.5	3.25
Mixing tolerance index, BU	55	60
Stability, min	4.0	4.0
Extensogram		
Length, cm	22	23
Height at 5 cm, BU	220	220
Maximum height, BU	310	325
Area, cm^2	100	110
Alveogram		
Length, mm	119	126
P (height x 1.1), mm	66	66
W, x 10^{-4} joules	206	209
Baking (remix-to-peak baking test)		
Absorption, %	58	57
Remix time, min	1.6	1.6
Loaf volume, cm^3/100 g flour	725	725

* 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 1998–99

	No. 2 CWSWS
Number of cargoes	4
Thousands of tonnes	35
Moisture content, %	
Weighted mean	10.8
Standard deviation	0.19
Minimum	10.6
Maximum	11.0
Test weight, kg/hl	
Weighted mean	81.3
Standard deviation	0.26
Minimum	81.0
Maximum	81.5
Wheats of other classes, %	
Weighted mean	1.53
Cereal grains other than wheat, %	
Weighted mean	0.28

* 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 1998–99

Quality parameter*	No. 2 CWSWS
Wheat	
Weight per 1000 kernels, g	33.0
Protein content, %	11.0
Protein content, % (dry matter basis)	12.7
Ash content, %	1.59
α-amylase activity, units/g	4.0
Falling number, s	375
Flour yield, %	76.3
PSI	70
Flour	
Protein content, %	10.0
Wet gluten content, %	28.1
Ash content, %	0.53
Grade colour	-0.2
AGTRON colour, %	65
Starch damage, %	3.0
α-amylase activity, units/g	1.5
Amylograph peak viscosity, BU	640
Maltose value, g/100 g	1.3
AWRC, %	60
Farinogram	
Absorption, %	54.1
Development time, min	1.25
Mixing tolerance index, BU	155
Stability, min	1.5
Alveogram	
Length, mm	125
P (height x 1.1), mm	24
W, x 10^{-4} joules	55
Cookie test	
Spread, mm	83.0
Ratio (spread/thickness)	9.4

* 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 or flour ash content, AACC Method 8-01 is used. Furnace temperature is set to 600°C.

AWRC (Alkaline water retention capacity)

AWRC is determined using AACC Method 56-10. Centrifugation is done at 1020 x *g* using a swinging bucket rotor.

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, 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

ICC Standard Method No. 137/1 is followed using the Glutomatic System Type 2200 with 80m metal sieves.

Extensogram

This test is conducted using AACC Method 54-10 with the exception that the dough is not stretched at 90 minutes. Length is in centimetres, height is in Brabender units, and area is in square centimetres. The extensograph 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

This test is conducted using AACC Method 54-21A constant flour weight procedure with small bowl.

- 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 reported to nearest 0.25 min.
- 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. Remaining quality parameters are measured at 90 rpm based on absorption obtained at 63 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.
- 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

Flour grade color is determined using a Colour Grader Series IV (Satake UK, Stockport, UK) according to Flour Testing Panel Method No. 007/4 (Flour Milling and Baking Research Association 1991), and expressed in Satake International colour grade units. The lower the number, the brighter the colour.

Hard vitreous kernels (HVK)

Determination of 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 22-15.

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).
Williams, P., Sobering, D. and Antoniszyn, J. 1998 Oct. 19. Protein testing methods at the Canadian Grain Commission. Proceedings of the Wheat Protein Symposium. Saskatoon, Sask. March 9 and 10, 1998 [conference paper online]. Available from:
http://www.cgc.ca/Pubs/confpaper/Williams/ProteinOct98/protein1-e.htm

PSI (Particle size index)

PSI is a measure of the texture 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 over 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 volumes

SDS sedimentation volumes are determined by a modified version of Axford and Redman (1979), *Cereal Chemistry* 56:582–584, using 3% SDS as described by Dexter et al. (1980), *Can. J. Plant Sci.* 60:25-29).

Semolina colour

Semolina colour is determined using a Minolta spectrophotometer (Model CM-525i) and expressed as L*, which indicates lightness, a* which represents redness, and b* which represents yellowness (CIELAB colour space) or alternately as L, a and b (Hunter Lab colour space). Difference in particle size will have a significant effect on colour readings so it is essential, for comparative purposes, to use semolina samples that have comparable particle size distributions.

Spaghetti

Spaghetti is processed from semolina using the microprocessing method of Matsuo et al. (1972), *Cereal Chemistry* 49:707-711, and dried at 70°C using a computer controlled laboratory scale dryer (AFREM, Lyon, France).

Spaghetti colour

Strands of spaghetti (5cm) are mounted on white cardboard, using double sided tape, for colour measurements. Spaghetti colour is determined using a Minolta spectrophotometer (Model CM-525i) and can be expressed as L* which indicates lightness, a* which represents redness, and b* which represents yellowness (CIELAB colour space) or alternately as L, a and b (Hunter Lab colour space).

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. For this 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.
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 - cargo data	Test weight is determined using the Ohaus 0.5-litre measure, a Cox funnel to standardize the pouring rate, and a striker to level the contents of the 0.5-litre measure. The grain in the container is weighed using an electronic scale. The weight in grams is electronically converted to test weight in kilograms per hectolitre.
Test weight - harvest survey data	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 20-g subsample of the cleaned sample is then counted using an electronic seed counter.
Wet gluten content - flour	ICC Standard Method No. 137/1 is followed using the Glutomatic System Type 2200 with 80m metal sieves.
Wet gluten content and gluten index - durum semolina	Effective August 1, 1998, durum semolina wet gluten content and gluten index are being determined using AACC Standard Method 38-12, following the procedure for whole meal. Results obtained using this procedure are lower when compared to values obtained using previous methodology.
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. 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.