Quality of western Canadian wheat • 1998

Summary

In 1998, Western Canada enjoyed one of its earliest harvests on record. Favorable harvesting conditions should result in a high percentage of the crop qualifying for the top milling grades. Production of all spring wheat is estimated at 15.7 million tonnes by Statistics Canada. This value represents the lowest production since 1988. In contrast, the estimated 5.9 million tonnes of durum wheat production represents a record crop. Generally dry conditions have resulted in an increase in the protein content of Canada Western Red Spring (CWRS) wheat while Canada Western Amber Durum (CWAD) wheat protein content is similar to last year and below the long term average.

The milling and baking quality of composite samples representing the two top grades of CWRS wheat is good. This years crop shows very sound kernel characteristics. Dough and baking properties are similar to last year. Overall, CWAD wheat quality is similar to 1997.

Table of contents

Seven classes of Canadian wheat

This report presents detailed information on the quality of the 1998 crop of seven classes of western Canadian wheat offered on the world market.

Canada Western Red Spring (CWRS) wheat is a hard wheat with superior milling and baking quality. It is offered at various guaranteed protein levels. There are three milling grades in the CWRS class.

Canada Western Amber Durum (CWAD) wheat is a durum wheat producing a high yield of semolina with excellent pasta-making quality. There are four milling grades in the CWAD class.

Canada Western Extra Strong (CWES) wheat is a hard red spring wheat with extra-strong gluten suitable for blending purposes and for special breads. There are two milling grades in the CWES class.

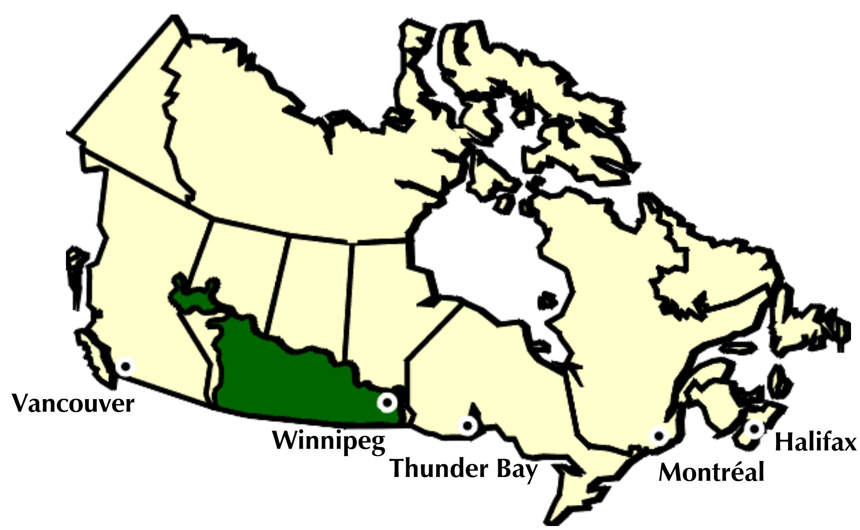
Canada Prairie Spring Red (CPSR) wheat is a medium-strength wheat suitable for the production of certain types of hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

Canada Western Red Winter (CWRW) wheat is a hard wheat of excellent milling quality suitable for the production of a wide variety of products including French breads, flat breads, steamed breads, and certain types of noodles. There are two milling grades in the CWRW class.

Canada Prairie Spring White (CPSW) wheat is a medium-strength wheat suitable for the production of various types of flat breads, noodles, chapatis, and related products. There are two milling grades in the CPSW class.

Canada Western Soft White Spring (CWSWS) wheat is a soft wheat of low protein content for production of cookies, cakes, and pastry, as well as various types of flat breads, noodles, steamed breads, and chapatis. There are three milling grades in the CWSWS class.

Figure 1 • Map of Canada showing major wheat producing areas in the prairies



Introduction

What data in this report represent

Data presented in this report were generated from quality tests carried out on composites of over 8000 individual samples submitted by producers and primary elevator managers from the three prairie provinces. Figure 1 highlights the wheat producing regions which are in the provinces of, from east to west, Manitoba, Saskatchewan and Alberta. These data are not quality specifications for Canadian wheat. Rather, they represent our best estimate of quality. How closely they represent the exact quality characteristics of wheat of any given grade exported during the coming year depends on

- The amounts and relative quality of carryover stocks of each grade
- the degree to which the harvest survey composites are representative of 1998 production

Background for the 1998 crop

Background information for the 1998 crop was provided by the Canadian Wheat Board. Early seeding, generally hot dry weather during crop development and favorable harvesting conditions resulted in one of the earliest harvests on record.

Seeding

The 1998 sowing campaign got off to one of the earliest starts on record due to below average snowfall and above normal temperatures during the winter months. Seeding was general across the Prairies by the end of April or early May, and over two-thirds of the wheat crop was planted by the second week of May—one to two weeks ahead of normal.

With the exception of the eastern two-thirds of Manitoba, the Prairies received 20 to 70 percent of normal rainfall from the beginning of April until the middle of May. Saskatchewan was the driest, with about two-thirds of the province receiving less than half the normal rainfall in the April through early May period. A dry fall and winter prior to this exacerbated the effects of below normal spring precipitation, causing uneven germination in west central and northwest Saskatchewan, as well as southeastern Alberta.

Growing conditions

Compounding the impact of the dry weather was a cold front that moved through western Canada during the last week of May and first week of June. This brought freezing temperatures on more than one night to most of Saskatchewan, especially northern and western areas, and western Manitoba. Wheat development had progressed far enough to minimize frost damage, but some leaf tip burning was noted.

Dry weather prevailed across the western Prairies until the middle of June when soaking rains developed across the Prairies. For isolated pockets in Saskatchewan, this was the first meaningful rain since July 1997. While welcome in most areas, the rains promoted secondary germination and induced some late tillering in plant stands that had germinated unevenly under dry conditions. The rains came too late for a full recovery of the crop in the driest areas and some yield was lost. Western Manitoba and the eastern one-third of Saskatchewan received excessive precipitation, drowning the crop in low lying areas.

The weather turned dry again in western Canada in the first half of July, but some wet weather returned by the middle of the month, worsening wet conditions in parts of the eastern Prairies. Precipitation from the middle of June to the middle of July was average overall, but below normal in the Peace River district and eastern Alberta. Conditions were hot and dry in the latter half of July, hastening the maturation process. The hot, dry weather continued for the first two weeks in August which caused further deterioration of crops. Heat stress during the heading stage resulted in incomplete head fill and test weights and yields, particularly in later crops were lowered. On the positive side, because of the drier weather, there were fewer fusarium-infected kernels in samples from the Red River Valley and generally higher protein levels across the Prairies. Fusarium head blight was more of a problem further west this year because of the excessive mid-season moisture in western Manitoba and eastern Saskatchewan.

Wheat midge was reported from Lloydminster to the Red River Valley and, this year, in parts of Alberta. Saskatchewan Agriculture and Food had forecast the highest infestation levels in eastern Saskatchewan. Although producers in this region are familiar with wheat midge management, the window of opportunity for spraying is brief. Some fields were not sprayed because of wet and windy conditions and the inability of commercial operators to meet demand. Midge damage occurred in some of these areas. Further west, where the problem is less known, severe midge damage showed up in isolated pockets.

Harvest conditions

The wheat harvest began in southern areas, as well as the Peace River region, by the second week of August, roughly ten days ahead of 1997 and one to two weeks ahead of normal. Harvest conditions were generally ideal for wheat and durum harvesting throughout most of the harvest period. However, rains delayed the harvest in parts of western Manitoba, and northern and eastern Saskatchewan. Western farmers completed roughly 60 to 65 percent of the wheat harvest by early September, and most of the remaining wheat harvest by the third week of September—at least three weeks ahead of average.

Production and grade information

Overall, prairie crop yields appear near or slightly below trend. A very high portion of all wheat classes should enter the top milling grades, because of the early wheat harvest and favorable conditions. The most notable degrading factors are midge and Fusarium damage in Canada Western Red Spring (CWRS) wheat, and low percentage of vitreous kernels and midge damage in Canada Western Amber Durum (CWAD) wheat.

Poor wheat prices resulted in a significant reduction in spring wheat acres. The only classes of wheat that showed an increase in acres were Canadian Prairie Spring Red (CPSR) and CWAD. The CWRS wheat production of slightly over 12 million tonnes dropped to its lowest level since 1988, despite near average yields. The acreage of CWAD was up twelve percent over the previous record and, combined with near average yields, resulted in a record CWAD crop of 5.9 million tonnes.

Protein

Table 1 compares mean protein values for each of the seven classes of western Canadian wheat surveyed in 1998 to corresponding values obtained in the 1997 and 1996 harvest survey. Wheat protein is higher for all classes except Canada Western Red Winter, which is 0.4 percentage units lower than last year and Canada Western Amber Durum which has the same protein content. Canada Western Red Spring protein is 0.6 percentage units higher than 1997.

Table 1 • Mean protein content of milling grades of western Canadian wheat classes, 1998, 1997 and 1996

	Protein content (%)[1]		
Class	1998	1997	1996
CWRS	14.1	13.5	12.9
CWAD	12.5	12.5	12.2
CWRW	11.1	11.5	11.1
CPSR	11.9	11.8	10.7
CPSW	11.7	11.6	10.8
CWES	12.6	12.5	12.2
CWSWS	10.9	10.5	10.6

[1] mean value, N x 5.7; 13.5% moisture content basis

Canada Western Red Spring wheat

Protein survey

Table 2 lists mean protein values for Canada Western Red Spring (CWRS) wheat by grade and province for 1998. Comparative values for western Canada by grade are shown for 1997 and for the previous ten years (1987–96). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of the 1998 Red Spring wheat crop is 14.1% – up 0.6 percentage units from 1997. This estimate is 0.5 percentage units higher than the long term average, based on 6 771 samples tested by October 30, 1998.

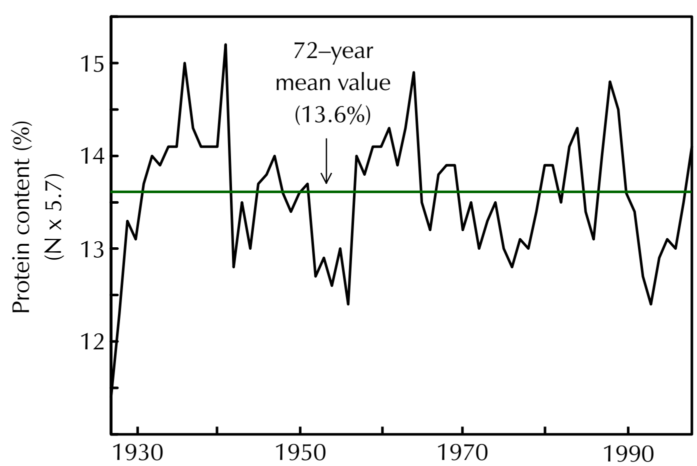
Protein is again not evenly distributed across the wheat growing area. Protein content is highest in Manitoba, where the mean value is 14.6% compared to the averages of 13.9% for Saskatchewan and 14.1% for Alberta. Protein content is lower in the top grade compared to the No. 2 and No. 3 grade.

Table 2 • Mean protein content of 1998 Canada Western Red Spring wheat, by grade, year and province

	Protein content (%)[1]					
	Western Canada			1998		
Grade	1998	1997	1987-96	Manitoba	Saskatchewan	Alberta
No. 1 CWRS	13.8	13.4	13.6	14.3	13.7	14.0
No. 2 CWRS	14.4	13.8	13.4	14.7	14.2	14.7
No. 3 CWRS	14.4	12.7	13.1	14.6	14.4	14.1
All milling grades	**14.1**	**13.5**	**13.4**	**14.6**	**13.9**	**14.1**

[1] N x 5.7; 13.5% moisture content basis

Figure 2 • Mean protein content of harvest survey Canada Western Red Spring wheat—1927 to 1998



Milling and baking quality Allis-Chalmers laboratory mill

To assess the quality of the 1998 CWRS wheat crop, composites were prepared from harvest survey samples representing the top two milling grades. The No. 1 and No. 2 CWRS samples were segregated into composites having minimum protein levels of 14.5%, 13.5% and 12.5%.

No. 1 Canada Western Red Spring wheat

Table 3 summarizes quality data for the No. 1 CWRS composites. Corresponding data are provided at the 13.5% minimum protein level for both last year's composite and the ten-year average, 1987-96.

Seed size is larger than last year and similar to the long-term average value. Overall wheat ash for No. 1 CWRS is similar to last year, although lower protein composites are slightly lower in ash than last year, whereas the 14.5 protein composite is slightly higher. A high degree of soundness is evident from the high wheat falling number and flour amylograph peak viscosity values, as well as the very low wheat and flour α-amylase activities.

Particle size index and flour starch damage values indicate that kernel texture is similar to last year. Flour yield shows an increase over last year. However, higher flour ash content in this year's crop results in a reduction of flour yield on a constant (0.50%) ash basis relative to 1997 values. Flour colour is similar to last year, indicating that the higher flour ash is related to higher endosperm ash content rather than a decline in flour refinement.

Rheological tests indicate dough strength and water absorption properties are similar to last year. Canadian short process baking characteristics are similar to 1997.

No. 2 Canada Western Red Spring wheat

Table 4 shows quality data for the 1998 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 1987-96.

Test weight and kernel weight are higher than last year's No. 2 grade composites while wheat ash is lower. Particle size index values indicate harder kernel texture relative to 1997, consistent with the corresponding increase in flour starch damage values. The No. 2 grade composites show a high degree of soundness, evident from the high wheat falling number and flour amylograph peak viscosity values, and low wheat and flour α-amylase activities.

Milling properties appear to be similar to those of 1997. Rheological tests indicate dough strength properties are similar to the long-term average but slightly weaker than last year. Canadian short process baking characteristics are similar to 1997.

Compared with the 1998 No. 1 CWRS composites, this year's No. 2 CWRS composites show lower test weight and weaker dough properties. Milling properties, when flour yield is computed as a proportion of clean wheat on a constant moisture basis, are comparable.

Table 3 • No. 1 Canada Western Red Spring wheat
Quality data for 1998 harvest survey grade composite samples

	Minimum protein content			No. 1 CWRS 13.5	
Quality parameter[1]	14.5	13.5	12.5	1997	1987–96 Mean
Wheat					
Test weight, kg/hl	80.9	81.5	82.2	81.3	81.0
Weight per 1000 kernels, g	31.7	31.8	31.5	30.0	31.5
Protein content, %	14.7	13.7	12.7	13.7	13.8
Protein content, % (dry matter basis)	17.0	15.8	14.7	15.8	16.0
Ash content, %	1.69	1.53	1.52	1.58	1.55
α-amylase activity, units/g	3.0	2.5	3.0	7.0	4.5
Falling number, s	390	395	395	385	400
PSI	53	52	51	53	52
Milling					
Flour yield					
Clean wheat basis, %	76.0	75.8	75.9	75.1	75.5
0.50% ash basis, %	76.0	75.3	74.9	76.6	76.5
Flour					
Protein content, %	14.1	13.1	12.1	13.0	13.1
Wet gluten content, %	39.0	35.5	32.4	34.1	N/A
Ash content, %	0.50	0.51	0.52	0.47	0.48
Grade colour	-1.2	-1.7	-1.9	-1.7	-1.2
AGTRON colour, %	66	69	70	72	70
Starch damage, %	6.6	6.9	7.4	7.2	N/A
α-amylase activity, units/g	0.5	0.5	0.5	1.5	1.3
Amylograph peak viscosity, BU	710	730	725	630	700
Maltose value, g/100 g	2.1	2.2	2.4	2.2	2.1
Farinogram					
Absorption, %	65.5	65.1	64.6	65.0	65.4
Development time, min	5.5	5.0	4.25	5.0	5.0
Mixing tolerance index, BU	25	25	30	20	25
Stability, min	9.5	9.5	8.5	11.0	9.5
Extensogram					
Length, cm	24	22	20	22	22
Height at 5 cm, BU	280	290	305	290	280
Maximum height, BU	535	525	510	525	480
Area, cm^2	170	160	140	160	140
Alveogram					
Length, mm	122	108	92	110	128
P (height x 1.1), mm	103	107	117	112	102
W, x 10^{-4} joules	443	396	397	425	415
Baking (Canadian Short Process Baking Test)					
Absorption, %	70	69	69	69	69
Mixing energy, W–h/kg	12.4	10.6	11.9	9.8	8.0
Mixing time, min	8.6	8.0	9.8	8.5	7.5
Loaf volume, cm^3/100 g flour	1130	1065	1025	1105	1105

[1] 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. 2 Canada Western Red Spring wheat
Quality data for 1998 harvest survey grade composite samples

Quality parameter[1]	Minimum protein content 14.5	13.5	12.5	No. 2 CWRS 13.5 1997	1987–96 Mean
Wheat					
Test weight, kg/hl	80.4	80.7	81.1	79.7	79.1
Weight per 1000 kernels, g	31.6	32.0	31.7	30.6	31.5
Protein content, %	14.6	13.6	12.6	13.7	13.7
Protein content, % (dry matter basis)	16.9	15.7	14.6	15.8	15.8
Ash content, %	1.66	1.63	1.55	1.68	1.60
α-amylase activity, units/g	4.5	7.0	3.0	14.5	9.6
Falling number, s	390	385	400	360	370
PSI	54	54	53	56	53
Milling					
Flour yield					
Clean wheat basis, %	75.9	75.5	75.9	75.5	75.2
0.50% ash basis, %	75.4	75.0	75.4	75.5	75.7
Flour					
Protein content, %	13.9	13.0	12.0	13.0	13.1
Wet gluten content, %	39.1	35.9	32.3	35.2	N/A
Ash content, %	0.51	0.51	0.51	0.50	0.49
Grade colour	-1.1	-1.5	-1.7	-1.3	-0.9
AGTRON colour, %	64	69	70	71	68
Starch damage, %	6.5	6.8	6.9	6.3	N/A
α-amylase activity, units/g	1.0	1.0	1.0	3.5	3.0
Amylograph peak viscosity, BU	675	670	700	480	525
Maltose value, g/100 g	2.2	2.3	2.4	2.2	2.1
Farinogram					
Absorption, %	66.0	65.5	64.7	64.4	65.1
Development time, min	5.0	4.5	3.25	5.25	4.75
Mixing tolerance index, BU	30	30	30	30	30
Stability, min	8.0	8.0	7.0	8.5	8.75
Extensogram					
Length, cm	23	23	23	24	22
Height at 5 cm, BU	255	255	260	280	280
Maximum height, BU	430	445	445	490	460
Area, cm^2	135	135	140	165	140
Alveogram					
Length, mm	114	106	103	131	131
P (height x 1.1), mm	101	106	108	93	98
W, x 10^{-4} joules	399	394	392	390	404
Baking (Canadian Short Process Baking Test)					
Absorption, %	70	69	68	69	69
Mixing energy, W–h/kg	11.8	11.4	10.7	9.4	7.6
Mixing time, min	8.2	7.7	7.7	8.2	7.3
Loaf volume, cm^3/100 g flour	1145	1045	1000	1100	1100

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

Comparative Allis Chalmers Laboratory Mill Flour Data

Samples of 1998 and stored 1997 harvest survey No. 1 CWRS-13.5 wheat composites were milled consecutively on the same day on the Allis Chalmers laboratory mill into straight grade and patent flour. Data are shown on Table 5.

In general, the milling and straight-grade flour properties of the 1997 harvest milled this year agree well with the results obtained last year (Table 3). Milling properties and flour starch damage values are similar for the 1998 and 1997 composites for both straight grade and patent flour (Table 5). The straight grade flour for the 1998 composite shows higher ash but also higher flour yield and better flour colour compared to the 1997 composite. This year's composite shows Farinograph properties comparable to last year.

Baking properties for the 1998 and 1997 straight grade flours are similar. The 1998 flour shows slightly lower sponge and dough process bread volume and slightly higher Canadian short process bread volume. The patent flours show comparable baking properties with both processes. Mixing requirements for the sponge and dough process are longer for this year's patent flour.

Table 5 • No. 1 Canada Western Red Spring wheat • 13.5% protein segregate
Comparative Allis mill flour data • 1998 and 1997 harvest survey composites[1]

Quality parameter[2]	Straight-grade 1998	Straight-grade 1997	Patent 1998	Patent 1997
Flour				
Yield, %	75.8	75.1	45.0	45.0
Protein content, %	13.1	12.9	11.8	11.6
Wet gluten content, %	35.5	34.9	32.5	31.8
Ash content, %	0.51	0.48	0.38	0.38
Grade colour	-1.7	-1.4	-3.5	-3.4
AGTRON colour, %	69	67	82	82
Amylograph peak viscosity, BU	730	680	800	750
Starch damage, %	6.9	6.7	7.6	7.4
Farinogram				
Absorption, %	65.1	64.9	64.5	63.9
Development time, min	5.0	5.3	4.5	4.75
Mixing tolerance index, BU	25	25	10	10
Stability, min	9.5	10.0	26.5	33.0
Sponge-and-Dough Method	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	64	64	63	64
Mixing: energy dough stage, W–h/kg	7.5	7.0	8.5	7.0
Mixing: time dough stage, min	6.8	6.9	8.9	7.8
Loaf volume, cm^3/100 g flour	1125	1160	1055	1050
Appearance	7.3	7.3	7.2	7.1
Crumb structure	5.9	5.9	5.8	6.1
Crumb colour	7.8	7.8	8.0	7.9
Canadian Short Process	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	69	69	66	66
Mixing: energy dough stage W–h/kg	10.6	10.6	11.5	11.3
Mixing: time dough stage, min	8.0	7.6	8.4	8.4
Loaf volume, cm^3/100 g flour	1065	1030	975	975
Appearance	7.3	7.3	7.4	7.5
Crumb structure	6.0	6.2	6.0	6.2
Crumb colour	7.9	8.0	7.9	8.0

[1] The 1997 composite was stored and milled the same day as the 1998.
[2] Data was reported on a 14.0% moisture basis.

Canada Western Amber Durum wheat

The overall mean protein content of the 1998 Canada Western Amber Durum (CWAD) wheat crop is 12.5% based on 2 599 samples, the same as in 1997. Protein content continues below the long term average of 13.3%, with No. 1 CWAD being marginally lower, No. 2 CWAD about the same and No. 3 and 4 CWAD 0.4% and 0.3% higher, respectively.

Data describing the quality characteristics for composite samples of the top two grades of 1998 CWAD wheat are shown in Table 7. Corresponding data for 1997 composites and mean values for previous years are provided for comparison.

Test weights for both grades are comparable to last year and the ten-year average, but weight per thousand kernels is marginally lower suggesting a slightly thinner kernel. Of note, vitreous kernel count shows a significant increase from values reported in 1997, to levels comparable to the ten-year average. Both grades have falling numbers higher than the ten-year average which signifies sound grain and testifies to the early, dry and rapid harvest conditions of 1998. Ash values for both wheat and semolina are higher than in 1997 and the ten-year average values. This increase is probably related to stress during the growing season which was generally dry and hot in the main durum growing areas of Saskatchewan. Higher ash normally would indicate inferior semolina refinement, but as noted below, both semolina and spaghetti have better colour than in 1997. Consequently, the higher ash is due to higher endosperm ash rather than poorer refinement. The major degrading factors for the 1998 crop are midge damage and starchy kernels.

Semolina milling yield is similar to last year and superior to the ten-year average. The overall milling yield, however, is lower as compared to 1997 and the long-term average. As noted above, wheat kernels from this year's crop are slightly thinner, which may account for the lower overall yield.

The colour characteristics of this year’s crop are excellent. This is shown by a yellow pigment content over 8.5 ppm for wheat and over 8.0 ppm for semolina. Semolina from the 1998 crop is brighter than last year and the ten-year average as illustrated by increased AGTRON values of 82 and 81 for No. 1 and 2 CWAD, respectively. Minolta L* and b* values for spaghetti are also higher for 1998 which indicates that pasta processed using the 1998 crop should have a bright amber yellow colour.

Protein strength is marginally lower than last year. Decreased gluten strength is shown by a slightly lower SDS sedimentation volumes but these values are comparable with long-term averages. Alveograph characteristics confirm the slightly weaker gluten characteristics as shown by lower P and W values. As was the case in 1997, both grades show good extensibility. Another indicator of gluten strength, called the gluten index (GI), is being reported for the first time in this year’s bulletin in response to industry needs. The method that we selected to determine first wet gluten content and then gluten index is AACC method 38-12 following the procedure for whole meal. Use of this method, as compared to previous methodology, gives lower wet gluten results as validated by re-analysis of wheat saved from the 1997 harvest.

Cooking scores, which are related to protein content and quality, are comparable to those reported last year for similar protein levels.

The variety distribution of the 1998 crop continues to show that Kyle is the most popular variety grown on the prairies, representing about 75% of the crop. New durum lines with extra-strong gluten characteristics continue to be evaluated in the marketplace to see if their gluten strength characteristics are of value.

Table 6 • Mean protein content of Canada Western Amber Durum wheat, by grade and year

	Protein content (%)[1]		
Grade	1998	1997	1987-96
No. 1 CWAD	12.5	12.7	13.4
No. 2 CWAD	12.4	12.3	13.0
No. 3 CWAD	12.8	12.3	12.7
All milling grades	**12.5**	**12.5**	**13.0**

[1] N x 5.7; 13.5% moisture content basis

Figure 3 • Mean protein content of harvest survey Western Canadian Amber Durum wheat–1963 to 1998

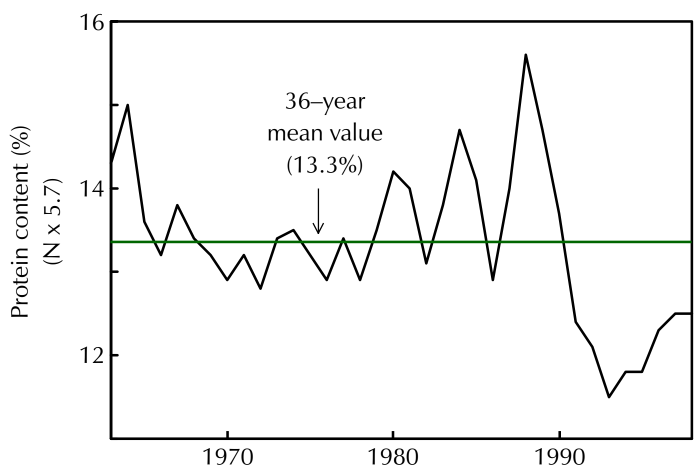


Table 7 • No. 1 and No. 2 Canada Western Amber Durum wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	No. 1 CWAD 1998	No. 1 CWAD 1997	No. 1 CWAD 1988-97 Mean	No. 2 CWAD 1998	No. 2 CWAD 1997	No. 2 CWAD 1988-97 Mean
Wheat						
Test weight, kg/hl	82.3	82.1	81.6	81.3	81.9	81.1
Weight per 1000 kernels, g	40.7	41.4	42.2	40.4	41.9	42.1
Hard vitreous kernels, %	88	80	88	81	67	79
Protein content, %	12.5	12.7	13.2	12.4	12.4	12.9
Protein content, % (dry matter basis)	14.5	14.7	15.3	14.3	14.3	15.0
SDS sedimentation, ml	36	39	37	35	37	35
Ash content, %	1.65	1.52	1.54	1.66	1.55	1.58
Yellow pigment content, ppm	8.6	8.6	8.5[2]	8.6	8.9	8.4[2]
Falling number, s	435	420	407	400	390	371
Milling yield, %	73.2	74.7	74.7	73.3	73.9	74.3
Semolina yield, %	66.1	66.3	65.2	65.8	65.0	64.5
PSI	37	39	38[3]	38	39	39[3]
Semolina						
Protein content, %	11.4	11.7	12.4	11.3	11.4	12.0
Wet gluten content, %	30.1	35.8	34.1[4]	30.2	34.7	33.1[4]
Dry gluten content, %	10.4	13.6	12.9[3]	10.5	13.2	12.9[3]
Gluten index, %	42	-	-[4]	40	-	-[4]
Ash content, %	0.68	0.65	0.66	0.69	0.65	0.67
Yellow pigment content, ppm	8.1	7.9	7.7[2]	8.0	7.9	7.5[2]
AGTRON colour, %	82	80	76	81	78	76
Minolta colour:						
L* (L)	89.0 86.1	88.4 85.4	-	88.7 85.7	88.6 85.6	-
a* (a)	-3.5 -3.5	-3.5 -3.5	-	-3.6 -3.6	-3.7 -3.6	-
b* (b)	34.8 23.8	34.7 23.6	-	35.3 24.0	34.2 23.4	-
Speck count per 50 cm^2	26	18	25	25	19	30
Falling number, s	530	455	475[2]	485	430	445[2]
Alveogram						
Length, mm	93	88	-	96	96	-
P (height x 1.1), mm	41	44	-	39	40	-
P/L	0.4	0.5	-	0.4	0.4	-
W x 10^{-4} joules	100	116	-	100	103	-
Spaghetti						
Dried at 70°C						
Minolta colour:						
L* (L)	81.0 76.5	78.5 73.5	-	80.9 76.4	78.6 73.6	-
a* (a)	0.1 0.1	-0.4 -0.4	-	0.1 0.1	-0.4 -0.4	-
b* (b)	72.3 36.5	67.0 34.2	-	72.4 36.5	67.4 34.4	-
Cooking quality, CQP	34	33	42	31	33	40

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14% moisture basis for semolina.
[2] Mean of data generated starting in 1992
[3] Mean of data generated starting in 1995
[4] As of 1998, AACC Method 38-12 will be used to determine Wet gluten and Gluten index

Canada Western Extra Strong wheat

Canada Western Extra Strong (CWES) red spring wheat is characterized by hard kernel texture and very strong physical dough properties. The strength of CWES makes it ideal as a correctional wheat in blends with weaker wheat. It also can be used for producing pan breads, hearth breads, and related products where extra strong dough properties are desirable.

Table 1 shows the mean protein content for top grade CWES wheat for 1998 and the previous two years. The mean protein content of No. 1 CWES for the1998 crop is estimated at 12.6%, similar to last year's value of 12.5%.

Table 8 summarizes quality data for the 1998 No. 1 CWES grade composite. Data for 1997 are included for comparison. Test weight is similar while kernel weight shows an increase over last year. A high degree of soundness is evident from the high wheat falling number and flour amylograph peak viscosity values as well as the low wheat and flour α-amylase activities. Wheat PSI values are similar to corresponding 1997 values, indicating very similar kernel textures for both years. Flour starch damage is higher this year.

Milling quality is similar to last year, although flour ash is slightly higher this year. Physical dough tests indicate somewhat weaker dough strength this year. Farinograph water absorption shows an increase over 1997. Remix-to-peak baking properties are similar to last year.

Glenlea continues to be the predominant variety in this class. The 1998–99 Canadian Wheat Board Variety Survey shows that 65% of the CWES acreage was planted to Glenlea, with Bluesky accounting for most of the remainder.

Table 8 • No. 1 Canada Western Extra Strong wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	1998	1997
Wheat		
Test weight, kg/hl	79.6	79.2
Weight per 1000 kernels, g	41.0	38.3
Protein content, %	12.5	12.4
Protein content, % (dry matter basis)	14.5	14.3
Ash content, %	1.65	1.58
α-amylase activity, units/g	7.5	10.5
Falling number, s	355	335
Flour yield, %	76.3	75.7
PSI	47	48
Flour		
Protein content, %	11.8	11.6
Wet gluten content, %	27.6	27.4
Ash content, %	0.59	0.56
Grade colour	-0.8	-0.7
AGTRON colour, %	59	64
Starch damage, %	9.2	8.3
α-amylase activity, units/g	3.0	4.0
Amylograph peak viscosity, BU	480	390
Maltose value, g/100 g	3.2	3.0
Farinogram		
Absorption, %	64.6	62.0
Development time, min[2]	5.5	6.0
Extensogram		
Length, cm	23	25
Height at 5 cm, BU	355	350
Maximum height, BU	640	660
Area, cm^2	205	225
Alveogram		
Length, mm	69	98
P (height x 1.1), mm	127	117
W, x 10^{-4} joules	378	460
Baking (Remix-to-Peak Baking Test)		
Absorption, %	64	64
Remix time, min	4.7	4.1
Loaf volume, cm^3/100 g flour	900	880

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

[2] At the normal Farinograph speed of 63 rpm, CWES flour does not develop and appears weak. Therefore Farinograph speed has been increased from 63 rpm to 90 rpm in order to achieve full development.

Canada Prairie Spring Red wheat

Canada Prairie Spring Red (CPSR) wheat is suitable for production of a wide range of products such as hearth breads, crackers, and certain types of flat breads, steamed breads and noodles.

The mean protein content for top grade CPSR wheat for 1998 and the previous two years is shown in Table 1. The mean protein content of No. 1 CPSR for the1998 crop is estimated at 11.9%, similar to last year's value of 11.8%.

Table 9 summarizes quality data for the No. 1 CPSR new crop composite. Data from 1997 are included for comparison. Test weight is similar while kernel weight shows an increase over last year. A high degree of soundness is evident from the high wheat falling number and flour amylograph peak viscosity values as well as the low wheat and flour α-amylase activities. Kernel texture is similar to last year as shown by comparable wheat PSI and flour starch damage values.

Milling quality is similar to last year. Although Farinogaph results indicate weaker dough properties compared to 1997, Extensograph results indicate the opposite. Remix-to-peak baking properties are similar to last year.

AC Taber continues to be the predominant variety in the CPSR class. The 1998–99 Canadian Wheat Board Variety Survey shows that 57% of the CWES acreage was planted to AC Taber. Biggar and AC Foremost account for 21% and 18%, respectively.

Table 9 • Canada Prairie Spring Red wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	1998	1997
Wheat		
Test weight, kg/hl	81.1	80.9
Weight per 1000 kernels, g	39.5	37.1
Protein content, %	11.8	11.7
Protein content, % (dry matter basis)	13.6	13.5
Ash content, %	1.57	1.50
α-amylase activity, units/g	4.0	7.0
Falling number, s	375	355
Flour yield, %	76.2	75.5
PSI	57	59
Flour		
Protein content, %	11.1	11.0
Wet gluten content, %	29.4	27.6
Ash content, %	0.47	0.47
Grade colour	-1.6	-1.8
AGTRON colour, %	67	70
Starch damage, %	6.1	5.9
α-amylase activity, units/g	0.5	1.5
Amylograph peak viscosity, BU	760	650
Maltose value, g/100 g	1.9	1.9
Farinogram		
Absorption, %	60.7	60.1
Development time, min	5.0	5.5
Mixing tolerance index, BU	45	40
Stability, min	6.5	8.0
Extensogram		
Length, cm	22	20
Height at 5 cm, BU	315	305
Maximum height, BU	610	550
Area, cm^2	175	145
Alveogram		
Length, mm	135	123
P (height x 1.1), mm	76	76
W, x 10^{-4} joules	302	299
Baking (Remix-to-Peak Baking Test)		
Absorption, %	60	61
Remix time, min	2.3	2.2
Loaf volume, cm^3/100 g flour	775	740

[1] 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 known for its excellent milling quality. Flour from high grade CWRW is well suited for hearth bread, crackers and certain types of noodles. CWRW flour also performs well in the production of flat bread, steamed bread and related products.

Table 1 shows the mean protein content for the No. 1 grade of CWRW for 1998. Data from 1997 and 1996 are included for comparison. The protein content No. 1 CWRW for 1998 is estimated at 11.1%, a decrease of 0.4% from last year.

Table 10 summarizes quality data for the 1998 No. 1 CWRW grade composite. Data for 1997 are included for comparison. Test weight is slightly higher and kernel weight is slightly lower compared to 1997. Wheat falling number and flour amylograph peak viscosity values are considerably higher than last year. These high values, as well as low wheat and flour α-amylase activities, indicate a very high degree of soundness. Comparable wheat PSI and flour starch damage values suggest kernel texture is similar to last year.

This year's CWRW crop exhibits very good milling quality. Although flour yield is higher than last year, this advantage may be offset by the higher flour ash content in the 1998 crop. Physical dough properties are weaker than last year while remix-to-peak baking performance is inferior due to reduced baking absorption.

According to the 1998–99 Canadian Wheat Board Variety Survey, CDC Kestral is the predominant variety, accounting for 82% of the CWRW wheat acreage. AC Readymade and CDC Clair account for most of the remainder.

Table 10 • Canada Western Red Winter wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	1998	1997
Wheat		
Test weight, kg/hl	82.2	81.7
Weight per 1000 kernels, g	30.9	31.9
Protein content, %	11.2	11.4
Protein content, % (dry matter basis)	12.9	13.2
Ash content, %	1.44	1.49
α-amylase activity, units/g	3.5	17.0
Falling number, s	395	325
Flour yield, %	77.5	75.1
PSI	58	57
Flour		
Protein content, %	10.6	10.9
Wet gluten content, %	29.3	28.1
Ash content, %	0.46	0.43
Grade colour	-1.8	-2.1
AGTRON colour, %	69	74
Starch damage, %	5.4	5.7
α-amylase activity, units/g	0.5	6.0
Amylograph peak viscosity, BU	740	290
Maltose value, g/100 g	1.9	2.2
Farinogram		
Absorption, %	58.6	59.2
Development time, min	4.0	5.25
Mixing tolerance index, BU	55	35
Stability, min	6.0	8.0
Extensogram		
Length, cm	23	19
Height at 5 cm, BU	225	300
Maximum height, BU	345	525
Area, cm^2	110	135
Alveogram		
Length, mm	147	132
P (height x 1.1), mm	60	74
W, x 10^{-4} joules	258	310
Baking (Remix-to-Peak Baking Test)		
Absorption, %	58	60
Remix time, min	2.1	2.1
Loaf volume, cm^3/100 g flour	775	750

[1] 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 is suitable for the production of various types of flat breads, chapatis, and noodles.

Table 1 shows the mean protein content for top grade CPSW wheat for 1998 and the previous two years. The mean protein content of No. 1 CPSW for the1998 crop is estimated at 11.7%, similar to last year's value of 11.6%.

Table 11 summarizes quality data for the No. 1 CPSW new crop composite. Data from the 1997 harvest are included for comparison. Test weight is lower although kernel weight is higher this year. A high degree of soundness is evident from the high wheat falling number and flour amylograph peak viscosity values as well as the low wheat and flour α-amylase activities. Kernel texture is similar to last year as shown by comparable wheat PSI and flour starch damage values.

Milling yield is higher, but flour ash content is also higher compared to last year. Flour colour is similar for both years. Physical dough tests indicate weaker dough properties compared to 1997.

The 1998–99 Canadian Wheat Board Variety Survey identifies AC Karma as the predominant CPSW variety this year with 64% of the acreage. Genesis accounts for most of the remainder.

Table 11 • Canada Prairie Spring White wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	1998	1997
Wheat		
Test weight, kg/hl	80.8	81.6
Weight per 1000 kernels, g	35.7	34.9
Protein content, %	11.5	11.5
Protein content, % (dry matter basis)	13.3	13.3
Ash content, %	1.46	1.46
α-amylase activity, units/g	3.5	3.0
Falling number, s	400	390
Flour yield, %	77.0	75.1
PSI	59	60
Flour		
Protein content, %	10.6	10.6
Wet gluten content, %	29.5	28.1
Ash content, %	0.51	0.48
Grade colour	-2.3	-2.1
AGTRON colour, %	73	76
Starch damage, %	6.0	5.6
α-amylase activity, units/g	1.0	1.0
Amylograph peak viscosity, BU	835	845
Maltose value, g/100 g	2.0	1.8
Farinogram		
Absorption, %	60.7	60.2
Development time, min	3.0	3.5
Mixing tolerance index, BU	60	55
Stability, min	4.0	4.5
Extensogram		
Length, cm	23	22
Height at 5 cm, BU	190	220
Maximum height, BU	255	340
Area, cm^2	85	105
Alveogram		
Length, mm	118	118
P (height x 1.1), mm	66	70
W, x 10^{-4} joules	204	221
Baking (Remix-to-Peak Baking Test)		
Absorption, %	56	58
Remix time, min	1.3	1.3
Loaf volume, cm^3/100 g flour	685	640

[1] 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 soft wheat with weak dough properties. Flours milled from CWSWS wheat are used in the preparation of cakes, cookies, biscuits and similar products. They can also be used alone or in blends with stronger wheat flours for the production of crackers, flat breads, steamed breads and some types of noodles.

This type of wheat is usually grown under irrigation to minimize protein content and maximize wheat yield.

Table 1 shows the mean protein content of No. 1 CWSWS for 1998, with comparative data from 1997 and 1996. The mean protein content for this year's No. 1 grade is 10.9%, an increase of 0.4% over last year.

Table 12 summarizes quality data for the 1998 No. 1 CWSWS grade composite. Data for 1997 are included for comparison. Test weight and kernel weight are lower compared to last year. High wheat falling number and flour amylograph peak viscosity values, as well as the low wheat and flour α-amylase activities, indicate a high degree of soundness. Kernel texture is similar to last year as shown by comparable wheat PSI and flour starch damage values.

Although milling yield is higher, flour ash is also higher and flour colour is inferior compared to last year. Dough properties appear somewhat weaker than in 1997, while cookie quality appears better for the 1998 sample.

The 1998–99 Canadian Wheat Board Variety Survey shows that AC Reed is the major CWSWS wheat variety, accounting for 75% of the acreage. Fielder was planted on 18% of the remaining acreage.

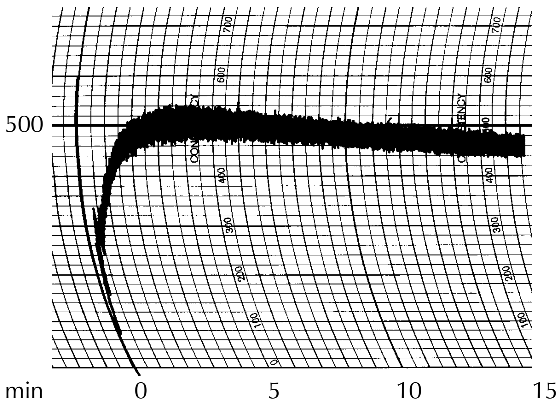
Table 12 • No. 1 Canada Western Soft White Spring wheat
Quality data for 1998 and 1997 harvest survey grade composite samples

Quality parameter[1]	1998	1997
Wheat		
Test weight, kg/hl	81.0	81.7
Weight per 1000 kernels, g	33.3	37.4
Protein content, %	10.6	10.3
Protein content, % (dry matter basis)	12.3	11.9
Ash content, %	1.66	1.54
α-amylase activity, units/g	4.5	8.0
Falling number, s	355	330
Flour yield, %	77.4	75.7
PSI	70	68
Flour		
Protein content, %	9.8	9.4
Wet gluten content, %	26.7	23.8
Ash content, %	0.55	0.47
Grade colour	-0.3	-0.8
AGTRON colour, %	60	67
Starch damage, %	2.9	3.2
α-amylase activity, units/g	1.0	2.0
Amylograph peak viscosity, BU	560	500
Maltose value, g/100 g	1.2	1.3
AWRC, %	65	60
Farinogram		
Absorption, %	53.4	54.8
Development time, min	1.0	1.25
Mixing tolerance index, BU	190	175
Stability, min	1.5	1.0
Alveogram		
Length, mm	108	95
P (height x 1.1), mm	19	23
W, x 10^{-4} joules	34	38
Cookie test		
Spread, mm	82.5	81.2
Ratio (spread/thickness)	8.9	8.7

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

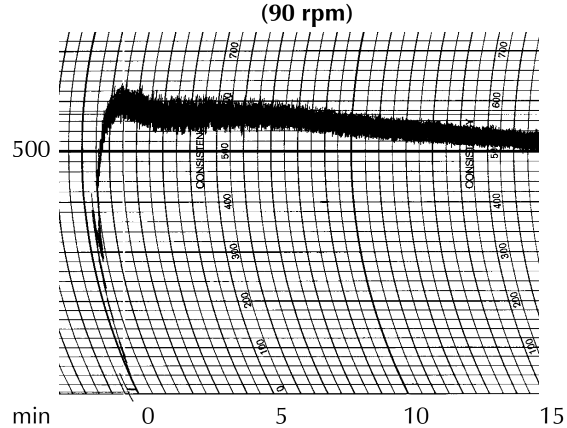
Figure 4 • Farinograms of 1998 crop composite samples

No. 1 Canada Western 13.5 Red Spring wheat

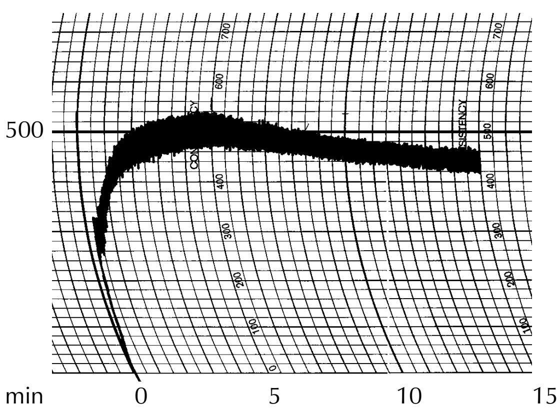


No. 1 Canada Western Extra Strong wheat

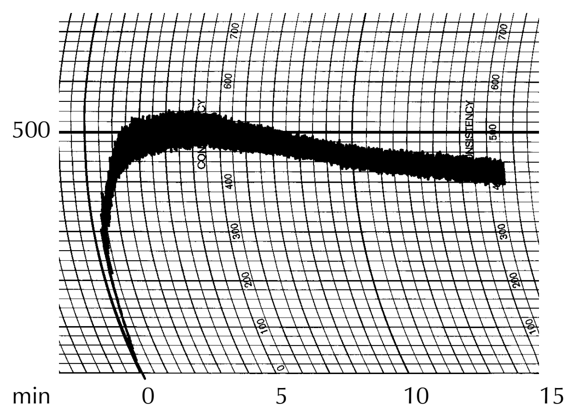
(90 rpm)



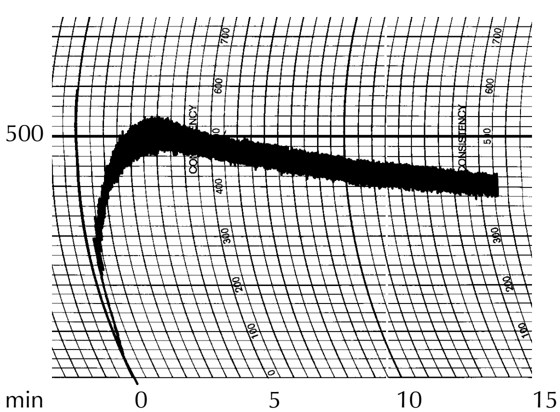
No. 1 Canada Prairie Spring Red wheat



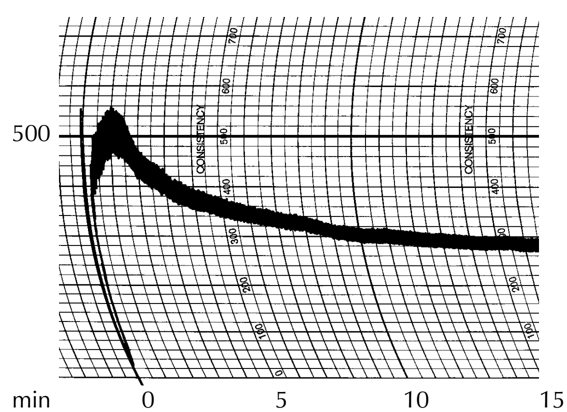
No. 1 Canada Western Red Winter wheat



No. 1 Canada Prairie Spring White wheat



No. 1 Canada Western Soft White Spring wheat



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

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

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

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 22-15.

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).

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 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).

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.

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 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.

Zeleny sedimentation

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

Collection of samples

Samples for the 1998 surveys were collected from grain companies operating primary elevators and from producers in western Canada. Producers were requested to send in samples of each of the seven classes of wheat grown on the prairies, together with canola, flax, peas, lentils and oats. The sample documentation system was streamlined by barcoding, which was used for both producer and elevator company samples. Producers were given a toll-free number to call to find out the protein content and unofficial grade for their samples.

The first cutoff date for composite preparation of wheat was September 23 for No. 1 CWRS.

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Tables

Figures