Quality of western Canadian wheat • 1999

Summary

The 1999 harvest was later than average over most of the prairie region because of late seeding and cool wet growing conditions. Sprouting damage is minimal, however, and all wheat classes show sound kernel characteristics. Protein content of all wheat classes is lower compared to last year. The predominant grade determinants are frost and green immature kernels associated with the late harvest. Ergot, fusarium damage, midge damage and low percentage of vitreous kernels are also factors. Spring and durum wheat production are estimated at 20.0 and 4.0 million tonnes, respectively. High grade Canada Western Red Spring (CWRS) wheat quality is very good, showing improved water absorption properties and better milling quality compared to last year. Canada Western Amber Durum (CWAD) wheat shows lower protein and poorer colour relative to 1998. Sample numbers of high grade Canada Western Red Winter (CWRW) and Canada Western Soft White Spring (CWSWS) wheat were insufficient for quality analysis.

Table of contents

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Seven classes of Canadian wheat

This report presents detailed information on the quality of the 1999 crop of five of the seven classes of western Canadian wheat offered on the world market. Insufficient high grade samples were available to prepare and test composites for Canada Western Red Winter and Canada Western Soft White Spring wheat.

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.

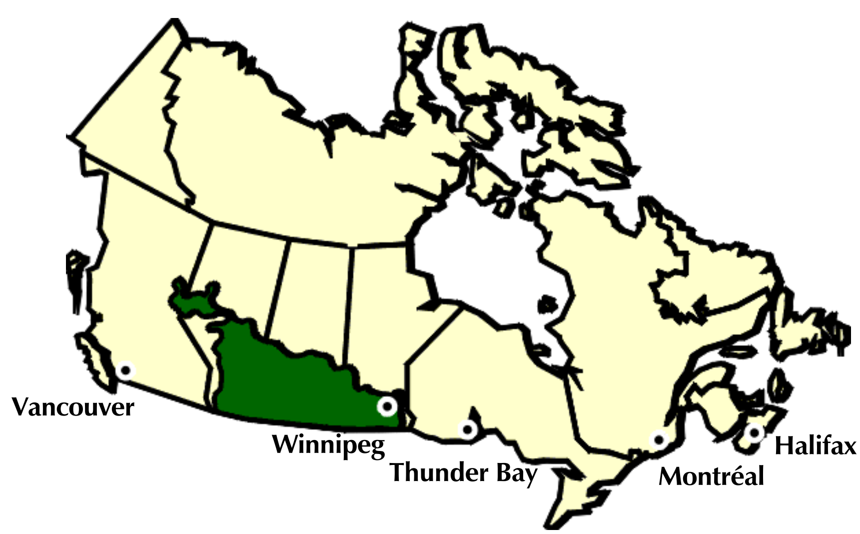
Canada Prairie Spring Red (CPSR) wheat is a medium-strength wheat suitable for the production of certain types of hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

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, noodles and related products. 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

A note on 1999 harvest survey data

Data presented in this report are generated from quality testing of composites representing over 13,000 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 1999 production

Background for the 1999 crop

Background information for the 1999 western wheat harvest survey was provided by the Weather and Crop Surveillance department of the Canadian Wheat Board. Late seeding and cool wet growing conditions over much of the prairie region resulted in a late harvest.

Seeding

The 1999 growing season started earlier than usual in parts of the prairies as warmer than normal temperatures in the second half of April encouraged planting. The warm, dry conditions continued into the first week of May and some regions, especially southern Alberta and southeastern Manitoba, managed to seed most of their cereal crops by this time. This was not the case for the rest of the prairie region, especially eastern Saskatchewan and western Manitoba, where seeding was delayed by heavier than normal snow cover and excessive soil moisture levels. May precipitation over most of the southern and central Prairies was significantly above normal, while amounts in northern regions were closer to normal. Temperatures in May also turned cooler with most prairie locations reporting deviations of one to two degrees below normal. These conditions slowed seeding progress and resulted in serious planting delays. The wet conditions continued through the first half of June, which resulted in the eventual abandonment of cropland in southwestern Manitoba and southeastern Saskatchewan. As a result of the prolonged seeding period, crop development stages varied greatly throughout the growing season.

Growing conditions

The wet conditions persisted through June across most of the Prairies. In areas where crops were planted and emerging, these soil moisture levels resulted in above average stands with excellent yield potential. Later seeded crops had greater difficulty in handling the excess moisture, and the resulting stands were poorer than the earlier seeded crops. The frequent rainfall pattern continued through July which helped maintain crop conditions. Temperatures remained cooler than normal through June and July, with stations reporting monthly averages ranging from 0.5^{o}C to 3.0^{o}C below normal. The coolest temperatures were reported in the western regions of the Prairies during June and July. August brought a change in the weather as rains generally tapered off and temperatures climbed to normal or above normal across the Prairies. The warm temperatures helped encourage crop development, although most regions were still 10 to 15 days behind normal development at the end of the month.

The only exception to the wetter than normal conditions in June and July was the Peace River region of Alberta. This region received below normal precipitation during June, which caused stress to developing crops. Dry conditions persisted in the region through July and August which cut yields significantly.

Harvest conditions

The lateness of the crop across the prairie region raised concerns about the potential for severe quantity or quality loss due to frost. The first sub-zero temperatures were reported in the foothills of southern and central Alberta and east-central Alberta during the first week of September. During the same week parts of northern and west-central Saskatchewan reported light frosts. The remainder of the Prairies did not report freezing temperatures until the second half of September. In most regions, the first frost in 1999 was very close to or after the average frost date for the region.

Harvest began in southeastern Manitoba and southern Alberta by the middle of August, but these regions were the exception rather than the rule. The bulk of the western Canadian harvest started in September and finished in October. Precipitation during September and October was below normal, especially in the western half of the Prairies. This helped maintain the quality of grain, despite the prolonged harvest. The eastern half of the Prairies received normal to above normal precipitation during September and October, which resulted in some deterioration of crop quality.

Production and grade information

Estimates for prairie grain production are above normal due to near record or record yields reported for the crops. Spring wheat yields are expected to reach record levels at 2.4 tonnes per hectare. Durum wheat yields are expected to be the second highest on record at 2.3 tonnes per hectare. Total wheat production for western Canada is estimated at 24.3 million, an increase of 1.7 million tonnes over 1998. Spring wheat production is estimated at 20.0 million tonnes—compared to 16.4 million tonnes in 1998—while durum wheat production is estimated at 4.0 million compared to last year's record production of 6.0 million tonnes.

Due to the late harvest in many regions, frost damage and green immature kernels due to frost are predominant grade determinants in spring wheat. The wet growing season also resulted in some downgrading of spring wheat due to the diseases ergot and fusarium, and insect damage, particularly wheat midge, especially in the eastern growing areas of the Prairies. Low percentage of vitreous kernels and frost damage including green immature kernels are the predominant grade determinants for durum wheat. Some downgrading of durum wheat is associated with smudge and midge damage. The generally dry and cool harvesting conditions prevented sprouting resulting in sound kernel characteristics. For CWRS and CWAD wheat, well over 50 percent of production is expected to grade into the top two milling grades.

Harvest survey samples

Samples for the Canadian Grain Commission harvest surveys are collected from grain companies operating primary elevators and from producers in western Canada. Producers are requested to send in their samples of any of the seven classes of wheat grown on the Prairies. The CGC uses a bar-coded documentation system for both producer and elevator company samples to track them from source to grading bench and quality analyses . Producers may call a toll-free number at the CGC and request the protein content and unofficial grade assigned to their samples by giving the bar-code identification.

For 1999 harvest survey data, the first cutoff date for No. 1 CWRS wheat composite preparation was October 12.

Acknowledgments

The Grain Research Laboratory acknowledges the cooperation and assistance of the following:

- The grain companies and their primary elevator managers and western Canadian wheat producers for providing samples
- The Prairie Region office of Industry Services, Canadian Grain Commission, in grading all harvest survey samples
- The Weather and Crop Surveillance Unit of the Canadian Wheat Board in providing the weather, crop condition and harvesting reviews

Protein

Table 1 compares mean protein values for each of the seven classes of western Canadian wheat surveyed in 1999 to corresponding values obtained in the 1997 and 1998 harvest survey. For all classes, wheat protein is lower compared to the two previous years. The lower protein content of this year’s crop is partially due to higher wheat yields. Poor market returns on wheat have also forced many producers to reduce nitrogen fertilization to limit input costs.

Table 1 • Mean protein content of milling grades of western Canadian wheat classes, 1999, 1998 and 1997

Class	Protein content (%)[1]		
	1999	1998	1997
CWRS	13.3	14.1	13.5
CWAD	11.9	12.5	12.5
CWRW	10.0	11.1	11.5
CPSR	11.2	11.9	11.8
CPSW	10.9	11.7	11.6
CWES	12.2	12.6	12.5
CWSWS	10.7	10.9	10.5

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

Canada Western Red Spring wheat

Protein and variety survey

Table 2 lists mean protein values for Canada Western Red Spring (CWRS) wheat by grade and province for 1999. Comparative values for western Canada by grade are shown for 1998 and for the previous 10 years (1989-1998). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of the 1999 CWRS wheat crop is 13.3%–down 0.8% from 1998 but the same as the ten year mean. Variation among the three milling grades is minimal. Manitoba continues to show the highest protein content with an average of 14.2%. Saskatchewan and Alberta show the same average, 13.1%.

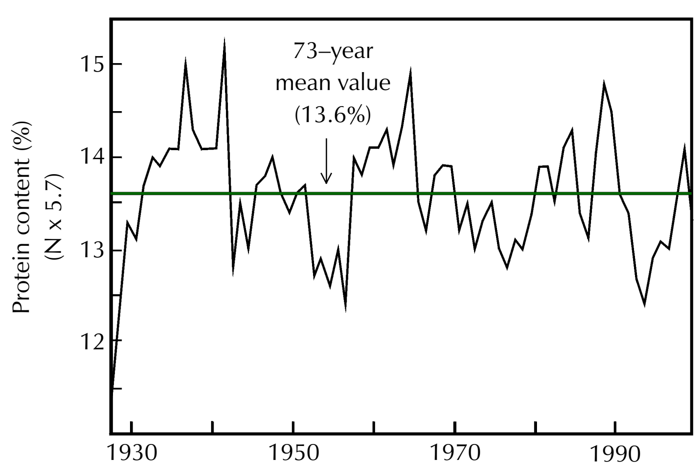
The Canadian Wheat Board Variety Survey shows that AC Barrie is the predominant variety in the CWRS class with 47.5% of the seeded acreage. CDC Teal is the second most widely grown variety at 13.8%.

Table 2 • Mean protein content of 1999 Canada Western Red Spring wheat, by grade, year and province

	Protein content (%)[1]					
	Western Canada			1999		
Grade	1999	1998	1989-98	Manitoba	Saskatchewan	Alberta
No. 1 CWRS	13.3	13.8	13.4	14.1	13.0	13.4
No. 2 CWRS	13.4	14.4	13.4	14.2	13.2	13.1
No. 3 CWRS	13.2	14.4	12.9	14.2	13.1	12.8
All milling grades	**13.3**	**14.1**	**13.3**	**14.2**	**13.1**	**13.1**

[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 1999



Milling and baking quality Allis-Chalmers laboratory mill

To assess the quality of the 1999 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, 1989-98.

High test weight and larger than normal seed size are characteristic of all 1999 No. 1 grade protein segregates. Wheat ash is similar to last year and to the long term average. A high degree of soundness is evident from the high wheat falling number, the high flour amylograph peak viscosity values and the low wheat and flour α-amylase activities.

Wheat particle size index and flour starch damage values indicate that kernel texture is similar to last year. Milling quality is excellent. The lower flour ash compared to 1998 reflects an improvement in milling yield on a constant (0.50%) ash basis. Flour colour is similar to last year.

Rheological tests involving dough extension—extensograph and alveograph—show stronger physical dough properties relative to previous years. Farinograph absorption is higher than last year. Canadian short process baking properties are somewhat superior to 1998. During processing, dough shows increased mixing requirements and superior handling properties compared to 1998.

No. 2 Canada Western Red Spring wheat

Table 4 shows quality data for the 1999 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 1989-98.

Test weight and kernel weight are higher than previous years. Particle size index and flour starch damage are comparable to 1998, indicating similar kernel texture. 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 are superior to last year as indicated by reduced flour ash content. Rheological tests demonstrate stronger dough strength properties in this year's crop, consistent with results obtained for the No. 1 grade. Canadian short process baking properties are similar to last year. During processing, dough shows increased mixing requirements and superior handling properties compared to 1998.

Table 3 • No. 1 Canada Western Red Spring wheat
Quality data for 1999 harvest survey grade composite samples

	Minimum protein content			No. 1 CWRS 13.5	
Quality parameter[1]	14.5	13.5	12.5	1998	1989–98 Mean
Wheat					
Test weight, kg/hl	81.5	82.0	82.4	81.5	81.1
Weight per 1000 kernels, g	33.5	34.9	33.7	31.8	31.4
Protein content, %	14.7	13.7	12.7	13.7	13.7
Protein content, % (dry matter basis)	17.0	15.8	14.7	15.8	15.8
Ash content, %	1.54	1.58	1.58	1.53	1.55
α-amylase activity, units/g	3.5	3.5	4.0	2.5	4.6
Falling number, s	370	385	375	395	395
PSI	55	53	52	52	52[2]
Milling					
Flour yield					
Clean wheat basis, %	75.2	75.6	75.3	75.8	75.6
0.50% ash basis, %	78.2	77.6	77.8	75.3	76.1
Flour					
Protein content, %	14.1	13.0	12.0	13.1	13.1
Wet gluten content, %	40.0	36.4	33.2	35.5	38.4
Ash content, %	0.44	0.46	0.45	0.51	0.49
Grade colour	-1.8	-2.0	-2.1	-1.7	-1.3
AGTRON colour, %	71	76	77	69	70[3]
Starch damage, %	6.9	7.3	7.4	6.9	6.8
α-amylase activity, units/g	1.0	1.0	1.0	0.5	1.3
Amylograph peak viscosity, BU	720	725	720	730	690
Maltose value, g/100 g	2.2	2.4	2.5	2.2	2.1
Farinogram					
Absorption, %	66.9	66.4	65.4	65.1	65.3
Development time, min	6.25	5.25	5.25	5.0	5.0
Mixing tolerance index, BU	25	30	30	25	25
Stability, min	10.5	10.0	8.0	9.5	10.0
Extensogram					
Length, cm	22	21	20	22	22
Height at 5 cm, BU	335	305	320	290	287
Maximum height, BU	620	575	570	525	493
Area, cm^2	175	160	150	160	146
Alveogram					
Length, mm	126	104	98	108	124
P (height x 1.1), mm	122	128	126	107	104
W, x 10^{-4} joules	530	468	432	396	415
Baking (Canadian short process baking test)					
Absorption, %	70	70	69	69	69
Mixing energy, W–h/kg	13.0	13.8	14.7	10.6	8.2
Mixing time, min	9.1	9.4	9.9	8.0	7.5
Loaf volume, cm^3/100 g flour	1160	1100	1010	1065	1100

1 Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
2 Mean of data generated starting 1990
3 Mean of data generated starting 1993

Table 4 • No. 2 Canada Western Red Spring wheat
Quality data for 1999 harvest survey grade composite samples

	Minimum protein content			No. 2 CWRS 13.5	
Quality parameter[1]	14.5	13.5	12.5	1998	1989–98 Mean
Wheat					
Test weight, kg/hl	81.3	81.8	82.1	80.7	79.3
Weight per 1000 kernels, g	33.8	33.7	32.9	32.0	31.6
Protein content, %	14.7	13.7	12.7	13.6	13.7
Protein content, % (dry matter basis)	17.0	15.8	14.7	15.7	15.8
Ash content, %	1.65	1.63	1.61	1.63	1.61
α-amylase activity, units/g	9.0	5.5	5.0	7.0	10.3
Falling number, s	370	385	380	385	371
PSI	55	53	53	54	54[2]
Milling					
Flour yield					
Clean wheat basis, %	75.2	75.4	74.7	75.5	75.4
0.50% ash basis, %	76.7	76.4	76.7	75.0	75.9
Flour					
Protein content, %	14.0	13.1	12.0	13.0	13.1
Wet gluten content, %	40.1	37.4	33.8	35.9	38.1
Ash content, %	0.47	0.48	0.46	0.51	0.49
Grade colour	-1.5	-1.7	-2.2	-1.5	-1.0
AGTRON colour, %	72	73	79	69	69[3]
Starch damage, %	6.1	6.4	6.7	6.8	6.6
α-amylase activity, units/g	2.5	2.0	2.0	1.0	3.0
Amylograph peak viscosity, BU	685	710	725	670	528
Maltose value, g/100 g	2.0	2.1	2.1	2.3	2.1
Farinogram					
Absorption, %	65.5	64.9	64.4	65.5	65.0
Development time, min	6.25	5.25	5.0	4.5	4.75
Mixing tolerance index, BU	35	30	30	30	30
Stability, min	9.5	8.0	8.0	8.0	9.0
Extensogram					
Length, cm	23	22	20	23	23
Height at 5 cm, BU	310	310	310	255	276
Maximum height, BU	565	555	550	445	467
Area, cm^2	170	165	150	135	144
Alveogram					
Length, mm	134	122	98	106	127
P (height x 1.1), mm	99	106	114	106	99
W, x 10^{-4} joules	441	425	400	394	400
Baking (Canadian short process baking test)					
Absorption, %	70	69	68	69	69
Mixing energy, W–h/kg	17.0	14.0	13.1	11.4	8.1
Mixing time, min	11.5	9.6	9.2	7.7	7.5
Loaf volume, cm^3/100 g flour	1095	1040	1020	1045	1099

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

[2] Mean of data generated starting in 1990

[3] Mean of data generated starting in 1993

Comparative Buhler laboratory mill flour data

Samples of 1999 and stored 1998 harvest survey No. 1 CWRS-13.5 wheat composites were milled consecutively on the same day on the tandem Buhler laboratory mill into straight grade and patent flour. Data are shown in Table 5.

The 1999 composite shows superior milling properties relative to the 1998 composite as indicated by reduced flour ash content. Straight grade and patent flour yields and flour colours are similar for both years. Starch damage for the 1999 composite is comparable to last year. Farinograph data indicate little change in dough strength properties for straight grade flour. For the patent flour, farinograph dough development time is longer while stability is shorter compared to last year. Increased farinograph absorption is evident with both flour types.

Overall, sponge-and-dough and Canadian short process baking properties are comparable to last year. Baking absorption appears to be somewhat higher this year.

Table 5 • No. 1 Canada Western Red Spring wheat • 13.5% protein segregate
Comparative Bühler mill flour data • 1999 and 1998 harvest survey composites[1]

	Straight-grade		Patent	
Quality parameter[2]	1999	1998	1999	1998
Flour				
Yield, %	75.1	74.7	45.0	45.0
Protein content, %	13.1	13.1	12.3	12.6
Wet gluten content, %	35.9	35.0	33.6	33.7
Ash content, %	0.43	0.47	0.36	0.38
Grade colour	-2.0	-2.1	-3.4	-3.3
AGTRON colour, %	74	78	87	86
Amylograph peak viscosity, BU	765	800	825	875
Starch damage, %	6.1	6.0	6.6	6.5
Farinogram				
Absorption, %	63.3	62.4	62.6	62.1
Development time, min	4.75	4.5	5.0	4.25
Mixing tolerance index, BU	35	25	25	20
Stability, min	8.0	8.5	11.0	20.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	65	64	65	64
Mixing: energy dough stage, W–h/kg	8.3	8.5	8.4	9.9
Mixing: time dough stage, min	7.8	8.1	8.9	9.5
Loaf volume, cm^3/100 g flour	1130	1120	1075	1060
Appearance	7.6	7.8	7.7	7.8
Crumb structure	6.0	6.0	6.0	6.2
Crumb colour	8.0	8.1	8.0	8.1
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	67	66	67	66
Mixing: energy dough stage W–h/kg	12.8	14.1	14.4	11.7
Mixing: time dough stage, min	8.9	9.5	10.1	8.5
Loaf volume, cm^3/100 g flour	1060	1070	1070	1095
Appearance	7.8	8.0	7.4	8.0
Crumb structure	6.0	6.2	6.2	6.0
Crumb colour	8.0	8.1	8.1	8.1

[1] The 1998 composite was stored and milled the same day as the 1999.
[2] Data was reported on a 14.0% moisture basis.

Canada Western Amber Durum wheat

The overall mean protein content of the 1999 Canada Western Amber Durum (CWAD) wheat crop is 11.9 % based on 3102 samples, 0.6% lower than 1998 (Table 6). Protein content is again below the long-term average of 13.3% (Figure 3). Protein content for No. 1 CWAD is marginally lower than 1998. The No. 2 and 3 CWAD grades show protein contents slightly below 12%. The major grade determinants for the 1999 crop are low vitreous kernel percentage, smudge, frost damage and midge damage.

Data describing the quality characteristics for composite samples of the top two grades of 1999 CWAD wheat are shown in Table 7. Corresponding data for 1998 composites and mean values for the previous ten years are provided for comparison.

Physical characteristics of the 1999 crop show improvement in test weight over 1998 and the long-term mean. Vitreous kernel percentage shows a significant increase in No. 1 CWAD over values reported in 1998. Falling numbers are only slightly lower than in 1998, indicating that sprout damage is not a factor in this year's crop. Both grades show similar milling yields with lower semolina ash contents compared to last year.

Lower yellow pigment content and decreased b* values are evident in semolina and spaghetti produced from this year's high grade composites. The brightness of semolina and pasta from the 1999 crop is marginally lower than last year but the semolina brightness, which is indicated by AGTRON color, is higher than the 10-year average.

SDS sedimentation volume and alveograph P and W values suggest that protein strength for No. 1 CWAD is higher this year than last, whereas No. 2 CWAD is similar although it does exhibit a higher P value. Gluten index values, on the other hand, are lower in 1999 indicating weakening of the gluten. Long-term data, however, are not yet available to assess the significance of the decrease in this new strength indicator. Cooking scores are slightly lower than those reported last year which is reflective of decreased protein content in these grades.

Kyle remains the most popular variety grown on the prairies, representing almost 80% of the crop. It is anticipated that the extra-strong gluten variety AC Navigator will be produced in significant commercial quantities next year.

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

Grade	Protein content (%)[1]		
	1999	1998	1989-98
No. 1 CWAD	12.2	12.5	13.0
No. 2 CWAD	11.8	12.4	12.5
No. 3 CWAD	11.9	12.8	12.2
All milling grades	**11.9**	**12.5**	**12.5**

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

Figure 3 • Mean protein content of harvest survey Canada Western Amber Durum wheat–1963 to 1999

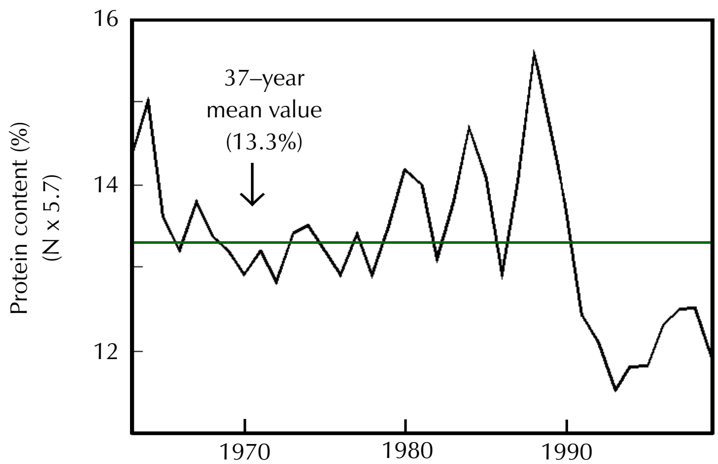


Table 7 • No. 1 and No. 2 Canada Western Amber Durum wheat
Quality data for 1999 and 1998 harvest survey grade composite samples

	No. 1 CWAD			No. 2 CWAD		
Quality parameter[1]	1999	1998	1989-98 Mean	1999	1998	1989-98 Mean
Wheat						
Test weight, kg/hl	83.4	82.3	81.7	83.2	81.3	81.2
Weight per 1000 kernels, g	43.0	40.7	42.1	44.5	40.4	41.9
Hard vitreous kernels, %	93	88	87.5	82	81	78.5
Protein content, %	12.2	12.5	12.9	11.9	12.4	12.5
Protein content, % (dry matter basis)	14.1	14.5	14.9	13.8	14.3	14.5
SDS sedimentation, ml	40	36	36	35	35	34
Ash content, %	1.58	1.65	1.55	1.66	1.66	1.59
Yellow pigment content, ppm	7.9	8.6	8.5[2]	7.8	8.6	8.5[2]
Falling number, s	415	435	409	385	400	374
Milling yield, %	73.2	73.2	74.5	74.0	73.3	74.1
Semolina yield, %	65.8	66.1	65.5	65.9	65.8	64.7
PSI	37	37	38[3]	38	38	38[3]
Semolina						
Protein content, %	11.1	11.4	12.1	10.8	11.3	11.7
Wet gluten content, %	29.0	30.1	33.3[3]	28.0	30.2	32.1[4]
Dry gluten content, %	10.1	10.4	12.3[3]	10.0	10.5	12.3[3]
Gluten index, %	26	42	-	25	40	-[4]
Ash content, %	0.65	0.68	0.66	0.66	0.69	0.67
Yellow pigment content, ppm	7.4	8.1	7.8[2]	7.2	8.0	7.6[2]
AGTRON colour, %	81	82	77	80	81	78
Minolta colour:						
L*	88.0	89.0	-	87.7	88.7	-
a*	-2.9	-3.5	-	-3.0	-3.6	-
b*	31.7	34.8	-	30.7	35.3	-
Speck count per 50 cm^2	20	26	26	26	25	31
Falling number, s	490	530	481[2]	450	485	449[2]
Alveogram						
Length, mm	79	93	-	74	96	-
P (height x 1.1), mm	52	41	-	50	39	-
P/L	0.7	0.4	-	0.7	0.4	-
W x 10^{-4} joules	114	100	-	103	100	-
Spaghetti						
Dried at 70°C						
Minolta colour:						
L*	79.9	81.0	-	79.6	80.9	-
a*	2.0	0.1	-	2.5	0.1	-
b*	65.1	72.3	-	64.0	72.4	-
Cooking quality, CQP	28	34	40	29	31	38

[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 is 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 1999 and the previous two years. The mean protein content of No. 1 CWES for the 1999 crop is estimated at 12.2%, 0.4% lower than last year.

Table 8 summarizes quality data for the 1999 No. 1 CWES grade composite. Data for 1998 are included for comparison. Test weight is higher while kernel weight is similar to 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 is similar to the 1998 value, indicating very similar kernel texture for both years. Flour starch damage is lower than last year.

Milling quality is superior to last year, evident from the lower flour ash content and higher flour colour values. Physical dough tests indicate dough strength properties comparable to last year. Farinograph water absorption shows a decrease over 1998. This decrease is probably related to this year's lower flour starch damage. Remix-to-peak mixing time is shorter while baking properties are similar to last year.

Glenlea continues to be the predominant variety in this class. The Canadian Wheat Board Variety Survey shows that 57% 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 1999 and 1998 harvest survey grade composite samples

Quality parameter[1]	1999	1998
Wheat		
Test weight, kg/hl	81.3	79.6
Weight per 1000 kernels, g	42.1	41.0
Protein content, %	12.0	12.5
Protein content, % (dry matter basis)	13.9	14.5
Ash content, %	1.57	1.65
α-amylase activity, units/g	10.5	7.5
Falling number, s	350	355
Flour yield, %	75.5	76.3
PSI	48	47
Flour		
Protein content, %	11.2	11.8
Wet gluten content, %	27.4	27.6
Ash content, %	0.51	0.59
Grade colour	-1.6	-0.8
AGTRON colour, %	70	59
Starch damage, %	7.8	9.2
α-amylase activity, units/g	3.5	3.0
Amylograph peak viscosity, BU	505	480
Maltose value, g/100 g	2.9	3.2
Farinogram		
Absorption, %	62.9	64.6
Development time, min[2]	5.5	5.5
Extensogram		
Length, cm	23	23
Height at 5 cm, BU	335	355
Maximum height, BU	625	640
Area, cm^2	200	205
Alveogram		
Length, mm	77	69
P (height x 1.1), mm	121	127
W, x 10^{-4} joules	382	378
Baking (remix-to-peak baking test)		
Absorption, %	64	64
Remix time, min	3.5	4.7
Loaf volume, cm^3/100 g flour	860	900

[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 1999 and the previous two years is shown in Table 1. The mean protein content of No. 1 CPSR for the 1999 crop is estimated at 11.2%, 0.7% lower than last year.

Table 9 summarizes quality data for the No. 1 CPSR new crop composite. Data from 1998 are included for comparison. Test weight is higher while kernel weight is similar compared to 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 somewhat inferior to last year as shown by lower flour yield. Flour ash and flour colour, however, are slightly superior to last year. Physical dough tests indicate weaker dough strength properties compared to 1998. Remix-to-peak baking properties appear to be somewhat inferior to last year.

Canadian Wheat Board Variety Survey results show that AC Taber continues to be the predominant variety in the CPSR class at 43.1% of the planted acreage. AC Foremost at 22.1% and Biggar at 17.2% also represent significant acreage. The newer variety, AC Crystal, with stronger dough properties, represents 13.7% of the planted acreage.

Table 9 • No. 1 Canada Prairie Spring Red wheat
Quality data for 1999 and 1998 harvest survey grade composite samples

Quality parameter[1]	1999	1998
Wheat		
Test weight, kg/hl	81.6	81.1
Weight per 1000 kernels, g	39.6	39.5
Protein content, %	11.4	11.8
Protein content, % (dry matter basis)	13.2	13.6
Ash content, %	1.53	1.57
α-amylase activity, units/g	6.5	4.0
Falling number, s	345	375
Flour yield, %	74.1	76.2
PSI	55	57
Flour		
Protein content, %	10.6	11.1
Wet gluten content, %	28.8	29.4
Ash content, %	0.46	0.47
Grade colour	-2.2	-1.6
AGTRON colour, %	74	67
Starch damage, %	5.9	6.1
α-amylase activity, units/g	1.5	0.5
Amylograph peak viscosity, BU	675	760
Maltose value, g/100 g	2.0	1.9
Farinogram		
Absorption, %	60.6	60.7
Development time, min	4.75	5.0
Mixing tolerance index, BU	50	45
Stability, min	6.0	6.5
Extensogram		
Length, cm	21	22
Height at 5 cm, BU	285	315
Maximum height, BU	500	610
Area, cm^2	145	175
Alveogram		
Length, mm	138	135
P (height x 1.1), mm	80	76
W, x 10^{-4} joules	316	302
Baking (remix-to-peak baking test)		
Absorption, %	59	60
Remix time, min	2.0	2.3
Loaf volume, cm^3/100 g flour	730	775

[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 10 • No. 1 Canada Western Red Winter wheat
Quality data for 1999 and 1998 harvest survey grade composite samples

Quality parameter[1]	1999	1998
Wheat		
Test weight, kg/hl	INSUFFICIENT SAMPLE RECEIVED	82.2
Weight per 1000 kernels, g		30.9
Protein content, %		11.2
Protein content, % (dry matter basis)		12.9
Ash content, %		1.44
α-amylase activity, units/g		3.5
Falling number, s		395
Flour yield, %		77.5
PSI		58
Flour		
Protein content, %		10.6
Wet gluten content, %		29.3
Ash content, %		0.46
Grade colour		-1.8
AGTRON colour, %		69
Starch damage, %		5.4
α-amylase activity, units/g		0.5
Amylograph peak viscosity, BU		740
Maltose value, g/100 g		1.9
Farinogram		
Absorption, %		58.6
Development time, min		4.0
Mixing tolerance index, BU		55
Stability, min		6.0
Extensogram		
Length, cm		23
Height at 5 cm, BU		225
Maximum height, BU		345
Area, cm^2		110
Alveogram		
Length, mm		147
P (height x 1.1), mm		60
W, x 10^{-4} joules		258
Baking (remix-to-peak baking test)		
Absorption, %		58
Remix time, min		2.1
Loaf volume, cm^3/100 g flour		775

[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 1999 and the previous two years. The mean protein content of No. 1 CPSW for the1999 crop is estimated at 10.9%, 0.8% lower than last year.

Table 10 summarizes quality data for the No. 1 CPSW new crop composite. Data from the 1998 harvest are included for comparison. Test weight is higher while kernel weight is similar to 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 yield is inferior compared to last year as indicated by reduced flour yield. Flour ash is lower while flour colour is similar to 1998. Physical dough tests indicate slightly weaker dough properties compared to last year.

The Canadian Wheat Board Variety Survey identifies AC Karma as the predominant CPSW variety this year with 57.5% of the acreage. Genesis (33.0%) and AC Vista (9.5%) account for the remainder.

Table 11 • No. 1 Canada Prairie Spring White wheat
Quality data for 1999 and 1998 harvest survey grade composite samples

Quality parameter[1]	1999	1998
Wheat		
Test weight, kg/hl	81.4	80.8
Weight per 1000 kernels, g	35.2	35.7
Protein content, %	10.9	11.5
Protein content, % (dry matter basis)	12.6	13.3
Ash content, %	1.63	1.46
α-amylase activity, units/g	5.5	3.5
Falling number, s	400	400
Flour yield, %	74.4	77.0
PSI	57	59
Flour		
Protein content, %	9.9	10.6
Wet gluten content, %	27.9	29.5
Ash content, %	0.48	0.51
Grade colour	-2.2	-2.3
AGTRON colour, %	75	73
Starch damage, %	5.9	6.0
α-amylase activity, units/g	2.0	1.0
Amylograph peak viscosity, BU	780	835
Maltose value, g/100 g	2.1	2.0
Farinogram		
Absorption, %	61.5	60.7
Development time, min	2.75	3.0
Mixing tolerance index, BU	65	60
Stability, min	3.0	4.0
Extensogram		
Length, cm	22	23
Height at 5 cm, BU	185	190
Maximum height, BU	240	255
Area, cm^2	80	85
Alveogram		
Length, mm	106	118
P (height x 1.1), mm	71	66
W, x 10^{-4} joules	197	204
Baking (remix-to-peak baking test)		
Absorption, %	58	56
Remix time, min	1.5	1.3
Loaf volume, cm^3/100 g flour	620	685

[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.

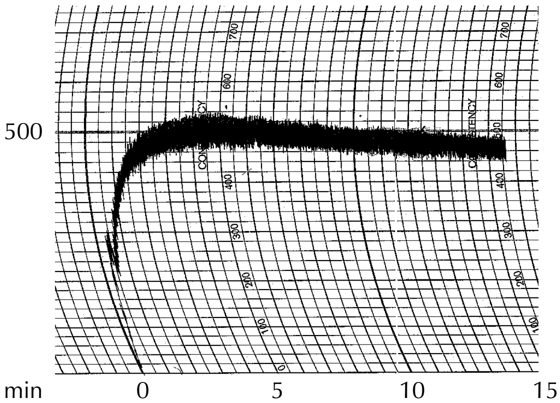
Table 12 • No. 1 Canada Western Soft White Spring wheat
Quality data for 1999 and 1998 harvest survey grade composite samples

Quality parameter[1]	1999	1998
Wheat		
Test weight, kg/hl	82.6	81.0
Weight per 1000 kernels, g	36.2	33.3
Protein content, %	10.4	10.6
Protein content, % (dry matter basis)	12.0	12.3
Ash content, %	1.49	1.66
α-amylase activity, units/g	4.0	4.5
Falling number, s	350	355
Flour yield, %	75.5	77.4
PSI	67	70
Flour		
Protein content, %	9.5	9.8
Wet gluten content, %	26.7	26.7
Ash content, %	0.46	0.55
Grade colour	-1.5	-0.3
AGTRON colour, %	77	60
Starch damage, %	3.0	2.9
α-amylase activity, units/g	1.5	1.0
Amylograph peak viscosity, BU	520	560
Maltose value, g/100 g	1.2	1.2
AWRC, %	63	65
Farinogram		
Absorption, %	54.3	53.4
Development time, min	1.25	1.0
Mixing tolerance index, BU	170	190
Stability, min	1.0	1.5
Alveogram		
Length, mm	94	108
P (height x 1.1), mm	23	19
W, x 10^{-4} joules	43	34
Cookie test		
Spread, mm	83.5	82.5
Ratio (spread/thickness)	8.9	8.9

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

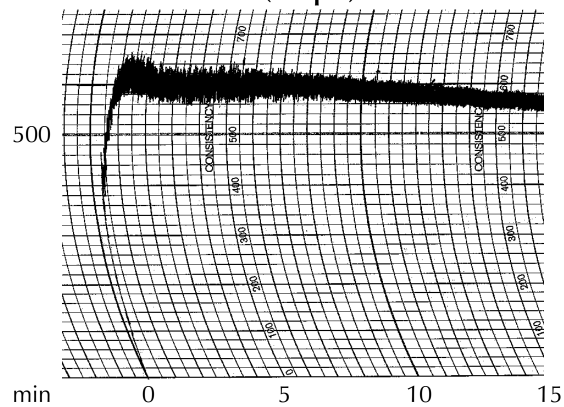
Figure 4 • Farinograms of 1999 crop composite samples

No. 1 Canada Western 13.5 Red Spring wheat

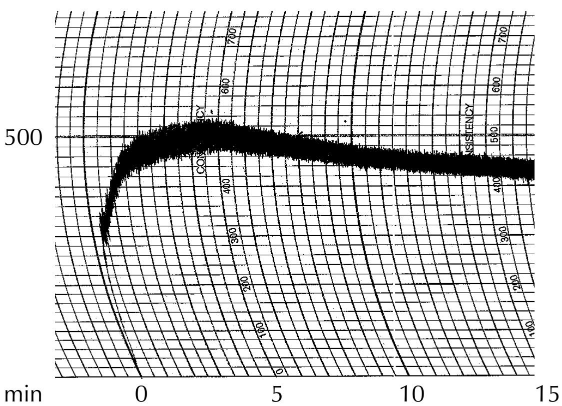


No. 1 Canada Western Extra Strong wheat

(90 rpm)



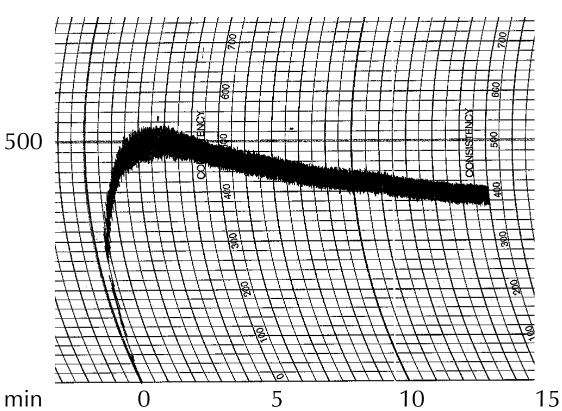
No. 1 Canada Prairie Spring Red wheat



No. 1 Canada Western Red Winter wheat

INSUFFICIENT SAMPLE SUBMITTED

No. 1 Canada Prairie Spring White wheat



No. 1 Canada Western Soft White Spring wheat

INSUFFICIENT SAMPLE SUBMITTED

Tables

Figures

Methods

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 (ICC): *ICC Standards: Standard Methods of the International Association for Cereal Chemistry*. 6th supplement, 1997
- Grade determinants and procedures are those used by Industry Services, Canadian Grain Commission (CGC).

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 1000 x *g* using a swinging bucket rotor.

Canadian short process baking test

The Canadian short process baking test, as described by Preston et al. (1982), *Canadian Institute of Food Science and Technology Journal* 15:29-36 is followed, using 150 ppm ascorbic acid as the oxidant. Loaves are produced from 200 g of flour in baking pans with cross-sectional dimensions similar to Canadian commercial baking pans. Loaf volume is reported on a 100-g flour basis. Mixing energy is measured in watt-hours per kilogram (W-h/kg).

Cookie test

The cookie test is performed according to AACC Method 10-50 D.

Dry gluten content–semolina

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 percentage.
- 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 0.5 min, between the point at which the top of the curve first intersects 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.
- No. 1 CWRS - 13.5 composites are milled to straight grade and patent flours using a tandem Bühler laboratory mill as described by Martin and Dexter (1991), *Association of Operative Millers - Bulletin* April:5855-5864 to allow direct comparison of the milling and baking properties of the current and previous year's crop.

Gluten index–semolina

Durum semolina gluten index is determined using AACC Standard Method 38-12, following the procedure for whole meal.

Grade colour

Flour grade colour 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

The percentage of hard vitreous kernels (HVK) is determined by examination of a sieved 25-g sample for the natural translucency associated with hardness. Kernels are classed as HVK or non-vitreous as defined in the Canadian Grain Commission's *Official Grain Grading Guide*, 1998, Chapter 4, Wheat

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

The moisture content of wheat is determined using the Model 919 moisture meter calibrated against the AACC method 44-15A subsection two-stage air-oven.

Protein content

Protein content (N x 5.7) of the composite samples is determined by Combustion Nitrogen Analysis (CNA). Samples are ground on a UDY cyclone sample mill fitted with a 1.0-mm screen. Sample size is 250 g and samples are not dried before analysis. Protein content is calculated from total nitrogen as determined on a LECO Model FP-428 Dumas CNA analyzer calibrated with EDTA and reported on a constant moisture basis. Moisture content is determined by the AACC Method No. 44-15A subsection one-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 min in a Ro-tap sieve shaker. The weight of throughs X 10 is recorded as the PSI.

Remix-to-peak

The remix-to-peak baking test is a modification of the remix baking test of Irvine and baking test 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.

SDS sedimentation

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

Durum semolina colour is determined using a Minolta Model CM-525i spectrophotometer and expressed as L*, which indicates lightness, a* which represents redness, and b* which represents yellowness. L*a*b* is referred to as the CIELAB colour space. Differences in particle size have a significant effect on colour readings. Semolina samples with similar particle size distributions are used for comparability.

Semolina yield

Durum wheat is milled on a four stand Allis-Chalmers laboratory 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-µm sieve. Milling yield, the combination of semolina and flour, and semolina yield are reported as a percentage of the cleaned wheat on a constant moisture basis.

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 using a computer controlled laboratory-scale dryer (AFREM, Lyon, France).

Spaghetti colour

Spaghetti colour is determined using a Minolta Model CM-525i spectrophotometer and expressed as L* which indicates lightness, a* which represents redness, and b* which represents yellowness. L*a*b* is referred to as the CIELAB colour space. For colour measurement, a 5-cm band of spaghetti strands is mounted on white cardboard using double sided tape.

Spaghetti cooking quality

Spaghetti cooking quality as measured by cooking quality parameter (CQP), is determined as described by Dexter and Matsuo (1977), *Canadian Journal of Plant Science* 57:717-727. Spaghetti firmness is determined using the TA.XT2 Texture Analyzer following AACC Method 16-50, with a crosswise cut through 10 strands of spaghetti cooked to optimum.

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-h 70% sponge system as described by Kilborn and Preston (1981), *Cereal Chemistry* 58:198-201. Ascorbic acid is used as the oxidant and is added at a level of 40 ppm for straight grade flour and 20 ppm for patent flour. 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 on a 100-g flour basis. Mixing energy is measured in watt-hours per kilogram (W-h/kg).

Starch damage

Starch damage is determined using AACC Method 76-31 Damaged Starch: Spectrophotometric Method. Starch damage is expressed 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 – export cargo

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 container. The grain in the container is poured into the pan of an approved electronic scale for weighing. The scale connects to a computer which calculates the test weight of the grain in kilograms per hectolitre (kg/hL) from grams weighed by the scale. If the computer interface is not available, test weight conversion charts are used.

Test weight – harvest survey	Test weight is determined using the Schopper chondrometer equipped with a one litre container. The weight in grams of the measured litre of wheat is divided by 10. The result is reported in kilograms per hectolitre (kg/hL) 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 80-µm metal sieves.
Wet gluten content – semolina	Semolina wet gluten content is determined using AACC Standard Method 38-12, following the procedure for whole meal. The method gives lower values compared to the ICC Standard Method No. 137/1 used prior to August 1, 1998.
Yellow pigment content	Yellow pigment content of durum wheat and semolina is determined using AACC Method 14-50.