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Quality of western Canadian wheat 2003

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Summary

Seeding was delayed in the western prairie region due to cool wet weather. After planting, germination and emergence was very good due, in part, to good soil moisture from fall and winter precipitation. Hot dry weather from mid-June to August caused drought stress reducing yield potential in most regions. Low rainfall across the southern Prairies in August and September resulted in ideal harvest conditions. Harvest was delayed in northern regions until mid-September due to cool rainy conditions. A very high proportion of the crop graded into the top milling grades.

Spring wheat production rebounded to near normal production levels and is estimated at 16 million tonnes by Statistics Canada, an increase of 6 million tonnes over last year. Durum wheat production is estimated at 4.2 million tonnes, slightly higher than the 3.9 million tonnes reported in 2002.

Overall protein content of Canada Western Red Spring wheat, at 14.1 %, is lower than last year. High grade Canada Western Red Spring wheat shows higher test weight, higher wheat falling number, superior flour colour, lower absorption and slightly stronger dough properties compared to last year. Overall protein content of Canada Western Amber Durum wheat is 13.6%, 0.3 % higher than last year. High grade Canada Western Amber Durum wheat shows much higher falling number, improved overall milling quality, increased semolina and spaghetti brightness and much improved semolina and spaghetti yellowness compared to last year.

Quality data is presented for Canada Prairie Spring Red wheat, Canada Western Red Winter wheat and Canada Western Soft White Spring wheat. Insufficient samples were available to analyze the quality of Canada Western Extra Strong and Canada Prairie Spring White wheat. Analysis was carried out on Canada Western Experimental Hard White wheat, a potential new Canadian wheat class.

Methodology used to obtain quality data is described in a separate report available on the CGC website at http://grainscanada.gc.ca/Quality/Methods/wheatmethods-e.htm.

Seven classes of Canadian wheat

This report presents information on the quality of the top grades of Canada Western Red Spring and Canada Western Amber Durum wheat for the 2003 crop. Information is also provided for Canada Western Experimental Hard White (CWXHW) wheat, a potential new Canadian wheat class, which was grown in commercial quantities in 2003, Canada Prairie Spring Red wheat, Canada Western Red Winter wheat and Canada Western Soft White Spring wheat. Insufficient samples were available to analyze the quality of Canada Western Extra Strong and Canada Prairie Spring White wheat. Methodology used to obtain quality data is described in a separate report available on the CGC website at http://grainscanada.gc.ca/Quality/Methods/wheatmethods-e.htm.

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.

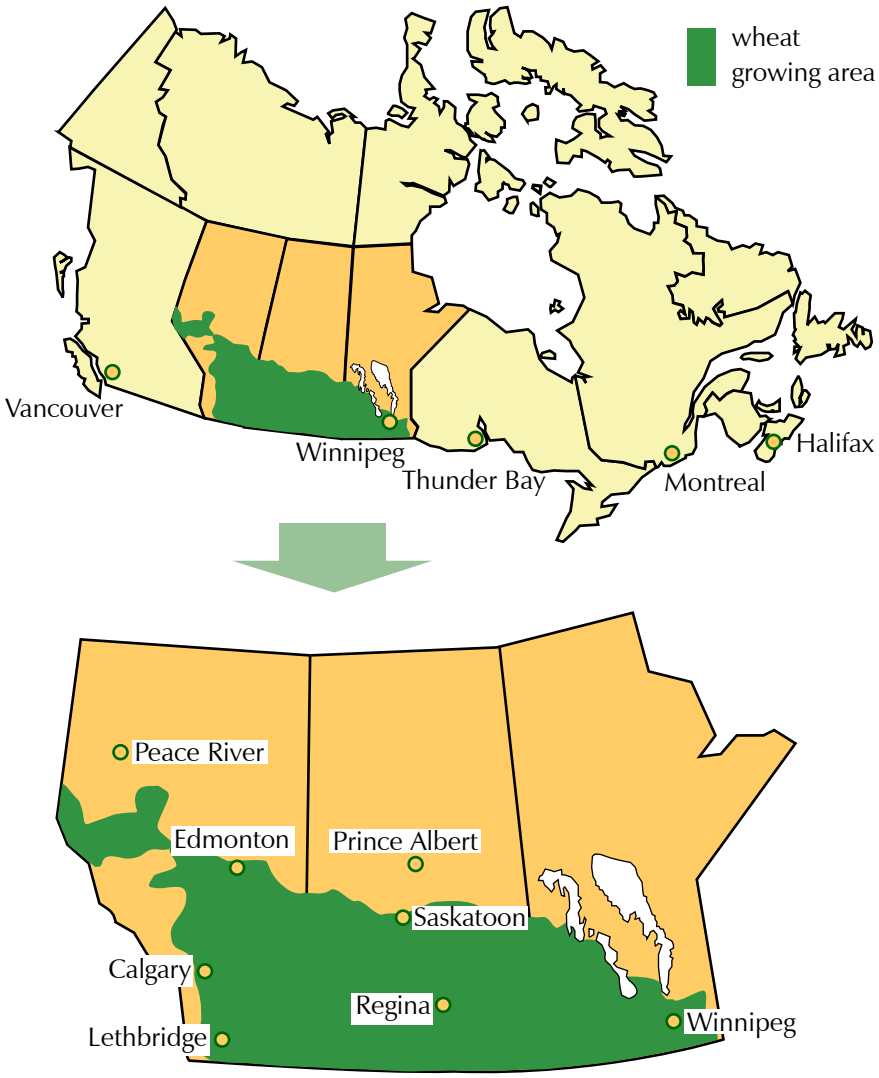
Canada Prairie Spring Red (CPSR) wheat is a medium-strength wheat suitable for the production of certain types of hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

Canada Western Red Winter (CWRW) wheat is a hard wheat with very good 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 suitable for the 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 representing over 5000 individual samples submitted by producers and primary elevator managers from the three prairie provinces. Figure 1 highlights the wheat producing regions 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 2003 production

Background for the 2003 crop

Background information for the 2003 crop was provided by the Canadian Wheat Board.

Seeding conditions

A combination of rain during the 2002 harvest season and normal to above normal winter precipitation greatly improved the soil moisture situation in Western Canada for the spring seeding season. Cool moist conditions throughout the month of April and into early May delayed seeding in Saskatchewan and Alberta. Temperatures recovered by May 15th and seeding advanced rapidly in the western Prairies. Manitoba and parts of eastern Saskatchewan did not experience the planting delays due to drier and warmer weather in the first half of May. This allowed farmers to plant most cereal and oilseed crops before the 15th of May. Germination and emergence of crops were very good, but some patches of severe frost in northern Saskatchewan and Alberta resulted in a need for reseeding of early planted crops.

Growing conditions

Hot dry conditions dominated the weather on the Prairies from mid-June to late August, resulting in wide spread crop stress, which reduced yield potential. The southern Prairies received less than 50 per cent of normal precipitation in July and August, while the northern areas received less than 75 per cent of normal precipitation. Timely rains in northern Alberta and northwestern Saskatchewan over the summer months helped maintain crop potential in this region.

The warm, dry weather during the summer months was ideal for grasshoppers and significant damage to the crop occurred throughout the prairie region. The environmental conditions did keep plant diseases in check, with leaf and head diseases reported at the lowest levels in a decade.

Crop development was boosted by the warmer than normal temperatures, with cereal crops reaching maturity by the end of July in the eastern Prairies. Cereal crops in western areas were not mature until the middle of August, while northern Alberta and the Peace River region were delayed until the end of the month.

Harvest conditions

The harvest began in the eastern Prairies during the first week of August and was underway in all areas except northern Alberta by the middle of the month. Rainfall during August and September was well below normal, which resulted in a rapid harvest pace. Over 80 per cent of the crop was harvested by the first week in September, with most of the unfinished harvest located in northern Alberta and Saskatchewan. Cool, rainy conditions in the northern areas slowed harvest in the middle of September, but the return of warm, dry conditions by the end of the month allowed harvest to proceed rapidly. The harvest was essentially complete by the first week of October, which is a dramatic improvement over the previous year when only two-thirds of the crop had been harvested by that time.

Production and grade information

Western Canada's wheat production rebounded back to near average levels in 2003 despite the severe growing conditions during the summer. Total wheat production for Western Canada is estimated at 21.1 million tonnes by Statistics Canada[1], with spring wheat production constituting 16 million tonnes of the total. Durum production increased slightly to 4.2 million tonnes, while red winter wheat increased to over 750,000 tonnes.

A very high proportion (over 90%) of the spring and durum wheat crop graded into the top milling grades due to the lack of disease and ideal harvesting conditions in almost all regions. The small proportion of lower grade CWRS resulted from a range of degrading factors including mildew, hard vitreous kernel content, green kernels, fusarium, ergot and frosted and/or heat stress. The small proportion of lower grade CWAD resulted primarily from wheat of other classes, hard vitreous kernel content and green and immature kernels. Tight grading tolerances for these factors ensure that the high inherent quality of the top milling grades of Canada Western Red Spring and Canada Western Amber Durum wheat are protected.

[1] Statistics Canada Field Crop Reporting Series Vol. 82, No. 8, Dec. 2003

Protein

Table 1 compares available mean protein values for each of the seven classes of western Canadian wheat surveyed in 2003 with corresponding values obtained in the 2002 and 2001 harvest surveys as of November 4, 2003. This year's value is also shown for Canada Western Experimental Hard White wheat (CWXHW). Canada Western Red Spring (CWRS) wheat shows a lower protein value compared to last year while Canada Western Amber Durum (CWAD) shows an increase of 0.3% relative to 2002. A large decrease in protein content relative to 2002, to a more normal level, is evident for the Canada Prairie Spring Red (CPSR) wheat class. Canada Western Red Winter (CWRW) wheat shows a small decrease in protein content over last year, while a slight increase is evident for Canada Western Soft White Spring (CWSWS) wheat. The protein content of CWXHW wheat is 13.6%, 0.5% lower than this year's value for CWRS wheat. Insufficient sample was available to assess the protein content of Canada Western Extra Strong (CWES) and Canada Prairie Spring White (CPSW) wheat accurately.

Table 1 - Mean protein content of milling grades of Western Canadian wheat classes, 2003, 2002 and 2001

	Protein content, %[1]		
Class	2003	2002	2001
CWRS	14.1	14.6	14.7
CWAD	13.6	13.3	14.1
CWES	N/A	N/A	13.4
CPSR	12.4	14.5	13.1
CWRW	11.2	11.5	11.1
CPSW	N/A	N/A	13.0
CWSWS	11.4	11.2	11.0
CWHXW	13.6	N/A	N/A

[1] Mean value, N x 5.7; 13.5% moisture content basis
N/A = not available

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 2003. Comparative values for western Canada by grade are shown for 2002 and for the previous 10 years (1993-2002). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of the 2003 CWRS wheat crop is 14.1%, a decrease of 0.5% from 2002 but 0.6% higher than the ten year mean. A decrease in protein content is evident with decreasing grade, ranging from 14.2% for the No. 1 grade to 13.5 % for the No. 3 grade. All three provinces show high protein content due, in large part, to drought conditions. Overall, very little difference in protein content is evident among provinces.

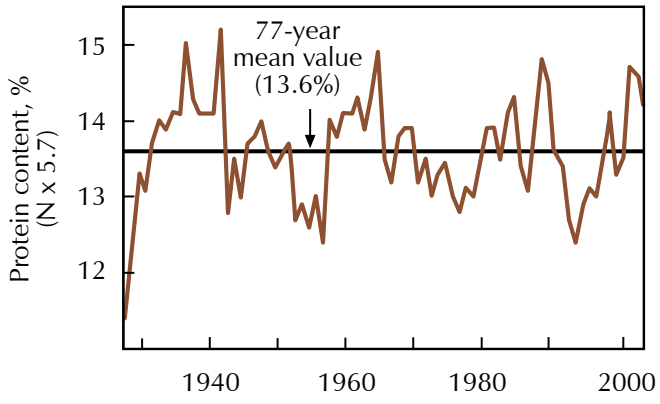
Preliminary results from the Canadian Wheat Board 2003 Variety Survey show that AC Barrie is the predominant variety in the CWRS class with 32% of the seeded acreage, down from 36% in 2002. Five varieties, including Prodigy, CDC Teal, AC Intrepid, McKenzie and AC Splendor, each account for 5-7% of the acreage.

Table 2 - Mean protein content of 2003 Canada Western Red Spring wheat, by grade, year and province

	Protein content, %[1]					
	Western Canada			2003		
Grade	2003	2002	1993-2002	Manitoba	Saskatchewan	Alberta
No. 1 CWRS	14.2	15.0	13.5	14.3	14.1	14.5
No. 2 CWRS	13.9	14.9	13.7	13.7	14.2	13.8
No. 3 CWRS	13.5	14.4	13.3	13.8	13.7	13.1
All milling grades	**14.1**	**14.6**	**13.5**	**14.2**	**14.1**	**14.3**

[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 2003



Milling and baking quality - Allis-Chalmers laboratory mill

To assess the quality of the 2003 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% and 13.5%. Results for the 12.5% composite are not reported due to the very small amount of wheat segregating into this protein level.

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, 1993-2002.

Test weight of the 2003 No. 1 grade 13.5% protein segregate is higher than last year and the long term average. Seed size is also higher than last year but lower than the long term average. Wheat ash is lower compared to both last year and the long term average. Warm dry harvest conditions over most of the prairie region, as well as a lack of disease, resulted in a very sound crop. This is reflected in the high wheat falling number and flour amylograph peak viscosity values, as well as the low levels of wheat and flour alpha-amylase activity.

Wheat particle size index and flour starch damage values indicate that kernel texture is somewhat softer relative to last year but harder than the long term average. Flour yield, when corrected for ash content, is comparable to last year and higher than the long term average. Flour grade and AGTRON colour values are superior to both last year and the long term average.

Farinograph absorption is about 2% lower than 2002 but very similar to the long term value. Farinograph and extensograph results indicate slightly stronger dough properties relative to last year. The stronger dough properties of the 2003 No. 1 grade composite are more evident when compared against the long term average. Canadian short process baking absorption is lower than last year and somewhat lower than the long term average, consistent with farinograph absorption results. Loaf volume is higher compared to 2002 and long term average values. During processing, the superior dough handling properties of this wheat class are clearly evident. Dough mixing time and energy requirements are similar to last year but greater than the long term average values.

No. 2 Canada Western Red Spring wheat

Quality data for the 2003 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 1993-2002, are shown in Table 4. Test weight and kernel weight values are comparable to last year while a decrease in wheat ash is evident. Both protein segregates show a high degree of soundness as evidenced by high falling number and flour amylograph peak viscosity values and low wheat and flour alpha-amylase activity.

Wheat particle size index and flour starch damage values indicate that kernel texture is somewhat softer relative to last year but harder than the long term average. Milling properties of the No. 2 grade 13.5% protein composite are comparable in extraction level and flour ash content and superior in terms of flour colour relative to last year and the long term average.

Farinograph absorption, dough strength properties and baking properties of the No. 2 grade composites are similar to this year's corresponding No.1 grade segregates and show the same trends as the higher grade relative to last year and the long term average values.

Table 3 - No. 1 Canada Western Red Spring wheat
Quality data for 2003 and 2002 harvest survey grade composite samples

	Minimum protein content		No. 1 CWRS 13.5	
Quality parameter[1]	14.5	13.5	2002	1993-02 mean
Wheat				
Test weight, kg/hL	82.2	82.4	81.2	81.4
Weight per 1000 kernels, g	31.6	31.3	30.8	31.9
Protein content, %	14.8	13.8	13.8	13.7
Protein content, % (dry matter basis)	17.1	16.0	15.9	15.9
Ash content, %	1.52	1.50	1.54	1.58
-amylase activity, units/g	2.5	2.5	8.5	5.3
Falling number, s	420	395	345	385
PSI,%	53	52	51	53
Milling				
Flour yield				
Clean wheat basis, %	75.4	75.7	74.9	75.5
0.50% ash basis, %	76.4	77.7	77.4	76.5
Flour				
Protein content, %	14.3	13.3	13.2	13.1
Wet gluten content, %	38.3	35.0	35.4	36.9[2]
Ash content, %	0.48	0.46	0.45	0.48
Grade colour, Satake units	-2.2	-2.2	-1.9	-1.6
AGTRON colour, %	76	79	76	72
Starch damage, %	7.8	8.1	8.5	7.4[3]
-amylase activity, units/g	0.5	0.5	3.0	1.4
Amylograph peak viscosity, BU	725	715	520	675
Maltose value, g/100g	2.4	2.6	2.7	2.3
Farinogram				
Absorption, %	66.3	65.7	67.5	65.7
Development time, min	6.50	5.75	6.00	5.25
Mixing tolerance index, BU	20	20	30	30
Stability, min	10.0	11.0	9.5	9.5
Extensogram				
Length, cm	22	21	21	22
Height at 5 cm, BU	345	365	370	303
Maximum height, BU	715	690	670	540
Area, cm^2	205	190	185	156
Alveogram				
Length, mm	127	105	121	120
P (height x 1.1), mm	124	124	130	111
W, x 10^{-4} joules	545	468	519	438
Baking (Canadian short process baking test)				
Absorption, %	71	69	72	70
Mixing energy, W-h/kg	14.1	13.7	13.8	10.7
Mixing time, min	10.6	9.9	9.8	8.3
Loaf volume, cm^3/100 g flour	1150	1110	1045	1087

[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 1996
[3] Mean of data generated starting in 1997

Table 4 - No. 2 Canada Western Red Spring wheat
Quality data for 2003 and 2002 harvest survey grade composite samples

	Minimum protein level		No. 2 CWRS 13.5	
Quality parameter[1]	14.5	13.5	2002	1993-02 mean
Wheat				
Test weight, kg/hL	80.8	80.8	80.7	80.0
Weight per 1000 kernels, g	32.3	34.6	31.7	31.9
Protein content, %	14.7	13.8	13.8	13.7
Protein content, % (dry matter basis)	17.0	16.0	15.9	15.9
Ash content, %	1.58	1.57	1.62	1.64
-amylase activity, units/g	3.5	5.0	6.0	8.3
Falling number, s	395	395	370	375
PSI, %	53	53	52	54
Milling				
Flour yield				
Clean wheat basis, %	75.4	75.4	75.6	75.4
0.50% ash basis, %	75.4	75.4	75.6	75.4
Flour				
Protein content, %	14.1	13.1	13.2	13.1
Wet gluten content, %	37.5	34.7	35.3	37.0[2]
Ash content, %	0.50	0.50	0.50	0.50
Grade colour, Satake units	-1.9	-2.1	-1.5	-1.3
AGTRON colour, %	73	76	71	70
Starch damage, %	7.3	7.6	8.5	7.1[3]
-amylase activity, units/g	1.0	1.0	1.5	2.5
Amylograph peak viscosity, BU	610	590	480	555
Maltose value, g/100g	2.2	2.5	2.8	2.3
Farinogram				
Absorption, %	66.1	65.9	67.3	65.5
Development time, min	6.50	5.75	6.25	5.00
Mixing tolerance index, BU	25	25	35	30
Stability, min	10.0	10.0	8.0	8.0
Extensogram				
Length, cm	23	24	21	22
Height at 5 cm, BU	330	305	335	285
Maximum height, BU	645	600	605	500
Area, cm^2	195	190	170	150
Alveogram				
Length, mm	137	134	109	123
P (height x 1.1), mm	110	128	133	106
W, x 10^{-4} joules	517	562	510	425
Baking (Canadian short process baking test)				
Absorption, %	70	70	71	70
Mixing energy, W-h/kg	16.0	12.3	15.0	11.6
Mixing time, min	10.5	9.1	10.2	8.7
Loaf volume, cm^3/100 g flour	1165	1115	1050	1075

[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 1996
[3] Mean of data generated starting in 1997

Comparative Buhler laboratory mill flour data

Samples of 2003 and stored 2002 harvest survey No. 1 CWRS 14.5 and 13.5 % minimum protein composites were milled consecutively on the same day on the tandem Buhler laboratory mill into 74% extraction straight grade and 60% and 45% extraction patent flours. Flour analytical and physical dough properties of the composites are shown in Table 5. Baking data using the straight grade and 45% patent flours are shown in Table 6 while noodle data using the straight grade and 60% patent flours are shown in Table 7a and Table 7b.

Straight grade and patent flours from the 2003 composites for both protein segregates show reduced wet gluten content, slightly lower starch damage values and higher amylograph peak viscosity values relative to the corresponding composite flours from last year. All flours from this year also show a higher degree of flour refinement compared to corresponding 2002 values as evidenced by slightly lower ash and brighter colour values.

Farinograph data show lower absorption and similar dough strength properties in this year's straight grade and patent flours compared to 2002. All patent flours show longer dough development times and stabilities relative to the corresponding straight grade flours.

This year's straight grade and 45% patent flours show a general trend to lower baking absorption relative to last year for both the sponge-and-dough and Canadian short process baking procedures. Longer mixing time and higher mixing energy requirements are clearly evident in this year's crop for the sponge-and-dough process. For the Canadian short process, no trend is evident for these parameters for the two years.

Yellow alkaline noodles prepared from the 2003 No. 1 13.5% protein segregate CWRS crop patent (60%) flour displayed desirable raw noodle brightness, L* values, similar to those of 2002 (Table 7b). Noodle redness, a*, or yellowness, b*, were comparable to the previous year. Alkaline noodles prepared from the straight grade flour exhibited improved brightness compared to 2002, reflecting the better flour colour and lower ash values. Noodle yellowness and redness remained similar to the previous year. Cooked noodle texture attributes of the 2003 13.5% patent and straight grade flours were found to be equivalent to those of the 2002 crop year samples.

Alkaline noodles prepared using No. 1 14.5% protein segregate patent flour were equivalent to last year's crop in terms of brightness and redness but offered improved yellowness, b* (Table 7a). Noodles derived from straight grade flour reflected this year's better flour colour characteristics as the noodles exhibited enhanced brightness and yellowness. Noodles prepared from either flour of the 2003 crop displayed similar texture characteristics relative to 2002 material.

White salted noodles prepared from this year 's No. 1 13.5% protein segregate 60% patent flour exhibited comparable colour characteristics to those of 2002 (Table 7b). Noodles prepared from the 2003 straight grade flour (74%) displayed similar colour characteristics to those of the previous year with improved brightness after 24 hrs. No significant differences were detected in the texture of the white salted noodles prepared from patent or straight grade flours between crop years.

Noodles made from No. 1 14.5% protein segregate patent flour displayed comparable brightness and redness to last year but with slightly higher b* values (Table 7a). Significant improvement in noodle brightness was observed in raw white salted noodles prepared using 2003 straight grade flour relative to those from the 2002 crop. Cooked noodles prepared from either of this year's flours were comparable in texture to those of the previous year.

Table 5 - No. 1 Canada Western Red Spring wheat - Analytical data and physical dough properties Comparative Buhler mill flour data - 2003 and 2002 harvest survey composites[1]

	14.5% protein segregate					
	74% Straight-grade		60% Patent		45% Patent	
Quality parameter[2]	2003	2002	2003	2002	2003	2002
Flour						
Yield, %	74.0	74.0	60.0	60.0	45.0	45.0
Protein content, %	14.1	14.2	13.9	13.7	13.3	13.2
Wet gluten content, %	37.2	38.7	37.6	38.4	35.3	36.1
Ash content, %	0.41	0.43	0.37	0.38	0.35	0.36
Grade colour, Satake units	-2.8	-2.0	-3.5	-3.2	-3.9	-3.5
AGTRON colour, %	84	78	90	86	95	91
Amylograph peak viscosity, BU	815	605	860	675	860	710
Starch damage, %	6.3	6.6	6.6	6.9	6.8	7.1
Farinogram						
Absorption, %	62.5	65.1	62.6	64.7	62.6	64.6
Development time, min	6.75	6.75	7.75	8.25	8.00	8.25
Mixing tolerance index, BU	20	20	10	20	5	5
Stability, min	11.5	12.0	22.0	25.0	25.0	28.0

	13.5% protein segregate					
	74% Straight-grade		60% Patent		45% Patent	
Quality parameter[2]	2003	2002	2003	2002	2003	2002
Flour						
Yield, %	74.0	74.0	60.0	60.0	45.0	45.0
Protein content, %	13.0	13.1	12.8	12.8	12.3	12.3
Wet gluten content, %	34.0	35.2	33.9	34.5	32.9	33.5
Ash content, %	0.40	0.43	0.36	0.38	0.35	0.36
Grade colour, Satake units	-3.2	-2.4	-3.9	-3.5	-4.2	-3.8
AGTRON colour, %	87	81	90	88	97	94
Amylograph peak viscosity, BU	810	595	850	655	865	695
Starch damage, %	6.3	6.7	6.5	6.9	6.9	7.3
Farinogram						
Absorption, %	62.1	64.0	61.9	63.1	62.0	63.3
Development time, min	6.25	6.25	6.75	7.25	9.00	7.50
Mixing tolerance index, BU	25	25	10	20	5	10
Stability, min	11.5	10.5	24.0	20.5	23.0	24.0

[1] The 2002 composite was stored and milled the same day as the 2003
[2] Data reported on 14.0% moisture basis

Table 6 - No. 1 Canada Western Red Spring wheat - Baking quality data
Comparative Buhler mill data - 2003 and 2002 harvest survey composites[1]

	14.5% protein segregate			
	74% Straight-grade		45% Patent	
Quality parameter[2]	2003	2002	2003	2002
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	66	67	65	67
Mixing energy dough stage, W-h/kg	9.6	8.6	11.4	9.5
Mixing time dough stage, min	8.8	7.3	11.1	9.2
Loaf volume, cm^3/100 g flour	1200	1155	1160	1105
Appearance	8.0	7.5	7.7	7.4
Crumb structure	5.9	6.0	6.0	6.0
Crumb color	7.9	7.9	8.2	8.1
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	69	71	69	69
Mixing energy, W-h/kg	14.3	15.0	14.8	14.0
Mixing time, min	10.4	10.8	11.5	10.1
Loaf volume, cm^3/100 g flour	1150	1155	1050	1090
Appearance	7.5	7.5	7.9	7.4
Crumb structure	6.3	6.0	6.3	6.3
Crumb color	8.0	8.0	8.0	7.9

	13.5% protein segregate			
	74% Straight-grade		45% Patent	
Quality parameter[2]	2003	2002	2003	2002
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	63	66	63	65
Mixing energy dough stage, W-h/kg	10.8	8.5	10.5	8.4
Mixing time dough stage, min	9.2	7.4	10.1	8.3
Loaf volume, cm^3/100 g flour	1115	1075	1060	1030
Appearance	7.7	7.5	7.4	7.7
Crumb structure	6.2	5.9	6.0	6.2
Crumb color	7.9	8.0	8.0	7.9
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	66	69	67	67
Mixing energy, W-h/kg	15.7	15.4	15.5	16.2
Mixing time, min	10.9	10.5	11.2	11.6
Loaf volume, cm^3/100 g flour	1110	1080	1095	1105
Appearance	7.5	7.8	7.8	7.4
Crumb structure	6.3	6.3	6.3	6.2
Crumb color	7.8	7.9	8.0	8.0

[1] The 2002 composite was stored and milled the same day as the 2003
[2] Data reported on 14.0% moisture basis

Table 7a - No. 1 Canada Western Red Spring wheat - Noodle quality data
Comparative Buhler mill data for the 2003 and 2002 harvest survey composite samples[1]

	14.5% protein segregate			
	74% Straight-grade		60% Patent	
Quality parameter	2003	2002	2003	2002
Fresh alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	79.2 (73.2)	78.1 (71.4)	80.5 (75.1)	80.3 (75.1)
Redness, a*	0.20 (0.41)	0.25 (0.71)	0.31 (0.32)	0.15 (0.28)
Yellowness, b*	28.9 (28.1)	27.3 (27.8)	28.1 (27.8)	27.0 (27.8)
Cooked colour				
Brightness, L*	70.7	68.5	70.3	69.7
Redness, a*	-2.10	-2.12	-2.08	-2.47
Yellowness, b*	26.3	25.6	26.5	26.1
Texture				
Thickness, mm	2.39	2.44	2.38	2.43
RTC, %	28.7	27.9	28.4	27.1
Recovery, %	33.7	33.0	34.2	32.3
MCS, g/mm^2	31.2	32.7	31.9	31.1
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.3 (75.4)	79.5 (73.5)	82.2 (77.3)	81.7 (76.0)
Redness, a*	2.90 (3.12)	2.90 (3.34)	2.70 (2.85)	2.54 (2.82)
Yellowness, b*	25.0 (23.9)	24.2 (23.1)	25.1 (25.0)	23.8 (24.2)
Cooked colour				
Brightness, L*	76.2	75.7	77.1	75.9
Redness, a*	-0.08	0.14	-0.14	-0.07
Yellowness, b*	17.7	16.8	17.7	17.2
Texture				
Thickness, mm	2.60	2.62	2.53	2.59
RTC, %	21.6	22.1	20.3	20.3
Recovery, %	24.7	26.0	24.4	25.1
MCS, g/mm^2	22.4	23.6	22.0	22.3

[1] The 2002 composites were stored and milled the same day as the respective 2003 composite and replicated the following day in reverse order.

Table 7b - No. 1 Canada Western Red Spring wheat - Noodle quality data
Comparative Buhler mill data for the 2003 and 2002 harvest survey composite samples[1]

	13.5% protein segregate			
	74% Straight-grade		60% Patent	
Quality parameter	2003	2002	2003	2002
Fresh alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.0 (74.3)	78.9 (73.0)	81.3 (76.1)	81.0 (76.2)
Redness, a*	0.18 (0.29)	0.29 (0.62)	0.16 (0.13)	0.15 (0.21)
Yellowness, b*	29.2 (28.7)	28.6 (28.8)	28.4 (28.1)	28.0 (28.4)
Cooked colour				
Brightness, L*	70.0	69.2	70.8	70.3
Redness, a*	-1.95	-2.20	-2.12	-2.39
Yellowness, b*	26.9	26.6	26.8	27.0
Texture				
Thickness, mm	2.37	2.36	2.37	2.36
RTC, %	26.6	26.4	27.1	26.1
Recovery, %	32.1	31.8	32.1	31.6
MCS, g/mm^2	27.7	29.1	27.9	27.5
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.5 (75.9)	81.3 (73.9)	82.6 (77.8)	82.3 (76.8)
Redness, a*	2.78 (3.11)	2.75 (3.24)	2.52 (2.74)	2.47 (2.69)
Yellowness, b*	25.1 (24.7)	23.7 (23.8)	25.0 (25.2)	24.4 (24.5)
Cooked colour				
Brightness, L*	76.2	75.6	76.6	76.1
Redness, a*	-0.08	-0.09	-0.31	-0.27
Yellowness, b*	17.7	17.0	17.8	17.3
Texture				
Thickness, mm	2.57	2.60	2.54	2.59
RTC, %	21.1	20.9	20.1	20.1
Recovery, %	24.9	25.3	24.1	24.9
MCS, g/mm^2	21.4	21.5	20.3	20.4

[1] The 2002 composites were stored and milled the same day as the respective 2003 composite and replicated the following day in reverse order.

Canada Western Experimental Hard White wheat

As noted in the description of classes of Canadian wheat on page 5, Canada Western Experimental Hard White (CWXHW) wheat is a potential new Canadian wheat class that was grown in commercial quantities in 2003. Data for this year's composite of the No. 1 grade 14.5, 13.5 and 12.5 protein segregates milled on the Allis-Chalmers laboratory mill are shown in Table 8. Data for tandem Buhler laboratory milled straight grade and 60% and 45% patent flours from the 13.5% protein segregate are shown in Table 9-11.

Allis-Chalmers laboratory mill results

Test weight, 1000 kernel weight and hardness (PSI and starch damage) values for the No. 1 grade CWXHW composites are comparable to those normally obtained for top grade CWRS wheat. All three protein segregates showed a high degree of soundness (high wheat falling number, high flour amylograph peak viscosity and low wheat and flour alpha amylase activity), consistent with the warm dry harvest conditions and lack of disease. Allis-Chalmers milled straight grade flours gave yields over 75% with low flour ash content and very good grade and AGTRON colour values.

Physical dough tests show strong yet extensible dough properties, comparable to top grade CWRS wheat flour. Farinograph absorptions for the three CWXHW composites range from 65.3 to 66.1% while dough development times range from 5.0 to 7.0 min. Canadian short process baking test showed high dough water absorption and high loaf volumes for all protein segregates.

Buhler laboratory mill results

The CWXHW Buhler flours show increased protein, wet gluten and ash content with increasing flour extraction rate (Table 9). All flours show very good flour colour values with the brightest values evident in the patent flours. Flour amylograph peak viscosity values are high for all flours. Farinograph absorption values are similar for all three flour extraction rates. Farinograph dough development time and stability increase with decreasing extraction rate.

Both the straight grade and patent flours show very good baking quality using both the sponge-and-dough and Canadian short process baking procedures (Table 10).

Yellow alkaline noodles prepared from the 2003 No. 1 13.5% protein CXHWW patent flour displayed good raw noodle colour characteristics initially (2 hrs), and after aging for 24hrs (Table 11). Noodles prepared using the straight grade flour also exhibited desirable noodle colour characteristics. Cooked alkaline noodles prepared from either flour exhibited excellent texture properties.

White salted noodles prepared with either CXHWW patent or straight grade flours yielded noodles with desirable colour characteristics (Table 11). Cooked salted noodles, from either patent or straight grade flours, displayed good textural properties associated with high quality hard wheat.

Table 8 - No. 1 Canada Western Experimental Hard White wheat
Quality data for 2003 harvest survey grade composite samples

	Minimum protein content		
Quality parameter[1]	14.5	13.5	12.5
Wheat			
Test weight, kg/hL	81.5	82.2	82.3
Weight per 1000 kernels, g	29.9	31.3	30.3
Protein content, %	14.8	13.7	12.7
Protein content, % (dry matter basis)	17.1	15.8	14.7
Ash content, %	1.50	1.45	1.47
-amylase activity, units/g	1.5	1.0	1.0
Falling number, s	430	425	420
PSI,%	52	51	51
Milling			
Flour yield			
Clean wheat basis, %	75.2	75.4	74.9
0.50% ash basis, %	77.2	77.4	76.4
Flour			
Protein content, %	14.1	13.1	12.1
Wet gluten content, %	37.4	33.6	30.1
Ash content, %	0.46	0.46	0.47
Grade colour, Satake units	-2.7	-2.9	-3.1
AGTRON colour, %	81	83	85
Starch damage, %	7.3	8.1	8.5
-amylase activity, units/g	0.5	0.5	0.5
Amylograph peak viscosity, BU	1110	1075	1075
Maltose value, g/100g	2.4	2.7	2.8
Farinogram			
Absorption, %	66.1	66.1	65.3
Development time, min	7.00	5.75	5.00
Mixing tolerance index, BU	25	30	25
Stability, min	8.0	8.0	7.5
Extensogram			
Length, cm	20	20	20
Height at 5 cm, BU	355	310	320
Maximum height, BU	655	580	580
Area, cm^2	175	155	155
Alveogram			
Length, mm	113	107	85
P (height x 1.1), mm	130	143	141
W, x 10^{-4} joules	533	556	445
Baking (Canadian short process baking test)			
Absorption, %	70	70	69
Mixing energy, W-h/kg	20.9	16.3	15.0
Mixing time, min	14.8	12.7	12.6
Loaf volume, cm^3/100 g flour	1120	1115	1040

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

Table 9 - No. 1 Canada Western Experimental Hard White wheat
Analytical data and physical dough properties
Buhler mill flour data - 2003 harvest survey composite[1]

	13.5% Protein segregate		
	74% Straight-grade	60% Patent	45% Patent
Quality parameter[2]	2003	2003	2003
Flour			
Yield, %	74.0	60.0	45.0
Protein content, %	13.2	12.8	12.6
Wet gluten content, %	34.4	33.4	33.0
Ash content, %	0.38	0.33	0.33
Grade colour, Satake units	-3.4	-4.0	-4.4
AGTRON colour, %	91	96	98
Amylograph peak viscosity, BU	1060	935	1220
Starch damage, %	6.3	6.4	6.5
Farinogram			
Absorption, %	62.0	62.3	62.2
Development time, min	6.75	7.75	8.50
Mixing tolerance index, BU	30	10	10
Stability, min	9.5	17.0	19.0

[1] This is the first year of extensive testing for this wheat. No sample was available from 2002 for comparison milling
[2] Data reported on 14.0% moisture basis

Table 10 - No. 1 Canada Western Experimental Hard White wheat - Baking quality data
Buhler mill flour data - 2003 harvest survey composite[1]

	13.5% Protein segregate	
	74% Straight-grade	45% Patent
Quality parameter[2]	2003	2003
Sponge-and-dough baking test (40 ppm ascorbic acid) (20 ppm ascorbic acid)		
Absorption, %	64	64
Mixing energy dough stage, W-h/kg	11.1	11.6
Mixing time dough stage, min	11.6	13.5
Loaf volume, cm^3/100 g flour	1090	1135
Appearance	7.3	7.6
Crumb structure	6.2	6.0
Crumb color	7.9	8.1
Canadian short process baking test (150 ppm ascorbic acid) (150 ppm ascorbic acid)		
Absorption, %	66	68
Mixing energy, W-h/kg	18.6	15.6
Mixing time, min	13.5	13.1
Loaf volume, cm^3/100 g flour	1130	1115
Appearance	7.5	7.4
Crumb structure	6.2	6.2
Crumb color	8.0	8.0

[1] This is the first year of extensive testing for this wheat. No sample was available from 2002 for comparison milling
[2] Data reported on 14.0% moisture basis

Table 11 - No. 1 Canada Western Experimental Hard White Wheat - Noodle quality data
Buhler mill flour data - 2003 harvest survey composite samples[1]

	13.5% protein segregate	
	74% Straight-grade	60% Patent
Quality parameter	2003	2003
Fresh alkaline noodles		
Raw colour at 2 hrs (24 hrs)		
Brightness, L*	81.1 (76.0)	81.9 (77.2)
Redness, a*	-0.11 (0.06)	0.06 (0.14)
Yellowness, b*	28.8 (28.8)	28.5 (28.5)
Cooked colour		
Brightness, L*	71.0	71.2
Redness, a*	-2.78	-2.83
Yellowness, b*	27.8	27.7
Texture		
Thickness, mm	2.29	2.27
RTC, %	27.2	26.8
Recovery, %	33.8	34.1
MCS, g/mm^2	30.0	30.7
Fresh white salted noodles		
Raw colour at 2 hrs (24 hrs)		
Brightness, L*	81.7 (76.5)	82.8 (78.2)
Redness, a*	2.45 (2.82)	2.25 (2.38)
Yellowness, b*	24.1 (23.6)	23.6 (23.7)
Cooked colour		
Brightness, L*	76.6	77.0
Redness, a*	-0.34	-0.47
Yellowness, b*	16.9	17.1
Texture		
Thickness, mm	2.47	2.48
RTC, %	20.3	19.9
Recovery, %	26.2	26.8
MCS, g/mm^2	21.7	22.6

[1] This is the first year of extensive testing for this wheat. No sample was available from 2002 for comparison milling.

Canada Western Amber Durum wheat

Protein and variety survey

Table 12 lists the mean protein content values for Canada Western Amber Durum (CWAD) wheat by grade. Comparative values by grade are shown for 2002 and for the previous 10 years (1993-2002). Figure 3 shows the variation in annual mean protein content since 1963.

The average protein content of the 2003 durum crop is 13.6%, which is 0.3% higher than 2002 and 1.2 % above the 10 year mean. Protein content for No. 1 decreased by 0.6% while No. 2 CWAD was comparable to 2002. Annual mean protein content values since 1963 (Figure 3) show that this quality factor is highly variable, mostly in response to environmental conditions.

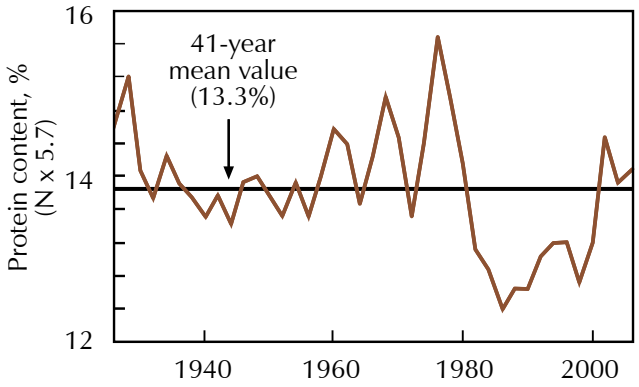
Preliminary Canadian Wheat Board 2003 variety survey information shows that Kyle remains the most popular variety grown on the prairies at 49% of acreage, a drop of 3% from 2002. AC Avonlea has increased from 26% in 2002 to 31% in 2003 while AC Morse represents about 9% and AC Navigator remained at 5% of acreage seeded. Electrophoretic analysis of grade composites confirmed the increasing popularity of AC Avonlea.

Table 12 - Mean protein content of 2003 Canada Western Amber Durum wheat, by grade and year

	Protein content, %[1]		
Grade	2003	2002	1993-2002
No. 1 CWAD	13.7	14.3	12.9
No. 2 CWAD	13.5	13.4	12.3
No. 3 CWAD	13.7	13.2	12.2
All milling grades	**13.6**	**13.3**	**12.4**

[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 2003



Wheat and pasta processing quality

Data describing the quality characteristics for composite samples of No. 1 and No. 2 CWAD for the 2003 crop are shown in Table 13. Corresponding data for 2002 composites and mean values for the previous ten years (1993-2002) are provided for comparison. Physical characteristics of both No. 1 and No. 2 CWAD of the 2003 crop show an increase in test weight and vitreous kernel counts compared to last year. Falling numbers in the wheat and semolina of these grades are higher than 2002 values, indicative of a very sound crop resulting from excellent growing and harvest conditions. Grading factors in the 2003 crop which resulted in downgrading include wheat of other classes, hard vitreous kernel count and green and immature kernels.

Wet gluten content decreased about 2% from 2002 for the top two grades which is a reflection of lower total protein content, particularly for No. 1 CWAD. SDS sedimentation volumes are higher than in 2002, which is indicative of an increase in gluten strength. Gluten index values, however, are similar to those of 2002 and alveograph P values decreased representative of slightly weaker gluten properties. The extensibility of the gluten increased as compared to 2002. The decrease in P and increase in L resulted in lower P/L ratios but similar W values when compared to 2002. As has been noted in previous reports, environmental conditions appear to be differentially influencing strength parameters such as SDS sedimentation, gluten index and alveograph P/L. These results further confirm the need to use more than one method to evaluate gluten strength.

Semolina milling yield decreased slightly from last year for No 1 CWAD but no significant change was evident for No. 2 CWAD. Total milling yield is lower than in 2002 but comparable to the 10-year mean. Wheat ash is much lower in the 2003 top grade composites compared to 2002. Semolina ash shows a substantial decrease (0.05%) from last year for No. 1 CWAD but little change is evident for the No. 2 grade. AGTRON colour is about 10% higher this year than last for both No. 1 and No. 2 CWAD. Taking all of these results into consideration, the 2003 crop exhibits excellent milling quality.

Wheat and semolina yellow pigment values show a substantial increase from last year, exhibiting values over 1 ppm higher. Similarly, pigment values are higher than the long-term averages for both No. 1 and 2 CWAD. The increase in pigment content for 2003 resulted in substantially increased b* values in both semolina and dried spaghetti. Brightness of semolina and pasta is higher for the 2003 crop as indicated by increased L* values. These results illustrate the significant impact of environment on the colour characteristics of both semolina and pasta.

Cooking quality for No. 1 CWAD, as indicated by firmness (peak force) values is slightly lower than last year. This result is attributable to a slightly lower semolina protein content. Although firmness of No. 2 CWAD is also slightly lower than in 2002, the values are comparable within the variation of the testing procedure.

Table 13 - No. 1 and No. 2 Canada Western Amber Durum wheat
Quality data for 2003 and 2002 harvest survey grade composite samples

	No. 1 CWAD			No. 2 CWAD		
Quality parameter[1]	2003	2002	1993-02 mean	2003	2002	1993-02 mean
Wheat						
Test weight, kg/hL	82.3	81.8	82.3	81.5	80.6	82.0
Weight per 1000 kernels, g	40.0	44.4	42.5	40.3	43.4	42.6
Vitreous kernels, %	90	85	88	84	76	78
Protein content, %	13.6	14.2	12.8	13.5	13.4	12.3
Protein content, % (dry matter basis)	15.7	16.4	14.9	15.6	15.5	14.3
SDS sedimentation, mL	43	33	36	42	29	33
Ash content, %	1.48	1.60	1.56	1.54	1.65	1.62
Yellow pigment content, ppm	9.1	7.8	8.4	8.8	7.7	8.3
Falling number, s	420	330	405	400	280	375
Milling yield, %	74.1	75.8	74.4	74.0	75.9	74.5
Semolina yield, %	65.4	66.3	66.1	66.0	66.4	65.7
PSI, %	37	38	38[2]	38	38	38[2]
Semolina						
Protein content, %	12.5	13.1	11.8	12.4	12.1	11.3
Wet gluten content, %	32.4	34.8	32.3[2]	31.3	33.0	30.8[2]
Dry gluten content, %	11.6	12.1	11.7[2]	10.5	11.5	11.4[2]
Gluten index, %[4]	21	26	28[3]	37	30	26[3]
Ash content, %	0.62	0.67	0.65	0.66	0.67	0.66
Yellow pigment content, ppm	8.7	7.5	7.8	8.4	7.1	7.6
AGTRON colour, %	86	76	80	83	76	79
Minolta colour:						
Brightness, L*	87.8	87.3	88.0[3]	87.4	87.4	87.9[3]
Redness, a*	-2.8	-3.0	-3.1[3]	-2.8	-2.9	-3.2[3]
Yellowness, b*	34.2	31.6	33.0[3]	33.6	30.1	32.4[3]
Speck count per 50 cm[2]	18	30	25	22	38	30
Falling number, s	530	370	480	490	355	450
Alveogram						
Length, mm	106	81	86[3]	108	81	87[3]
P (height x 1.1), mm	47	61	49[3]	45	59	47[3]
P/L	0.4	0.8	0.6[3]	0.4	0.7	0.5[3]
W, x 10^{-4} joules	122	131	113[3]	117	125	105[3]
Spaghetti						
Dried at 70°C						
Minolta colour:						
Brightness, L*	77.8	75.6	78.3[3]	77.2	75.3	78.0[3]
Redness, a*	2.5	2.9	2.0[3]	2.7	3.5	2.2[3]
Yellowness, b*	68.6	60.8	66.6[3]	67.7	60.5	67.4[3]
Firmness, g-cm	1012	1086	929[4]	930	983	879[4]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.
[2] Mean of data generated starting in 1995
[3] Mean of data generated starting in 1997
[4] Mean of data generated starting in 1998

Canada Prairie Spring Red wheat

The mean protein content for CPSR wheat for 2003 and the previous two years is shown in Table 1. The mean protein content of the 2003 crop is estimated at 12.4%. This value is much lower than last year but higher than the long term (1993-2002) average of 11.7%.

Table 14 summarizes quality data for the No. 1 CPSR new crop composite. The five year average data for the No. 1 grade from the 1998-2002 crop are given for comparative purposes. Test weight is similar while kernel weight is lower than the five year average. High wheat falling number and flour amylograph peak viscosity values, as well as low wheat and flour -amylase activities, indicate a high degree of soundness in this year's crop. Kernel texture is comparable to the five year average as shown by similar wheat PSI and flour starch damage values.

This year's crop shows similar milling yield, somewhat higher flour ash but superior flour colour relative to the five year average. Physical dough tests indicate slightly stronger dough strength properties compared to the five year average. This year's crop also shows improved remix-to-peak loaf volume that is likely related to the higher protein content.

Canadian Wheat Board Variety Survey results indicate that AC Crystal is the leading variety at 65% of the acreage followed by AC Foremost at 15% and AC Taber at 13%.

Table 14 - No. 1 Canada Prairie Spring Red wheat
Quality data for 2003 harvest survey grade composite sample

Quality parameter[1]	2003	1998-2002 Mean[2]
Wheat		
Test weight, kg/hL	81.4	81.1
Weight per 1000 kernels, g	38.3	40.5
Protein content, %	12.5	12.5
Protein content, % (dry matter basis)	14.5	14.5
Ash content, %	1.46	1.51
-amylase activity, units/g	2.0	5.2
Falling number, s	380	360
Flour yield, %	75.0	74.9
PSI, %	57	56
Flour		
Protein content, %	12.0	11.7
Wet gluten content, %	28.6	31.0
Ash content, %	0.48	0.46
Grade colour, Satake units	-2.3	-1.5
AGTRON colour, %	77	69
Starch damage, %	6.7	6.3
-amylase activity, units/g	0.5	1.9
Amylograph peak viscosity, BU	795	593
Maltose value, g/100g	2.0	2.0
Farinogram		
Absorption, %	61.8	62.1
Development time, min	7.25	5.90
Mixing tolerance index, BU	30	41
Stability, min	10.5	7.8
Extensogram		
Length, cm	21	21
Height at 5 cm, BU	395	330
Maximum height, BU	790	631
Area, cm^2	220	177
Alveogram		
Length, mm	139	132
P (height x 1.1), mm	93	89
W, x 10^{-4} joules	438	371
Baking (Remix-to-peak baking test)		
Absorption, %	62	62
Remix time, min	2.9	2.4
Loaf volume, cm^3	840	789

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Five year average values included for comparison purposes since there was an insufficient number of samples received in 2002 harvest to provide accurate data.

Canada Western Red Winter wheat

Table 1 shows the mean protein content for CWRW wheat for 2003 and the previous two years. The mean protein content of the 2003 crop is estimated at 11.2%, 0.3% lower than last year.

Table 15 summarizes quality data for the No. 1 CWRW new crop composite. Data from the 2002 harvest are not available for comparison. High test weight is evident in the 2003 crop. 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 -amylase activities. The CWRW composite shows hard kernel texture based on the PSI value and the related flour starch damage value.

Good milling quality is evident from the high flour yield, low flour ash content and bright flour colour value. Physical dough tests demonstrate the medium-strong dough characteristics of this wheat class. Good loaf volume for the protein content is evident with the remix-to-peak baking procedure.

The Canadian Wheat Board Variety Survey identifies CDC Falcon as the predominant variety at 34% of the acreage followed by CDC Clair at 26% and CDC Osprey at 10%.

Table 15 - No. 1 Canada Western Red Winter wheat
Quality data for 2003 harvest survey grade composite sample

Quality parameter[1]	2003
Wheat	
Test weight, kg/hL	81.8
Weight per 1000 kernels, g	31.6
Protein content, %	11.8
Protein content, % (dry matter basis)	13.6
Ash content, %	1.40
-amylase activity, units/g	2.0
Falling number, s	410
Flour yield, %	75.1
PSI, %	56
Flour	
Protein content, %	11.0
Wet gluten content, %	28.1
Ash content, %	0.47
Grade colour, Satake units	-1.5
AGTRON colour, %	72
Starch damage, %	6.6
-amylase activity, units/g	0.5
Amylograph peak viscosity, BU	700
Maltose value, g/100g	2.1
Farinogram	
Absorption, %	59.4
Development time, min	4.50
Mixing tolerance index, BU	45
Stability, min	6.0
Extensogram	
Length, cm	21
Height at 5 cm, BU	265
Maximum height, BU	425
Area, cm^2	125
Alveogram	
Length, mm	144
P (height x 1.1), mm	74
W, x 10^{-4} joules	307
Baking (Remix-to-peak baking test)	
Absorption, %	57
Remix time, min	2.6
Loaf volume, cm^3	780

[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

Table 1 shows the mean protein content for CWSWS wheat for 2003 and the previous two years. The mean protein content of the 2003 crop is estimated at 11.4%, 0.2% higher than last year.

Table 16 summarizes quality data for the No. 1 CWSWS new crop composite. Data from the 2002 harvest are not available for comparison. Good test weight is evident in this year's crop. 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 -amylase activities. Kernel texture and flour starch damage are consistent with values expected for this wheat class.

Milling properties are within the range normally expected for this wheat class. Dough strength properties are somewhat stronger than normally expected resulting in a reduced cookie ratio relative to results obtained from previous crops.

The Canadian Wheat Board Variety Survey identifies AC Andrew as the predominant CWSWS variety this year with 41% of the acreage. AC Reed (38%), AC Nanda (11%) and AC Phil (8%) account for most of the remainder.

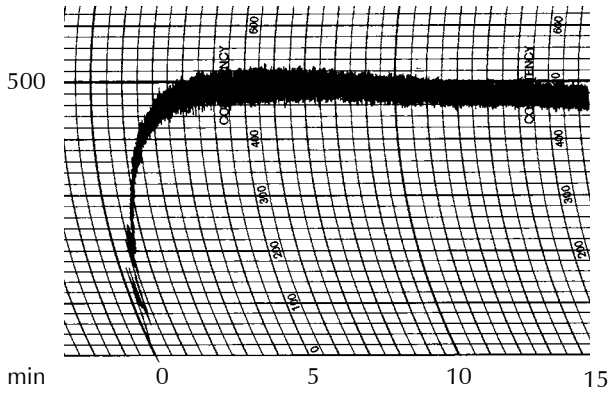
Table 16 - No. 1 Canada Western Soft White Spring wheat
Quality data for 2003 harvest survey grade composite sample

Quality parameter[1]	2003
Wheat	
Test weight, kg/hL	80.3
Weight per 1000 kernels, g	32.2
Protein content, %	11.5
Protein content, % (dry matter basis)	13.3
Ash content, %	1.59
-amylase activity, units/g	3.5
Falling number, s	365
Flour yield, %	75.2
PSI, %	76
Flour	
Protein content, %	10.4
Wet gluten content, %	29.7
Ash content, %	0.56
Grade colour, Satake units	-0.8
AGTRON colour, %	68
Starch damage, %	3.3
-amylase activity, units/g	1.0
Amylograph peak viscosity, BU	430
Maltose value, g/100g	1.2
AWRC, %	66.0
Farinogram	
Absorption, %	54.7
Development time, min	1.75
Mixing tolerance index, BU	180
Stability, min	1.5
Alveogram	
Length, mm	121
P (height x 1.1), mm	25
W, x 10^{-4} joules	54
Cookie test	
Spread, mm	82.2
Ratio (spread/thickness)	8.6

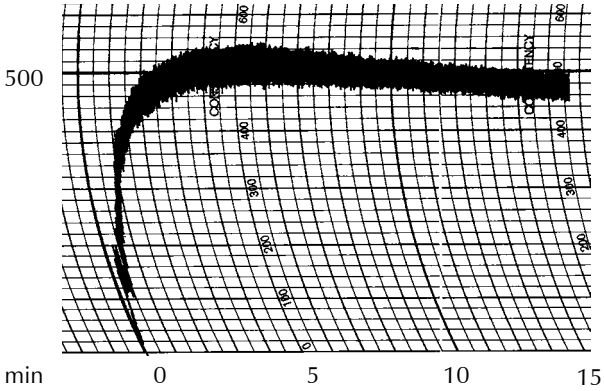
[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Farinograms
2003 crop composite samples

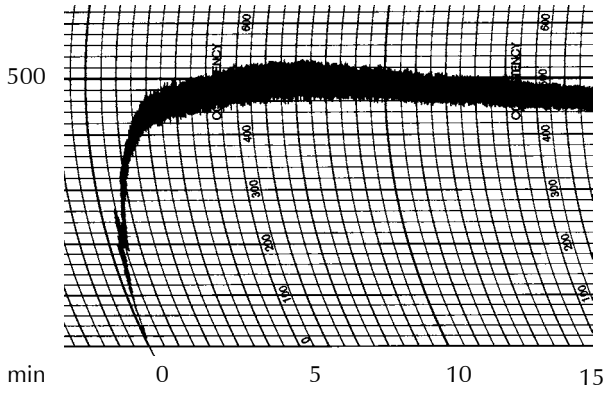
No. 1 Canada Western Red Spring wheat - 13.5



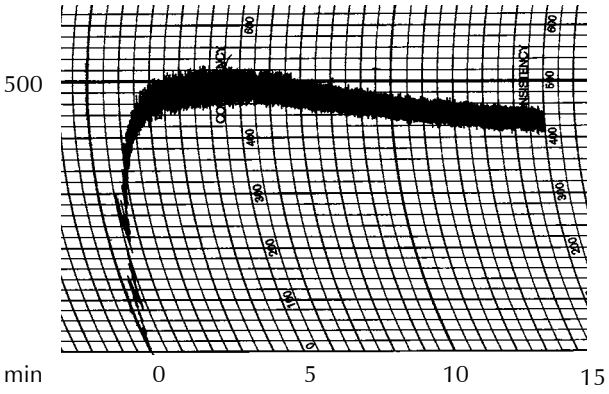
No. 2 Canada Western Red Spring wheat - 13.5



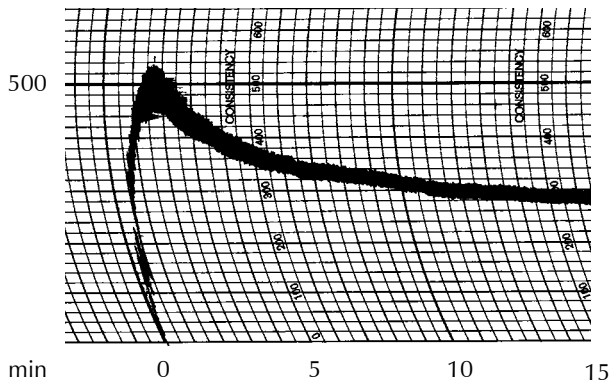
No. 1 Canada Prairie Spring Red wheat



No. 1 Canada Western Red Winter wheat



No. 1 Canada Western Soft White Spring wheat



No. 1 Canada Western Experimental Hard White wheat