Canadian Grain Commission   Commission canadienne des grains

Quality of western Canadian wheat 2000

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Canada

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Summary

Early seeding was followed by cooler conditions in May and June and heavy rainfall and normal temperatures in July over much of the region. In southern Alberta, drought persisted throughout most of the growing season. Early harvesting occurred in much of Manitoba and southern Alberta. However, harvesting in other regions was delayed by below normal temperatures and high rainfall during most of September. The predominant grading factors in red spring wheat include frost and green immature kernels, fusarium damage, mildew, bleached kernels and some sprouting. In durum wheat, predominent grading factors are low vitreous kernel content, midge damage, smudge, mildew and fusarium. Spring and durum wheat production are estimated at 18.2 and 5.5 million tonnes, respectively. High grade Canada Western Red Spring (CWRS) wheat shows milling quality and dough strength properties comparable to 1999, but reduced water absorption potential is evident. Canada Western Amber Durum (CWAD) wheat shows higher protein content and superior colour relative to 1999.

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Acknowledgments

The CGC 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 Weather and Crop Surveillance department of the Canadian Wheat Board for providing the review of the 2000 growing season.
- And CGC staff—Industry Services grain inspectors for grading the harvest survey samples and Grain Research Laboratory staff for conducting the analyses and preparing the report.

Seven classes of Canadian wheat

This report presents final information on the quality of the 2000 crop of the seven classes of western Canadian wheat listed below.

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.

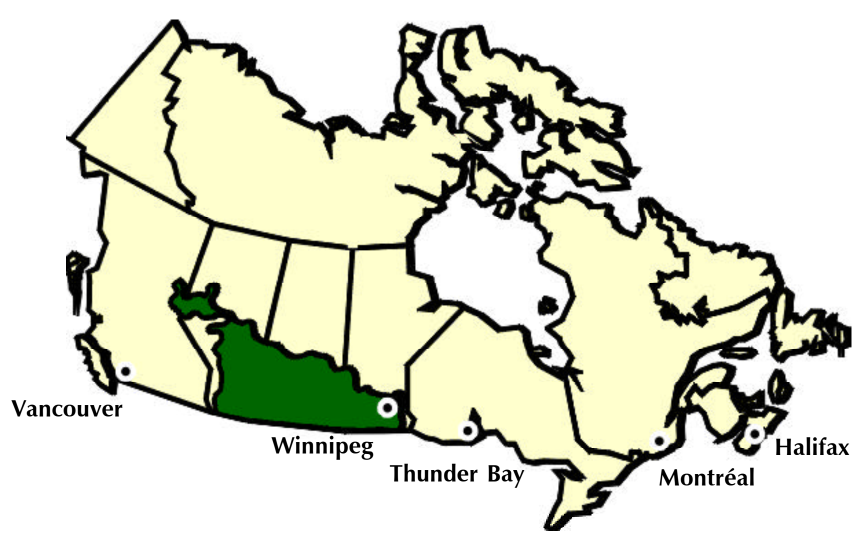
Canada Prairie Spring Red (CPSR) wheat is a medium-strength wheat suitable for the production of certain types of hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

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

About the 2000 harvest survey data

Data presented in this report were generated from quality tests carried out on composites representing over 10,000 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 2000 production

Background for the 2000 crop

The following information on seeding, growing and harvest conditions for the 2000 crop was provided by the Canadian Wheat Board (CWB).

Seeding

Seeding on the Prairies in 2000 was completed in early June, and the average seeding date was approximately two weeks earlier than normal.

Early seeding was a welcome contrast to the delays experienced during seeding in 1999. Because of warmer than normal temperatures and dry conditions during April and the first half of May, seeding began early and was completed quickly, especially in Manitoba and Alberta. Close to half of the crop in Alberta and over three-quarters of the crop in Manitoba was in the ground by the second week of May. While seeding was slightly slower in Saskatchewan, it was nevertheless earlier than normal.

Soil moisture was significantly below normal in southern and eastern Alberta and western Saskatchewan due to a lack of precipitation during the fall and winter. Although parts of this area received precipitation in the second half of May, drought conditions persisted in southern Alberta and parts of western Saskatchewan throughout the growing season.

Growing conditions

Cooler temperatures during the second half of May and most of June slowed early crop development. Some of the benefits of early seeding were lost to slow growth during this period. Temperatures were 1–5°C below normal across the Prairies during the month of June. Cooler temperatures helped minimize crop stress in southern Alberta and western Saskatchewan.

Precipitation during June ranged from significantly above normal in the eastern Prairies to well below normal in southern Alberta. Dry regions of western Saskatchewan received rainfall during the month of June, considerably reducing the size of the area affected by drought. Remaining dry areas were concentrated in the west-central region of the province, where soil moisture levels only partially recovered.

Temperatures during July increased to near normal levels improving crop development. Frequent, heavy rainfall covered a good portion of the Prairies during July, with exceptional amounts reported in various locations in the eastern Prairies. While the cloudy weather that accompanied the rainfall slowed crop development slightly, crops were on average one week ahead of schedule by the end of the month. Rains during July caused concerns about disease development in crops, especially in the eastern growing areas. Southern Alberta, however, received only 3–7 mm of moisture during July. The dry weather combined with the warm temperatures caused significant stress to crops, eventually resulting in significantly lower than normal yields in the region. Scattered frosts during the middle of July in northeastern and east central Saskatchewan caused some damage to flowering oilseed and cereal crops.

Harvest conditions

The harvest began during the first two weeks in August in Manitoba and Alberta where crops were seeded early and matured quickly. Elsewhere in Alberta and southern Saskatchewan, most of the crops were not ready to harvest until the third week in September. Weather during September was poor for harvesting. Below normal temperatures, i.e., 1–2°C, and moderate to heavy rainfall persisted throughout the month. Particularly damaging was a heavy and widespread rainfall across the Prairies during the first weekend in September. Combined with damp conditions during the following weeks, it caused some cereal and oilseed crops to sprout. Severe frost during the third week in September caused some damage to crops in the Peace River region.

Production and grade information[1]

Statistics Canada production estimates for Western Canada are below last year's levels due to a return to average or slightly above average yields. Spring wheat yields are expected to reach slightly above average levels at 2.3 tonnes per hectare, while durum yields are forecast at 2.1 tonnes per hectare. Total wheat production for Western Canada is estimated at 24.1 million tonnes, a reduction of 0.2 million tonnes from 1999. Spring wheat production is estimated at 18.2 million tonnes (76% of total production) which represents a decrease of 1.8 million tonnes from last year. Durum production is estimated at 5.5 million tonnes compared to 4.0 million tonnes in 1999.

For red spring wheat, the generally wet growing season promoted the development of diseases including fusarium and mildew which hurt grades in the eastern Prairies. Freezing temperatures in the northern regions during September resulted in some frost and immaturity. The rainfall during September caused sprouting in some wheat growing regions. For durum wheat, which is grown primarily in the southern regions of Saskatchewan, low vitreous kernel content, midge damage, smudge, fusarium and sprouting are the major grading factors. Tight grading tolerances for these factors ensure that the high inherent quality of the top milling grades of Canada Western Red Spring (CWRS) and Canada Western Amber Durum (CWAD) wheat are protected.

[1] Source: Statistics Canada, *Field Crop Reporting Series, No. 7,* October 2, 2000

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 asked 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 a protein content and unofficial grade assigned to their samples by giving the bar-code identification.

For 2000 harvest survey data, the first cutoff date for No. 1 Canada Western Red Spring (CWRS) wheat composite preparation was September 28.

Protein

Table 1 compares mean protein values for each of the seven classes of western Canadian wheat surveyed in 2000 to corresponding values obtained in the 1998 and 1999 harvest surveys. Both of the major wheat classes, Canada Western Red Spring (CWRS) and Canada Western Amber Durum (CWAD), show increased protein content compared to 1999. For the other wheat classes, protein content is similar to last year.

Table 1 • Mean protein content of milling grades of western Canadian wheat classes, 2000, 1999 and 1998

	Protein content (%)[1]		
Class	2000	1999	1998
CWRS	13.6	13.3	14.1
CWAD	12.5	11.9	12.5
CWES	12.3	12.2	12.6
CPSR	11.2	11.2	11.9
CWRW	10.3	10.0	11.1
CPSW	11.4	10.9	11.7
CWSWS	10.9	10.7	10.9

[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 CWRS wheat by grade and province for 2000. Comparative values for western Canada by grade are shown for 1999 and for the previous 10 years (1990–1999). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of the 2000 CWRS wheat crop is 13.5%—up 0.2% from 1999 and the 10-year mean. Variation among the three milling grades is minimal. Manitoba continues to show the highest protein content with an average of 14.2% while Saskatchewan has an average of 13.4% and Alberta, 13.5%.

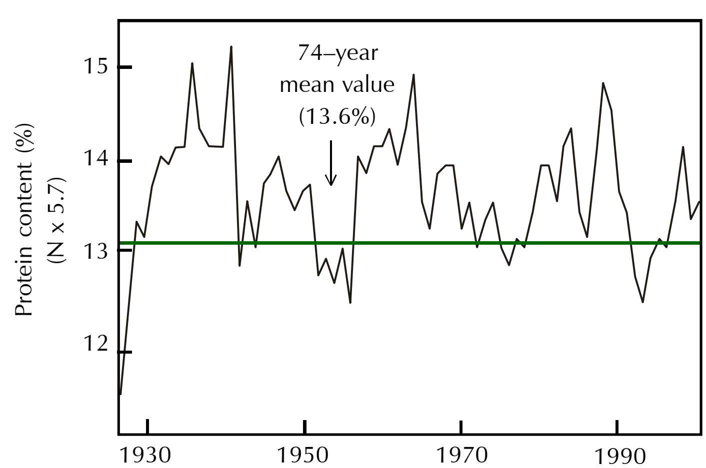
The Canadian Wheat Board Variety Survey shows that AC Barrie is the predominant variety in the CWRS class with 44% of the seeded acreage. CDC Teal is the second most widely grown variety at 13%.

Table 2 • Mean protein content of 2000 Canada Western Red Spring wheat, by grade, year and province

	Protein content (%)[1]					
	Western Canada			2000		
Grade	2000	1999	1990–99	Manitoba	Saskatchewan	Alberta
No. 1 CWRS	13.6	13.3	13.2	14.1	13.3	13.9
No. 2 CWRS	13.6	13.4	13.2	14.3	13.6	13.4
No. 3 CWRS	13.5	13.2	12.9	14.1	13.3	13.2
All milling grades	**13.6**	**13.3**	**13.2**	**14.2**	**13.4**	**13.5**

[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 2000



Milling and baking quality Allis-Chalmers laboratory mill

To assess the quality of the 2000 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 10-year average, 1990–99.

Test weight and seed size of the 2000 No. 1 grade protein segregates are lower than last year but similar to long-term averages. Wheat ash is similar to last year and to the long-term average. The high degree of soundness expected of No. 1 CWRS is evident from the high wheat falling number and flour amylograph peak viscosity values and the low wheat and flour alpha-amylase activities.

Wheat particle size index and flour starch damage values indicate that kernel texture is softer relative to last year. Flour yield and flour colour are similar to 1999 values while flour ash is slightly higher. Compared to long-term averages, this year's No. 1 grade composites show similar flour yield and flour ash content and superior flour colour.

Farinograph absorption is much lower than last year and lower than the long-term average. Lower starch damage this year is probably the major contributor to this decreased absorption. Farinograph and extensograph results indicate somewhat stronger dough properties relative to last year. Higher L and lower P alveograph values, indicating greater extensibility, may be related to lower flour absorption which can strongly influence alveogram shape. Canadian short process baking absorption is lower than last year, consistent with farinograph absorption results. Loaf volumes are comparable to 1999 values. During processing, dough shows similar mixing requirements and the superior handling properties characteristic of last year's crop.

No. 2 Canada Western Red Spring wheat

Table 4 shows quality data for the 2000 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the 10-year average, 1990–99.

Test weight and kernel weight are lower than last year but similar to the long-term average. 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 alpha-amylase activities.

Milling properties are comparable to last year. Rheological tests demonstrate dough strength properties similar to last year. Farinograph absorption is also similar to 1999. Canadian short process baking properties are comparable to last year.

Table 3 • No. 1 Canada Western Red Spring wheat
Quality data for 2000 harvest survey grade composite samples

Quality parameter[1]	Minimum protein content 14.5	13.5	12.5	No. 1 CWRS 13.5 1999	1990–99 Mean
Wheat					
Test weight, kg/hl	80.8	81.3	82.2	82.0	81.2
Weight per 1000 kernels, g	30.0	30.7	31.0	34.9	32.0
Protein content, %	14.8	13.8	12.8	13.7	13.7
Protein content, % (dry matter basis)	17.1	16.0	14.8	15.8	15.8
Ash content, %	1.52	1.56	1.62	1.58	1.56
Alpha-amylase activity, units/g	3.0	4.5	3.5	3.5	4.6
Falling number, s	380	375	390	385	395
PSI	56	54	53	53	52
Milling					
Flour yield					
Clean wheat basis, %	75.1	75.4	75.5	75.6	75.7
0.50% ash basis, %	77.6	76.4	77.0	77.6	76.2
Flour					
Protein content, %	14.3	13.3	12.2	13.0	13.1
Wet gluten content, %	38.8	35.1	32.0	36.4	35.9[2]
Ash content, %	0.45	0.48	0.47	0.46	0.48
Grade colour	-1.8	-1.9	-2.3	-2.0	-1.4
AGTRON colour, %	77	79	81	76	71[3]
Starch damage, %	6.2	6.4	6.7	7.3	6.8
Alpha-amylase activity, units/g	1.0	1.0	1.0	1.0	1.3
Amylograph peak viscosity, BU	720	730	770	725	690
Maltose value, g/100 g	2.0	2.2	2.3	2.4	2.2
Farinogram					
Absorption, %	64.1	63.5	62.5	66.4	65.6
Development time, min	6.25	5.75	4.50	5.25	5.0
Mixing tolerance index, BU	25	35	30	30	25
Stability, min	9.5	8.5	8.5	10.0	10.0
Extensogram					
Length, cm	23	22	22	21	22
Height at 5 cm, BU	325	345	320	305	288
Maximum height, BU	640	645	570	575	502
Area, cm^2	190	190	165	160	147
Alveogram					
Length, mm	155	137	115	104	121
P (height x 1.1), mm	91	93	98	128	107
W, x 10^{-4} joules	458	438	392	468	419
Baking (Canadian short process baking test)					
Absorption, %	68	67	67	70	70
Mixing energy, W–h/kg	16.0	13.1	12.5	13.8	8.7
Mixing time, min	11.7	10.1	10.2	9.4	7.7
Loaf volume, cm^3/100 g flour	1115	1080	1035	1100	1100

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Mean of data generated starting in 1996
[3] Mean of data generated starting in 1993

Table 4 • No. 2 Canada Western Red Spring wheat
Quality data for 2000 harvest survey grade composite samples

Quality parameter[1]	Minimum protein content 14.5	Minimum protein content 13.5	Minimum protein content 12.5	No. 2 CWRS 13.5 1999	No. 2 CWRS 13.5 1990–99 Mean
Wheat					
Test weight, kg/hl	79.4	80.1	80.4	81.8	79.6
Weight per 1000 kernels, g	31.1	31.9	31.6	33.7	31.9
Protein content, %	14.7	13.7	12.8	13.7	13.7
Protein content, % (dry matter basis)	17.0	15.8	14.8	15.8	15.8
Ash content, %	1.45	1.63	1.61	1.63	1.62
Alpha-amylase activity, units/g	7.0	7.0	9.0	5.5	9.3
Falling number, s	375	375	360	385	375
PSI	57	55	54	53	54
Milling					
Flour yield					
Clean wheat basis, %	75.3	75.2	75.2	75.4	75.4
0.50% ash basis, %	76.3	75.7	75.7	76.4	76.4
Flour					
Protein content, %	14.2	13.3	12.2	13.1	13.1
Wet gluten content, %	38.1	35.8	32.3	37.4	36.4[2]
Ash content, %	0.48	0.49	0.49	0.48	0.49
Grade colour	-1.2	-1.4	-1.7	-1.7	-1.1
AGTRON colour, %	72	75	78	73	69[3]
Starch damage, %	6.2	6.5	7.0	6.4	6.5
Alpha-amylase activity, units/g	3.0	3.5	4.0	2.0	2.7
Amylograph peak viscosity, BU	500	465	465	710	560
Maltose value, g/100 g	2.2	2.3	2.5	2.1	2.2
Farinogram					
Absorption, %	65.1	64.8	64.6	64.9	65.2
Development time, min	6.0	5.25	4.5	5.25	5.0
Mixing tolerance index, BU	30	35	30	30	30
Stability, min	8.0	8.0	7.5	8.0	9.0
Extensogram					
Length, cm	23	22	22	22	23
Height at 5 cm, BU	300	295	270	310	278
Maximum height, BU	580	565	495	555	474
Area, cm^2	175	165	145	165	146
Alveogram					
Length, mm	151	129	101	122	126
P (height x 1.1), mm	91	99	104	106	100
W, x 10^{-4} joules	448	425	370	425	403
Baking (Canadian short process baking test)					
Absorption, %	69	69	69	69	69
Mixing energy, W–h/kg	16.1	13.5	12.6	14.0	8.9
Mixing time, min	11.4	10.4	10.2	9.6	7.8
Loaf volume, cm^3/100 g flour	1105	1090	1055	1040	1090

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 1993

Comparative Buhler laboratory mill flour data

Samples of 2000 and stored 1999 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 2000 composite shows milling properties comparable to 1999. Starch damage values for both straight grade and patent flour are lower than last year. Farinograph data indicate lower absorption but little change in dough strength properties compared to last year. Reduced baking absorption is evident with both the Canadian short process and the sponge-and-dough procedures. Mixing time for both baking processes are somewhat longer than last year.

Table 5 • No. 1 Canada Western Red Spring wheat • 13.5% protein segregate
Comparative Buhler mill flour data • 2000 and 1999 harvest survey composites[1]

Quality parameter[2]	Straight grade 2000	Straight grade 1999	Patent 2000	Patent 1999
Flour				
Yield, %	75.7	76.1	45.0	45.0
Protein content, %	13.2	13.1	12.4	12.2
Wet gluten content, %	35.2	35.2	32.8	33.4
Ash content, %	0.44	0.44	0.34	0.34
Grade colour	-2.4	-2.1	-4.1	-3.9
AGTRON colour, %	81	80	98	96
Amylograph peak viscosity, BU	750	725	835	815
Starch damage, %	5.7	6.2	6.1	6.5
Farinogram				
Absorption, %	61.3	62.5	60.5	62.3
Development time, min	5.5	5.25	6.0	6.0
Mixing tolerance index, BU	35	35	15	15
Stability, min	9.5	9.0	17.5	17.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	63	65	62	64
Mixing: energy dough stage, W–h/kg	8.8	7.4	11.3	8.7
Mixing: time dough stage, min	8.2	7.3	10.8	9.0
Loaf volume, cm^3/100 g flour	1105	1120	1095	1100
Appearance	7.4	7.9	8.0	7.9
Crumb structure	5.9	5.8	5.9	6.0
Crumb colour	7.9	7.9	8.1	8.1
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	65	67	64	66
Mixing energy dough stage W–h/kg	14.7	13.6	14.3	12.9
Mixing time dough stage, min	10.9	10.0	10.8	9.5
Loaf volume, cm^3/100 g flour	1075	1055	1075	1025
Appearance	7.4	7.8	8.0	7.7
Crumb structure	6.3	6.2	6.0	6.3
Crumb colour	7.9	8.0	8.0	8.0

[1] The 1999 composite was stored and milled the same day as the 2000
[2] Data reported on 14.0% moisture basis

Canada Western Amber Durum wheat

Data describing the quality characteristics for composite samples of the top two grades of the 2000 CWAD wheat crop are shown in Table 7. Corresponding data for 1999 composites and mean values for the previous 10 years (1990–99) are provided for comparison.

Physical characteristics of the 2000 crop show a small decrease in test weight and kernel weight. Vitreous kernel counts are similar to last year. Falling numbers are high and comparable to 1999 values, indicating that sprout damage is not a factor in this year's top grades. The major grading factors in the 2000 crop year are starchy kernels, sprouting, midge damage, smudge, mildew and fusarium.

Protein content for No.1 CWAD shows a significant 1% improvement compared to 1999 while No. 2 CWAD exhibits an increase of 0.5% over last year. As expected, wet gluten values also increased from 1999. SDS sedimentation volume and gluten index values suggest that both grades have gluten strength similar to last year, but lower alveograph P and W values imply slightly weaker gluten strength properties.

Wheat ash values are substantially lower than in 1999 for No. 1 CWAD and about the same for No. 2 CWAD. Milling quality and semolina ash are comparable for the top two grades of this and last year's durum crop.

The 2000 durum crop exhibits superior yellow colour, in comparison to the 1999 crop, as indicated by much higher yellow pigment contents and Minolta b* values for both the semolina and spaghetti from the top two grades. Slightly lower lightness values (Minolta L*) are consistent with the higher protein content.

Cooking score for the No. 1 grade is superior to last year while the No. 2 grade shows a similar value to 1999. The higher cooking score for the No.1 CWAD reflects the increase in protein content

Kyle remains the most popular variety grown on the Prairies, representing 70% of the crop. AC Morse at 7%, is the second most widely grown variety. AC Avonlea, a newly released variety with improved colour and higher protein content than Kyle, represents 3% of the crop.

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

Grade	Protein content (%)[1] 2000	1999	1990–99
No. 1 CWAD	13.2	12.2	12.7
No. 2 CWAD	12.3	11.8	12.1
No. 3 CWAD	12.4	11.9	11.9
All milling grades	**12.5**	**11.9**	**12.2**

[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 2000

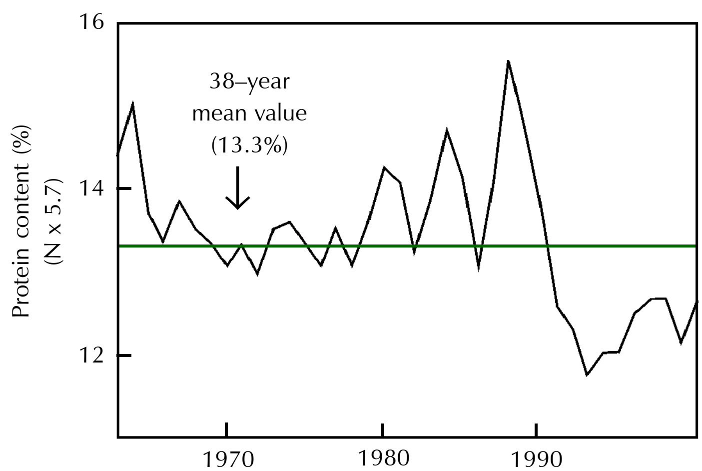


Table 7 • No. 1 and No. 2 Canada Western Amber Durum wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

	No. 1 CWAD			No. 2 CWAD		
Quality parameter[1]	2000	1999	1990-99 Mean	2000	1999	1990-99 Mean
Wheat						
Test weight, kg/hl	82.9	83.4	81.9	83.0	83.2	81.5
Weight per 1000 kernels, g	41.2	43.0	42.6	41.3	44.5	42.6
Hard vitreous kernels, %	93	93	87.8	78	82	78.6
Protein content, %	13.1	12.2	12.6	12.1	11.9	12.2
Protein content, % (dry matter basis)	15.1	14.1	14.6	14.0	13.8	14.1
SDS sedimentation, ml	41	40	36	36	35	33
Ash content, %	1.52	1.58	1.56	1.67	1.66	1.59
Yellow pigment content, ppm	8.6	7.9	8.4[2]	8.4	7.8	8.4[2]
Falling number, s	400	415	408	390	385	380
Milling yield, %	74.8	73.2	74.3	75.2	74.0	74.0
Semolina yield, %	66.2	65.8	65.5	66.0	65.9	64.8
PSI	38	37	37[3]	39	38	38[3]
Semolina						
Protein content, %	12.2	11.1	11.8	11.2	10.8	11.3
Wet gluten content, %	31.1	29.0	32.5[4]	28.9	28.0	31.1[4]
Dry gluten content, %	10.6	10.1	11.8[3]	10.7	10.0	11.9[3]
Gluten index, %	27	26	nd[4]	24	25	nd[4]
Ash content, %	0.64	0.65	0.65	0.65	0.66	0.66
Yellow pigment content, ppm	8.0	7.4	7.7[2]	7.6	7.2	7.5[2]
AGTRON colour, %	85	81	79	86	80	79
Minolta colour:						
L*	87.6	88.0	nd	87.3	87.7	nd
a*	-2.9	-2.9	nd	-3.0	-3.0	nd
b*	32.6	31.7	nd	31.7	30.7	nd
Speck count per 50 cm^2	24	20	27	27	26	32
Falling number, s	480	490	482[2]	455	450	449[2]
Alveogram						
Length, mm	80	79	nd	85	74	nd
P (height x 1.1), mm	43	52	nd	39	50	nd
P/L	0.6	0.7	nd	0.5	0.7	nd
W x 10^{-4} joules	98	114	nd	86	103	nd
Spaghetti						
Dried at 70°C						
Minolta colour:						
L*	77.7	79.9	nd	77.7	79.6	nd
a*	3.7	2.0	nd	3.5	2.5	nd
b*	66.8	65.1	nd	65.0	64.0	nd
Cooking quality, CQP	33	28	37	29	29	36

[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 1992
[3] Mean of data generated starting in 1995
[4] As of 1998, AACC Method 38-12 will be used to determine Wet gluten content and Gluten index
nd not determined

Canada Western Extra Strong wheat

Table 1 shows the mean protein content for CWES wheat for 2000 and the previous two years. The mean protein content of this year's crop is estimated at 12.2%, the same as last year.

Table 8 summarizes quality data for the 2000 No. 1 CWES grade composite. Data for 1999 are included for comparison. Test weight and kernel weight are lower compared to last year. Lower values for wheat falling number and flour amylograph peak viscosity, as well as higher levels of wheat and flour alpha-amylase activities are evident relative to 1999. Wheat PSI is the same as the 1999 value, indicating very similar kernel texture for both years. Flour starch damage is also very similar to last year.

Flour yield is similar while flour ash content is higher than last year. Flour colour is not as compared to last year. Physical dough tests indicate dough strength properties somewhat stronger than last year. Farinograph water absorption shows a decrease over the 1999 value. Remix-to-peak mixing time is longer while baking properties show increased loaf volume compared to last year.

Glenlea continues to be the predominant variety in this class. The Canadian Wheat Board Variety Survey shows that 50% of the CWES acreage was planted to Glenlea, with Bluesky (29%) and Laser (14%) accounting for most of the remainder.

Table 8 • No. 1 Canada Western Extra Strong wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

Quality parameter[1]	2000	1999
Test weight, kg/hl	78.5	81.3
Weight per 1000 kernels, g	36.6	42.1
Protein content, %	12.3	12.0
Protein content, % (dry matter basis)	14.2	13.9
Ash content, %	1.50	1.57
Alpha-amylase activity, units/g	15.5	10.5
Falling number, s	305	350
Flour yield, %	75.3	75.5
PSI	48	48
Protein content, %	11.7	11.2
Wet gluten content, %	27.4	27.4
Ash content, %	0.55	0.51
Grade colour	-0.8	-1.6
AGTRON colour, %	69	70
Starch damage, %	7.9	7.8
Alpha-amylase activity, units/g	7.5	3.5
Amylograph peak viscosity, BU	270	505
Maltose value, g/100 g	3.1	2.9
Absorption, %	61.9	62.9
Development time, min[2]	6.5	5.5
Length, cm	25	23
Height at 5 cm, BU	340	335
Maximum height, BU	635	625
Area, cm^2	215	200
Length, mm	108	77
P (height x 1.1), mm	109	121
W, x 10^{-4} joules	461	382
Absorption, %	64	64
Remix time, min	4.3	3.5
Loaf volume, cm^3/100 g flour	905	860

[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. Farinograph speed has been increased from 63 rpm to 90 rpm in order to achieve full development.

Canada Prairie Spring Red wheat

The mean protein content for CPSR wheat for 2000 and the previous two years is shown in Table 1. The mean protein content of the 2000 crop is estimated at 11.2%, the same value as last year.

Table 9 summarizes quality data for the No. 1 CPSR new crop composite. Data from 1999 are included for comparison. Test weight is lower 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 alpha-amylase activities. Kernel texture is slightly softer than last year as shown by higher wheat PSI, while flour starch damage is similar to the 1999 value.

Milling yield is higher than last year while flour is slightly inferior. Physical dough tests indicate slightly stronger dough strength properties compared to 1999. Farinograph absorption is about 1% lower than last year. Remix-to-peak baking properties are comparable to 1999 results.

Canadian Wheat Board Variety Survey results show that AC Crystal, at 40%, has replaced AC Taber (27%) as the predominant variety in the CPSR class. AC Foremost, at 20%, also represents significant acreage.

Table 9 • No. 1 Canada Prairie Spring Red wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

Quality parameter[1]	2000	1999
Wheat		
Test weight, kg/hl	80.1	81.6
Weight per 1000 kernels, g	39.8	39.6
Protein content, %	11.2	11.4
Protein content, % (dry matter basis)	12.9	13.2
Ash content, %	1.47	1.53
Alpha-amylase activity, units/g	7.5	6.5
Falling number, s	345	345
Flour yield, %	75.3	74.1
PSI	57	55
Flour		
Protein content, %	10.3	10.6
Wet gluten content, %	27.1	28.8
Ash content, %	0.47	0.46
Grade colour	-1.7	-2.2
AGTRON colour, %	74	74
Starch damage, %	5.8	5.9
Alpha-amylase activity, units/g	4.5	1.5
Amylograph peak viscosity, BU	400	675
Maltose value, g/100 g	2.0	2.0
Farinogram		
Absorption, %	59.7	60.6
Development time, min	5.0	4.75
Mixing tolerance index, BU	55	50
Stability, min	6.5	6.0
Extensogram		
Length, cm	21	21
Height at 5 cm, BU	295	285
Maximum height, BU	560	500
Area, cm^2	155	145
Alveogram		
Length, mm	139	138
P (height x 1.1), mm	69	80
W, x 10^{-4} joules	291	316
Baking (remix-to-peak baking test)		
Absorption, %	59	59
Remix time, min	2.2	2.0
Loaf volume, cm^3/100 g flour	750	730

[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

Table 1 shows the mean protein content for CWRW wheat for 2000 and the previous two years. The mean protein content of the 2000 crop is estimated at 10.3%, 0.3% higher than last year.

Table 10 summarizes quality data for the No. 1 CWRW new crop composite. Data from the 1999 harvest are not available for comparison. High test weight is evident in the 2000 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 alpha-amylase activities. The CWRW composite shows harder kernel texture based on the PSI value and the related flour starch damage value.

Good milling quality is evident from the higher flour yield, low flour ash content and brighter 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 Clair as the predominant variety at 55% while CDC Kestrel represents 35% of the acreage.

Table 10 • No. 1 Canada Western Red Winter wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

Quality parameter[1]	2000	1999
Wheat		
Test weight, kg/hl	82.3	INSUFFICIENT SAMPLE RECEIVED
Weight per 1000 kernels, g	30.8	
Protein content, %	11.4	
Protein content, % (dry matter basis)	13.2	
Ash content, %	1.40	
Alpha-amylase activity, units/g	4.5	
Falling number, s	375	
Flour yield, %	75.4	
PSI	58	
Flour		
Protein content, %	10.6	
Wet gluten content, %	26.6	
Ash content, %	0.43	
Grade colour	-1.6	
AGTRON colour, %	73	
Starch damage, %	5.4	
Alpha-amylase activity, units/g	2.0	
Amylograph peak viscosity, BU	615	
Maltose value, g/100 g	1.8	
Farinogram		
Absorption, %	58.4	
Development time, min	4.5	
Mixing tolerance index, BU	50	
Stability, min	6.0	
Extensogram		
Length, cm	22	
Height at 5 cm, BU	285	
Maximum height, BU	450	
Area, cm^2	125	
Alveogram		
Length, mm	119	
P (height x 1.1), mm	69	
W, x 10^{-4} joules	258	
Baking (remix-to-peak baking test)		
Absorption, %	57	
Remix time, min	2.4	
Loaf volume, cm^3/100 g flour	765	

[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

Table 1 shows the mean protein content for CPSW wheat for 2000 and the previous two years. The mean protein content of the 2000 crop is estimated at 11.4%, 0.5% higher than last year.

Table 11 summarizes quality data for the No. 1 CPSW new crop composite. Data from the 1999 harvest are included for comparison. Test weight is lower while kernel weight is higher than 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 alpha-amylase activities. Kernel texture is similar to last year as shown by comparable wheat PSI. Flour starch damage is also very similar to last year.

Milling yield is higher compared to last year, although flour ash and colour values are somewhat inferior. Physical dough tests indicate slightly stronger dough properties compared to last year, while farinograph absorption is comparable to 1999.

The Canadian Wheat Board Variety Survey identifies AC Karma as the predominant CPSW variety this year with 47% of the acreage. AC Vista (28%) and Genesis (25%) account for the remainder.

Table 11 • No. 1 Canada Prairie Spring White wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

Quality parameter[1]	2000	1999
Wheat		
Test weight, kg/hl	80.5	81.4
Weight per 1000 kernels, g	37.8	35.2
Protein content, %	11.3	10.9
Protein content, % (dry matter basis)	13.0	12.6
Ash content, %	1.48	1.63
Alpha-amylase activity, units/g	7.5	5.5
Falling number, s	380	400
Flour yield, %	76.2	74.4
PSI	57	57
Flour		
Protein content, %	10.3	9.9
Wet gluten content, %	28.4	27.9
Ash content, %	0.50	0.48
Grade colour	-1.9	-2.2
AGTRON colour, %	78	75
Starch damage, %	6.1	5.9
Alpha-amylase activity, units/g	2.5	2.0
Amylograph peak viscosity, BU	625	780
Maltose value, g/100 g	2.0	2.1
Farinogram		
Absorption, %	61.6	61.5
Development time, min	3.25	2.75
Mixing tolerance index, BU	70	65
Stability, min	4.0	3.0
Extensogram		
Length, cm	22	22
Height at 5 cm, BU	200	185
Maximum height, BU	270	240
Area, cm^2	85	80
Alveogram		
Length, mm	123	106
P (height x 1.1), mm	69	71
W, x 10^{-4} joules	211	197
Baking (remix-to-peak baking test)		
Absorption, %	58	58
Remix time, min	1.4	1.5
Loaf volume, cm^3/100 g flour	680	620

[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 2000 and the previous two years. The mean protein content of the 2000 crop is estimated at 10.9%, 0.2% higher than last year.

Table 12 summarizes quality data for the No. 1 CWSWS new crop composite. Data from the 1999 harvest are included for comparison. Test weight and kernel weight are 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 alpha-amylase activities. Kernel texture is somewhat softer compared to last year as shown by wheat PSI. Flour starch damage is comparable to last year.

Milling yield is higher compared to last year while flour ash and colour values are inferior. Physical dough tests indicate that dough properties are comparable to 1999. Farinograph absorption is slightly lower compared to 1999.

The Canadian Wheat Board Variety Survey identifies AC Reed as the predominant CWSWS variety this year with 62% of the acreage. AC Phil (14%) and AC Nanda (13%) account for most of the remainder.

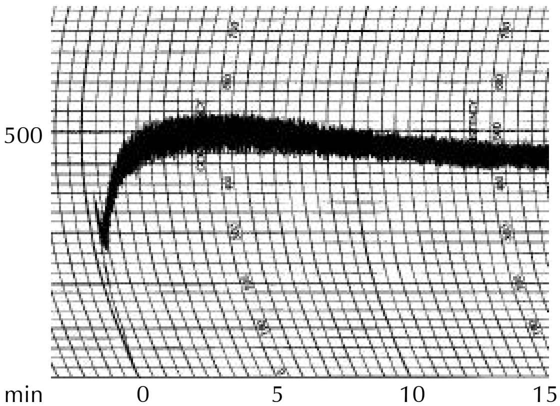
Table 12 • No. 1 Canada Western Soft White Spring wheat
Quality data for 2000 and 1999 harvest survey grade composite samples

Quality parameter[1]	2000	1999
Wheat		
Test weight, kg/hl	82.5	82.6
Weight per 1000 kernels, g	35.8	36.2
Protein content, %	10.6	10.4
Protein content, % (dry matter basis)	12.3	12.0
Ash content, %	1.46	1.49
Alpha-amylase activity, units/g	7.0	4.0
Falling number, s	340	350
Flour yield, %	76.8	75.5
PSI	69	67
Flour		
Protein content, %	9.6	9.5
Wet gluten content, %	24.8	26.7
Ash content, %	0.54	0.46
Grade colour	-0.6	-1.5
AGTRON colour, %	71	77
Starch damage, %	3.0	3.0
Alpha-amylase activity, units/g	3.0	1.5
Amylograph peak viscosity, BU	400	520
Maltose value, g/100 g	1.2	1.2
AWRC, %	62	63
Farinogram		
Absorption, %	53.9	54.3
Development time, min	1.25	1.25
Mixing tolerance index, BU	180	170
Stability, min	1.0	1.0
Alveogram		
Length, mm	96	94
P (height x 1.1), mm	21	23
W, x 10^{-4} joules	38	43
Cookie test		
Spread, mm	83.5	83.5
Ratio (spread/thickness)	9.5	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.

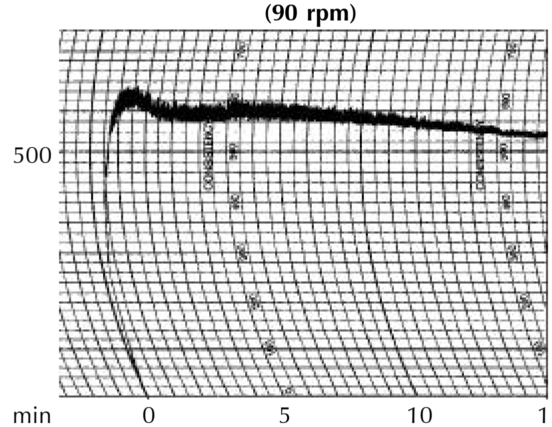
Figure 4 • Farinograms of 2000 crop composite samples

No. 1 Canada Western Red Spring wheat • 13.5

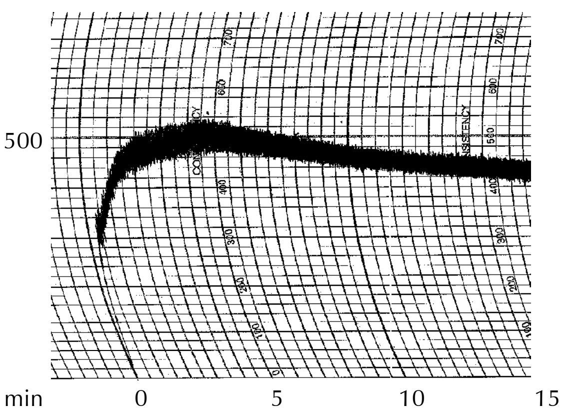


No. 1 Canada Western Extra Strong wheat

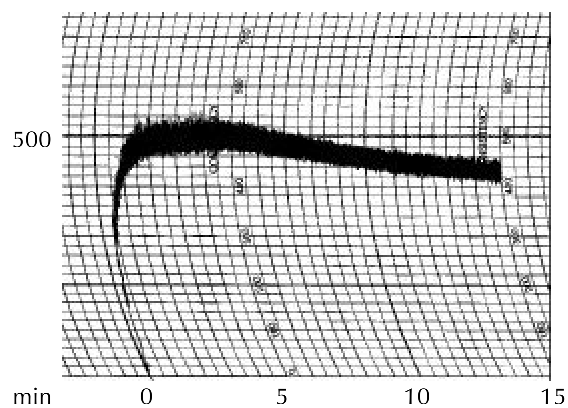
(90 rpm)



No. 1 Canada Prairie Spring Red wheat



No. 1 Canada Western Red Winter wheat



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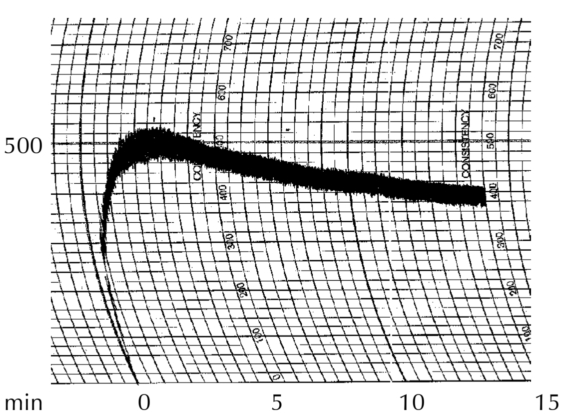
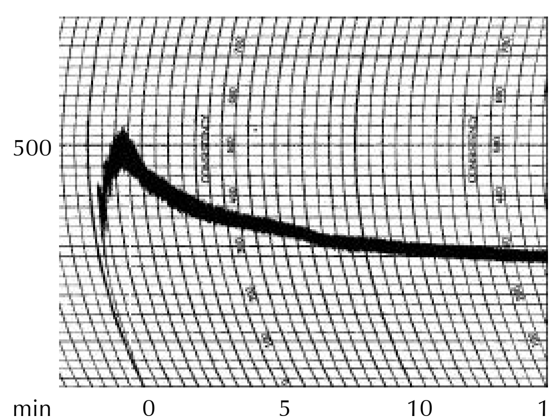


No. 1 Canada Western Soft White Spring wheat



Noodle evaluation

Canada Western Red Spring (CWRS)

No. 1 and No. 2 CWRS from the 2000 and 1999 crop composites, for both 13.5 and 12.5% protein segregates, were milled on the GRL Tandem Buhler mill to produce a patent flour (60% yield on a clean wheat basis) and a straight grade flour. Modifications to the mill resulted in improved flour colour from that reported in previous years. In order to allow direct comparison, composites from both years were milled under the new optimized conditions. Yellow alkaline noodles were prepared with a 1% *kansui* reagent (9:1 sodium and potassium carbonates) at a 32 % water absorption level. White salted noodles were prepared using a 1% sodium chloride solution at a 30% water absorption level in order to maintain proper dough crumb and sheeting characteristics. Data are shown in Tables 13–16.

Yellow alkaline noodles from the 2000 crop composite, for either patent (60%) or straight grade flours, were comparable in raw noodle colour at both 2 and 24 hours after production to that of 1999. Noodle brightness values reflect the optimized mill conditions over those reported in previous years. Cooked noodle colour was also comparable to last year in all samples. Comparable values for the textural attributes of the cooked noodles were found between both years. The slight reduction in noodle texture using flours at 12.5% protein versus 13.5% protein is consistent with the lower protein content.

The colour of white salted noodles prepared from the 2000 crop using either patent or straight grade flours was consistent with the 1999 composite in fresh raw (2 hr) or aged (24 hr). The cooked noodle colour displayed no discernible difference from the 1999 composite sample. Texture characteristics of the 2000 composite cooked noodles were consistent with those of the previous year.

Table 13 • No. 1 Canada Western Red Spring wheat • Fresh alkaline noodles
Comparative noodle quality data for the 2000 and 1999 harvest survey composite samples[1]

	Minimum protein content							
	13.5				12.5			
	60% patent		Straight grade		60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999	2000	1999	2000	1999
Flour								
Flour yield (clean basis), %	60.0	60.0	75.7	76.1	60.0	INSUFFICIENT SAMPLE RECEIVED	75.7	INSUFFICIENT SAMPLE RECEIVED
Protein content, %	12.6	12.6	13.2	13.1	11.6		12.1	
Wet gluten content, %	34.0	34.4	35.2	35.2	30.5		31.2	
Ash content, %	0.38	0.38	0.44	0.44	0.38		0.47	
Grade colour, K-J units	-3.8	-3.6	-2.4	-2.1	-3.9		-2.4	
AGTRON colour, %	93	95	81	80	95		83	
Starch damage, Megazyme %	6.1	6.7	5.7	6.2	6.5		6.1	
Alpha-amylase activity, units/g	0.5	0.5	4.5	3.5	0.5		3.5	
Amylograph peak viscosity, BU	805	805	750	725	795		750	
Farinogram								
Absorption, %	61.0	63.1	61.3	62.5	60.3		60.7	
Development time, min	5.75	5.75	5.50	5.25	4.25		4.50	
Mixing tolerance index, BU	15	20	35	35	20		30	
Stability, min	17.0	16.0	9.5	9.0	12.0		8.5	
Fresh alkaline noodles								
Raw colour at 2 hrs								
Brightness, L*	81.5	81.8	78.2	78.4	82.3		78.7	
Redness, a*	0.22	0.21	0.28	0.32	0.10		0.35	
Yellowness, b*	28.1	27.7	29.5	29.3	28.1		30.1	
Raw colour at 24 hrs								
Brightness, L*	76.3	77.2	71.6	72.2	77.7		72.5	
Redness, a*	0.46	0.43	0.86	0.84	0.32		0.92	
Yellowness, b*	28.2	28.8	28.5	29.0	28.7		29.4	
Cooked colour								
Brightness, L*	65.0	64.6	63.4	63.3	64.5		63.8	
Redness, a*	-1.52	-1.42	-1.13	-1.27	-1.44		-1.39	
Yellowness, b*	27.8	28.1	27.8	27.6	28.6		28.5	
Texture								
Thickness, mm	2.20	2.23	2.24	2.26	2.16		2.15	
RTC, %	31.6	32.2	31.9	32.8	30.2		31.4	
Recovery, %	34.2	34.9	32.7	33.5	32.2		32.0	
MCS, g/mm²	26.3	26.9	26.2	26.7	23.8		24.4	

[1] The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.
[2] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 14 • No. 1 Canada Western Red Spring wheat • Fresh white salted noodles
Comparative noodle quality data for the 2000 and 1999 harvest survey composite samples[1]

	Minimum protein content							
	13.5				12.5			
	60% patent		Straight grade		60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999	2000	1999	2000	1999
Flour								
Flour yield (clean basis), %	60.0	60.0	75.7	76.1	60.0	INSUFFICIENT SAMPLE RECEIVED	75.7	INSUFFICIENT SAMPLE RECEIVED
Protein content, %	12.6	12.6	13.2	13.1	11.6		12.1	
Wet gluten content, %	34.0	34.4	35.2	35.2	30.5		31.2	
Ash content, %	0.38	0.38	0.44	0.44	0.38		0.47	
Grade colour, K-J units	-3.8	-3.6	-2.4	-2.1	-3.9		-2.4	
AGTRON colour, %	93	95	81	80	95		83	
Starch damage, Megazyme %	6.1	6.7	5.7	6.2	6.5		6.1	
Alpha-amylase activity, units/g	0.5	0.5	4.5	3.5	0.5		3.5	
Amylograph peak viscosity, BU	805	805	750	725	795		750	
Farinogram								
Absorption, %	61.0	63.1	61.3	62.5	60.3		60.7	
Development time, min	5.75	5.75	5.50	5.25	4.25		4.50	
Mixing tolerance index, BU	15	20	35	35	20		30	
Stability, min	17.0	16.0	9.5	9.0	12.0		8.5	
Fresh white salted noodles								
Raw colour at 2 hrs								
Brightness, L*	82.5	82.7	79.5	79.7	82.9		81.0	
Redness, a*	2.49	2.41	3.05	3.02	2.26		2.81	
Yellowness, b*	25.0	24.3	25.8	25.6	25.0		25.2	
Raw colour at 24 hrs								
Brightness, L*	77.8	77.3	74.0	73.5	78.6		75.0	
Redness, a*	2.73	2.83	3.79	3.83	2.58		3.60	
Yellowness, b*	25.7	25.6	25.7	25.6	25.6		25.2	
Cooked colour								
Brightness, L*	76.3	76.6	75.9	75.8	76.3		75.8	
Redness, a*	-0.31	-0.26	0.19	0.25	-0.45		0.03	
Yellowness, b*	17.6	17.7	17.6	17.7	17.8		17.4	
Texture								
Thickness, mm	2.38	2.39	2.35	2.39	2.32		2.30	
RTC, %	27.6	29.4	28.2	29.3	27.3		28.0	
Recovery, %	25.2	27.3	25.8	27.4	24.9		26.6	
MCS, g/mm²	21.7	22.1	22.6	23.1	19.8		20.0	

[1] The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.
[2] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 15 • No. 2 Canada Western Red Spring wheat • Fresh alkaline noodles
Comparative noodle quality data for 2000 and 1999 harvest survey composite samples[1]

	Minimum protein content							
	13.5				12.5			
	60% patent		Straight grade		60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999	2000	1999	2000	1999
Flour								
Flour yield (clean basis), %	60.0	60.0	75.9	76.1	60.0	60.0	76.0	76.4
Protein content, %	12.6	12.6	13.1	13.1	11.7	11.7	12.1	12.1
Wet gluten content, %	34.1	34.0	35.0	35.5	31.4	31.2	32.1	32.3
Ash content, %	0.35	0.37	0.48	0.47	0.34	0.37	0.45	0.45
Grade colour, K-J units	-3.6	-3.4	-1.9	-2.1	-3.7	-3.3	-2.0	-2.1
AGTRON colour, %	90	93	78	80	92	90	79	79
Starch damage, Megazyme %	6.1	6.6	5.8	6.1	6.4	6.9	6.1	6.3
Alpha-amylase activity, units/g	3.0	1.5	7.0	5.5	3.0	1.5	9.0	5.0
Amylograph peak viscosity, BU	550	720	495	665	515	695	460	640
Farinogram								
Absorption, %	62.0	63.1	62.3	63.3	61.7	62.4	62.0	62.7
Development time, min	5.00	5.25	5.00	5.25	4.25	4.50	4.75	5.00
Mixing tolerance index, BU	25	20	40	35	25	25	35	35
Stability, min	11.50	13.00	8.50	8.50	8.50	10.00	7.50	8.00
Fresh alkaline noodles								
Raw colour at 2 hrs								
Brightness, L*	81.1	81.0	77.5	77.7	81.4	81.9	78.4	78.8
Redness, a*	0.29	0.29	0.41	0.48	0.20	0.06	0.26	0.20
Yellowness, b*	27.3	28.1	29.1	29.2	27.8	28.0	28.9	29.2
Raw colour at 24 hrs								
Brightness, L*	76.2	76.9	71.2	71.4	77.3	77.5	72.5	72.8
Redness, a*	0.59	0.52	1.14	1.14	0.40	0.32	0.98	0.89
Yellowness, b*	28.4	28.9	29.0	29.0	28.5	29.2	29.1	29.6
Cooked colour								
Brightness, L*	65.2	64.9	63.8	63.8	64.4	64.3	63.2	63.5
Redness, a*	-1.97	-1.79	-1.57	-1.54	-2.00	-1.88 -	1.65	-1.67
Yellowness, b*	28.0	28.0	27.6	27.4	27.9	27.9	27.9	27.9
Texture								
Thickness, mm	2.19	2.20	2.18	2.23	2.16	2.18	2.16	2.17
RTC, %	31.8	33.1	32.2	33.2	31.8	33.1	32.3	33.3
Recovery, %	32.8	33.6	32.9	33.5	32.0	34.0	32.2	33.8
MCS, g/mm^2	27.5	27.6	26.8	28.0	25.5	26.5	26.3	26.7

[1] The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.

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

Table 16 • No. 2 Canada Western Red Spring wheat • Fresh white salted noodles
Comparative noodle quality data for 2000 and 1999 harvest survey composite samples[1]

	Minimum protein content							
	13.5				12.5			
	60% patent		Straight grade		60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999	2000	1999	2000	1999
Flour								
Flour yield (clean basis), %	60.0	60.0	75.9	76.1	60.0	60.0	76.0	76.4
Protein content, %	12.6	12.6	13.1	13.1	11.7	11.7	12.1	12.1
Wet gluten content, %	34.1	34.0	35.0	35.5	31.4	31.2	32.1	32.3
Ash content, %	0.35	0.37	0.48	0.47	0.34	0.37	0.45	0.45
Grade colour, K-J units	-3.6	-3.4	-1.9	-2.1	-3.7	-3.3	-2.0	-2.1
AGTRON colour, %	90	93	78	80	92	90	79	79
Starch damage, Megazyme %	6.1	6.6	5.8	6.1	6.4	6.9	6.1	6.3
Alpha-amylase activity, units/g	3.0	1.5	7.0	5.5	3.0	1.5	9.0	5.0
Amylograph peak viscosity, BU	550	720	495	665	515	695	460	640
Farinogram								
Absorption, %	62.0	63.1	62.3	63.3	61.7	62.4	62.0	62.7
Development time, min	5.00	5.25	5.00	5.25	4.25	4.50	4.75	5.00
Mixing tolerance index, BU	25	20	40	35	25	25	35	35
Stability, min	11.50	13.00	8.50	8.50	8.50	10.00	7.50	8.00
Fresh white salted noodles								
Raw colour at 2 hrs								
Brightness, L*	82.2	82.5	80.0	79.9	83.2	83.1	80.9	81.1
Redness, a*	2.49	2.51	2.99	3.00	2.25	2.31	2.77	2.80
Yellowness, b*	24.8	25.1	25.0	25.5	24.3	24.7	24.4	25.2
Raw colour at 24 hrs								
Brightness, L*	77.2	77.6	73.9	74.1	78.4	78.1	74.2	74.3
Redness, a*	2.77	2.76	3.73	3.81	2.44	2.64	3.40	3.52
Yellowness, b*	25.5	25.6	24.6	25.6	24.7	25.3	23.9	24.7
Cooked colour								
Brightness, L*	76.5	76.5	75.5	75.4	76.4	76.3	75.4	76.1
Redness, a*	-0.18	-0.18	0.26	0.35	-0.32	-0.28	0.22	0.12
Yellowness, b*	17.6	17.7	17.1	17.7	17.5	17.8	17.3	17.5
Texture								
Thickness, mm	2.33	2.36	2.31	2.34	2.32	2.36	2.31	2.29
RTC, %	28.2	28.5	28.7	30.2	28.7	28.6	28.5	29.1
Recovery, %	26.1	25.9	26.4	27.5	26.4	26.9	26.5	27.1
MCS, g/mm^2	24.4	22.9	23.6	22.7	22.7	22.4	22.8	21.7

[1] The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.
[2] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Canada Praire Spring White (CPSW)

The protein content of the No. 1 CPSW 2000 crop was higher than 1999 resulting in the corresponding flours having approximately 0.5% greater protein content (Tables 17 and 18). Even with the higher protein content, both the yellow alkaline and white salted noodles displayed similar or slightly better noodle brightness compared to the 1999 crop. This was consistent with the improved flour colour observed in the patent flour from the 2000 crop.

Yellow alkaline noodles prepared from the 60% patent flour displayed improved textural attributes in 2000 due to the increased protein content. White salted noodles prepared with patent or straight grade flours exhibited texture values similar to 1999.

Table 17 • No. 1 Canada Prairie Spring White wheat • Fresh alkaline noodles
Comparative noodle quality data for 2000 and 1999 harvest survey composite samples[1]

	60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999
Flour				
Flour yield (clean basis), %	60	60	74.9	74.9
Protein content, %	9.9	9.4	10.3	9.9
Wet gluten content, %	26.9	26.3	27.7	26.8
Ash content, %	0.38	0.37	0.44	0.44
Grade colour, K-J units	-4.4	-4.0	-2.8	-2.7
AGTRON colour, %	98	97	85	85
Starch damage, Megazyme %	5.6	5.9	5.0	5.4
Alpha-amylase activity, units/g	1.5	1.0		
Amylograph peak viscosity, BU	800	870	730	820
Farinogram				
Absorption, %	59.1	59.2	58.9	58.8
Development time, min	3.25	2.75	3.25	3.00
Mixing tolerance index, BU	60	50	65	65
Stability, min	4.5	4.0	4.0	4.0
Fresh alkaline noodles				
Raw colour at 2 hrs				
Brightness, L*	83.7	83.0	80.3	80.0
Redness, a*	-0.92	-0.91	-0.85	-0.79
Yellowness, b*	26.9	28.2	28.9	29.5
Raw colour at 24 hrs				
Brightness, L*	78.9	78.3	73.9	73.4
Redness, a*	-0.61	-0.44	0.16	0.40
Yellowness, b*	27.4	28.0	28.3	29.0
Cooked colour				
Brightness, L*	65.0	65.9	64.2	64.2
Redness, a*	-2.65	-2.48	-2.51	-1.96
Yellowness, b*	28.8	30.3	29.0	30.2
Texture				
Thickness, mm	2.08	2.04	2.07	2.04
RTC, %	29.3	27.4	28.9	28.8
Recovery, %	28.3	25.9	27.2	26.5
MCS, g/mm^2	21.4	19.5	20.7	19.6

1 The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.
2 Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Table 18 • No. 1 Canada Prairie Spring White wheat • Fresh white salted noodles
Comparative noodle quality data for 2000 and 1999 harvest survey composite samples[1]

	60% patent		Straight grade	
Quality parameter[2]	2000	1999	2000	1999
Flour				
Flour yield (clean basis), %	60	60	74.9	74.9
Protein content, %	9.9	9.4	10.3	9.9
Wet gluten content, %	26.9	26.3	27.7	26.8
Ash content, %	0.38	0.37	0.44	0.44
Grade colour, K-J units	-4.4	-4.0	-2.8	-2.7
AGTRON colour, %	98	97	85	85
Starch damage, Megazyme %	5.6	5.9	5.0	5.4
Alpha-amylase activity, units/g	1.5	1.0		
Amylograph peak viscosity, BU	800	870	730	820
Farinogram				
Absorption, %	59.1	59.2	58.9	58.8
Development time, min	3.25	2.75	3.25	3.00
Mixing tolerance index, BU	60	50	65	65
Stability, min	4.5	4.0	4.0	4.0
Fresh white salted noodles				
Raw colour at 2 hrs				
Brightness, L*	85.4	85.5	83.1	83.2
Redness, a*	1.61	1.65	2.08	2.10
Yellowness, b*	22.4	22.8	23.3	24.4
Raw colour at 24 hrs				
Brightness, L*	79.6	79.7	75.0	74.6
Redness, a*	1.71	1.78	2.30	2.25
Yellowness, b*	23.3	23.7	22.5	22.7
Cooked colour				
Brightness, L*	75.6	76.2	75.0	75.6
Redness, a*	-0.89	-0.93	-0.44	-0.36
Yellowness, b*	17.3	17.6	17.3	18.1
Texture				
Thickness, mm	2.23	2.22	2.21	2.23
RTC, %	25.5	24.7	25.3	25.5
Recovery, %	22.9	22.2	22.6	23.1
MCS, g/mm^2	18.1	17.0	18.1	17.5

[1] The 1999 composites were stored and milled the same day as the respective 2000 composite and replicated the following day in reverse order.
[2] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods • Wheat

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,* Tenth Edition, 2000.
- 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. Total mixing time is modified depending on wheat class as follows: CWES 8 min; CWRS 7.5 min; CWRW 7 min; CPSR, CPSW and CWAD (semolina) 6.5 min; and CWSWS and CEWW 6 min. Following milling, flour samples are stored for a minimum of seven days prior to analysis.

Alpha-amylase activity

The alpha-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, flour or semolina ash content, AACC Method 08-01 is used. Samples are incinerated overnight in a muffle furnace at 600°C.

AWRC

Alkaline water retention capacity (AWRC) is determined using AACC Method 56-10. Centrifugation is done at 1000 × *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 10-50D.

Dry gluten content–semolina

Dry gluten 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 (BU), 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 54-21, following the procedure for constant flour weight using the 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 five 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 crops.

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*, 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 1 hr in a semi-automatic flour 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, following the procedure for two-stage air-oven.

Noodle colour

Colour is determined on a raw noodle sheet using a Hunterlab Labscan II spectrocolorimeter using the CIE (1976) L*, a* and b* colour scale with a D65 illuminant.

L* is a measure of brightness.

a* indicates red-green chromacity. Positive values indicate increased redness.

b* indicates yellow-blue chromacity. Positive values indicate increased yellowness.

Protein content (N x 5.7)

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 mg and samples are not dried before analysis. Protein content is calculated from total nitrogen as determined on a LECO Model FP-428 Nitrogen/Protein Determinator calibrated with EDTA and reported on a constant moisture basis. Moisture content is determined by the AACC Method No. 44-15A, following the procedure for one-stage air-oven. The method for Dumas CNA analysis is explained in Williams, Sobering, and Antoniszyn. 1998. Protein testing methods at the Canadian Grain Commission. In: *Wheat Protein Symposium: proceedings*; 1998 March 9–10; Saskatoon, Sask. P 37. The conference paper is available online at

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 U.S. Standard 200-mesh sieve for 10 min in a Ro-tap sieve shaker. The weight of throughs × 10 is recorded as the PSI.

Remix-to-peak baking test

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

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 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-micrometre 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 using the micro-processing method of Matsuo et al. (1972), *Cereal Chemistry* 49:707-711, and dried at 70°C in 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 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 66-50, 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-hr, 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 p

Farrand = 6.6092 * MegaZyme - 11.972

Tandem Bühler Pilot Mill

Composites are milled in duplicate on the Tandem Bühler Pilot Mill as described by Martin and Dexter (1991), *AOM Bulletin* p. 5855, to produce 60% extraction patent flours for noodle evaluation.

Test weight – export cargo

Test weight is determined using the Ohaus 0.5-L 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 1-L 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.

Texture characteristics

Texture measurements were carried out using a computer-assisted Instron model 4201 Universal Texture Meter and represent the average of four replicate cookings in which each cook evaluated five sets of noodles. Characteristics were determined as per Oh, N.H. et al. (1983), *Cereal Chemistry* 60:433-438.

- Maximum cutting stress (MCS, g/mm^2) reports the bite or firmness of the cooked noodle (g/mm^2)
- Resistance to compression (RTC, %) correlates with the noodle's firmness and chewiness.
- Recovery, % correlates with the noodle's firmness and springiness.

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 2200 with 80-micrometre 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 used prior to August 1, 1998.

Yellow pigment content

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