Canadian Grain Commission
Commission canadienne des grains

Agriculture and Agri-Food Canada
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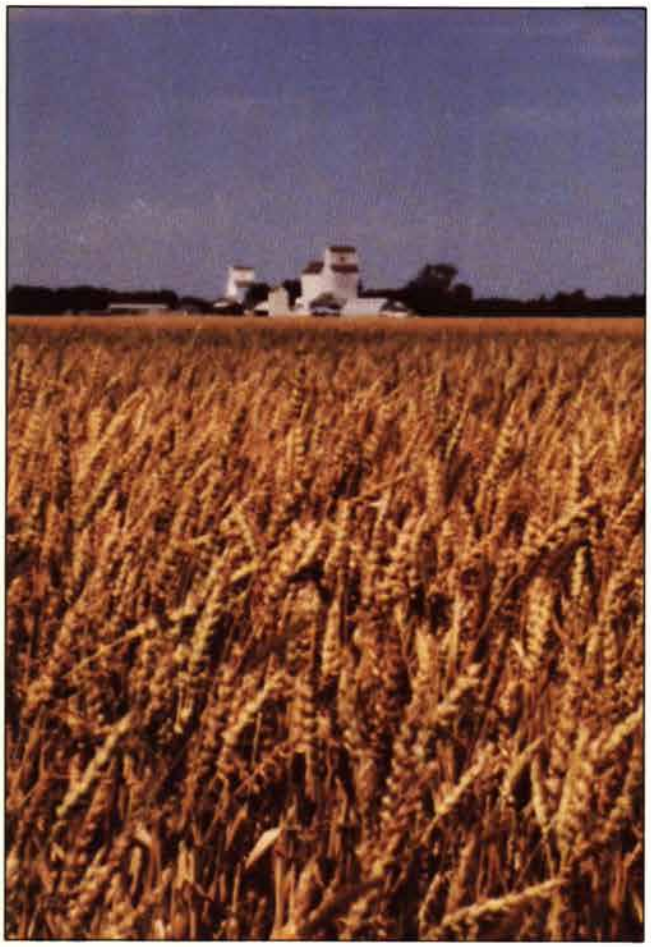

GRAIN RESEARCH LABORATORY

QUALITY OF CANADIAN WHEAT 1988

Canada

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K.H. TIPPLES
Director

Grain Research Laboratory
Canadian Grain Commission
1404-303 Main Street
Winnipeg, Manitoba
R3C 3G8

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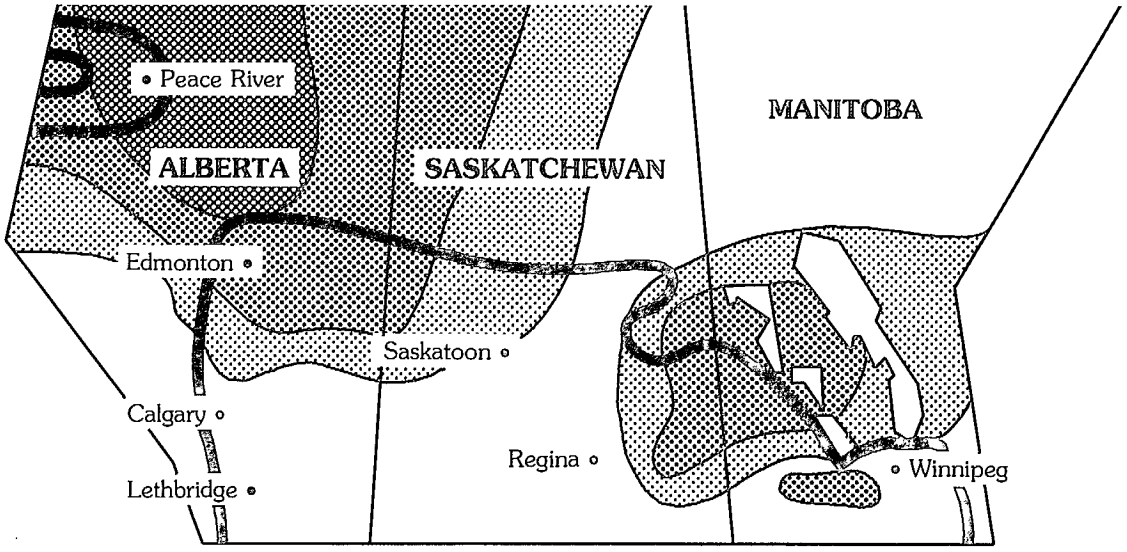
Figure 1 • Map of Western Canada Showing the Extent of Drought Conditions throughout the Major Wheat Growing Area in 1988



* Precipitation:
Sept. 1, 1987 to July 31, 1988

above normal
near normal
below normal
much below normal

approximate wheat growing area

* from *Grain Matters*, July - August 1988 Issue, Canadian Wheat Board

SUMMARY

Severe drought conditions, particularly in Saskatchewan, were responsible for greatly reduced yields and significantly higher protein content for all classes of Western Canadian wheat. Total 1988 Prairie wheat production was more than one third lower than the average for the preceding ten years, although production of Eastern Canadian white winter wheat was back to a more normal level.

The Canada Western red spring wheat has somewhat poorer milling quality this year but baking performance is once again very good in all baking methods. The Amber Durum wheat crop is extraordinarily high in protein content which contributes to its exceptional cooking quality.

CONTENTS

INTRODUCTION

This bulletin presents detailed information on the quality of the 1988 crop of six classes of Canadian wheat offered on the world market:

- **Canada Western Red Spring Wheat:** a hard wheat with superior milling and baking quality. It is offered at various guaranteed levels of protein content.
- **Canada Western Amber Durum Wheat:** a durum wheat producing a high yield of semolina with excellent pasta-making quality.
- **Canada Western Red Winter Wheat:** a hard wheat suitable for the production of a wide variety of products including French breads, flat breads, steamed breads and certain types of noodles.
- **Canada Prairie Spring Wheat:** a wheat of medium hardness, medium protein content and medium gluten strength. It is suitable for a wide range of products including various types of noodles, French-type hearth breads, flat breads, pan bread, steamed breads and crackers.
- **Canada Western Soft White Spring Wheat:** soft wheat of medium-to-low protein content for production of various types of flat breads, noodles, steamed breads, chapattis, cookies, cakes and pastry.
- **Canada Eastern White Winter Wheat:** a premium quality soft wheat of low protein content eminently suitable for the production of breakfast cereals and of cookie, cake and pastry flours.

Insufficient samples were received of a seventh class of Canadian wheat, Canada Western Utility Wheat, to allow generation of milling and baking data. This wheat is characterized by its hard kernels and very strong physical dough properties.

It is important to note that data presented in this bulletin are **not** quality specifications for Canadian wheat. Rather, they represent the best estimate we can obtain in time for the Grain Research Laboratory to report at the end of October to the Committee on Western Grain Standards.

The extent to which the data in this bulletin indicate the exact quality characteristics of wheat of any given grade that will be exported during the coming year depends on a number of factors including:

- The amounts and relative quality of carryover stocks of each grade.
- Whether the new crop composites are, indeed, truly representative of the harvest production, both on a geographic basis and in terms of harvest progress, from the earliest harvested samples to the latest.
- The extent to which the quality (grade) of the grain varies within the receival area of each primary elevator.

Primary elevators are required to receive grain from producers in the order it is presented. Small amounts of grain from one delivery, remaining in an elevator's handling system, may be picked up by a subsequent delivery. The impact of this inadvertent mixing is directly related to variation in the quality (grade) of the grain within a primary elevator's drawing area, which could range all the way from No. 1 grade to Canada Feed wheat.

For the preceding reasons the average quality of carlot unloads and, hence, of cargoes of any given grade may be slightly lower than that indicated by our new crop survey. In particular, falling number values of lower grades tend to be somewhat lower and more variable for subsequent export cargoes.

The growing season began with bleak crop prospects due to below average precipitation from late autumn of last year to the end of April this year throughout much of Western Canada. Generally, growing conditions did not improve with the result that yields and production levels were as much as 40% below the average annual value of the preceding 10 years. Most wheat matured very early and harvesting on the whole was completed earlier than usual, with the northwest part of the grain belt an exception.

Below average winter snowfall and almost total lack of early spring rains resulted in both low soil moisture levels and wind erosion problems across the Pariries to start the growing season. There was minimal winter kill to the winter wheat crop this year, but by the end of April it was starting to suffer from lack of moisture. Seeding was delayed in most areas as farmers awaited the moisture needed for adequate germination. In the first two weeks of May, substantial amounts of rain were received in eastern regions and seeding progressed well except in the Swan River Valley where severe flooding took place. By the third week of May seeding was widespread throughout Western Canada

and was complete by the first week of June. Some reseeding was required in southern portions due to wind damage.

Although some precipitation occurred in many areas in the second and third weeks of June, Saskatchewan and southern Alberta didn't benefit much and drought stress became evident at this early time. Intense and continuing heat depleted moisture reserves quickly and by mid-July it was certain that the wheat crop would suffer severe drought effects. Any rain which occurred after August 1 was too late to significantly improve yields. Exceptions to this picture were the northerly growing areas in Manitoba and Alberta, including the Peace River district where precipitation subsequent to April 1 was normal to much above normal.

Swathing of winter wheat began by July 10 while swathing of spring wheat began by August 1 in the south. Swathing of spring wheat was general throughout northern sections by the third week of August - by which time the winter wheat harvest was virtually complete. In the last week of August, some fairly general rains fell, delaying completion of the harvest in the south until mid-September. In northern Alberta and Saskatchewan, cool and unsettled weather prevailed during the last half of September, delaying the end of this year's wheat harvest until about the first week of October.

Statistics Canada (Field Crop Reporting Series No. 7, October 5, 1988) estimates production of spring wheat in Western Canada to be 12.03 million tonnes from 10.04 million hectares, compared with final estimates of 20.38 million tonnes from 10.63 million hectares in 1987. Durum wheat production is estimated at 1.99 million tonnes, compared with the record of 4.01 million tonnes set last year - a drop of 50% despite a record 2.29 million hectares being seeded this year. Winter wheat production dropped for the second consecutive year to 0.26 from 0.69 million tonnes; and seeded area dropped to 0.23 from 0.39 million hectares. Ontario winter wheat production is estimated at 0.92 million tonnes, almost twice last year's production of 0.48 million tonnes - due mainly to an increase in seeded area to 0.25 from 0.14 million hectares.

The Canadian Grain Commission estimates that 47% of the 1988 red spring wheat crop will qualify for the grade No. 1 CW, 34% for No. 2 CW, 16% for No. 3 CW and 3% for CW Feed. Grade distribution estimates for amber durum wheat are: 30% No. 1 CWAD, 40% No. 2 CWAD, 24% No. 3 CWAD, 6% No. 4 CWAD and 0% No. 5 CWAD. Most Canada Eastern White Winter wheat will again this year qualify for the top two grades.

Data from the 1988 protein content survey and from tests on grade composite samples of the six classes of wheat are presented in the series of tables, figures and comments which now follow. Details regarding the collection of samples and methods used to obtain the data are provided at the end of this bulletin. Variety distribution information for wheat grown in Western Canada was obtained from *Prairie Grain Variety Survey 1988* published by Prairie Pools Inc., Regina, Saskatchewan.

1. Protein Content of 1988 and 1987 Crop Canadian Wheat Classes (Preliminary as at October 21, 1988)

Class	1988 - Preliminary		1987 - Final	
	Number of Samples	Protein Content*	Number of Samples	Protein Content*
		%		%
Canada Western Red Spring	12 312	14.8	5 256	14.0
Canada Western Amber Durum	3 243	15.6	1 050	14.0
Canada Prairie Spring	78	12.9	130	12.3
Canada Western Red Winter	438	12.7	574	11.8
Canada Western Soft White Spring	168	11.1	615	10.3
Canada Eastern White Winter	301	10.6	365	10.6

* Mean Value (All Grades), N x 5.7; 13.5% moisture content basis.

CANADA WESTERN RED SPRING WHEAT

Katepwa is the predominant variety of Canada Western Red Spring (CWRS) wheat grown in 1988 at 50.8% of the total area planted. Neepawa is the second leading variety at 21.8% of seeded area, down again from the preceding year. Other major CWRS varieties include Columbus at 18.5%, about the same as last year, and Park (2.9%).

Protein Survey - Preliminary Data for Red Spring Wheat

The average protein content of the 1988 red spring wheat crop is currently estimated at 14.8%. This estimate is based on 12,312 survey samples tested up to October 21. The 1988 average is 0.8 percentage units higher than that of last year and 1.2 percentage units higher than the long term (62 year) mean of 13.6% as shown in Figure 2.

Table 2 shows the new crop wheat from the province of Saskatchewan to be highest in protein content, averaging 15.2%, followed by Manitoba at 14.6%. The Alberta average is lowest at 13.6%. This is in contrast to 1987 results where Alberta had the highest mean protein content at 14.1% followed by Saskatchewan at 14.0% and Manitoba at 13.6%.

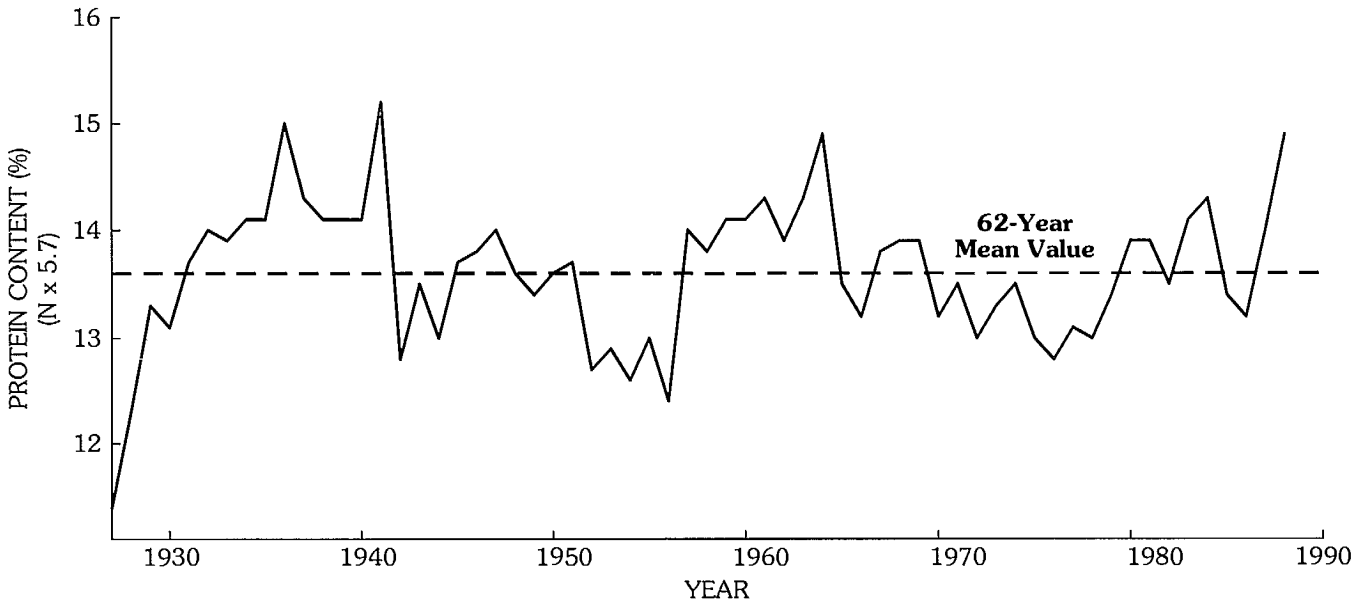
This year, the mean protein content is about the same for all milling grades of CWRS wheat as shown in Table 2. Overall, the No. 1 CW provincial averages (mean of 14.9% for Western Canada) are considerably higher than corresponding averages obtained in 1987 (mean of 14.2%), with only the Alberta value being about the same. Table 2 also shows 10-year mean values by grade for the period 1978-1987 for comparative purposes.

2. Protein Content of 1988 Crop Red Spring Wheat (Preliminary as at October 21, 1988)

Grade	Number of Samples Western Canada 1988	Protein Content (%)*					
		Western Canada			1988		
		1988	1987	1978-87	Manitoba	Saskatchewan	Alberta
No. 1 CW	6 348	14.9	14.2	14.0	14.8	15.3	14.0
No. 2 CW	3 600	14.8	14.0	13.6	14.4	15.1	13.4
No. 3 CW	2 207	14.8	13.7	13.2	13.3	15.3	12.9
CW Feed	157	15.5	13.8	13.4	-	15.9	13.1
All Grades	**12 312**	**14.8**	**14.0**	**13.7**	**14.6**	**15.2**	**13.6**

* N x 5.7; 13.5% moisture content basis.

Figure 2 • Mean Protein Content of New Crop Western Canadian Red Spring Wheat 1927 to 1988



MILLING AND BAKING QUALITY DATA

For the assessment of quality for the 1988 Canada Western Red Spring (CWRS) wheat crop, composites were prepared from survey samples representing each of the three milling grades. These composites are subdivided by region (Eastern Prairie and Western Prairie) - with each regional composite representing grain which is expected to follow the normal movement patterns (Eastern Prairie composites representing wheat which will be exported through Atlantic ports and Western Prairie composites representing wheat which will be exported through Pacific ports). The No. 1 and No. 2 CW grades are further segregated according to protein content with minimum levels of 14.5%, 13.5% and 12.5% (13.5% moisture basis). Given the very high average protein content of this year's crop, it is likely that the largest proportion will fall into the 14.5% category with little or no wheat available for export at the 12.5% level. Furthermore, the average protein content of cargo shipments of any given segregate is likely to be higher than normal.

No. 1 Canada Western Red Spring Wheat

Quality data for No. 1 CWRS wheat segregated by protein content and by region are given in Tables 3 to 6. Test weight of the No. 1 CW grade composites are similar to those obtained in 1987 but somewhat lower than the 10-year long term averages. Kernel weight is lower than last year but similar to long term averages. All No. 1 grade composites show low levels of alpha-amylase activity and correspondingly high values for wheat falling number and flour amylograph peak viscosity.

Flour yield for the 1988 No. 1 CW grade composites averages 1.5 percentage units lower than values obtained in 1987. However, flour ash values for the eastern composites are lower than in 1987. Values for the western composites are similar to 1987 and long term average values.

Flour color for this year's No. 1 CW crop once again shows superior (lower) values compared with long term averages. Starch damage values of both the eastern and western prairie composites are similar to corresponding values obtained in 1987, indicating little change in hardness at any given protein level.

Farinograph absorption values of the No. 1 CW western composites averaged 2.0 percentage units higher than values for the No. 1 CW eastern composites. The eastern composites show similar absorption values compared with 1987 and the long term averages. Absorption values of the western composites are similar to corresponding values obtained in 1987 and higher than long term average values. Farinograph dough development times of the eastern and western composites show little change from last year. Extensigraph areas of the No. 1 CW eastern composites are larger than last year, indicating stronger dough properties. Areas for the western composites are similar to last year.

Overall baking results indicate very good quality for this year's crop including, as usual, high loaf volume per unit of flour protein and excellent baking absorption. Both the eastern and western composites show similar loaf volume potential compared with 1987 performance. Baking absorption is similar to or slightly higher than 1987, depending on the baking process. Oxidation requirements of this year's crop appear to be similar to those of last year.

No. 2 Canada Western Red Spring Wheat

The quality characteristics of the 1987 No. 2 CWRS wheat segregated by protein content and by region are shown in Tables 7 to 10. Test weight and kernel weight for the eastern prairie composites are similar to values obtained in 1987, while values for the western composites are lower than corresponding values obtained in 1987. All No. 2 CW composites show low levels of alpha-amylase activity and corresponding high wheat falling number and flour amylograph peak viscosity values.

Flour yield for both the eastern and western No. 2 grade composites show the same trend as the No. 1 grade. Yields are lower than last year's values. However flour ash values are superior to 1987 and long term averages. Flour color values are similar to those obtained in 1987 and superior to long term averages.

Starch damage values of the 1988 new crop composites are about the same as last year, indicating similar hardness levels.

Farinograph absorption for the western composites averages 1.4 percentage units higher than the eastern composites. Values for both the eastern and western composites are similar to corresponding 1987 values. Both eastern and western composites show increased dough strength properties compared with 1987 and long term averages as evidenced by longer farinograph dough develoment times and larger extensigraph areas. The overall baking quality of the No. 2 grade composites is very good. Loaf volume per unit protein and baking absorption values were generally higher than in 1987.

No. 3 Canada Western Red Spring Wheat

Tables 11 and 12 list quality data for the No. 3 CW eastern and western new crop grade composites. Both composites exhibit very high wheat and flour protein content. These high values, compared with the long term average, are most likely a result of the severe drought conditions occurring in the major wheat growing areas of Western Canada. Test weight and kernel weight for the eastern composite is similar to the 1987 value. Test weight of the western composite is similar to the 1987 value while kernel weight is lower. The No. 3 eastern and western composites both show higher alpha-amylase activities and corresponding lower wheat falling number and flour amylograph peak viscosity values than corresponding 1987 and long term average values. It should be noted that wheat falling number values for export shipments of No. 3 CW wheat can show considerable variation, depending upon their origin in Western Canada. The likelihood is, however, that cargoes of this grade during the current year will show a drop in falling number compared with recent shipments. Flour yield for the composites is lower than in 1987. However flour ash values are superior (lower) than 1987 and long term average values. Flour color values of this year's No. 3 new crop composites are higher than 1987 values and similar to long term averages. Flour starch damage values are lower than 1987 values, indicating softer kernel characteristics.

Dough strength properties of the No. 3 composites are stronger than 1987 values as evidenced by longer farinograph dough development times and larger extensigraph areas. Baking quality shows good performance. This is associated with the high protein content of No. 3 grade wheat.

3. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1987	Mean*
Number of Samples Represented	3 706	2 486	902	646	-
WHEAT					
Test Weight, kg/hL	81.1	81.2	81.7	80.9	81.6
Weight per 1000 Kernels, g	29.9	29.7	30.4	31.6	30.3
Protein Content, % (N x 5.7)	14.9	14.1	13.0	13.8	13.7
Ash Content, %	1.60	1.49	1.49	1.64	1.59
Alpha-amylase Activity, units/g	3.0	3.1	3.1	3.3	3.6
Falling Number, s	405	405	405	420	395
Flour Yield, %	74.1	74.3	74.6	75.6	75.4
FLOUR					
Protein Content, %	14.2	13.3	12.2	13.3	13.2
Wet Gluten Content, %	44.8	40.3	35.7	39.7	39.2
Ash Content, %	0.45	0.45	0.46	0.47	0.47
Color, units	-0.7	-0.9	-1.5	-1.3	-0.5
Starch Damage, Farrand units	31	33	37	31	30
Alpha-amylase Activity, units/g	0.7	0.8	0.9	0.7	0.9
Amylograph Peak Viscosity, BU	770	775	740	775	725
Maltose Value, g/100g	1.9	2.0	2.3	1.8	N/A
BREAD					
Baking Absorption, %	66	65	64	65	65
Loaf Volume, cm^3	955	895	780	870	865
Appearance	8.5	8.5	7.5	8.5	8.0
Crumb Structure	6.5-o	6.8-o	7.0-o	7.0-o	6.8-o
Crumb Color	7.0	6.0-d	5.5-d	6.5-d	6.2-dy
Blend Loaf Volume, cm^3	760	740	670	710	710
FARINOGRAM					
Absorption, %	65.8	64.6	64.0	64.7	64.9
Development Time, min	5.25	4.75	4.00	5.00	4.50
Mixing Tolerance Index, BU	25	20	25	35	30
Stability, min	12.00	10.50	8.50	7.50	7.75
EXTENSIGRAM					
Length, cm	22	22	21	22	22
Height at 5 cm, BU	285	290	300	270	260
Maximum Height, BU	505	500	505	460	415
Area, cm^2	155	150	140	135	130
ALVEOGRAM					
Length, mm	150	135	126	139	112
P (height x 1.1), mm	95	100	112	96	98
W, x 10^3 ergs	445	438	455	412	364

* Mean values are for the 10-year period 1977 to 1986.

4. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1987	Mean*
Number of Samples Represented	1 411	1 016	648	659	-
WHEAT					
Test Weight, kg/hL	80.3	80.9	81.9	81.5	82.0
Weight per 1000 Kernels, g	30.0	31.4	32.6	32.3	30.5
Protein Content, % (N x 5.7)	14.8	14.0	12.8	13.6	13.7
Ash Content, %	1.54	1.51	1.57	1.53	1.53
Alpha-amylase Activity, units/g	5.0	4.4	5.2	5.6	3.7
Falling Number, s	390	395	370	380	385
Flour Yield, %	74.7	74.6	74.9	76.5	75.4
FLOUR					
Protein Content, %	14.1	13.2	12.2	13.1	13.2
Wet Gluten Content, %	45.9	41.6	37.3	39.7	38.7
Ash Content, %	0.46	0.47	0.48	0.47	0.46
Color, units	-0.8	-1.1	-1.5	-1.2	-0.5
Starch Damage, Farrand units	28	32	38	34	30
Alpha-amylase Activity, units/g	1.7	1.3	1.4	1.5	1.0
Amylograph Peak Viscosity, BU	690	715	685	650	675
Maltose Value, g/100g	1.9	2.1	2.6	2.0	N/A
BREAD					
Baking Absorption, %	66	66	65	64	64
Loaf Volume, cm^3	955	875	795	855	855
Appearance	8.2	8.0	7.8	8.0	8.0
Crumb Structure	6.8-o	7.0-o	6.8-o	6.8-o	6.8-o
Crumb Color	6.8-d	6.5-d	6.0-d	6.8-d	6.5-d
Blend Loaf Volume, cm^3	770	740	700	700	700
FARINOGRAM					
Absorption, %	66.5	66.9	67.1	66.0	65.2
Development Time, min	5.50	4.75	4.00	5.00	4.75
Mixing Tolerance Index, BU	25	30	30	35	30
Stability, min	10.00	8.00	6.50	6.50	8.00
EXTENSIGRAM					
Length, cm	23	22	21	21	22
Height at 5 cm, BU	260	245	250	270	265
Maximum Height, BU	450	405	400	435	430
Area, cm^2	135	125	110	125	130
ALVEOGRAM					
Length, mm	141	112	103	134	110
P (height x 1.1), mm	92	105	121	106	100
W, x 10^3 ergs	413	383	389	425	377

* Mean values are for the 10-year period 1977 to 1986.

5. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Eastern Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			1987
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	66	66	65	66
Mixing*: energy, Whr/kg	4.2	3.7	4.0	3.2
Mixing*: time, min	3.6	3.6	3.8	3.5
Loaf volume, cm^3/100 g flour	1 095	1 060	983	1 085
Yield: Bread Wt/Flour Wt	1.44	1.44	1.44	1.44
Appearance	8.0	7.8	7.5	7.7
Crumb Structure	6.8-o+	6.8-o	6.8-o	6.8-o
Crumb Color	8.2	8.2	8.3	8.0
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	69	67	69
Mixing*: energy, Whr/kg	9.2	7.8	8.3	7.7
Mixing*: time, min	6.3	6.5	6.6	7.1
Loaf volume, cm^3/100 g flour	1 153	1 128	1 063	1 095
Yield: Bread Wt/Flour Wt	1.55	1.54	1.54	1.55
Appearance	8.5	8.2	7.7	7.5
Crumb Structure	6.7-o	6.8-o	6.7-o	6.8-o
Crumb Color	8.8	8.5	8.0	8.3

* Dough Stage

6. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Western Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			1987
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	67	68	68	67
Mixing*: energy, Whr/kg	3.8	3.5	3.3	3.1
Mixing*: time, min	3.1	3.3	3.2	3.4
Loaf volume, cm^3/100 g flour	1 120	1 058	953	1 085
Yield: Bread Wt/Flour Wt	1.45	1.45	1.45	1.45
Appearance	7.9	7.7	7.3	7.7
Crumb Structure	6.8-o+	6.8-o	6.8-o	6.9-o
Crumb Color	8.2	7.9	7.8	8.2
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	69	70	70	69
Mixing*: energy, Whr/kg	7.7	7.7	7.0	8.4
Mixing*: time, min	6.0	6.2	5.9	7.3
Loaf volume, cm^3/100 g flour	1 145	1 093	1 050	1 038
Yield: Bread Wt/Flour Wt	1.55	1.55	1.55	1.54
Appearance	8.3	8.2	7.7	7.5
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.4	8.2	8.2	8.5

* Dough Stage

7. NO. 2 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			No. 2 CW 13.5	
	14.5	13.5	12.5	1987	Mean*
Number of Samples Represented	1 166	863	552	768	-
WHEAT					
Test Weight, kg/hL	78.9	79.2	79.5	78.8	80.2
Weight per 1000 Kernels, g	30.3	30.9	31.0	30.3	31.2
Protein Content, % (N x 5.7)	15.0	14.1	13.0	13.5	13.7
Ash Content, %	1.55	1.53	1.51	1.62	1.61
Alpha-amylase Activity, units/g	5.1	6.1	6.9	4.4	5.4
Falling Number, s	395	375	385	415	385
Flour Yield, %	73.9	73.8	73.8	74.9	75.0
FLOUR					
Protein Content, %	14.2	13.2	12.2	12.8	13.1
Wet Gluten Content, %	43.3	39.4	36.6	39.1	38.7
Ash Content, %	0.46	0.44	0.44	0.51	0.48
Color, units	-0.6	-0.9	-1.3	-0.9	-0.3
Starch Damage, Farrand units	26	27	34	30	28
Alpha-amylase Activity, units/g	1.7	2.8	2.2	1.2	1.7
Amylograph Peak Viscosity, BU	645	590	640	665	620
Maltose Value, g/100g	1.7	1.8	2.0	1.9	N/A
BREAD					
Baking Absorption, %	66	64	63	63	64
Loaf Volume, cm^3	965	910	800	855	870
Appearance	8.5	8.5	8.0	8.0	8.0
Crumb Structure	6.5-o	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	7.0	6.8-d	6.0-d	6.2-dy	6.2-dy
Blend Loaf Volume, cm^3	800	730	690	690	705
FARINOGRAM					
Absorption, %	65.0	63.8	63.1	63.9	64.5
Development Time, min	5.00	4.75	3.75	4.50	4.50
Mixing Tolerance Index, BU	30	30	30	35	35
Stability, min	9.50	9.00	7.50	7.00	7.75
EXTENSIGRAM					
Length, cm	23	22	22	21	22
Height at 5 cm, BU	280	300	285	275	250
Maximum Height, BU	500	520	495	445	395
Area, cm^2	155	155	145	130	125
ALVEOGRAM					
Length, mm	161	154	126	152	107
P (height x 1.1), mm	90	88	96	93	95
W, x 10^3 ergs	447	425	405	425	344

* Mean values are for the 10-year period 1977 to 1986.

8. NO. 2 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1988 Crop

	Minimum Protein Level			No. 2 CW 13.5	
Quality Parameter	14.5	13.5	12.5	1987	Mean*
Number of Samples Represented	1 058	790	626	742	-
WHEAT					
Test Weight, kg/hL	78.5	79.3	79.9	79.8	80.3
Weight per 1000 Kernels, g	29.6	30.8	31.9	31.9	31.3
Protein Content, % (N x 5.7)	14.8	14.0	13.0	13.7	13.7
Ash Content, %	1.60	1.59	1.58	1.57	1.53
Alpha-amylase Activity, units/g	9.0	7.5	5.4	10.1	5.5
Falling Number, s	365	370	385	345	365
Flour Yield, %	74.1	74.0	74.2	75.0	75.1
FLOUR					
Protein Content, %	14.4	13.4	12.3	13.0	13.1
Wet Gluten Content, %	44.4	41.8	37.5	39.3	38.7
Ash Content, %	0.47	0.47	0.48	0.50	0.48
Color, units	-0.7	-0.9	-1.1	-0.6	-0.2
Starch Damage, Farrand units	28	30	35	33	30
Alpha-amylase Activity, units/g	3.2	2.8	2.2	2.8	2.3
Amylograph Peak Viscosity, BU	545	570	595	445	520
Maltose Value, g/100g	2.1	2.2	2.4	2.2	N/A
BREAD					
Baking Absorption, %	66	66	65	65	65
Loaf Volume, cm^3	995	915	825	845	865
Appearance	8.5	8.2	7.5	7.5	8.0
Crumb Structure	6.5-o	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	7.2	6.8-d	5.8-d	6.5-d	6.0-dy
Blend Loaf Volume, cm^3	760	720	710	700	705
FARINOGRAM					
Absorption, %	66.3	66.3	66.3	66.5	65.2
Development Time, min	6.00	5.25	4.25	4.50	4.50
Mixing Tolerance Index, BU	25	30	30	35	30
Stability, min	10.50	8.50	8.00	6.50	7.50
EXTENSIGRAM					
Length, cm	23	21	20	21	22
Height at 5 cm, BU	285	275	265	235	245
Maximum Height, BU	500	455	410	365	385
Area, cm^2	150	130	110	105	120
ALVEOGRAM					
Length, mm	138	123	102	128	109
P (height x 1.1), mm	89	100	110	110	96
W, x 10^3 ergs	384	384	364	420	342

* Mean values are for the 10-year period 1977 to 1986.

9. NO. 2 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Eastern Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			1987
	14.5	13.5	12.5	No. 2 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	66	65	64	65
Mixing*: energy, Whr/kg	4.5	4.0	4.1	3.0
Mixing*: time, min	3.7	3.8	3.8	3.4
Loaf volume, cm^3/100 g flour	1 123	1 090	940	1 033
Yield: Bread Wt/Flour Wt	1.43	1.45	1.44	1.43
Appearance	8.0	8.0	7.5	6.7
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.4	8.5	8.0	7.7
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	69	68	67	68
Mixing*: energy, Whr/kg	8.2	9.4	9.4	8.0
Mixing*: time, min	6.4	7.1	7.0	7.2
Loaf volume, cm^3/100 g flour	1 128	1 128	1 043	1 055
Yield: Bread Wt/Flour Wt	1.53	1.53	1.53	1.53
Appearance	8.1	8.2	7.9	7.5
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.8	8.7	8.7	8.5

* Dough Stage

10. NO. 2 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Western Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	Minimum Protein Level			1987
	14.5	13.5	12.5	No. 2 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	67	67	66	67
Mixing*: energy, Whr/kg	3.9	3.4	3.6	2.7
Mixing*: time, min	3.3	3.3	3.5	3.0
Loaf volume, cm^3/100 g flour	1 135	1 053	968	1 010
Yield: Bread Wt/Flour Wt	1.44	1.46	1.44	1.45
Appearance	7.8	7.8	7.4	6.7
Crumb Structure	6.8-o+	6.7-o	6.8-o	6.8-o
Crumb Color	8.0	8.0	7.7	8.0
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	70	69	70
Mixing*: energy, Whr/kg	8.4	9.3	7.7	7.4
Mixing*: time, min	5.9	6.6	5.8	6.7
Loaf volume, cm^3/100 g flour	1 060	1 053	980	1 028
Yield: Bread Wt/Flour Wt	1.56	1.55	1.56	1.56
Appearance	7.9	7.8	7.5	7.1
Crumb Structure	6.7-o	6.7-o	6.7-o	6.9-o
Crumb Color	8.8	8.1	8.1	8.4

* Dough Stage

11. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	1988	1987	Mean*
Number of Samples in Composite	1 264	718	-
WHEAT			
Test Weight, kg/hL	77.6	77.2	78.6
Weight per 1000 Kernels, g	31.3	31.0	31.1
Protein Content, % (N x 5.7)	15.3	13.4	13.2
Ash Content, %	1.49	1.65	1.61
Alpha-amylase Activity, units/g	53.7	9.3	17.9
Falling Number, s	240	365	315
Flour Yield, %	74.0	74.7	74.3
FLOUR			
Protein Content, %	14.5	12.8	12.6
Wet Gluten Content, %	44.7	37.4	36.6
Ash Content, %	0.46	0.51	0.49
Color, units	0.3	-0.3	0.3
Starch Damage, Farrand units	26	29	29
Alpha-amylase Activity, units/g	17.2	3.8	5.3
Amylograph Peak Viscosity, BU	135	390	300
Maltose Value, g/100g	2.5	2.0	N/A
BREAD			
Baking Absorption, %	65	63	63
Loaf Volume, cm^3	990	865	830
Appearance	8.5	8.0	8.0
Crumb Structure	6.5-o	6.8-o	6.8-o
Crumb Color	6.8-d	6.0-d	5.8-dy
Blend Loaf Volume, cm^3	750	710	685
FARINOGRAM			
Absorption, %	65.1	64.3	64.2
Development Time, min	4.50	4.25	4.00
Mixing Tolerance Index, BU	30	40	35
Stability, min	7.50	6.50	6.50
EXTENSIGRAM			
Length, cm	25	22	22
Height at 5 cm, BU	235	265	245
Maximum Height, BU	415	420	380
Area, cm^2	140	125	115
ALVEOGRAM			
Length, mm	160	144	106
P (height x 1.1), mm	82	99	100
W, x 10^3 ergs	402	425	351

* Mean values are for the 10-year period 1977 to 1986.

12. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1988 Crop

Quality Parameter	1988	1987	Mean*
Number of Samples in Composite	854	603	-
WHEAT			
Test Weight, kg/hL	78.0	78.2	79.4
Weight per 1000 Kernels, g	30.8	32.2	31.7
Protein Content, % (N x 5.7)	14.6	14.2	12.9
Ash Content, %	1.65	1.63	1.57
Alpha-amylase Activity, units/g	42.8	20.3	24.5
Falling Number, s	255	300	290
Flour Yield, %	73.7	74.6	74.7
FLOUR			
Protein Content, %	13.9	13.6	12.2
Wet Gluten Content, %	44.1	40.6	35.6
Ash Content, %	0.49	0.51	0.50
Color, units	0.4	-0.1	0.3
Starch Damage, Farrand units	29	31	32
Alpha-amylase Activity, units/g	17.8	5.9	8.1
Amylograph Peak Viscosity, BU	110	275	240
Maltose Value, g/100g	2.9	2.3	N/A
BREAD			
Baking Absorption, %	65	65	63
Loaf Volume, cm^3	905	895	775
Appearance	8.2	7.8	7.5
Crumb Structure	6.8-o	6.8-o	6.5-o
Crumb Color	6.2-d	5.5-d	5.2-dy
Blend Loaf Volume, cm^3	715	725	665
FARINOGRAM			
Absorption, %	65.8	66.2	64.9
Development Time, min	4.50	4.25	3.75
Mixing Tolerance Index, BU	35	40	45
Stability, min	7.00	6.00	6.25
EXTENSIGRAM			
Length, cm	24	24	21
Height at 5 cm, BU	235	220	240
Maximum Height, BU	430	340	340
Area, cm^2	140	110	105
ALVEOGRAM			
Length, mm	126	146	89
P (height x 1.1), mm	93	100	109
W, x 10^3 ergs	379	415	334

* Mean values are for the 10-year period 1977 to 1986.

CANADA WESTERN AMBER DURUM WHEAT

As mentioned earlier in this report, the prolonged drought in the durum wheat growing areas was the major influence that determined the quantity and quality of the 1988 crop. Production of 2.0 million tonnes is a little less than 50% of the 1987 crop, and below the 10-year average of 2.74 million tonnes (1978-87). The severity of the drought is reflected in the very low yield, only 0.87 tonnes/hectare (1978-87 mean: 1.71 t/ha). The predominant variety grown this year is Kyle, accounting for 30% of the area seeded to durum wheat in Western Canada. Wakooma is now down to second at 23%, Medora has dropped to 18% and Wascana has dropped again to 17%.

Not surprisingly, the principal factor affecting grade is immaturity, characterized by shrunken and green kernels. The incidence of red smudge, a major degrading factor for the past several years, is low in the 1988 durum crop.

The most notable quality feature of this year's crop is the very high protein content, the highest since 1941 - the year that the Grain Research Laboratory began recording protein survey data for durum wheat.

The mean of 15.6% is based on 3,243 samples, a three-fold increase in the number of samples surveyed. The increased number of survey samples hopefully will provide a better estimate of other quality factors, specifically falling number values.

As indicated by the high falling number values, there is no sprout damage in the top two grades, a little in No. 3 CWAD and some in No. 4 CWAD. In isolated areas where poorer harvest conditions were encountered, a small percentage of the crop will contain sprouted kernels. In last year's bulletin, *Quality of Canadian Wheat 1987,* it was reported that sprouting did occur in some areas but the falling number values for No. 3 and No. 4 CWAD were appreciably higher than those for the 1988 crop. Later harvested material in 1987, not included in the survey, contributed to a significant decrease in falling number values for the lower grades of export durum. For the 1988 crop, as the harvest was complete at the time when grade composite samples were prepared, it is expected that quality parameters will not likely change appreciably for the export shipments.

Carryover of durum stocks from the previous year is estimated to be about 1.5 million tonnes. By the end of the calendar year, much of the durum exported may be expected to be new crop wheat.

Test weight values for the 1988 crop are comparable to those of the 1987 crop but kernel size is smaller. Smaller kernels are the result of immaturity and account for about a 1.5 percentage unit lower semolina yield for all grades compared with 1987 values. Gluten strength is similar to that of the 1987 crop.

Semolina ash content is higher and Agron color is lower for all grades when compared to last year. Semolina speck count is lower, probably a reflection of the absence of red smudge.

Spaghetti color for all grades (under both drying temperatures in processing) appears to be poorer than in 1987. However, the lower values are actually the result of a change (to provide better estimates) in the computer program used to approximate the color calculated manually using the "Ten Selected Ordinates" method. Spaghetti color is very good for all grades.

Spaghetti cooking quality is excellent as evidenced by the high value for cooking quality (CQP). Compared with last year's samples, surface stickiness is significantly lower.

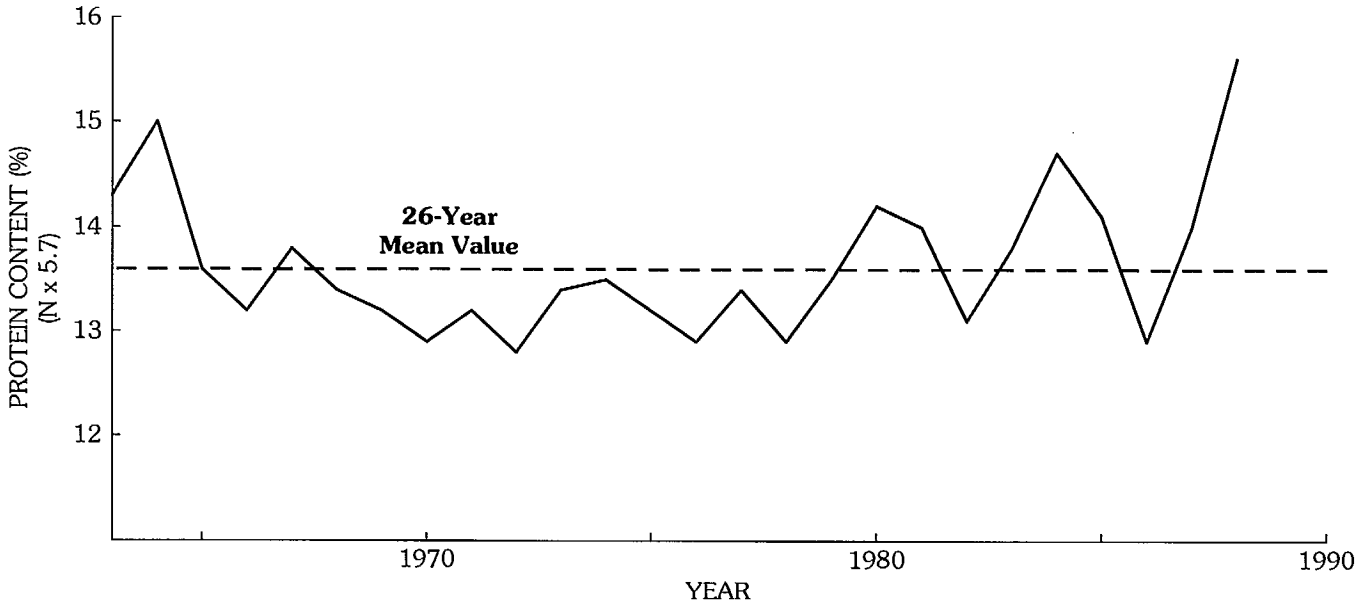
Tables 14 and 15 provide complete quality data for grade composite samples of the 1988 crop.

13. Protein Content of 1988 Crop Canada Western Amber Durum Wheat

Grade	Number of Samples Western Canada 1988	Protein Content (%)*					
		Western Canada			1988		
		1988	1987	1981-87	Manitoba	Saskatchewan	Alberta
No. 1 CWAD	1 079	15.5	14.1	13.9	14.9	15.6	14.9
No. 2 CWAD	1 109	15.7	14.1	13.8	15.0	16.0	14.8
No. 3 CWAD	743	15.5	14.0	13.9	15.1	15.7	15.0
No. 4 CWAD	198	15.2	13.6	13.3	14.7	15.4	13.5
All Grades	**3 129**	**15.6**	**14.0**	**13.8**	**15.0**	**15.7**	**14.9**

* N x 5.7; 13.5% moisture content basis.

Figure 3 • Mean Protein Content of New Crop Western Canadian Amber Durum Wheat 1963 to 1988



14. NO. 1 AND NO. 2 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

Quality Parameter	1988		1987	
	No. 1 CWAD	No. 2 CWAD	No. 1 CWAD	No. 2 CWAD
Number of Samples in Composite	1 079	1 109	176	349
WHEAT				
Test Weight, kg/hL	81.5	80.4	81.2	80.3
Weight per 1000 Kernels, g	41.8	41.6	46.4	45.5
Vitreous Kernels, %	93	86	85	74
Protein Content, %	15.5	15.8	14.2	14.0
Ash Content, %	1.59	1.61	1.46	1.57
SDS Sedimentation, mL	42	44	40	42
Falling Number, s	410	370	355	325
Milling Yield, %	74.9	75.1	76.6	76.0
Semolina Yield, %	63.6	63.3	65.2	64.6
SEMOLINA				
Protein Content, %	14.6	14.8	13.0	13.0
Wet Gluten Content, %	38.6	40.6	32.6	32.6
Ash Content, %	0.66	0.68	0.62	0.64
AGTRON Color, units	68	69	72	72
Speck Count per $50cm^2$	14	21	24	30
SPAGHETTI				
Dried at 39°C				
Color:				
Brightness, %	46.1	46.2	48.2	47.8
Purity, %	54.7	54.5	59.0	58.6
Dominant Wavelength, nm	577.4	577.4	577.6	577.6
Cooking Quality, CQP	29.9	31.6	21.8	28.0
Stickiness, N/m^2	580	540	835	750
Cooking Loss, %	6.5	6.3	7.5	7.4
Dried at 70°C				
Color:				
Brightness, %	47.3	47.4	47.8	48.1
Purity, %	55.1	54.8	56.6	57.2
Dominant Wavelength, nm	577.7	577.7	577.6	577.5
Cooking Quality, CQP	53.7	50.4	29.0	31.1
Stickiness, N/m^2	590	480	850	740
Cooking Loss, %	5.2	5.1	7.1	7.2

15. NO. 3 AND NO. 4 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

Quality Parameter	1988		1987	
	No. 3 CWAD	No. 4 CWAD	No. 3 CWAD	No. 4 CWAD
Number of Samples in Composite	743	198	369	150
WHEAT				
Test Weight, kg/hL	79.4	77.8	79.1	77.8
Weight per 1000 Kernels, g	42.7	42.1	44.2	43.4
Vitreous Kernels, %	68	55	59	35
Protein Content, %	15.4	15.2	13.9	13.8
Ash Content, %	1.66	1.65	1.64	1.72
SDS Sedimentation, mL	42	44	42	43
Falling Number, s	270	160	295	250
Milling Yield, %	74.3	74.1	75.6	74.6
Semolina Yield, %	63.2	62.9	64.6	64.0
SEMOLINA				
Protein Content, %	14.7	14.3	13.2	13.1
Wet Gluten Content, %	40.1	39.5	33.2	32.1
Ash Content, %	0.69	0.69	0.65	0.66
AGTRON Color, units	65	65	68	65
Speck Count per $50cm^2$	31	40	43	68
SPAGHETTI				
Dried at 39°C				
Color:				
Brightness, %	45.8	45.0	46.6	47.0
Purity, %	54.7	53.3	59.0	59.1
Dominant Wavelength, nm	577.4	577.5	577.8	577.8
Cooking Quality, CQP	31.8	24.8	24.0	21.6
Stickiness, N/m^2	560	600	790	895
Cooking Loss, %	6.6	7.0	7.4	7.9
Dried at 70°C				
Color:				
Brightness, %	45.7	45.6	46.9	45.5
Purity, %	53.9	53.0	57.4	57.5
Dominant Wavelength, nm	577.8	577.9	577.8	578.1
Cooking Quality, CQP	55.9	43.4	28.4	23.8
Stickiness, N/m^2	520	550	730	880
Cooking Loss, %	5.3	5.5	7.0	7.0

CANADA WESTERN RED WINTER WHEAT

Canada Western Red Winter (CWRW) wheat has excellent milling quality. Flours milled from the top grades of this class of wheat perform very well in the production of hearth breads and certain types of noodles. They are also suitable for the production of various kinds of flat breads, steamed breads and related products. At present the variety Norstar accounts for over 90% of the acreage of CWRW wheat grown in Western Canada with Sundance (4.5%) and Norwin (3%) the other major varieties grown.

As indicated in Table 16, this year's CWRW crop shows a higher than average overall protein content of 12.7%, based upon 438 survey samples. The No. 1 grade wheat averages 13.2% compared with 12.2% in 1987, while the No. 2 grade averages 12.5%, 0.6 percentage units higher than last year.

Quality data for composite samples of the three grades of 1988 CWRW wheat are given in Table 17.

For comparison, corresponding data are shown for the 1987 new crop composites of No. 1 and No. 2 CWRW wheat. Test weight and kernel weight values for the 1988 composites are similar to those obtained last year. Wheat Falling Number and flour amylograph peak viscosity data indicate lower alpha-amylase activity in this year's crop.

Although flour yield is lower for all three grades compared with last year, overall milling quality is still excellent. All CWRW grades show strong physical dough properties as evidenced by long farinograph dough development times and large extensigraph areas. In particular, the two lower grades show stronger dough properties and better baking quality than last year due, in large part, to their higher protein content. As usual, high loaf volume per unit of flour protein content is obtained with the Remix straight dough baking test.

16. Protein Content of 1988 Crop Canada Western Red Winter Wheat

Grade	Number of Samples Western Canada 1988	Protein Content (%)*				
		Western Canada		1988		
		1988	1987	Manitoba	Saskatchewan	Alberta
No. 1 CW	260	13.2	12.2	13.4	12.9	13.2
No. 2 CW	89	12.5	11.9	11.6	12.8	12.6
No. 3 CW	80	11.8	11.1	9.9	11.6	12.3
CW Feed	9	11.5	12.6	-	10.0	11.7
All Grades	**438**	**12.7**	**11.8**	**12.1**	**12.6**	**12.9**

* N x 5.7; 13.5% moisture content basis.

17. CANADA WESTERN RED WINTER WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

Quality Parameter	1988			1987	
	No. 1 CW	No. 2 CW	No. 3 CW	No. 1 CW	No. 2 CW
Number of Samples in Composite	260	89	80	219	121
WHEAT					
Test Weight, kg/hL	82.9	81.4	80.4	83.1	81.7
Weight per 1000 Kernels, g	29.5	29.4	31.5	29.2	29.7
Protein Content, % (N x 5.7)	13.1	12.6	12.0	12.3	11.8
Ash Content, %	1.39	1.42	1.49	1.31	1.43
Alpha-amylase Activity, units/g	15.5	27.1	164.3	9.6	26.2
Falling Number, s	325	280	150	335	285
Flour Yield, %	76.4	75.6	75.6	77.7	77.5
FLOUR					
Protein Content, %	12.2	11.7	11.1	11.6	11.3
Wet Gluten Content, %	38.3	35.8	33.4	33.2	34.1
Ash Content, %	0.42	0.43	0.42	0.42	0.44
Color, units	-1.1	-0.8	-0.9	-1.4	-1.1
Starch Damage, Farrand units	19	20	21	24	23
Alpha-amylase Activity, units/g	3.8	7.3	55.1	3.7	11.1
Amylograph Peak Viscosity, BU	450	235	50	390	160
Maltose Value, g/100g	1.8	2.1	3.3	1.8	2.0
BREAD					
Baking Absorption, %	61	60	57	57	57
Loaf Volume, cm^3	855	805	785	805	795
Appearance	8.5	8.2	8.2	8.2	8.2
Crumb Structure	7.0-o	6.8-o	6.8-o	6.5-o	6.8-o
Crumb Color	7.0	7.0	6.2-d	6.8-d	6.5-d
FARINOGRAM					
Absorption, %	58.6	58.2	57.0	57.7	57.0
Development Time, min	6.25	5.25	4.75	5.50	5.25
Mixing Tolerance Index, BU	50	50	65	45	55
Stability, min	8.50	7.50	7.00	9.00	8.00
EXTENSIGRAM					
Length, cm	24	25	24	25	24
Height at 5 cm, BU	270	280	265	275	260
Maximum Height, BU	525	525	500	505	470
Area, cm^2	165	170	155	170	145
ALVEOGRAM					
Length, mm	197	186	202	207	191
P (height x 1.1), mm	51	52	51	57	55
W, x 10^3 ergs	310	298	304	350	313

CANADA PRAIRIE SPRING WHEAT

Canada Prairie Spring (CPS) wheat is suitable for the production of French-type hearth breads and flat breads. It can also be used alone or in blends to produce various types of noodles, steam breads, pan breads, crackers and related products. This wheat normally is characterized by medium protein content, medium strength and extensible dough properties and medium-soft kernel properties.

This year's 78 survey samples for all grades of CPS wheat show a mean protein content of 12.9% (Table 18) compared with the 1987 value of 12.3%. The mean protein content for the No. 1 CPS grade is also 12.9%. The major variety planted was once again HY320 which was sown on about two-thirds of the CPS wheat area. The variety Oslo accounted for the remaining third. Quality data for the No. 1 CPS grade composite are given in Table 19 along with comparative data for 1987. The No. 1 CPS grade composite is higher in test weight than in 1987. Milling yield is similar but flour ash is superior compared with last year. Physical dough properties of this year's No. 1 CPS grade are stronger than in 1987. Baking performance for 1988 shows improvement in terms of loaf volume, crumb color and baking absorption.

18. Protein Content of 1988 Crop
Canada Prairie Spring Wheat

Grade	Number of Samples 1988	Protein Content (%)* 1988	1987	1986
No. 1 CPS	59	12.9	11.8	11.4
No. 2 CPS	16	13.2	12.9	12.0
CW Feed	3	11.0	12.7	11.2
All Grades	**78**	**12.9**	**12.3**	**11.5**

* N x 5.7; 13.5% moisture content basis.

19. CANADA PRAIRIE SPRING WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

Quality Parameter	No. 1 CPS	
	1988	1987
Number of Samples in Composite	59	66
WHEAT		
Test Weight, kg/hL	81.0	80.0
Weight per 1000 Kernels, g	39.4	40.2
Protein Content, % (N x 5.7)	12.6	11.9
Ash Content, %	1.47	1.41
Alpha-amylase Activity, units/g	4.6	8.8
Falling Number, s	350	330
Flour Yield, %	75.4	75.0
FLOUR		
Protein Content, %	11.8	11.0
Wet Gluten Content, %	36.4	33.2
Ash Content, %	0.48	0.53
Color, units	0.5	0.8
Starch Damage, Farrand units	15	14
Alpha-amylase Activity, units/g	1.0	1.9
Amylograph Peak Viscosity, BU	770	560
Maltose Value, g/100g	1.3	1.4
BREAD		
Baking Absorption, %	58	56
Loaf Volume, cm^3	720	685
Appearance	7.0	5.8
Crumb Structure	6.0-o	6.0
Crumb Color	5.5-d	5.0-d
FARINOGRAM		
Absorption, %	58.2	57.6
Development Time, min	3.75	3.25
Mixing Tolerance Index, BU	65	95
Stability, min	5.00	4.50
EXTENSIGRAM		
Length, cm	27	26
Height at 5 cm, BU	220	200
Maximum Height, BU	365	280
Area, cm^2	135	110
ALVEOGRAM		
Length, mm	213	238
P (height x 1.1), mm	45	47
W, x 10^3 ergs	220	220

CANADA WESTERN SOFT WHITE SPRING WHEAT

Canada Western Soft White Spring (CWSWS) wheat is a lower protein, soft wheat with weak dough properties suitable for a wide range of products such as cookies, cakes, biscuits, steamed bread and other related products. It is also suitable alone or in blends with stronger wheats for the production of certain types of noodles and flat breads. The variety Fielder was once again the predominant variety planted (84% of CWSWS area), with Owens representing 15%.

Table 20 gives protein survey data for this year's new crop composites of CWSWS and corresponding values for 1987. The protein content for the 1988 survey of 168 samples is 11.1%, 0.8 percentage units higher than last year. The No. 1 grade shows a protein content of 11.0% compared with values of 11.5% and 11.4% for the No. 2 and No. 3 grades respectively.

Quality data for the No. 1 and No. 2 grade composites for 1988 and 1987 are shown in Table 21. The No. 1 and No. 2 CW composites are higher in test weight and kernel weight than in 1987. Due to better harvesting conditions than last year, alpha-amylase activity for both grades is lower and wheat falling number and flour amylograph peak viscosity values are much higher. Milling properties of the No. 1 CW composite are similar to last year while those of the No. 2 grade are inferior. It should be noted that milling yields obtained in our laboratory mill for soft wheats are normally much lower than would be obtained on a large commercial mill where a longer flow can be utilized. This year's crop shows somewhat stronger dough properties compared with 1987 composites.

20. Protein Content of 1988 Crop Canada Western Soft White Spring Wheat

Grade	Number of Samples 1988	Protein Content (%)* 1988	1987	1986
No. 1 CWSWS	127	11.0	10.0	10.3
No. 2 CWSWS	30	11.5	10.4	10.9
No. 3 CWSWS	10	11.4	10.5	11.2
CW Feed	1	10.8	10.4	10.4
All Grades	**168**	**11.1**	**10.3**	**10.6**

* N x 5.7; 13.5% moisture content basis.

21. CANADA WESTERN SOFT WHITE SPRING WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

Quality Parameter	1988		1987	
	No. 1 CWSWS	No. 2 CWSWS	No. 1 CWSWS	No. 2 CWSWS
Number of Samples in Composite	127	30	218	264
WHEAT				
Test Weight, kg/hL	82.3	81.5	80.5	79.5
Weight per 1000 Kernels, g	38.1	36.4	37.5	35.7
Protein Content, % (N x 5.7)	11.2	11.5	10.2	10.6
Ash Content, %	1.47	1.55	1.43	1.48
Alpha-amylase Activity, units/g	4.8	6.7	27.6	51.8
Falling Number, s	360	330	265	215
Flour Yield, %	71.8	69.7	72.2	71.8
FLOUR				
Protein Content, %	9.6	10.0	8.9	9.3
Wet Gluten Content, %	33.4	33.4	30.1	30.9
Ash Content, %	0.42	0.40	0.40	0.42
Color, units	-1.1	-0.8	-1.0	-0.5
Starch Damage, Farrand units	7	5	9	8
Alpha-amylase Activity, units/g	1.6	2.0	4.9	12.9
Amylograph Peak Viscosity, BU	985	895	485	225
Maltose Value, g/100g	1.0	1.0	1.2	1.2
AWRC, units	75	74	74	72
FARINOGRAM				
Absorption, %	55.6	55.2	55.2	55.2
Development Time, min	1.75	1.00	1.25	1.00
Mixing Tolerance Index, BU	175	160	165	190
Stability, min	1.50	1.50	1.50	1.50
ALVEOGRAM				
Length, mm	156	189	155	145
P (height x 1.1), mm	25	23	26	24
W, x 10^3 ergs	60	63	69	55

CANADA EASTERN WHITE WINTER WHEAT

Canada Eastern White Winter (CEWW) wheat is suitable for a wide range of soft wheat products. This year's crop was grown under favorable conditions and consists mainly of high grade wheat. Preliminary estimates indicate that 73% of the crop will grade No. 1 CE and 17% will grade No. 2 CE. The predominant variety grown this year was Augusta which represented approximately 80% of the acreage. Other major varieties grown included Harris and Fredrick.

The average protein content of the CEWW wheat crop, based upon 301 survey samples, is 10.6%. This compares with a value of 10.6% in 1987 and 9.6% in 1986. Values for both the No. 1 and No. 2 grade also average 10.6%. Table 22 provides additional details and comparisons with 1987 and 1986 protein survey data.

Quality data for the top two grades of the 1988 CEWW new crop composites along with 1987 new crop comparative data are shown in Table 23. The 1988 new crop shows superior milling quality compared with 1987 as indicated by the much lower flour ash content and superior flour color. The No. 1 grade composite has low alpha-amylase activity and high wheat falling number and flour amylograph peak viscosity values. The No. 2 grade shows higher levels of alpha-amylase. Dough properties for this year's crop are stronger than last year as shown by the higher alveograph W values. Cookie quality is similar to that of the 1987 composites.

22. Protein Content of 1988 Crop Canada Eastern White Winter Wheat

Grade	Number of Samples 1988	Protein Content (%)* 1988	1987	1986
No. 1 CE	229	10.6	10.7	10.1
No. 2 CE	55	10.6	10.5	9.5
No. 3 CE	15	10.5	10.5	9.6
No. 4 CE	-	-	-	9.6
No. 5 CE	-	-	-	9.8
Canada Feed	2	10.2	11.0	9.6
All Grades	**301**	**10.6**	**10.6**	**9.6**

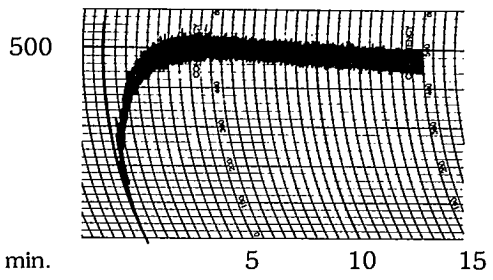
* N x 5.7; 13.5% moisture content basis.

23. CANADA EASTERN WHITE WINTER WHEAT
Quality Data for Grade Composite Samples of 1988 Crop

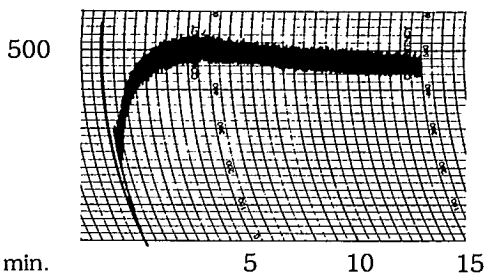
Quality Parameter	1988			1987
	No. 1 CEWW	No. 2 CEWW	No. 3 CEWW	No. 1 CEWW
Number of Samples in Composite	229	55	15	220
WHEAT				
Test Weight, kg/hL	78.5	77.7	78.0	78.7
Weight per 1000 Kernels, g	31.9	33.7	35.7	35.1
Protein Content, % (N x 5.7)	10.7	10.7	10.3	10.7
Ash Content, %	1.41	1.40	1.58	1.48
Alpha-amylase Activity, units/g	6.1	52.1	52.4	6.2
Falling Number, s	375	240	235	365
Flour Yield, %	73.3	73.2	73.2	74.2
FLOUR				
Protein Content, %	9.5	9.2	9.0	9.5
Wet Gluten Content, %	30.8	30.2	29.1	28.8
Ash Content, %	0.41	0.41	0.40	0.48
Color, units	-1.7	-1.5	-1.1	-0.3
Starch Damage, Farrand units	8	5	5	8
Alpha-amylase Activity, units/g	1.9	21.2	28.0	2.1
Amylograph Peak Viscosity, BU	535	100	60	440
Maltose Value, g/100g	1.0	1.3	1.4	1.0
AWRC, units	67	66	65	68
COOKIE				
Spread, mm	81	82	83	80
Ratio (spread/thickness)	8.1	8.6	9.0	8.2
FARINOGRAM				
Absorption, %	52.6	52.6	52.1	51.0
Development Time, min	1.25	0.75	0.75	1.00
Mixing Tolerance Index, BU	110	105	120	150
Stability, min	2.50	3.00	2.50	1.50
ALVEOGRAM				
Length, mm	180	170	190	233
P (height x 1.1), mm	30	29	25	20
W, x 10^3 ergs	126	124	108	78

Figure 4 • Farinograms of 1988 Crop Composite Samples

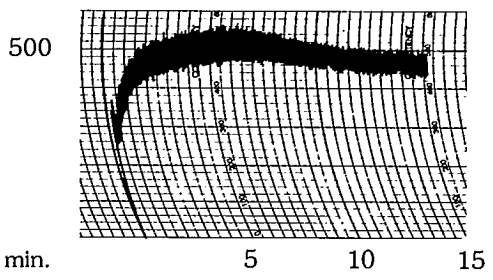
No. 1 Canada Western 13.5 Red Spring Wheat
Eastern Prairie



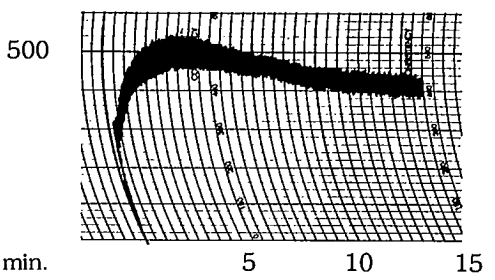
No. 1 Canada Western 13.5 Red Spring Wheat
Western Prairie



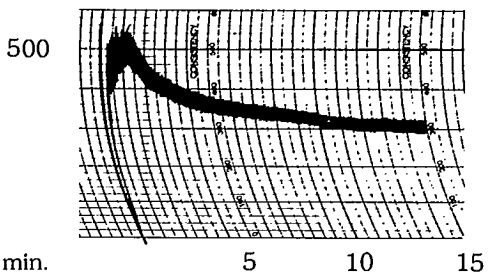
No. 1 Canada Western Red Winter Wheat



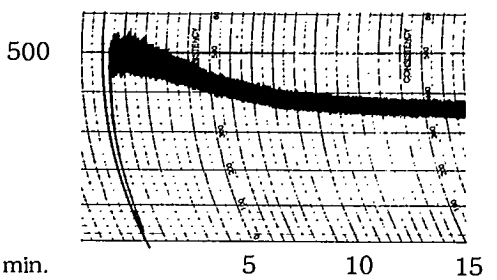
No. 1 Canada Prairie Spring Wheat



No. 1 Canada Western Soft White Spring Wheat



No. 1 Canada Eastern White Winter Wheat



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METHODS

Notes on the methods used by the Laboratory are given below. Unless otherwise specified, analytical results for wheat are reported on a 13.5% moisture basis and for flour on a 14.0% moisture basis. The AACC methods cited are those of the American Association of Cereal Chemists given in Cereal Laboratory Methods, Eighth Edition, 1983. The ICC methods are those of the International Association for Cereal Chemistry.

Test Weight is determined using the Schopper Chondrometer equipped with the 1 litre container. The weight in grams of the measured litre of wheat is divided by 10 and the result is reported on an "as is" moisture content basis.

Weight per Thousand Kernels. Broken kernels and foreign material are first removed from a sample by hand-picking. The number of kernels in a 20 g sub-sample of this cleaned material is then counted using an electronic seed counter.

Protein Content (N x 5.7) is determined by the Kjeldahl method as modified by Williams, "Journal of the Science of Food and Agriculture" 24:243,1973.

Alpha-amylase Activity of wheat and of flour is determined by the method of Kruger and Tipples, "Cereal Chem." 58:271-274, 1981.

Falling Number determined on a 7 g sample of ground wheat by the method of Hagberg, "Cereal Chem." 38:202-203, 1961. Wheat (300 g) is ground in a Falling Number Laboratory Mill 3100 (ICC Standard Method No. 107). Results are reported on a 14.0% moisture content basis.

Milling (flour) is carried out in an Allis- Chalmers laboratory mill using the GRL sifter flow as described by Black *et al*, "Cereal Foods World" 25:757-760, 1980.

Wet Gluten Content. The ICC Standard Method No. 137 is followed using the "Glutamatic" system. Note that this represents a change from the method used by the Grain Research Laboratory until July 31, 1988. Tests performed throughout the 1987-88 crop year indicated that, compared with the previous method, results were essentially the same for Canada Western Red Spring and Red Winter wheat - while slightly higher values were obtained for durum wheat and soft wheats.

Ash Content is determined on a 4 g sample in a silica dish incinerated overnight at 600 C. After cooling, the dish plus ash are weighed, the ash brushed out, the dish reweighed, and the weight of ash determined by difference.

Flour Color. A color index is obtained using the automated Simon Series IV Flour Color Grader which gives the relative reflectance of a flour-water slurry. Results are reported as arbitrary scale units; the lower the number, the brighter the color.

Starch Damage is determined on a 5 g sample by the method of Farrand, "Cereal Chem." 41:98- 111, 1964.

Amylogram. Sixty-five grams of flour (14.0% moisture content basis) and 450 mL 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.

Maltose Value is determined according to AACC Method 22-16.

Baking is carried out by the Remix baking test procedure of Irvine and McMullan, "Cereal Chem." 37:603-613, 1960, as described in detail by Kilborn and Tipples, "Cereal Foods World" 26: 624-628, 1981.

Remix-to-peak is a modification of the Remix method in which dough is mixed to optimum (peak) consistency.

Farinogram. Fifty grams of flour (14.0% moisture content basis) are mixed in a small stainless steel farinograph bowl (63 r.p.m. drive) for 15 min with sufficient distilled water to give a maximum dough consistency centered about the 500 Brabender Unit line. Farinograph absorption is the amount of water which must be added to a flour of 14.0% moisture

content to give the required consistency, and is reported as percent. Dough development time is the time required for the curve to reach its maximum height. For additional details, see the *Farinograph Handbook*, AACC, 1960.

Extensigram. Doughs are made from 300 g flour (14.0% moisture content basis), 6 g salt, and distilled water equal to the farinograph absorption less 2.0 percentage units to compensate both for the salt and for the substitution of the large stainless steel farinograph bowl. Doughs are mixed for 1 min, rested for 5 min, and mixing is then continued until the curve is centered about the 500 Brabender Unit line. Curves are drawn for duplicate doughs at 45 and at 135 min though doughs are also rounded and shaped at 90 min. Average curves for 45 and 135 min are reproduced, but measurements (length in centimeters, height in Brabender Units, and area in square centimeters) are reported only for the 135 min curve (solid line). The Extensigraph is set so that 100 Brabender Units equal a 100 g load.

Alveogram. The ICC Standard Method No. 121 is followed, using the constant pressure Model MA82 instrument.

Supplementary Baking Tests. The Sponge-and Dough method (4.5 hr, 70% sponge) is carried out as described by Kilborn and Preston, "Cereal Chem." 58:198-201, 1981. The Canadian Short Process method is carried out as described by Preston *et al*, "Can. Inst. Food Sci. Technol. J.", 15:29-36, 1982. For both methods loaves are produced from 200 g of flour in baking pans that have cross-section dimensions similar to those of Canadian commercial baking pans. Preliminary baking tests are carried out to determine optimum oxidation requirements.

Vitreous Kernels. This determination is made by the Grain Inspection Division on a 25 g sample of clean wheat. The vitreous kernels are handpicked and weighed.

SDS Sedimentation values are determined by the method of Axford and Redman, "Cereal Chemistry" 56:582(1979), using 3% SDS.

Milling (semolina). Wheat is cleaned, scoured and tempered overnight to 16.5% moisture prior to milling by a modified Buhler Laboratory Mill (Black and Bushuk, "Cereal Science Today" 12:164, 1967) in conjunction with a laboratory purifier (Black, "Cereal Science Today" 11:533, 1966). The mill flow

described by Dexter *et al* ("Canadian Institute of Food Science and Technology Journal" 15:225, 1982) was lengthened to achieve a higher extraction. Milling yield (including flour) and semolina yield (less than 1% through a 149 micron sieve) are reported, on a constant moisture basis, as a percentage of the cleaned tempered wheat. The millroom is controlled for temperature (22 C) and humidity (60%).

Semolina Color is determined according to AACC Method 14-30. An AGTRON direct reading reflectance spectrophotometer is used.

Speck Count is determined as described by Dexter and Matsuo, "Cereal Chemistry" 59:63 (1982).

Spaghetti is processed from semolina on a DEMACO laboratory-scale continuous extrusion press as described by Matsuo *et al* "Cereal Chemistry" 55:744 (1978) and dried both by a conventional low-temperature drying cycle (39°C) and by a high-temperature cycle (70°C) as described by Dexter *et al* "Journal of Food Science" 46:1741 (1981).

Spaghetti Color. Whole strands of spaghetti are mounted on white cardboard for color measurements. Dominant wavelength, purity, and brightness are determined, using the Ten Selected Ordinates method, with a Beckman DU-7 Spectrophotometer.

Spaghetti Cooking Quality is determined according to the method of Dexter and Matsuo, "Canadian Journal of Plant Science" 57: 717-727, 1977.

Stickiness of Cooked Spaghetti is measured on the GRL Compression Tester as described by Dexter *et al*, "Cereal Chemistry" 60:139, 1983.

Cooking Loss, the amount of material lost in the cooking water, is determined as described by Dexter and Matsuo, "Cereal Chemistry" 56:394, 1979.

Farinogram (semolina). Fifty grams of semolina (14% moisture content basis) is mixed with distilled water (31.5% absorption) in the small stainless steel farinograph bowl (59 r.p.m. drive), using the rear sensitivity setting.

Alkaline Water Retention Capacity (AWRC) is determined by the method of Yamazaki *et al*, "Crop Science" 8:199, 1968.

Cookie Test is performed according to AACC Method 10-50 D.

Collection of Samples. Samples are obtained from grain companies operating primary elevators in Western Canada. The grade composites of Red Spring Wheat are prepared by using samples from Manitoba and the eastern half of Saskatchewan for the Eastern Prairie composites and from Alberta and the western half of Saskatchewan for the Western Prairie composites. Samples collected up to and including the following dates were used:

September 26 - All grades of Canada Eastern White Winter Wheat.

September 27 - All grades of Canada Western Red Winter Wheat.

September 28 - All grades of Canada Western Amber Durum Wheat.

September 29 - No. 1 and No. 2 Canada Western Red Spring Wheat, Eastern Prairie.

October 5 - No. 1 and No. 2 Canada Western Red Spring Wheat, Western Prairie.

October 7 - All grades of Canada Prairie Spring Wheat.

October 11 - No. 3 Canada Western Red Spring Wheat and all grades of Canada Western Soft White Spring Wheat.

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