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GRAIN RESEARCH LABORATORY

QUALITY OF CANADIAN WHEAT 1987

Canada

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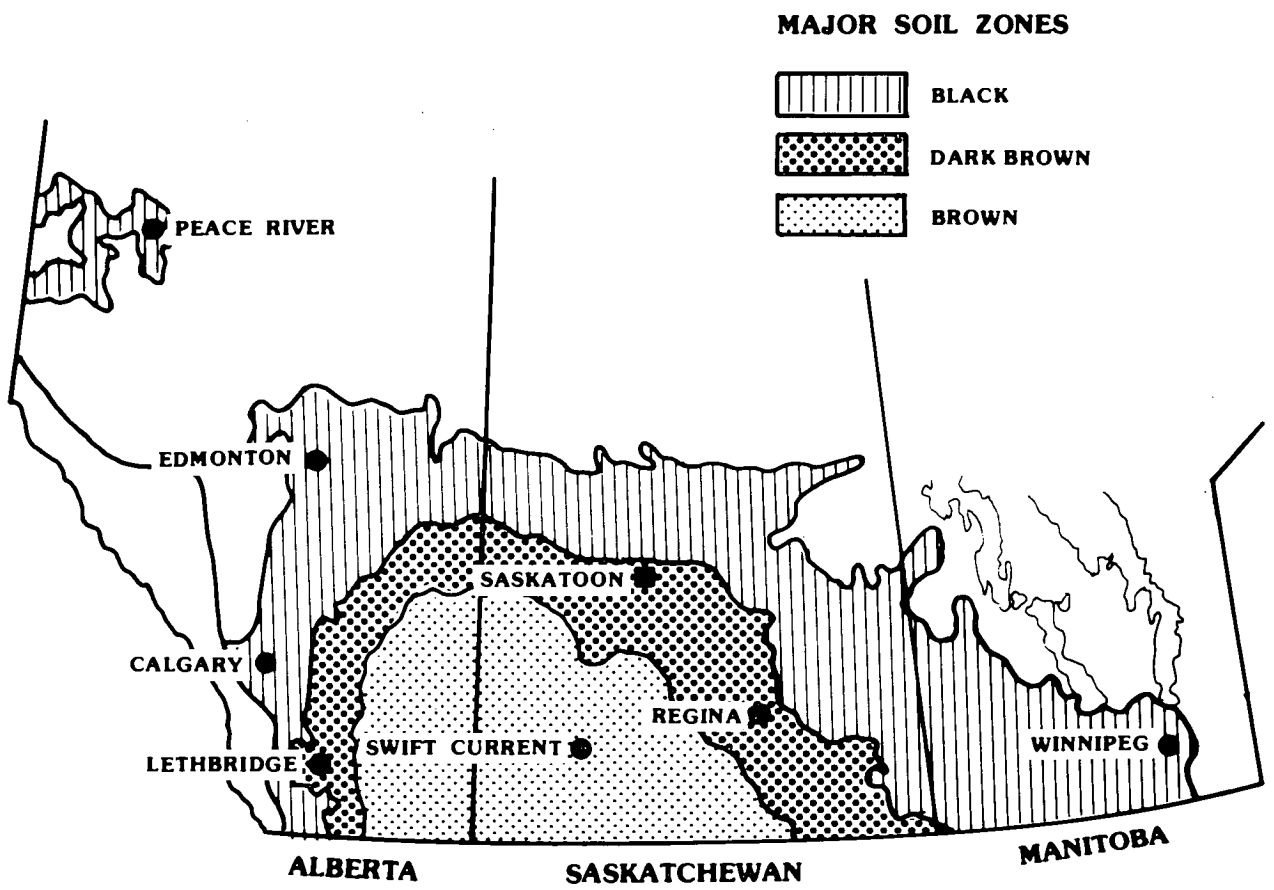
Figure 1 • Map of Western Canada Showing the Major Soil Zones in the Wheat Producing Areas



SUMMARY

The 1987 Canadian red spring wheat crop is reduced in size but has excellent quality. Protein content is high and milling quality is excellent, especially flour color, while dough strength shows a welcome increase to normal levels. Baking quality is very good, particularly in terms of loaf volume per unit flour protein content, in all baking methods.

Quality of other classes of Canadian wheat is generally good with higher than average protein levels and very good processing characteristics.

CONTENTS

INTRODUCTION

This bulletin presents detailed information on the quality of the 1987 crop of seven 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 Utility Wheat: a hard red spring wheat with extra-strong gluten suitable for blending purposes and for the production of pan breads and hearth breads.
- Canada Western Soft White Spring Wheat: a 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.

It is important to note that data presented 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.

Crop prospects fluctuated as the season progressed, but the final picture that emerged was, overall, a favorable one with almost all wheat safely in the bin earlier than usual.

The month of June was very dry and this affected extensive stands of winter wheat in Western Canada, with many fields ploughed down or cut for feed. However, timely rains through July and into August resulted in good crop prospects for spring-seeded wheat. Other production-reducing influences were not widespread: a predicted massive grasshopper infestation did not materialize; midge was again evident in northeast Saskatchewan but was controlled by effective spraying; and the Edmonton tornado caused little crop damage.

Swathing of spring wheat started by August 6, by which time a large proportion of the winter wheat was combined. After several rain delays, the harvest was completed by about September 10 in the southern third of the grain belt and by the end of September in the northern third - much earlier than the previous two years.

Statistics Canada (Field Crop Reporting Series No. 7, October 2, 1987) estimates production of spring wheat in Western Canada to be 20.54 million tonnes from 10.67 million hectares, compared with final estimates of 25.30 million tonnes from 11.53 million hectares in 1986. Durum wheat production is estimated at a record 4.04 million tonnes, compared with the previous record of 3.90 million tonnes set last year. This second successive record production resulted from a record 2.19 million hectares being seeded. Winter wheat production this year dropped to 0.66 from 0.95 million tonnes; and seeded area dropped to 0.37 from 0.51 million hectares. Ontario winter wheat production is estimated at 0.48 million tonnes, about 50% less than last year's production of 0.95 million tonnes - due to a decrease in seeded area to 0.14 from 0.26 million hectares.

In addition to total production being lower this year, the amount of western Canadian wheat entering the top grades may be down somewhat, mainly due to preharvest weathering. Occurrence of smudge also resulted in some degrading of durum wheat. The Canadian Grain Commission estimates that 19% of the 1987 red spring wheat crop will qualify for the grade No. 1 CW, 46% for No. 2 CW, 32% for No. 3 CW and 3% for CW Feed. Grade distribution estimates for amber durum wheat are: 14% No. 1 CWAD, 24% No. 2 CWAD, 36% No. 3 CWAD, 22% No. 4 CWAD and 4% No. 5 CWAD. Growing and harvesting conditions in Ontario were good - with the result that most Canada Eastern White Winter wheat will qualify for the top two grades.

Data from the 1987 protein content survey and from tests on grade composite samples of the seven classes of wheat are presented in the series of tables, figures and comments which now follow. Figure 1 is a map showing the predominant soil zones in the wheat-growing area of Western Canada; and Table 1 lists the mean protein content values obtained in this year's survey of quality of the various classes of Canadian wheat. 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 1987 published by Prairie Pools Inc., Regina, Saskatchewan.

1. Protein Content of 1987 and 1986 Crop Canadian Wheat Classes (Preliminary as at October 23, 1987)

Class	1987 - Preliminary		1986 - Final	
	Number of Samples	Protein Content, %*	Number of Samples	Protein Content, %*
Canada Western Red Spring	5,178	14.0	10,439	13.1
Canada Western Amber Durum	1,050	14.0	1,764	12.9
Canada Western Utility	56	13.6	91	12.0
Canada Prairie Spring	130	12.3	295	11.5
Canada Western Red Winter	574	11.8	890	10.9
Canada Western Soft White Spring	615	10.3	283	10.6
Canada Eastern White Winter	365	10.6	262	9.6

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

CANADA WESTERN RED SPRING WHEAT

Katepwa, registered in 1981, is once again the predominant variety of Canada Western Red Spring (CWRS) wheat grown in 1987 at 45.0% of the total area planted. Neepawa is the second leading variety at 26.1% of seeded area. Other major CWRS varieties include Columbus (18.8%), Park (2.8%), Leader (2.1%) and Benito (1.6%).

Protein Survey - Preliminary Data for Red Spring Wheat

The average protein content of the 1987 red spring wheat crop is currently estimated at 14.0%. This estimate is based on 5,178 survey samples tested up to October 23. The 1987 average is 0.9 percentage units higher than that of last year and 0.4 percentage units higher than the long term (61 year) mean of 13.6% as shown in Figure 2.

Table 2 shows the new crop wheat from the province of Alberta to be highest in protein content, averaging 14.1% followed closely by Saskatchewan at 14.0%. The Manitoba average is lowest at 13.6%. This is in contrast to 1986 results where Manitoba had the highest mean protein content at 13.3% followed by Alberta at 13.1% and Saskatchewan at 13.0%.

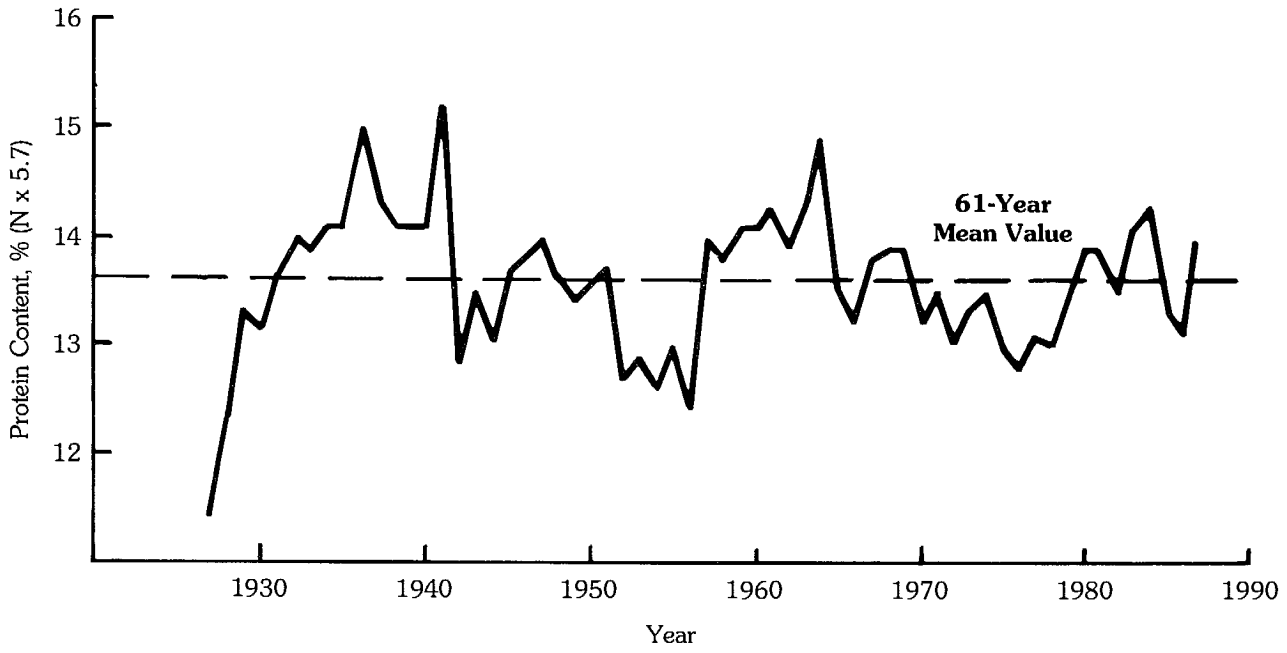
In general, the protein content decreases progressively from the higher to lower grades of CWRS wheat as shown in Table 2. Overall, the No. 1 CW provincial averages (mean of 14.2% for Western Canada) are considerably higher than corresponding averages obtained in 1986. Table 2 also shows 10-year mean values by grade for the period 1977-1986 for comparative purposes.

2. Protein Content of 1987 Crop Red Spring Wheat (Preliminary as at October 23, 1987)

Grade	Number of Samples Prairies 1987	Protein Content, %*					
		Prairies			1987		
		1987	1986	1977-86	Manitoba	Saskatchewan	Alberta
No. 1 CW	1,706	14.2	13.4	13.9	13.8	14.3	14.1
No. 2 CW	2,060	14.0	13.3	13.5	13.8	14.0	14.0
No. 3 CW	1,343	13.7	12.8	13.1	13.3	13.6	14.3
CW Feed	69	13.8	12.9	-	13.9	13.9	13.8
All Grades	5,178	14.0	13.1	13.6	13.6	14.0	14.1

* N x 5.7; 13.5% moisture content basis.

Figure 2 • Mean Protein Content of New Crop Canadian Red Spring Wheat 1927 to 1987



MILLING AND BAKING QUALITY DATA

For the assessment of quality for the 1987 Canada Western Red Spring (CWRS) wheat crop, composites were prepared from survey samples representing each of the three 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).

No. 1 Canada Western Red Spring Wheat

Tables 3 to 6 provide detailed quality data for No. 1 CWRS wheat segregated by protein content and by region. Test weight values for all No. 1 CW grade composites are lower than in 1986 and lower than the 10 year long term average. Kernel weight is generally lower than last year but higher than long term averages. Both the No. 1 CW Eastern and Western Prairie composites exhibit low levels of alpha-amylase activity and correspondingly high values for wheat falling number and flour amylograph viscosity. Values for the two sets of composites show consistent and significant differences, however, with Western Prairie composites having a slightly higher enzyme activity and correspondingly lower falling number and amylograph values.

The 1987 crop has excellent milling quality. Eastern Prairie composites show lower milling yield compared with 1986 but flour ash and flour color values are markedly improved. Flour yield and flour ash values are similar to long-term averages but flour color is better (lower values) than have ever been seen in new crop surveys. Milling yield of 1987 Western Prairie composites is similar to those of 1986 and slightly higher than average while flour color values are similar to those of the Eastern Prairie composites and superior to both 1986 and long term averages. Flour starch damage levels for the Eastern Prairie No. 1 CW composites are distinctly lower than in 1986, indicating a reduction to a normal level of kernel hardness. In contrast, the Western Prairie composites, as in 1986, show elevated starch damage levels, indicating harder kernel characteristics.

This year's No. 1 CW Red Spring wheat shows a distinct improvement in dough strength properties compared with 1986. Flour from both the Eastern and Western Prairie composites have longer farinograph dough development times and larger extensigraph areas than last year. The Western Prairie composites have dough strength levels similar to the long term averages while the Eastern Prairie composites are slightly stronger than normal. Farinograph absorption for composites from both regions is lower than in 1986 and similar to long term average values.

Overall baking results indicate very good quality including, as usual, high loaf volume per unit of flour protein content and excellent baking absorption. Both the Eastern and Western composites show improvement over last year's crop in loaf volume per unit flour protein content in all baking procedures utilized.

No. 2 Canada Western Red Spring Wheat

The quality characteristics of the 1987 crop composites for No. 2 CWRS wheat segregated by protein content and by region are given in Tables 7 to 10. Test weight and kernel weight for both the Eastern Prairie and Western Prairie composites are lower than in 1986. The Eastern Prairie No. 2 CW composites have low levels of alpha-amylase activity and correspondingly high wheat falling number and flour amylograph peak viscosity values. Somewhat higher levels of alpha-amylase activity are present in the Western Prairie composites - resulting in correspondingly lower wheat falling number and amylograph peak viscosity values. However these levels still indicate sound kernel characteristics and should present no problems in processing.

Flour yield for the No. 2 CW composites from both prairie regions is lower than in 1986 and similar to the long term averages. Flour ash values are similar to those obtained last year but higher than average while flour color is similar to 1986 but superior when compared with long term averages.

Physical dough strength of No. 2 CW composites is increased over last year to the same extent that the strength of No. 1 CW composites has increased over 1986 comparative values. Overall, the baking data for the No. 2 CW grade composites exhibit the same good quality characteristics inherent in top grade wheat. In particular this year's No. 2 CW composites show an improved loaf volume response per unit of flour protein content compared with 1986.

No. 3 Canada Western Red Spring Wheat

Tables 11 and 12 list quality data for the No. 3 CW Eastern and Western Prairie new crop grade composites. The composites from both prairie regions show reduced test weight and kernel weight compared with 1986. Flour yield for both composites is lower than last year and similar to long term averages while flour ash values are similar to those obtained for the 1986 composites and higher than long term averages. Flour color values are superior to the 10-year average.

Both Eastern and Western Prairie No. 3 CWRS new crop composites show marked improvements in dough strength properties compared with 1986 as evidenced by longer farinograph dough development times and larger extensigraph areas. Baking properties of this year's No. 3 CW grade composites also show improvements compared with 1986, especially in terms of loaf volume. This can be attributed to the increased dough strength properties and, in particular, to the higher than average protein content.

Alpha-amylase activity for both the Eastern and Western Prairie No. 3 CW new crop composites are much lower than corresponding values obtained in 1986 - resulting in much higher wheat falling number and flour amylograph peak viscosity values. It should be noted that wheat falling number values for exports of No. 3 CW wheat can show considerable variation. For the current crop year (1987-88), it is anticipated that early (1st and 2nd quarter) shipments of No. 3 CWRS wheat will have much lower falling number values than is suggested by the 1987 new crop data due to carryover stocks of 1986 harvest wheat.

3. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1986	Mean*
Number of Samples Represented	587	646	405	1158	-
WHEAT					
Test Weight, kg/hL	80.8	80.9	80.9	81.7	81.7
1000 Kernel Weight, g	31.9	31.6	31.3	32.6	30.0
Protein Content, % (N x 5.7)	14.7	13.8	12.8	13.5	13.7
Ash Content, %	1.56	1.64	1.59	1.70	1.57
Alpha-amylase Activity, units/g	3.6	3.3	3.3	4.0	3.4
Falling Number, s	420	420	420	405	390
Flour Yield, %	75.5	75.6	75.5	76.6	75.4
FLOUR					
Protein Content, %	14.2	13.3	12.2	13.1	13.2
Wet Gluten Content, %	43.2	39.7	35.3	38.0	39.4
Ash Content, %	0.46	0.47	0.49	0.51	0.47
Color, units	-1.1	-1.3	-1.4	-0.8	-0.5
Alpha-amylase Activity, units/g	0.9	0.7	0.8	0.7	0.9
Amylograph Peak Viscosity, B.U.	765	775	775	730	730
Maltose Value, g/100 g	1.7	1.8	2.0	2.1	N/A
Starch Damage, Farrand units	30	31	33	36	30
Baking Absorption, %	66	65	62	65	64
BREAD					
Loaf Volume, cm^3	985	870	795	860	865
Appearance	8.8	8.5	7.8	8.0	8.0
Crumb Structure	6.8-o	7.0-o	7.0-o	7.0-o	6.8-o
Crumb Color	7.2	6.5-d	5.5-d	6.0-dy	6.2-dy
Blend Loaf Volume, cm^3	745	710	685	695	710
FARINOGRAM					
Absorption, %	65.8	64.7	63.6	66.2	64.6
Development Time, min	5.50	5.00	3.50	4.00	4.50
M.T.I., B.U.	30	35	30	40	30
Stability, min	8.00	7.50	7.00	6.50	8.00
EXTENSIGRAM					
Length, cm	22	22	22	21	22
Height at 5 cm, B.U.	260	270	265	235	260
Maximum Height, B.U.	455	460	425	345	420
Area, cm^2	140	135	130	100	130
ALVEOGRAM					
Length, mm	144	139	137	104	113
P (height x 1.1), mm	91	96	104	110	97
W, x 10^3 ergs	415	412	424	366	364

* Mean values are for the 10-year period 1976 to 1985.

4. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1986	Mean*
Number of Samples Represented	720	659	434	840	-
WHEAT					
Test Weight, kg/hL	81.2	81.5	81.6	81.9	82.0
1000 Kernel Weight, g	33.4	32.3	33.3	32.5	30.4
Protein Content, % (N x 5.7)	14.7	13.6	12.8	13.5	13.7
Ash Content, %	1.54	1.53	1.54	1.53	1.54
Alpha-amylase Activity, units/g	5.6	5.6	5.6	4.2	3.6
Falling Number, s	380	380	395	395	380
Flour Yield, %	76.7	76.5	76.1	75.9	75.4
FLOUR					
Protein Content, %	14.2	13.1	12.2	13.1	13.2
Wet Gluten Content, %	43.2	39.7	35.2	37.8	38.9
Ash Content, %	0.46	0.47	0.48	0.48	0.46
Color, units	-1.0	-1.2	-1.4	-0.8	-0.5
Alpha-amylase Activity, units/g	1.6	1.5	1.6	0.6	1.1
Amylograph Peak Viscosity, B.U.	630	650	630	650	690
Maltose Value, g/100 g	2.0	2.0	2.2	2.2	N/A
Starch Damage, Farrand units	29	34	39	36	30
Baking Absorption, %	66	64	64	64	64
BREAD					
Loaf Volume, cm^3	935	855	780	830	865
Appearance	8.2	8.0	8.0	8.0	8.0
Crumb Structure	6.8-o	6.8-o	7.0-o	7.0-o	6.8-o
Crumb Color	7.0	6.8-d	6.0-d	6.0-dy	6.2-dy
Blend Loaf Volume, cm^3	735	700	670	675	710
FARINOGRAM					
Absorption, %	66.6	66.0	66.1	66.6	65.0
Development Time, min	5.25	5.00	4.25	4.00	4.75
M.T.I., B.U.	35	35	35	30	30
Stability, min	7.50	6.50	7.00	7.00	8.25
EXTENSIGRAM					
Length, cm	22	21	22	22	22
Height at 5 cm, B.U.	260	270	250	225	265
Maximum Height, B.U.	440	435	390	350	430
Area, cm^2	135	125	120	105	130
ALVEOGRAM					
Length, mm	143	134	104	119	109
P (height x 1.1), mm	100	106	122	108	99
W, x 10^3 ergs	424	425	404	386	375

* Mean values are for the 10-year period 1976 to 1985.

5. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Eastern Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			1986
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	67	66	65	67
Mixing*: energy, Whr/kg	3.2	3.2	3.0	3.1
Mixing*: time, min	3.2	3.5	3.5	3.2
Loaf volume, cm^3/100 g flour	1128	1085	975	1020
Yield: Bread Wt/Flour Wt	1.44	1.44	1.44	1.47
Appearance	7.9	7.7	6.5	7.9
Crumb Structure	6.8-o+	6.8-o	6.7-o	6.8-o
Crumb Color	8.2	8.0	7.7	7.8
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	69	67	68
Mixing: energy, Whr/kg	6.9	7.7	6.3	6.7
Mixing: time, min	6.5	7.1	6.3	5.8
Loaf Volume, cm^3/100 g flour	1108	1095	1015	1050
Yield: Bread Wt/Flour Wt	1.55	1.55	1.53	1.54
Appearance	7.5	7.5	6.5	7.8
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.5	8.3	8.0	8.2

* Dough Stage

6. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Western Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			1986
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	68	67	67	67
Mixing*: energy, Whr/kg	3.1	3.1	2.8	2.8
Mixing*: time, min	3.2	3.4	3.2	3.0
Loaf volume, cm^3/100 g flour	1130	1085	990	1045
Yield: Bread Wt/Flour Wt	1.46	1.45	1.45	1.45
Appearance	7.5	7.7	6.1	8.0
Crumb Structure	6.8-o	6.9-o	6.8-o	6.8-o
Crumb Color	8.2	8.2	7.8	7.9
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	69	69	68
Mixing: energy, Whr/kg	7.3	8.4	7.1	6.0
Mixing: time, min	6.5	7.3	6.7	5.6
Loaf Volume, cm^3/100 g flour	1085	1038	1003	1100
Yield: Bread Wt/Flour Wt	1.55	1.54	1.55	1.57
Appearance	7.5	7.5	7.4	7.8
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.5	8.5	8.4	8.3

* Dough Stage

7. NO. 2 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			No. 2 CW 13.5	
	14.5	13.5	12.5	1986	Mean*
Number of Samples Represented	743	768	557	1415	-
WHEAT					
Test Weight, kg/hL	79.0	78.8	79.2	80.1	80.2
1000 Kernel Weight, g	30.6	30.3	30.4	32.6	30.8
Protein Content, % (N x 5.7)	14.5	13.5	12.5	13.8	13.7
Ash Content, %	1.64	1.62	1.65	1.65	1.61
Alpha-amylase Activity, units/g	5.3	4.4	3.6	4.5	5.6
Falling Number, s	390	415	425	415	380
Flour Yield, %	75.0	74.9	74.9	75.8	75.0
FLOUR					
Protein Content, %	13.8	12.8	11.9	13.3	13.1
Wet Gluten Content, %	40.7	39.1	34.5	37.7	38.8
Ash Content, %	0.49	0.51	0.51	0.52	0.47
Color, units	-0.5	-0.9	-1.1	-0.7	-0.2
Alpha-amylase Activity, units/g	1.5	1.2	1.4	2.4	1.6
Amylograph Peak Viscosity, B.U.	635	665	680	490	645
Maltose Value, g/100 g	1.8	1.9	2.1	2.0	N/A
Starch Damage, Farrand units	29	30	31	30	28
Baking Absorption, %	65	63	62	64	64
BREAD					
Loaf Volume, cm^3	955	855	785	870	870
Appearance	8.5	8.0	8.0	7.8	8.2
Crumb Structure	6.5-o	6.8-o	7.2	6.8-o	6.8-o
Crumb Color	7.2	6.2-dy	5.5-d	6.5-d	6.2-dy
Blend Loaf Volume, cm^3	730	690	665	730	705
FARINOGRAM					
Absorption, %	64.9	63.9	63.1	64.8	64.4
Development Time, min	4.75	4.50	3.25	4.25	4.50
M.T.I., B.U.	35	35	45	35	35
Stability, min	8.00	7.00	6.00	7.00	7.50
EXTENSIGRAM					
Length, cm	23	21	22	22	22
Height at 5 cm, B.U.	270	275	265	240	255
Maximum Height, B.U.	450	445	430	345	395
Area, cm^2	140	130	125	105	125
ALVEOGRAM					
Length, mm	159	152	125	125	105
P (height x 1.1), mm	92	93	109	94	95
W, x 10^3 ergs	435	425	417	334	345

* Mean values are for the 10-year period 1976 to 1985.

8. NO. 2 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			No. 2 CW 13.5	
	14.5	13.5	12.5	1986	Mean*
Number of Samples Represented	743	742	554	485	-
WHEAT					
Test Weight, kg/hL	79.6	79.8	80.4	81.0	80.3
1000 Kernel Weight, g	33.0	31.9	31.5	33.8	31.0
Protein Content, % (N x 5.7)	14.7	13.7	12.6	13.7	13.7
Ash Content, %	1.67	1.57	1.68	1.47	1.54
Alpha-amylase Activity, units/g	14.1	10.1	6.2	6.1	5.4
Falling Number, s	320	345	370	390	360
Flour Yield, %	75.3	75.0	75.0	75.6	75.1
FLOUR					
Protein Content, %	14.1	13.0	12.1	13.3	13.1
Wet Gluten Content, %	43.2	39.3	35.1	38.4	38.8
Ash Content, %	0.50	0.50	0.52	0.49	0.47
Color, units	-0.5	-0.6	-0.8	-0.6	-0.1
Alpha-amylase Activity, units/g	3.5	2.8	2.4	3.1	2.1
Amylograph Peak Viscosity, B.U.	430	445	550	430	550
Maltose Value, g/100 g	2.0	2.2	2.4	2.1	N/A
Starch Damage, Farrand units	28	33	38	34	29
Baking Absorption, %	66	65	64	65	64
BREAD					
Loaf Volume, cm^3	930	845	755	840	865
Appearance	8.0	7.5	7.5	7.5	8.0
Crumb Structure	6.5-o	6.8-o	6.8-o	7.0-o	6.8-o
Crumb Color	6.8-d	6.5-d	5.2-dy	6.0-dy	6.2-dy
Blend Loaf Volume, cm^3	730	700	665	700	700
FARINOGRAM					
Absorption, %	66.9	66.5	66.4	66.0	65.0
Development Time, min	5.00	4.50	3.50	4.00	4.50
M.T.I., B.U.	35	35	40	30	35
Stability, min	6.50	6.50	6.00	7.00	7.50
EXTENSIGRAM					
Length, cm	23	21	21	22	22
Height at 5 cm, B.U.	225	235	240	245	245
Maximum Height, B.U.	350	365	340	350	385
Area, cm^2	110	105	100	115	120
ALVEOGRAM					
Length, mm	150	128	98	129	107
P (height x 1.1), mm	96	110	122	93	96
W, x 10^3 ergs	414	420	375	337	343

* Mean values are for the 10-year period 1976 to 1985.

9. NO. 2 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Eastern Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			1986
	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	67
Mixing*: energy, Whr/kg	3.2	3.0	2.9	2.6
Mixing*: time, min	3.3	3.4	3.3	2.9
Loaf volume, cm^3/100 g flour	1160	1033	975	1015
Yield: Bread Wt/Flour Wt	1.45	1.43	1.42	1.44
Appearance	8.3	6.7	6.3	7.4
Crumb Structure	6.8-o	6.8-o	6.7-o+	6.8-o
Crumb Color	8.3	7.7	7.7	7.5
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	69	68	67	69
Mixing: energy, Whr/kg	7.7	8.0	7.6	7.2
Mixing: time, min	6.8	7.2	7.2	5.9
Loaf Volume, cm^3/100 g flour	1055	1055	960	1045
Yield: Bread Wt/Flour Wt	1.54	1.53	1.53	1.55
Appearance	7.7	7.5	7.0	7.9
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.5	8.5	7.8	8.0

* Dough Stage

10. NO. 2 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data • Western Prairie Grade Composite Samples of 1987 Crop

Quality Parameter	Minimum Protein Level			1986
	14.5	13.5	12.5	No. 2 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	68	67	66	67
Mixing*: energy, Whr/kg	3.0	2.7	2.7	2.7
Mixing*: time, min	3.0	3.0	3.0	2.8
Loaf volume, cm^3/100 g flour	1100	1010	915	1010
Yield: Bread Wt/Flour Wt	1.46	1.45	1.45	1.44
Appearance	7.8	6.7	6.4	7.5
Crumb Structure	6.8-o+	6.8-o	6.8-o+	6.8-o
Crumb Color	8.1	8.0	7.5	7.7
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	70	69	69
Mixing: energy, Whr/kg	6.6	7.4	6.7	7.1
Mixing: time, min	6.0	6.7	6.3	5.8
Loaf Volume, cm^3/100 g flour	1088	1028	980	1060
Yield: Bread Wt/Flour Wt	1.55	1.56	1.57	1.56
Appearance	7.8	7.1	7.2	8.0
Crumb Structure	6.8-o	6.9-o	6.7-o	7.0
Crumb Color	8.7	8.4	8.1	8.3

* Dough Stage

11. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Sample of 1987 Crop

Quality Parameter	1987	1986	Mean*
Number of Samples in Composite	718	2,869	-
WHEAT			
Test Weight, kg/hL	77.2	79.0	78.7
1000 Kernel Weight, g	31.0	32.0	30.9
Protein Content, % (N x 5.7)	13.4	12.9	13.1
Ash Content, %	1.65	1.58	1.62
Alpha-amylase Activity, units/g	9.3	41.6	12.0
Falling Number, s	365	275	325
Flour Yield, %	74.7	75.8	74.1
FLOUR			
Protein Content, %	12.8	12.4	12.4
Wet Gluten Content, %	37.4	35.0	36.3
Ash Content, %	0.51	0.52	0.49
Color, units	-0.3	-0.4	0.3
Alpha-amylase Activity, units/g	3.8	11.5	3.7
Amylograph Peak Viscosity, B.U.	390	135	355
Maltose Value, g/100 g	2.0	2.9	N/A
Starch Damage, Farrand units	29	32	29
Baking Absorption, %	63	63	63
BREAD			
Loaf Volume, cm^3	865	815	820
Appearance	8.0	7.5	8.0
Crumb Structure	6.8-o	7.0-o	6.8-o
Crumb Color	6.0-d	5.8-d	5.8-dy
Blend Loaf Volume, cm^3	710	695	680
FARINOGRAM			
Absorption, %	64.3	64.2	63.9
Development Time, min	4.25	3.75	4.00
M.T.I., B.U.	40	40	40
Stability, min	6.50	5.50	6.50
EXTENSIGRAM			
Length, cm	22	22	21
Height at 5 cm, B.U.	265	210	255
Maximum Height, B.U.	420	310	390
Area, cm^2	125	95	120
ALVEOGRAM			
Length, mm	144	128	104
P (height x 1.1), mm	99	95	101
W, x 10^3 ergs	425	364	349

* Mean values are for the 10-year period 1976 to 1985.

12. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Sample of 1987 Crop

Quality Parameter	1987	1986	Mean*
Number of Samples in Composite	603	1,772	-
WHEAT			
Test Weight, kg/hL	78.2	79.3	79.5
1000 Kernel Weight, g	32.2	34.1	31.4
Protein Content, % (N x 5.7)	14.2	12.8	12.8
Ash Content, %	1.63	1.55	1.58
Alpha-amylase Activity, units/g	20.3	43.6	19.8
Falling Number, s	300	250	290
Flour Yield, %	74.6	74.9	74.6
FLOUR			
Protein Content, %	13.6	12.1	12.0
Wet Gluten Content, %	40.6	34.4	35.2
Ash Content, %	0.51	0.50	0.50
Color, units	-0.1	-0.4	0.3
Alpha-amylase Activity, units/g	5.9	20.7	6.4
Amylograph Peak Viscosity, B.U.	275	90	270
Maltose Value, g/100 g	2.3	3.2	N/A
Starch Damage, Farrand units	31	33	32
Baking Absorption, %	65	63	63
BREAD			
Loaf Volume, cm^3	895	780	765
Appearance	7.8	7.5	7.5
Crumb Structure	6.8-o	7.0-o	6.5-o
Crumb Color	5.5-d	5.2-d	5.2-dy
Blend Loaf Volume, cm^3	725	680	660
FARINOGRAM			
Absorption, %	66.2	64.4	64.6
Development Time, min	4.25	3.75	3.75
M.T.I., B.U.	40	50	45
Stability, min	6.00	6.00	6.00
EXTENSIGRAM			
Length, cm	24	21	21
Height at 5 cm, B.U.	220	210	245
Maximum Height, B.U.	340	300	345
Area, cm^2	110	90	105
ALVEOGRAM			
Length, mm	146	114	85
P (height x 1.1), mm	100	99	112
W, x 10^3 ergs	415	344	328

* Mean values are for the 10-year period 1976 to 1985.

CANADA WESTERN AMBER DURUM WHEAT

The salient feature of this year's amber durum wheat crop is the very low percentage of the crop entering the No. 1 CWAD grade. The major contributing factor for the downgrading is the presence of kernels with reddish discoloration, commonly referred to as red smudge. Only 14% of the crop is estimated by the Grain Inspection Division of the Canadian Grain Commission to qualify for the No. 1 Canada Western Amber Durum wheat grade, 24% for No. 2 CWAD, 36% for No. 3 CWAD and 22% for No. 4 CWAD, compared with the 10-year average (1977-86) distribution of 25.4% No. 1, 31.7% No. 2, 23.1% No. 3 and 14.7% No. 4.

Protein content in 1987 (see Table 13) is about one percentage unit higher than in 1986 and well above the 20-year mean (1967-1986) of 13.4%. Test weight values for all grades are slightly lower than those for last year but kernel weight is higher.

Wakooma is still the predominant variety grown, accounting for 34.0% of the area seeded to durum wheat in Western Canada. Medora at 21% is now second, replacing Wascana (20%). Kyle, another of the strong-gluten cultivars recently registered, increased to 13% of the area from less than 1% in 1986, meaning that strong-gluten varieties now account for about 80% of the durum production.It is expected that spaghetti cooking quality will continue to be good with the predominance of strong-gluten durum wheat varieties.

13. Protein Content of 1987 Crop Amber Durum Wheat (Preliminary as at October 23, 1987)

Grade	Number of Samples Prairies 1987	Protein Content, %*					
		Prairies			1987		
		1987	1986	1981-85	Manitoba	Saskatchewan	Alberta
No. 1 CWAD	176	14.1	13.2	13.9	-	14.1	14.2
No. 2 CWAD	349	14.1	12.9	13.9	12.8	14.0	14.3
No. 3 CWAD	369	14.0	13.1	14.0	13.3	14.1	14.4
No. 4 CWAD	150	13.6	12.5	13.4	13.5	13.6	14.2
All Grades	1,044	14.0	12.9	13.9	14.3	14.0	14.3

* N x 5.7; 13.5% moisture content basis.

Rain during the harvest period in some areas resulted in weathering and sprouting as indicated by lower falling number values in the top three grades compared with 1986 values. The falling number value for No. 4 CWAD is significantly higher this year than last.

Red smudge has been a major degrading factor for the last several years but its incidence is the highest this year. It is a major concern to producers because of the very low tolerance for red smudge in the top grades. The Official Grain Grading Guide of the Canadian Grain Commission specifies the following tolerance levels: 30 kernels in the No. 1 CWAD grade, 1% in No. 2 CWAD and 1.5% in No. 3 CWAD.

On the basis of Laboratory tests carried out over a number of years, red smudge affects spaghetti quality only at levels approaching 10%. At such a high level, spaghetti color is poorer and undesirable dark specks are evident. Semolina speck count for No. 1 CWAD is about the same as that in 1986 but for the other grades this year's samples have a lower count.

For spaghetti processed by the conventional low temperature system (39°C), cooking quality is decidedly better this year than last; but for the samples processed using the high temperature drying system, differences are not significant. Tables 14 and 15 provide complete quality data for grade composite samples of the 1987 crop.

14. NO. 1 AND NO. 2 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for Grade Composite Samples of 1987 Crop

	1987		1986	
Quality Parameter	No. 1 CWAD	No. 2 CWAD	No. 1 CWAD	No. 2 CWAD
Number of Samples	176	349	587	284
WHEAT				
Test Weight, kg/hL	81.2	80.3	82.6	81.9
1000 Kernel Weight, g	46.4	45.5	44.2	43.4
Vitreous Kernels, %	85	74	92	83
Protein Content, %	14.2	14.0	13.3	13.0
Ash Content, %	1.46	1.57	1.51	1.64
SDS Sedimentation, mL	40	42	43	38
Falling Number, s	355	325	400	400
Milling Yield, %	76.6	76.0	76.3	76.6
Semolina Yield, %	65.2	64.6	65.4	65.0
SEMOLINA				
Protein Content, %	13.0	13.0	12.4	12.2
Wet Gluten Content, %	32.6	32.6	31.9	30.5
Ash Content, %	0.62	0.64	0.61	0.64
AGTRON Color, units	72	72	78	78
Speck Count, per 50 cm^2	24	30	22	34
SPAGHETTI				
Dried at 39°C				
Color:				
Brightness, %	48.2	47.8	50.8	50.1
Purity, %	59.0	58.6	63.1	63.4
Dominant Wavelength, nm	577.6	577.6	577.4	577.4
Cooking Quality, CQP	21.8	28.0	14.3	12.8
Stickiness, N/m^2	835	750	955	910
Cooking Loss, %	7.5	7.4	7.4	6.8
Dried at 70°C				
Color:				
Brightness, %	47.8	48.1	50.2	50.0
Purity, %	56.6	57.2	59.1	60.0
Dominant Wavelength, nm	577.6	577.5	577.5	577.7
Cooking Quality, CQP	29.0	31.1	31.8	29.8
Stickiness, N/m^2	850	740	700	660
Cooking Loss, %	7.1	7.2	7.6	7.2

15. NO. 3 AND NO. 4 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for Grade Composite Samples of 1987 Crop

Quality Parameter	1987		1986	
	No. 3 CWAD	No. 4 CWAD	No. 3 CWAD	No. 4 CWAD
Number of Samples	369	150	344	504
WHEAT				
Test Weight, kg/hL	79.1	77.8	80.7	79.0
1000 Kernel Weight, g	44.2	43.4	42.0	43.9
Vitreous Kernels, %	59	35	69	59
Protein Content, %	13.9	13.8	12.9	12.6
Ash Content, %	1.64	1.72	1.71	1.55
SDS Sedimentation, mL	42	43	36	35
Falling Number, s	295	250	310	165
Milling Yield, %	75.6	74.6	76.2	76.3
Semolina Yield, %	64.6	64.0	64.8	64.6
SEMOLINA				
Protein Content, %	13.2	13.1	12.4	12.0
Wet Gluten Content, %	33.2	32.1	31.8	29.6
Ash Content, %	0.65	0.66	0.67	0.68
AGTRON Color, units	68	65	72	69
Speck Count, per 50 cm^2	43	68	50	74
SPAGHETTI				
Dried at 39°C				
Color:				
Brightness, %	46.6	47.0	48.3	48.2
Purity, %	59.0	59.1	64.6	60.7
Dominant Wavelength, nm	577.8	577.8	577.6	577.6
Cooking Quality, CQP	24.0	21.6	12.4	14.4
Stickiness, N/m^2	790	895	1210	1120
Cooking Loss, %	7.4	7.9	7.9	8.3
Dried at 70°C				
Color:				
Brightness, %	46.9	45.5	47.1	46.6
Purity, %	57.4	57.5	62.8	60.7
Dominant Wavelength, nm	577.8	578.1	577.8	577.8
Cooking Quality, CQP	28.4	23.8	26.4	23.8
Stickiness, N/m^2	730	880	748	780
Cooking Loss, %	7.0	7.0	6.4	6.6

CANADA WESTERN RED WINTER WHEAT

Canada Western Red Winter (CWRW) wheat has superior milling quality, and flours milled from the top grades of this class of wheat perform very well in the production of French-type hearth breads. They are also suitable for the production of certain types of noodles, flat breads, steamed breads and related products.

The variety Norstar continued to account for most of the Canada Western Red Winter wheat grown, representing 94.6% of the area seeded to this crop, planted in 1987. Small quantities of Sundance (4.2%) and the newly registered variety Norwin were also grown.

Based on a total of 574 survey samples, the protein content of the 1987 CWRW crop for all grades is estimated at 11.8%, which represents a considerable increase over last year's all grades average of 10.9%. Survey data indicate an average protein content of 12.2% for the No. 1 CW grade, 11.9% for No. 2 CW and 11.1% for No. 3 CWRW. Table 16 provides additional details and comparisons with 1986.

Quality data for composite samples of the three grades of 1987 CWRW wheat are given in Table 17. For comparison, corresponding data are shown for the 1986 composites of No. 1 and No. 2 CWRW wheat. All three grades show excellent milling performance as indicated by high flour yield and very low flour ash content and flour color values. All three grades also exhibit higher alpha-amylase activity and correspondingly lower wheat falling number and flour amylograph peak viscosity values compared with last year's new crop composites. Stronger dough properties are evident for each of the three grades compared with results obtained in 1986. As usual, high loaf volume per unit of flour protein content was obtained with the Remix straight dough baking test.

16. Protein Content of 1987 Crop Canada Western Red Winter Wheat

Grade	Number of Samples Prairies 1987	Protein Content, %*				
		Prairies		1987		
		1987	1986	Manitoba	Saskatchewan	Alberta
No. 1 CW	219	12.2	11.5	12.2	12.1	12.3
No. 2 CW	121	11.9	10.6	12.4	11.8	12.1
No. 3 CW	192	11.1	9.7	10.8	10.5	12.5
CW Feed	42	12.6	-	-	11.7	13.0
All Grades	574	11.8	10.9	11.2	11.3	12.4

* N x 5.7; 13.5% moisture content basis.

17. CANADA WESTERN RED WINTER WHEAT
Quality Data for Grade Composite Samples of 1987 Crop

Quality Parameter	1987			1986	
	No. 1 CW	No. 2 CW	No. 3 CW	No. 1 CW	No. 2 CW
Number of Samples Represented	219	121	192	501	213
WHEAT					
Test Weight, kg/hL	83.1	81.7	79.7	82.5	80.4
1000 Kernel Weight, g	29.2	29.7	30.1	30.8	28.6
Protein Content, % (N x 5.7)	12.3	11.8	11.1	11.4	10.3
Ash Content, %	1.31	1.43	1.45	1.39	1.48
Alpha-amylase Activity, units/g	9.6	26.2	101.1	4.3	7.2
Falling Number, s	335	285	165	375	350
Flour Yield, %	77.7	77.5	77.7	76.9	75.9
FLOUR					
Protein Content, %	11.6	11.3	10.3	10.8	9.7
Wet Gluten Content, %	33.2	34.1	30.7	32.3	28.1
Ash Content, %	0.42	0.44	0.42	0.45	0.45
Color, units	-1.4	-1.1	-0.8	-1.2	-0.8
Alpha-amylase Activity, units/g	3.7	11.1	45.2	2.2	3.2
Amylograph Peak Viscosity, B.U.	390	160	55	470	370
Maltose Value, g/100 g	1.8	2.0	2.9	1.7	1.7
Starch Damage, Farrand units	24	23	17	22	21
Baking Absorption, %	57	57	53	57	54
BREAD					
Loaf Volume, cm^3	805	795	745	735	660
Appearance	8.2	8.2	8.2	8.0	7.5
Crumb Structure	6.5-o	6.8-o	6.8-o	6.8-o	6.5
Crumb Color	6.8-d	6.5-d	6.2-d	6.8-d	5.5-dy
FARINOGRAM					
Absorption, %	57.7	57.0	54.6	56.9	54.5
Development Time, min	5.50	5.25	3.00	5.00	2.75
M.T.I., B.U.	45	55	50	55	45
Stability, min	9.00	8.00	7.00	7.50	6.00
EXTENSIGRAM					
Length, cm	25	24	24	22	22
Height at 5 cm, B.U.	275	260	240	260	240
Maximum Height, B.U.	505	470	440	450	365
Area, cm^2	170	145	140	135	115
ALVEOGRAM					
Length, mm	207	191	208	178	185
P (height x 1.1), mm	57	55	44	56	47
W, x 10^3 ergs	350	313	264	291	230

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 is characterized by medium protein content, medium strength and extensible dough properties and medium-soft kernel properties.

This year's 130 survey samples for all grades of CPS wheat show a mean protein content of 12.3% compared with the 1986 value of 11.5%. The mean protein content for the No. 1 CPS grade is 11.8% while the value for No. 2 CPS is 12.9%. The major variety planted was once again HY320 at 76.5% of the seeded area while the newly-registered variety Oslo accounted for the remaining 23.5% of the area. Quality data for the No. 1 CPS grade composite is given in Table 18 along with comparative data for 1986. The No. 1 CPS grade composite is lower in test weight than in 1986. The milling yield is lower but so is flour ash compared to last year. Physical dough properties of this year's No. 1 CPS grade are stronger than in 1986. Baking performance for 1987 shows some improvement in terms of loaf volume, crumb color and baking absorption.

CANADA WESTERN UTILITY WHEAT

Canada Western Utility (CW Utility) wheat is characterized by its hard kernels and very strong physical dough properties. This wheat is excellent for blending purposes and can also be used for the production of pan breads, hearth breads and common wheat pasta products.

The 1987 mean protein content for all grades of Canada Western Utility wheat is estimated at 13.6% based on the 56 survey samples collected. This is considerably higher than the 1986 value of 12.0%. The major variety grown continues to be Glenlea. However, small areas of the newly-registered variety Wildcat were also grown. Quality data for the No. 1 CW Utility grade composite are shown in Table 19. Corresponding data for 1986 are also shown. The 1987 composite is characterized by lower flour yield and flour ash values compared with 1986. Dough strength properties are somewhat better than in the 1986 composite. It should be noted that CW Utility wheat gives misleading farinograph dough development times due to very strong dough properties. Increasing farinograph mixing speed to 94 rpm normally results in dough development times of about eight minutes.

The No. 1 CW Utility grade composite has the characteristically low loaf volume response with the Remix baking test due to insufficient mixing. High loaf volume is obtained when the longer mixing requirements are satisfied (Remix-to-Peak method). The high blend loaf volume also demonstrates the excellent blending quality of this wheat.

CANADA WESTERN SOFT WHITE SPRING WHEAT

The mean protein content for all grades of Canada Western Soft White Spring (CWSWS) wheat in the 1987 new crop survey (615 samples) is 10.3% compared with the 1986 value of 10.6%. No. 1 CWSWS wheat averages 10.0%, No. 2 CW 10.4%, and No. 3 CW 10.5%. The predominant variety grown this year was Fielder at 81.3% of the seeded area while Owens accounted for the remainder.

Quality data for composites representing the top two grades of CWSWS wheat are given in Table 20. The No. 1 and No. 2 CW composites are lower in test weight than in 1986 while kernel weight is similar. Due to adverse harvesting conditions in the major soft white spring wheat growing area, all grades show elevated levels of alpha-amylase activity and correspondingly lower falling number and amylograph peak viscosity values compared with last year. However, milling quality shows a definite improvement over 1986 as indicated by lower flour ash and flour color values. Physical dough properties of the No. 1 CWSWS composite are somewhat stronger than last year.

18. CANADA PRAIRIE SPRING WHEAT
Quality Data for Grade Composite Sample of 1987 Crop

Quality Parameter	No. 1 CPS	
	1987	1986
Number of Samples	66	155
WHEAT		
Test Weight, kg/hL	80.0	80.7
1000 Kernel Weight, g	40.2	36.7
Protein Content, % (N x 5.7)	11.9	11.5
Ash Content, %	1.41	1.58
Alpha-amylase Activity, units/g	8.8	2.0
Falling Number, s	330	395
Flour Yield, %	75.0	76.1
FLOUR		
Protein Content, %	11.0	10.8
Wet Gluten Content, %	33.2	31.8
Ash Content, %	0.53	0.56
Color, units	0.8	0.6
Alpha-amylase Activity, units/g	1.9	0.5
Amylograph Peak Viscosity, B.U.	560	770
Maltose Value, g/100 g	1.4	1.3
Starch Damage, Farrand units	14	13
Baking Absorption, %	56	55
BREAD		
Loaf Volume, cm^3	685	660
Appearance	5.8	6.0
Crumb Structure	6.0	6.0-o
Crumb Color	5.0-d	4.5-g
FARINOGRAM		
Absorption, %	57.6	56.2
Development Time, min	3.25	2.75
M.T.I., B.U.	95	95
Stability, min	4.50	4.00
EXTENSIGRAM		
Length, cm	26	26
Height at 5 cm, B.U.	200	185
Maximum Height, B.U.	280	235
Area, cm^2	110	90
ALVEOGRAM		
Length, mm	238	192
P (height x 1.1), mm	47	38
W, x 10^3 ergs	220	147

19. CANADA WESTERN UTILITY WHEAT
Quality Data for Grade Composite Sample of 1987 Crop

Quality Parameter	No. 1 Canada Western Utility	
	1987	1986
Number of Samples	32	43
WHEAT		
Test Weight, kg/hL	77.1	77.8
1000 Kernel Weight, g	41.4	39.2
Protein Content, % (N x 5.7)	13.6	12.5
Ash Content, %	1.76	1.64
Alpha-amylase Activity, units/g	14.7	4.8
Falling Number, s	340	380
Flour Yield, %	75.0	76.5
FLOUR		
Protein Content, %	13.0	11.8
Wet Gluten Content, %	33.4	33.4
Ash Content, %	0.57	0.60
Color, units	0.2	-0.3
Alpha-amylase Activity, units/g	3.6	1.4
Amylograph Peak Viscosity, B.U.	415	600
Maltose Value, g/100 g	2.5	2.2
Starch Damage, Farrand units	34	33
Baking Absorption, %	63	61
BREAD		
Loaf Volume, cm^3	680	670
Loaf Volume (Remix-to-Peak), cm^3	945	860
Time (Remix-to-Peak), min	4.7	4.5
Blend Loaf Volume, cm^3	750	735
FARINOGRAM		
Absorption, %	62.5	60.3
Development Time, min	3.00	2.50
M.T.I., B.U.	15	15
Stability, min	11.00	10.00
EXTENSIGRAM		
Length, cm	24	26
Height at 5 cm, B.U.	390	330
Maximum Height, B.U.	765	660
Area, cm^2	245	225
ALVEOGRAM		
Length, mm	131	132
P (height x 1.1), mm	117	87
W, x 10^3 ergs	585	426

20. CANADA WESTERN SOFT WHITE SPRING WHEAT
Quality Data for Grade Composite Samples of 1987 Crop

Quality Parameter	1987		1986	
	No. 1 CWSWS	No. 2 CWSWS	No. 1 CWSWS	No. 2 CWSWS
Number of Samples	218	264	133	81
WHEAT				
Test Weight, kg/hL	80.5	79.5	81.8	79.8
1000 Kernel Weight, g	37.5	35.7	37.2	33.7
Protein Content, % (N x 5.7)	10.2	10.6	10.1	10.6
Ash Content, %	1.43	1.48	1.45	1.61
Alpha-amylase Activity, units/g	27.6	51.8	3.6	12.2
Falling Number, s	265	215	370	350
Flour Yield, %	72.2	71.8	72.1	72.6
FLOUR				
Protein Content, %	8.9	9.3	9.0	9.6
Wet Gluten Content, %	30.1	30.9	28.2	29.8
Ash Content, %	0.40	0.42	0.47	0.49
Color, units	-1.0	-0.5	-0.6	0.6
Alpha-amylase Activity, units/g	4.9	12.9	1.1	3.6
Amylograph Peak Viscosity, B.U.	485	225	990	600
Maltose Value, g/100 g	1.2	1.2	1.1	1.1
Starch Damage, Farrand units	9	8	11	9
AWRC, units	74	72	75	78
FARINOGRAM				
Absorption, %	55.2	55.2	55.6	56.4
Development Time, min	1.25	1.00	1.00	1.00
M.T.I., B.U.	165	190	205	220
Stability, min	1.50	1.50	1.00	1.00
ALVEOGRAM				
Length, cm	155	145	100	98
P (height x 1.1), mm	26	24	25	20
W, x 10^3 ergs	69	55	43	40

CANADA EASTERN WHITE WINTER WHEAT

The favorable growing and harvesting conditions in Ontario this year have meant that most Canada Eastern White Winter (CEWW) wheat has been stored in sound condition. It is estimated that a high proportion will grade No. 1 CE, and this is borne out by the fact that no samples of No. 4 and No. 5 CEWW wheat were received in the Laboratory survey this year. The predominant varieties grown are still Fredrick and Augusta, with some Frankenmuth also seeded.

Protein survey results for Canada Eastern White Winter wheat are based upon 365 survey samples representing wheat of this class grown in the province of Ontario. As indicated in Table 21, the mean protein content for all grades is 10.6%, which is considerably higher than the mean value of 9.6% obtained in 1986. The mean protein content for the No. 1 CE grade is 10.7% while the value for the No. 2 and No. 3 CE grades is 10.5%. Quality data for the three grade composites of CEWW wheat are given in Table 22. Corresponding data for the 1986 No. 2 CEWW grade composite are also listed. Flour yield for all three grades is lower than in 1986. No. 2 CEWW has a similar level of alpha-amylase activity to last year and this is confirmed by similar wheat falling number and flour amylograph peak viscosity values. Dough properties for this year's crop are stronger than last year as illustrated by the higher alveograph work values. Cookie quality this year is inferior to that of last year. The stronger dough properties and reduced cookie quality are most probably a result of the higher protein content of 1987 CEWW wheat.

21. Protein Content of 1987 Crop Canada Eastern White Winter Wheat

Grade	Number of Samples 1987	Protein Content, %*	
		1987	1986
No. 1 CE	220	10.7	10.1
No. 2 CE	115	10.5	9.5
No. 3 CE	22	10.5	9.6
No. 4 CE	-	-	9.6
No. 5 CE	-	-	9.8
Canada Feed	8	11.0	9.6
All Grades	365	10.6	9.6

* N x 5.7; 13.5% moisture content basis.

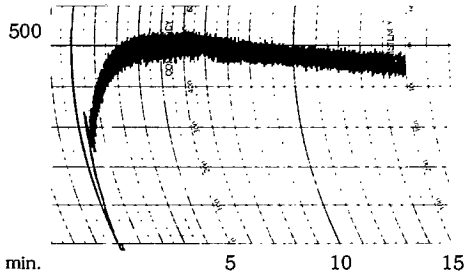
22. CANADA EASTERN WHITE WINTER WHEAT
Quality Data for Grade Composite Samples of 1987 Crop

Quality Parameter	1987			1986
	No. 1 CEWW	No. 2 CEWW	No. 3 CEWW	No. 2 CEWW
Number of Samples	220	115	22	105
WHEAT				
Test Weight, kg/hL	78.7	76.8	75.2	78.5
1000 Kernel Weight, g	35.1	35.0	34.0	35.3
Protein Content, % (N x 5.7)	10.7	10.5	10.4	9.6
Ash Content, %	1.48	1.57	1.52	1.84
Alpha-amylase Activity, units/g	6.2	40.9	86.0	22.4
Falling Number, s	365	260	205	320
Flour Yield, %	74.2	72.7	73.5	75.1
FLOUR				
Protein Content, %	9.5	8.2	8.5	8.4
Wet Gluten Content, %	28.8	24.0	23.5	23.3
Ash Content, %	0.48	0.48	0.46	0.47
Color, units	-1.3	-0.9	-0.2	-1.0
Alpha-amylase Activity, units/g	2.1	15.0	16.8	9.1
Amylograph Peak Viscosity, B.U.	440	105	80	180
Maltose Value, g/100 g	1.0	1.4	1.5	1.2
Starch Damage, Farrand units	8	9	9	9
AWRC, units	68	70	70	71
COOKIE				
Spread, mm	80	83	82	82
Ratio	8.2	8.7	8.8	9.8
FARINOGRAM				
Absorption, %	51.0	51.3	50.6	50.5
Development Time, min	1.00	0.75	0.75	0.75
M.T.I., B.U.	150	140	150	150
Stability, min	1.50	2.00	2.00	1.50
ALVEOGRAM				
Length, mm	233	200	209	184
P (height x 1.1), mm	20	21	19	20
W, x 10^3 ergs	78	84	84	61

Figure 3 • Farinograms of 1987 Crop Composite Samples

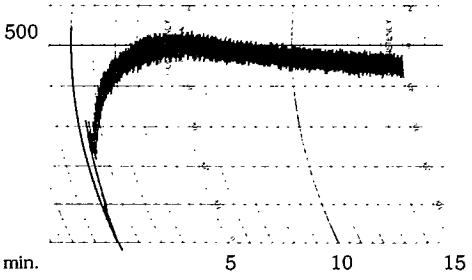
No. 1 Canada Western 13.5 Red Spring Wheat

Eastern Prairie

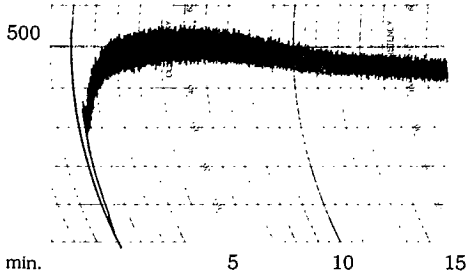


No. 1 Canada Western 13.5 Red Spring Wheat

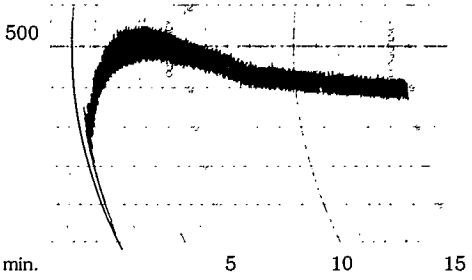
Western Prairie



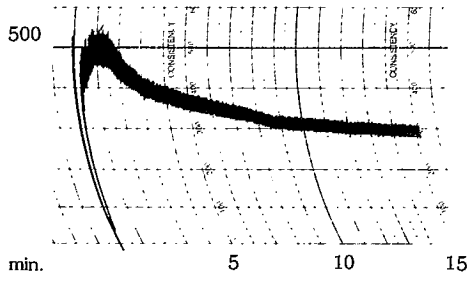
No. 1 Canada Western Red Winter Wheat



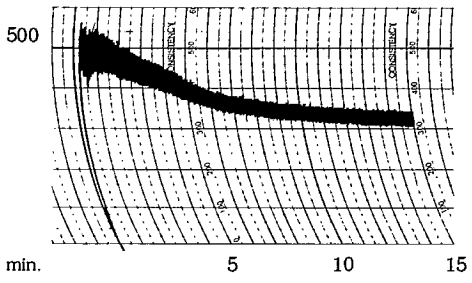
No. 1 Canada Prairie Spring Wheat



No. 1 Canada Western Soft White Spring Wheat



No. 2 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 is 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. Ten grams of flour and 6 mL of distilled water are mixed by hand for about 2 min. The dough is then washed for 12 min in a Theby Gluten Washer using a salt-phosphate buffer of pH 6.7; this is followed by 2 min hand washing. The resulting gluten is worked between the fingers until it becomes tacky, and is then weighed.

Ash Content is determined on a 4 g sample in a silica dish incinerated overnight at 585°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 with the Kent-Jones and Martin Flour Color Grader which gives the relative reflectance (with filter No. 58) of a flour-water slurry. Results are reported as arbitrary scale units; the lower the number the brighter the flour.

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 16-22.

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.

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 equipment.

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, in a Beckman Color DB-G Spectrophotometer (Daun, "Cereal Chemistry" 55:692, 1978).

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 28 - All grades of Canada Eastern White Winter Wheat.
September 29 - All grades of Canada Western Red Winter Wheat.
September 30 - No. 1, No. 2 and No. 3 Canada Western Amber Durum Wheat.
October 2 - No. 1 Canada Western Red Spring Wheat.
October 7 - No. 2 and No. 3 Canada Western Red Spring Wheat; No. 4 Canada Western Amber Durum Wheat; No. 1 Canada Prairie Spring Wheat; and No. 1 and No. 2 Canada Western Soft White Spring Wheat.
October 9 - No. 1 Canada Western Utility Wheat.

ACKNOWLEDGEMENTS

The Grain Research Laboratory acknowledges the cooperation of the grain companies and their primary elevator managers for providing samples. The Laboratory also acknowledges the assistance of the Winnipeg Office of the Grain Inspection Division, Canadian Grain Commission, and Mr. Peter Edwards, Chairman, Grain Appeal Tribunal of the Canadian Grain Commission in grading all new-crop samples.

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