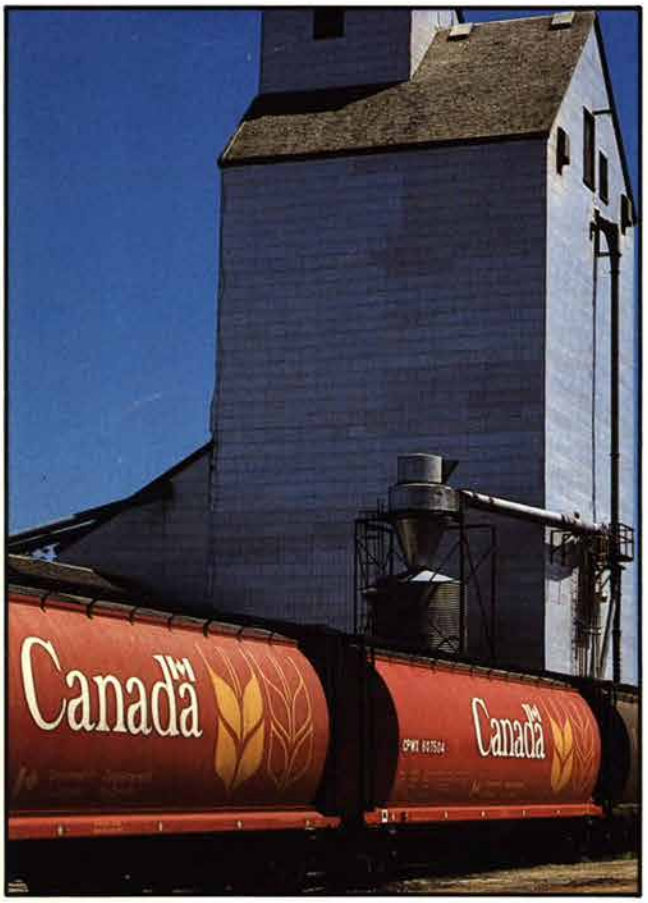
Agriculture
Canada

Canadian Grain Commission
Commission canadienne des grains



GRAIN RESEARCH LABORATORY

QUALITY OF 1986 CANADIAN WHEAT

Canada

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SUMMARY

A second successive late, wet harvest has made it impossible to obtain representative samples of 1986 new crop deliveries of lower grades of all spring wheat classes in time to meet our printing deadline for the November 3 meeting of the Committee on Western Grain Standards. Most of the quality data presented in this bulletin, therefore, are related to composites of top grades of seven classes of Canadian wheat. Data for lower grades will be available around the end of December 1986.

As expected, the grading system has once again effectively protected the number one grades from the deleterious effect of adverse harvest conditions. Milling, baking and other end-processing-related data are generally within the normal high quality ranges expected for the different types of Canadian wheat.

CONTENTS

INTRODUCTION

This bulletin presents detailed information on the quality of the 1986 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 quaranteed 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 relatively new class of Canadian 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 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 and chapattis.
- 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.

On the Prairies, this year's growing season started favorably and continued in a very promising fashion - leading to predictions of record production levels. However, farmers were later disappointed by very cool, wet conditions which lasted from September 1 to October 10 and resulted in lowered grades and production estimates and a very late harvest for the second year in a row. Consequently, the Grain Research Laboratory's 1986 harvest survey again represents a much smaller proportion of the crop than usual.

Samples of grain harvested up until the end of September are included in the survey; however, estimates by provincial Agriculture Departments indicate that only about 50% of the crop had been combined by that time. Since most of this wheat was harvested before the unfavorable conditions became entrenched, it was predominantly of high grade. Samples of lower grade wheat received by the beginning of October were not only low in number but did not reflect the quality of this year's crop which will be heavily influenced by later-harvested material. Therefore, quality data presented in this report are primarily for the top grades of each class. Exceptions are the earlier-harvested Western and Eastern Winter Wheat classes for which sufficient samples of lower grades were received. Ontario wheat producers also experienced unfavorable harvesting conditions - resulting in a lower grade pattern than usual. An insufficient number of samples of No. 1 C.E. grade wheat were received for quality testing.

The following summarizes in more detail the weather conditions which influenced the growing and harvesting of this year's Prairie wheat crop.

Although winter snowfall was below normal levels over much of the Prairies, particularly Saskatchewan, enough moisture reserves had been built up last autumn to allow moisture conditions to be generally rated as good to excellent at the start of field operations. Seeding was considered general by May 7 and complete by June 7 (about the same as last year). Good germination and continuing adequate moisture levels for good growth throughout the summer resulted in heavy stands.

The major problems encountered by producers (prior to harvest) included: general grasshopper and cutworm infestations, localized outbreaks of midge activity in parts of Saskatchewan and Manitoba, rust damage to winter wheat - particularly in southeast Saskatchewan, and some evidence of Fusarium infections in parts of Manitoba. The cool, wet harvest resulted in lowered grades and

a significant amount of wheat being combined in tough or damp condition. Therefore, use of farm driers will likely be widespread again this year.

The prairie winter wheat harvest was complete by August 20; and although swathing of spring-seeded wheat had begun by about this time, the poor weather which settled-in about two weeks later brought harvesting activity to a standstill. Warm, dry weather dominated the middle two weeks of October and harvesting was essentially complete by November 1.

Statistics Canada (Field Crop Reporting Series No. 7, October 3, 1986) estimates that production of spring wheat is a record 25.22 million tonnes from 11.44 million hectares, compared with 20.39 million tonnes from 11.22 million hectares in 1985. Durum wheat production is estimated at a record 3.86 million tonnes from 1.88 million hectares, representing a 97% increase from the 1985 production of 1.96 million tonnes from 1.74 million hectares. Prairie winter wheat production of 1.01 million tonnes is a 43% increase from the 1985 production of 0.70 million tonnes. Seeded area was 0.55 million hectares compared with 0.49 million hectares in 1985. Ontario winter wheat production is estimated at 0.92 million tonnes from 0.25 million hectares. Corresponding figures for 1985 are 0.95 million tonnes and 0.21 million hectares.

Indications are that the grade distribution pattern for 1986 red spring wheat production may be similar to that estimated for the 1985 crop. Due to the late harvest conditions in Western Canada, official Canadian Grain Commission grade distribution estimates are unavailable at time of publishing. Predominant degrading factors this year will likely be those resulting from weathering - again, similar to last year. In higher grade amber durum wheat, red smudge caused some downgrading of otherwise sound material.

Detailed quality data on the 1986 protein content survey and on grade composite samples of the seven 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 1986 published by Prairie Pools Inc., Regina, Saskatchewan.

CANADA WESTERN RED SPRING WHEAT

Due to the late harvest, red spring wheat new crop survey samples received that graded No. 2 Canada Western Red Spring and lower were not considered sufficiently representative of new crop production of these grades to warrant compositing and quality testing to be carried out in time to meet the deadline for this bulletin. Samples of lower grade material harvested during the improved weather conditions that prevailed during the last three weeks of October will continue to be collected and it is anticipated that milling and baking quality data will be generated and made available at a later date.

Neepawa's "reign" as Canada's leading red spring wheat variety finally came to an end after fourteen years. Katepwa, licensed in 1981, is the new predominant variety and is similar in quality to Neepawa but has some agronomic advantages. It is more resistant than Neepawa to both stem rust and leaf rust and is slightly easier to thresh. The estimated distribution, as percent of seeded area, of Canada Western Red Spring Wheat varieties for 1986 is: Katepwa - 34.4%; Neepawa - 32.5%; Columbus - 20.8%; Park - 3.1%; Benito - 2.1%; Canuck - 1.1%; Thatcher, Selkirk, Sinton, Leader and Chester each accounted for less than 1%.

Tables 2 and 3 provide detailed quality data for composite samples representing new crop No. 1 C.W.R.S. wheat segregated according to protein content (minimum levels of 14.5, 13.5 and 12.5%) and to area of origin (Eastern Prairie and Western Prairie).

Test weight values for all No. 1 grade composites are higher than in 1985 and similar to long-term averages. Kernel weights are considerably higher than normal. Both the Eastern and Western Prairie No. 1 C.W. composites show low levels of alpha-amylase activity and correspondingly high values for wheat falling number and flour amylograph viscosity. This is a further example of how Canada's grading system effectively protects the high quality of top grade wheat during an adverse harvest season.

The 1986 Eastern Prairie composites gave higher milling yields and superior flour color compared with 1985 and long-term average values. However, wheat and flour ash content is higher. The milling quality of the Western Prairie composites is similar to that of 1985 samples. Both the Eastern and Western Prairie No. 1 C.W. composites for this year produce more starch damage on milling than corresponding 1985 samples, indicating somewhat harder kernel characteristics than those that are indicated by long-term average values.

Physical dough properties for this year's No. 1 C.W. composites are weaker than normal but farinograph absorption is higher.

Overall baking results indicate good quality - including, as usual, high loaf volume per unit of flour protein content and excellent baking absorption.

Protein Survey – Preliminary Data for Red Spring Wheat

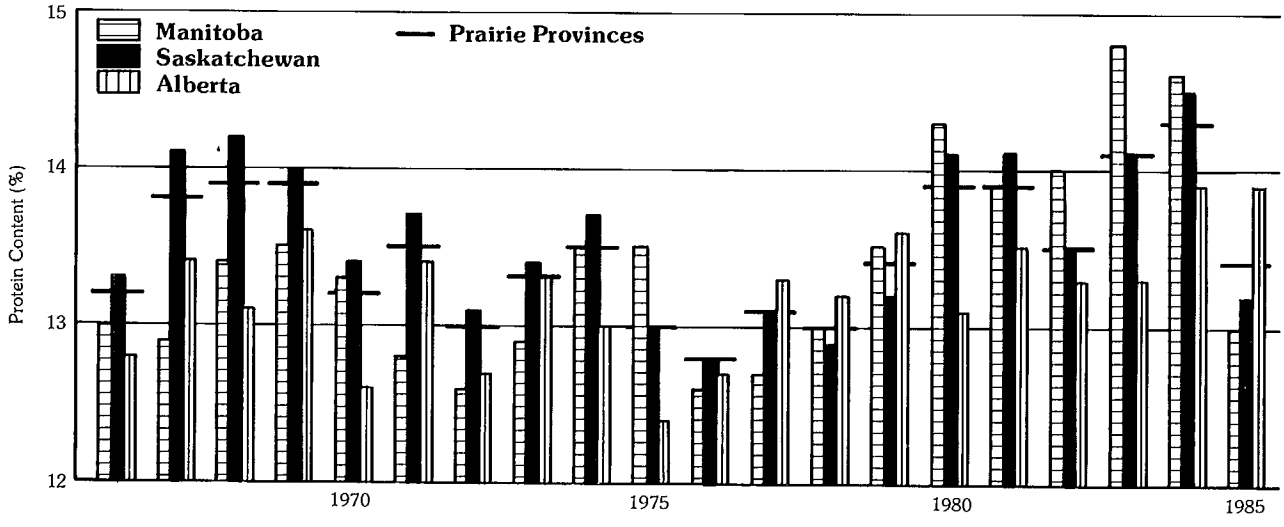
The 1986 crop averages 13.2% in protein content. This is a preliminary estimate based on 4,941 samples tested up to October 24. The 1986 mean value is 0.2 percentage units lower than that of last year and 0.3 percentage units lower than the average value of 13.5% for the period 1966 to 1985.

Table 1 shows the new crop wheat from Manitoba to be the highest in protein content at 13.3%, followed by Saskatchewan and Alberta wheat at 13.2%. This is in sharp contrast to 1985 results which showed Alberta to be the highest protein province at 13.9% and Manitoba to be the lowest at 13.0%. In general, the protein content decreases progressively the lower the grade, although the decrease is more pronounced in Alberta and Saskatchewan. Overall, No. 1 C.W.R.S. wheat averages 13.4% protein, No. 2 C.W. averages 13.2% and No. 3 C.W. averages 12.8%. Included in Table 1 for comparative purposes are 10-year mean values by grade, for the period 1976 to 1985.

The histogram outlines mean protein content values by province for the years 1966 to 1985.

The preliminary protein map for No. 1 Canada Western Red Spring wheat (as at September 30, 1986) is based on 2,386 samples from 646 stations. The mean protein content values for samples from the individual provinces are similar at 13.5% for Manitoba, 13.4% for Saskatchewan and 13.6% for Alberta. The distribution by crop district shows quite an even pattern - although there is a trend for lower protein content samples to have originated from northern Manitoba and northern Alberta. An exception is the extreme northwest district of Alberta which shows an unusually high mean value.

Protein Content of Red Spring Wheat for the Period 1966 to 1985



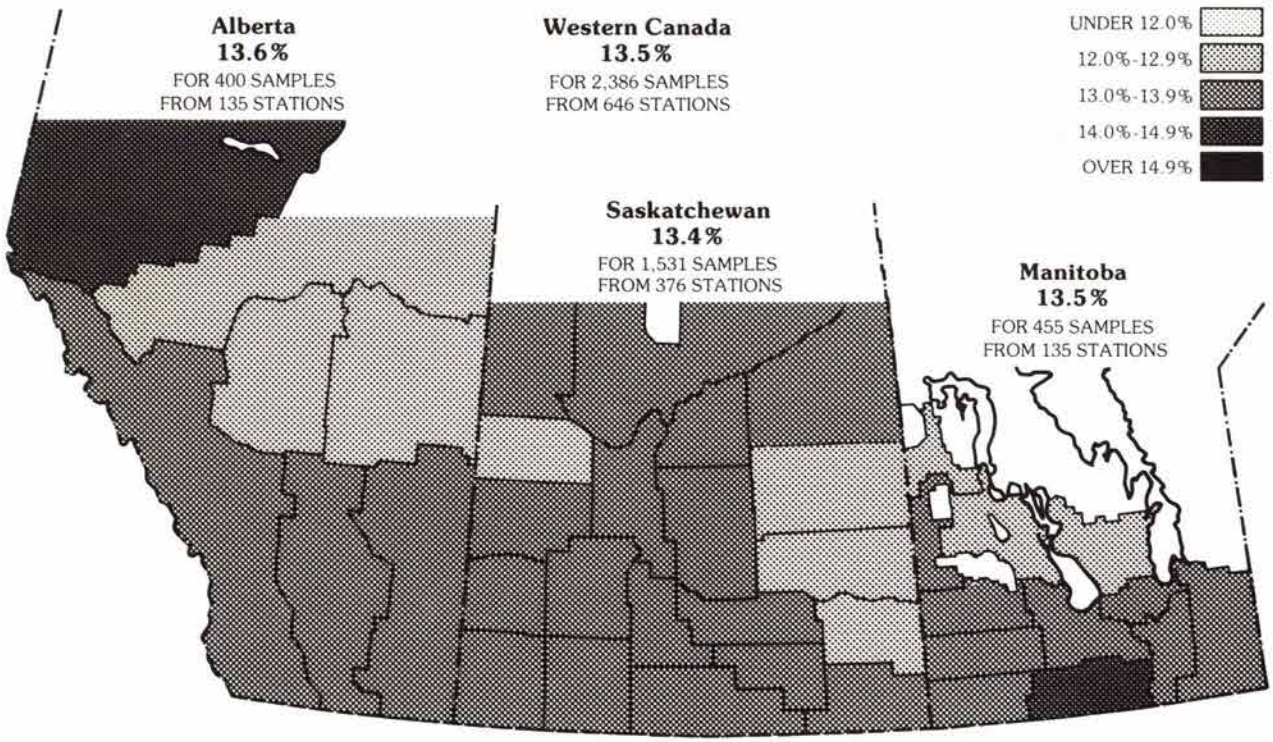
1. Protein Content of 1986 Crop Red Spring Wheat (Preliminary as at October 24, 1986)

Grade	Number of samples Prairies 1986	Protein Content, %*					
		Prairies			1986		
		1986	1985	1976-85	Manitoba	Saskatchewan	Alberta
No. 1 C.W.	2,724	13.4	14.0	13.9	13.4	13.4	13.5
No. 2 C.W.	933	13.2	13.4	13.4	13.6	13.1	12.9
No. 3 C.W.	1,106	12.8	12.7	13.0	13.0	12.7	12.7
Canada Feed	178	12.9	13.0	-	12.8	12.8	13.0
All Grades	4,941	13.2	13.4	13.5	13.3	13.2	13.2

* N x 5.7; 13.5% moisture content basis.

Protein Content of No. 1 C.W. Red Spring Wheat – 1986 Crop

(as at September 30, 1986)



2. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Eastern Prairie Grade Composite Samples of 1986 Crop

Quality Parameter	Minimum Protein Level			No. 1 C.W. 13.5	
	14.5	13.5	12.5	1985	Mean*
Number of Samples Represented	788	1158	996	631	-
WHEAT					
Test Weight, kg/hL	81.2	81.7	81.9	80.3	81.9
1000 Kernel Weight, g	32.2	32.6	31.9	27.8	30.1
Protein Content, % (N x 5.7)	14.6	13.5	12.5	13.8	13.7
Ash Content, %	1.69	1.70	1.64	1.52	1.58
Alpha-amylase Activity, units/g	3.8	4.0	3.4	5.7	2.7
Falling Number, s	420	405	410	380	385
Flour Yield, %	76.3	76.6	76.1	75.8	75.4
FLOUR					
Protein Content, %	14.2	13.1	11.9	13.4	13.1
Wet Gluten Content, %	42.8	38.0	34.3	38.4	39.4
Ash Content, %	0.51	0.51	0.52	0.49	0.47
Color, units	-0.6	-0.8	-1.2	-0.5	-0.4
Alpha-amylase Activity, units/g	0.7	0.7	0.6	2.0	0.5
Amylograph Peak Viscosity, B.U.	745	730	715	610	730
Maltose Value, g/100 g	2.0	2.1	2.2	2.0	N/A
Starch Damage, Farrand units	32	36	39	31	29
Baking Absorption, %	66	65	62	65	64
BREAD					
Loaf Volume, cm^3	945	860	755	880	860
Appearance	8.0	8.0	7.5	8.0	8.0
Crumb Structure	7.0-o	7.0-o	7.0-o	6.5-o	6.8-o
Crumb Color	6.5-d	6.0-dy	5.5-dy	6.0-dy	6.2-dy
Blend Loaf Volume, cm^3	725	695	670	725	705
FARINOGRAM					
Absorption, %	66.4	66.2	65.2	65.5	64.6
Development Time, min	4.75	4.00	3.50	5.00	4.50
M.T.I., B.U.	35	40	40	30	30
Stability, min	7.00	6.50	6.00	7.50	7.75
EXTENSIGRAM					
Length, cm	24	21	20	24	22
Height at 5 cm, B.U.	235	235	250	270	260
Maximum Height, B.U.	360	345	360	450	415
Area, cm^2	120	100	105	145	130
ALVEOGRAM					
Length, mm	144	104	96	138	111
P (height x 1.1), mm	101	110	117	94	101
W, x 10^3 ergs	432	366	354	386	364

* Mean values are for the 10-year period 1975 to 1984.

3. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for Western Prairie Grade Composite Samples of 1986 Crop

Quality Parameter	Minimum Protein Level			No. 1 C.W. 13.5	
	14.5	13.5	12.5	1985	Mean*
Number of Samples Represented	585	840	774	1076	-
WHEAT					
Test Weight, kg/hL	81.7	81.9	82.6	80.3	82.3
1000 Kernel Weight, g	33.0	32.5	33.5	28.3	30.6
Protein Content, % (N x 5.7)	14.5	13.5	12.6	13.9	13.7
Ash Content, %	1.55	1.53	1.53	1.58	1.53
Alpha-amylase Activity, units/g	4.0	4.2	4.2	3.9	3.5
Falling Number, s	400	395	395	375	375
Flour Yield, %	76.5	75.9	76.6	76.1	75.4
FLOUR					
Protein Content, %	14.1	13.1	12.0	13.5	13.1
Wet Gluten Content, %	41.9	37.8	33.7	39.1	38.8
Ash Content, %	0.47	0.48	0.49	0.47	0.46
Color, units	-0.7	-0.8	-1.2	-0.6	-0.4
Alpha-amylase Activity, units/g	0.6	0.6	0.7	1.5	0.9
Amylograph Peak Viscosity, B.U.	705	650	670	675	680
Maltose Value, g/100 g	2.1	2.2	2.4	2.0	N/A
Starch Damage, Farrand units	32	36	40	31	30
Baking Absorption, %	65	64	63	64	64
BREAD					
Loaf Volume, cm^3	920	830	750	900	855
Appearance	8.2	8.0	7.8	8.2	8.0
Crumb Structure	6.8-o	7.0-o	7.0-o	6.5-o	6.8-o
Crumb Color	6.5-d	6.0-dy	5.5-d	6.0-dy	6.2-dy
Blend Loaf Volume, cm^3	725	675	650	735	695
FARINOGRAM					
Absorption, %	66.9	66.6	66.2	65.2	65.2
Development Time, min	4.50	4.00	3.75	5.25	4.75
M.T.I., B.U.	30	30	30	25	30
Stability, min	7.00	7.00	7.00	9.50	8.00
EXTENSIGRAM					
Length, cm	22	22	20	22	22
Height at 5 cm, B.U.	250	225	240	270	265
Maximum Height, B.U.	390	350	360	465	420
Area, cm^2	125	105	105	140	130
ALVEOGRAM					
Length, mm	95	119	130	143	104
P (height x 1.1), mm	121	108	97	95	106
W, x 10^3 ergs	360	386	384	402	377

* Mean values are for the 10-year period 1975 to 1984.

AMBER DURUM WHEAT

Quality data for the No. 1 and No. 2 C.W.A.D. grades (Table 5) of the 1986 durum crop indicate overall satisfactory quality. The major difference from last year's crop is lower protein content. Table 4 shows that for both grades, protein content is 1.3% lower than that of the 1985 crop, and over 0.5% lower than that of the 5-year mean. The 20-year mean protein content for all grades is 13.5%.

Test weight and 1000 kernel weight are significantly higher than for the 1985 crop. Despite the low protein content, spaghetti cooking quality is about the same as last year's crop for the low temperature spaghetti but significantly better for the high temperature product. Semolina color as measured by the Agtron color meter is better than that of last year. For spaghetti color brightness and purity are both higher so that spaghetti quality is very good.

For the lower grades, it is expected that the major degrading factors, red smudge and sprout damage, will affect spaghetti color and perhaps the cooking quality. The No. 1 and No. 2 C.W.A.D. grades have not been affected by these factors.

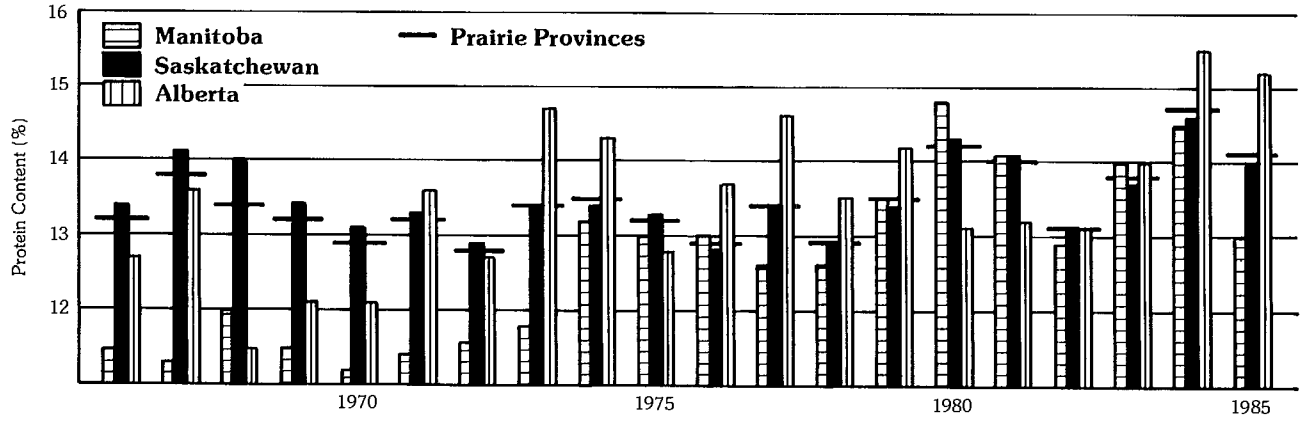
The improvement in cooking quality noted in this year's crop may be attributable to a change in varietal distribution in Western Canada. Wakooma is still the predominant variety (41.3%), followed by Wascana (26.7%), Medora (15.0%) and other strong gluten varieties (16.2%). In the next several years it is expected that the percentage of Wascana will decrease further, concomitant with an increase in newer varieties (Medora, Kyle, Arcola and Sceptre) to improve the overall quality.

4. Protein Content of 1986 Crop Amber Durum Wheat (Preliminary as at October 17, 1986)

Grade	Number of samples Prairies 1986	Protein Content, %*					
		Prairies			1986		
		1986	1985	1980-84	Manitoba	Saskatchewan	Alberta
No. 1 C.W.A.D.	587	13.2	14.5	13.8	12.1	13.1	13.3
No. 2 C.W.A.D.	284	12.9	14.2	13.7	12.8	12.9	13.2

* N x 5.7; 13.5% moisture content basis.

Protein Content of Amber Durum Wheat for the Period 1966 to 1985



5. AMBER DURUM WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

Quality Parameter	1986		1985	
	No. 1 C.W.A.D.	No. 2 C.W.A.D.	No. 1 C.W.A.D.	No. 2 C.W.A.D.
Number of Samples	587	284	467	341
WHEAT				
Test Weight, kg/hL	82.6	81.9	80.8	79.9
Weight per 1000 Kernels, g	44.2	43.4	38.5	37.9
Vitreous Kernels, %	92	83	92	88
Protein Content, %	13.3	13.0	14.4	14.1
Ash Content, %	1.51	1.64	1.45	1.47
SDS Sedimentation, mL	43	38	49	48
Falling Number, s	400	400	365	355
Milling Yield, %	76.3	76.6	75.6	75.2
Semolina Yield, %	65.4	65.0	63.0	62.2
SEMOLINA				
Protein Content, %	12.4	12.2	13.4	13.4
Wet Gluten Content, %	31.9	30.5	34.0	33.6
Ash Content, %	0.61	0.64	0.64	0.64
AGTRON Color, units	78	78	74	74
Speck Count, per 50 cm^2	22	34	14	22
SPAGHETTI				
Dried at 39°C				
Color:				
Brightness, %	50.8	50.1	48.7	49.2
Purity, %	63.1	63.4	62.4	61.8
Dominant Wavelength, nm	577.4	577.4	577.2	577.4
Cooking Quality, CQP	14.3	12.8	14.0	16.2
Stickiness, N/m^2	955	910	1150	1215
Cooking Loss, %	7.4	6.8	9.2	9.4
Dried at 70°C				
Color:				
Brightness, %	50.2	50.0	49.2	48.8
Purity, %	59.1	60.0	57.2	57.6
Dominant Wavelength, nm	577.5	577.7	577.4	577.6
Cooking Quality, CQP	31.8	29.8	20.4	20.1
Stickiness, N/m^2	700	660	945	930
Cooking Loss, %	7.6	7.2	7.4	7.5

CANADA WESTERN RED WINTER WHEAT

Canada Western Red Winter (C.W.R.W.) wheat has superior milling quality, and flours milled from the top grades 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 varieties Norstar (at 95.4%) and Sundance (at 3.9%) continue to account for most of the area seeded to this class of wheat.

Based on a total of 890 samples of all grades of C.W.R.W. wheat received to date in the 1986 survey, mean protein content, at 10.9%, is considerably lower than the 1985 all-grades mean of 11.5%. Survey data indicate an average protein content of 11.5% for the No. 1 C.W. grade wheat, 10.6% for the No. 2 C.W. grade and 9.7% for the No. 3 C.W. grade. The major degrading factor this year is a low percentage of vitreous kernels - accounting for the marked reduction in protein content with decreasing grade.

Table 7 presents detailed quality data for composite samples representing the top three grades of 1986 C.W.R.W. wheat. For comparison, corresponding data are shown for the 1985 composite of No. 1 C.W.R.W. wheat. The No. 1 C.W. grade material is much higher in test weight and kernel weight than last year. Overall, the three grades show excellent milling performance as evidenced by high flour yield, low flour ash content and very low flour color values. Alpha-amylase activity, wheat falling number and flour amylograph peak viscosity for the top grades exhibit large improvement over last year's values, indicating very low levels of sprout damage.

Dough strength properties for the No. 1 C.W. grade are similar to those of the 1985 composite, while those for the No. 2 C.W. grade are slightly weaker. Loaf volumes were lower this year due to the low protein content. However, as usual, high loaf volume per unit of flour protein content was obtained - demonstrating the inherently high quality of C.W.R.W. protein.

6. Protein Content of 1986 Crop Canada Western Red Winter Wheat

Grade	Number of samples Prairies 1986	Protein Content, %*				
		Prairies		1986		
		1986	1985	Manitoba	Saskatchewan	Alberta
No. 1 C.W.	501	11.5	12.3	10.8	11.2	12.0
No. 2 C.W.	213	10.6	11.4	10.2	10.5	11.3
No. 3 C.W.	176	9.7	10.0	9.3	9.8	10.0
All Grades	890	10.9	11.5	9.8	10.7	11.7

* N x 5.7; 13.5% moisture content basis.

7. CANADA WESTERN RED WINTER WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

Quality Parameter	Canada Western Red Winter			No. 1 C.W.R.W.
	No. 1 C.W.	No. 2 C.W.	No. 3 C.W.	1985
Number of Samples	501	213	176	634
WHEAT				
Test Weight, kg/hL	82.5	80.4	80.0	80.8
1000 Kernel Weight, g	30.8	28.6	29.7	25.4
Protein Content, % (N x 5.7)	11.4	10.3	9.5	12.2
Ash Content, %	1.39	1.48	1.50	1.21
Alpha-amylase Activity, units/g	4.3	7.2	13.3	14.2
Falling Number, s	375	350	315	315
Flour Yield, %	76.9	75.9	76.1	76.2
FLOUR				
Protein Content, %	10.8	9.7	8.8	11.5
Wet Gluten Content, %	32.3	28.1	25.3	33.1
Ash Content, %	0.45	0.45	0.45	0.46
Color, units	-1.2	-0.8	-1.0	-0.6
Alpha-amylase Activity, units/g	2.2	3.2	4.8	5.4
Amylograph Peak Viscosity, B.U.	470	370	290	365
Maltose Value, g/100 g	1.7	1.7	1.8	1.9
Starch Damage, Farrand units	22	21	21	22
Baking Absorption, %	57	54	53	57
BREAD				
Loaf Volume, cm^3	735	660	615	835
Appearance	8.0	7.5	7.0	8.5
Crumb Structure	6.8-o	6.5	6.0	6.2-o
Crumb Color	6.8-d	5.5-dy	5.0-d	6.5-d
FARINOGRAM				
Absorption, %	56.9	54.5	54.1	56.7
Development Time, min	5.00	2.75	1.75	5.25
M.T.I., B.U.	55	45	65	40
Stability, min	7.50	6.00	5.00	10.00
EXTENSIGRAM				
Length, cm	22	22	20	22
Height at 5 cm, B.U.	260	240	240	290
Maximum Height, B.U.	450	365	345	510
Area, cm^2	135	115	95	150
ALVEOGRAM				
Length, mm	178	185	160	157
P (height x 1.1), mm	56	47	44	55
W, x 10^3 ergs	291	230	195	275

CANADA PRAIRIE SPRING WHEAT

Canada Prairie Spring (C.P.S.) wheat is a new class of Canadian wheat introduced in 1985. Pilot-scale and commercial-scale tests have indicated that this 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 characteristized by medium protein content, medium strength and extensible dough properties and medium-soft kernel properties. Commercial milling trials indicate that C.P.S. wheat gives high milling yields provided that tempering conditions and mill flow are optimized to take account of its softer kernel characteristics. The variety HY320 is currently the only variety eligible for this class.

Samples of all grades in this year's crop survey (210 samples) gave an average protein content of 11.6%, compared with 11.8% in 1985. Due to the late harvest, sufficient samples were available for only a No. 1 C.P.S. grade representative composite. Therefore, detailed quality data are provided only for this grade.

Test weight for the 1986 No. 1 C.P.S. grade composite is higher than last year. Milling yield is similar to 1985 while flour ash content is slightly higher and flour color is lower. Alpha-amylase activity, wheat falling number and flour amylograph peak viscosity indicate sound kernel characteristics. Physical dough properties are slightly weaker than last year.

Baking quality is not as good as in 1985 in terms of loaf volume and crumb and crust characteristics. The baking absorption of 55% is one percentage unit lower than last year.

8. CANADA PRAIRIE SPRING WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

Quality Parameter	No. 1 C.P.S. 1986	No. 1 C.P.S. 1985
Number of Samples	155	318
WHEAT		
Test Weight, kg/hL	80.7	79.7
1000 Kernel Weight, g	36.7	40.4
Protein Content, % (N x 5.7)	11.5	11.7
Ash Content, %	1.58	1.27
Alpha-amylase Activity, units/g	2.0	14.0
Falling Number, s	395	265
Flour Yield, %	76.1	76.3
FLOUR		
Protein Content, %	10.8	10.9
Wet Gluten Content, %	31.8	32.8
Ash Content, %	0.56	0.53
Color, units	0.6	1.4
Alpha-amylase Activity, units/g	0.5	4.0
Amylograph Peak Viscosity, B.U.	770	330
Maltose Value, g/100 g	1.3	1.4
Starch Damage, Farrand units	13	14
Baking Absorption, %	55	56
BREAD		
Loaf Volume, cm^3	660	705
Appearance	6.0	6.8
Crumb Structure	6.0-o	6.5-o
Crumb Color	4.5-g	5.5-d
FARINOGRAM		
Absorption, %	56.2	56.9
Development Time, min	2.75	3.00
M.T.I., B.U.	95	90
Stability, min	4.00	4.50
EXTENSIGRAM		
Length, cm	26	25
Height at 5 cm, B.U.	185	195
Maximum Height, B.U.	235	280
Area, cm^2	90	100
ALVEOGRAM		
Length, mm	192	192
P (height x 1.1), mm	38	44
W, x 10^3 ergs	147	164

CANADA UTILITY WHEAT

Canada Utility (C.U.) 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 variety Glenlea currently represents almost all of the Canada Utility wheat grown.

Due to the late harvest, sufficient samples were available for the preparation of only the No. 1 C.U. grade composite. The quality data for this year's and last year's composites of the No. 1 C.U. grade material are provided in Table 9.

The average protein content of this year's crop is estimated at 12.5%, similar to the value of 12.4% obtained in 1985. Test weight and kernel weight values are similar to those recorded in 1985. With respect to milling quality, flour yield is higher and flour color is superior, while flour ash content is slightly higher than last year. Alpha-amylase activity, wheat falling number and amylograph peak viscosity data suggest sound kernel characteristics with a minimum of sprout damage. Physical dough tests show typical results for this wheat class - very strong dough properties. It should be noted that the apparent short farinograph development time is due to a false water absorption-related peak. The standard farinograph speed is insufficient to develop the dough. When the blade mixing speed of the farinograph was increased to 90 rpm, the farinograph dough development time was 6 min.

The No. 1 C.U. grade wheat flour gave a low Remix loaf volume as expected due to the insufficient mixing time and resulting underdeveloped dough. High loaf volumes were obtained with the Remix-to-Peak procedure where mixing requirements were satisfied. The high Remix blend loaf volume demonstrates the excellent blending quality of this wheat.

9. CANADA UTILITY WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

Quality Parameter	No. 1 C.U. 1986	No. 1 C.U. 1985
Number of Samples	43	147
WHEAT		
Test Weight, kg/hL	77.8	77.7
1000 Kernel Weight, g	39.2	39.9
Protein Content, % (N x 5.7)	12.5	12.1
Ash Content, %	1.64	1.43
Alpha-amylase Activity, units/g	4.8	15.5
Falling Number, s	380	335
Flour Yield, %	76.5	75.0
FLOUR		
Protein Content, %	11.8	11.4
Wet Gluten Content, %	33.4	33.4
Ash Content, %	0.60	0.56
Color, units	-0.3	0.2
Alpha-amylase Activity, units/g	1.4	5.0
Amylograph Peak Viscosity, B.U.	600	290
Maltose Value, g/100 g	2.2	2.9
Starch Damage, Farrand units	33	42
Baking Absorption, %	61	62
BREAD		
Loaf Volume, cm^3	670	570
Loaf Volume (Remix-to-Peak), cm^3	860	845
Time (Remix-to-Peak), min	4.5	4.7
Blend Loaf Volume, cm^3	735	725
FARINOGRAM		
Absorption, %	60.3	62.1
Development Time, min	2.50	2.00
M.T.I., B.U.	15	30
Stability, min	10.00	9.00
EXTENSIGRAM		
Length, cm	26	24
Height at 5 cm, B.U.	330	360
Maximum Height, B.U.	660	720
Area, cm^2	225	235
ALVEOGRAM		
Length, mm	132	110
P (height x 1.1), mm	87	116
W, x 10^3 ergs	426	480

CANADA WESTERN SOFT WHITE SPRING WHEAT

Protein survey results for soft white spring wheat are based on 214 samples of all grades. Mean protein content is 10.5%, which is identical to that of the 1985 crop. However, the protein content of the No. 1 C.W. grade samples is lower by 0.4 percentage units.

Table 10 lists quality data for a composite representing 133 samples of No. 1 C.W. Soft White Spring wheat. As was the case with the other spring wheats, an insufficient number of representative samples were received to allow meaningful testing of lower grades of soft white spring wheat to be accomplished prior to publication of this bulletin. Fielder, at 87.0% of the seeded area, and Owens, at 12.6% represent almost all of the Soft White Spring Wheat varieties grown.

Compared with 1985 new crop No. 1 C.W.S.W.S. wheat, the 1986 composite has slightly lower kernel weight and test weight. Wheat falling number and flour amylograph peak viscosity values are higher this year and alpha-amylase activity is at a satisfactory low level. Milling quality, in terms of flour yield and flour color, is similar to that of last year - although flour ash content is significantly higher despite the fact that there is no difference in wheat ash content.

Farinograph characteristics and particularly alveograph data indicate that the No. 1 C.W. grade composite is significantly weaker this year. Water absorption is similar to that of last year and alkaline water retention capacity is lower.

10. CANADA WESTERN SOFT WHITE SPRING WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

Quality Parameter	No. 1 C.W.S.W.S.	
	1986	1985
Number of Samples	133	70
WHEAT		
Test Weight, kg/hL	81.8	82.1
1000 Kernel Weight, g	37.2	38.3
Protein Content, % (N x 5.7)	10.1	10.5
Ash Content, %	1.45	1.43
Alpha-amylase Activity, units/g	3.6	12.4
Falling Number, s	370	295
Flour Yield, %	72.1	72.6
FLOUR		
Protein Content, %	9.0	9.1
Wet Gluten Content, %	28.2	29.0
Ash Content, %	0.47	0.41
Color, units	-0.6	-0.6
Alpha-amylase Activity, units/g	1.1	2.6
Amylograph Peak Viscosity, B.U.	990	790
Maltose Value, g/100 g	1.1	1.2
Starch Damage, Farrand units	11	10
AWRC, units	75	78
FARINOGRAM		
Absorption, %	55.6	55.2
Development Time, min	1.00	1.25
M.T.I., B.U.	205	175
Stability, min	1.00	1.50
ALVEOGRAM		
Length, cm	100	136
P (height x 1.1), mm	25	26
W, x 10^3 ergs	43	56

CANADA EASTERN WHITE WINTER WHEAT

The 1986 new crop survey for Canada Eastern White Winter Wheat was based on 262 samples of Ontario-grown soft white winter wheat with an overall mean protein content for all grades of 9.6%. This is slightly higher than the new-crop mean of 9.3% recorded for both the 1985 and 1984 crops. Due to adverse weather conditions, insufficient samples of the No. 1 C.E.W.W. grade were received to make a composite for quality testing. Fredrick and Augusta are the principal varieties of this class of wheat grown in Ontario, with Frankenmuth representing a very small proportion.

Table 12 presents detailed quality data for composites representing the grades No. 2, 3 and 4 C.E.W.W. wheat. Comparative data are shown for the 1985 new crop composite of No. 2 C.E.W.W.

Test weight and particularly kernel weight values are lower than last year. Higher wheat protein content and wheat ash content results are consistent with the lower kernel weight. Milling quality is similar to that of 1985 samples: slightly higher flour yield is offset by slightly higher flour ash content and flour color values. Lower wheat falling number and flour amylograph peak viscosity values reflect a substantial increase in alpha-amylase activity associated with sprouting and weathering caused by the adverse harvest conditions.

Alveograph data indicate a significant increase in gluten strength which is not apparent from the farinograph results but which is verified by the somewhat poorer cookie quality.

11. Protein Content of 1986 Crop Canada Eastern White Winter Wheat

Grade	Number of samples 1986	Protein Content, %*	
		1986	1985
No. 1 C.E.	9	10.1	9.7
No. 2 C.E.	105	9.5	9.1
No. 3 C.E.	94	9.6	8.8
No. 4 C.E.	33	9.6	-
No. 5 C.E.	13	9.8	-
Canada Feed	8	9.6	-
All Grades	262	9.6	9.3

* N x 5.7; 13.5% moisture content basis.

12. CANADA EASTERN WHITE WINTER WHEAT
Quality Data for Grade Composite Samples of 1986 Crop

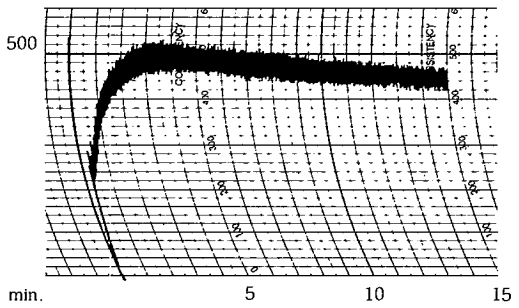
Quality Parameter	1986			1985
	No. 2 C.E.W.W.	No. 3 C.E.W.W.	No. 4 C.E.W.W.	No. 2 C.E.W.W.
Number of Samples	105	94	33	167
WHEAT				
Test Weight, kg/hL	78.5	77.8	77.0	80.1
1000 Kernel Weight, g	35.3	34.5	33.3	40.7
Protein Content, %	9.6	9.5	9.6	8.9
Ash Content, %	1.84	1.55	1.66	1.35
Alpha-amylase Activity, units/g	22.4	35.0	47.3	8.2
Falling Number, s	320	275	270	355
Flour Yield,%	75.1	74.8	75.1	74.3
FLOUR				
Protein Content, %	8.4	8.2	8.5	8.1
Wet Gluten Content, %	23.3	24.0	23.5	22.4
Ash Content, %	0.47	0.48	0.46	0.46
Color, units	-1.0	-1.0	-0.7	-1.7
Alpha-amylase Activity, units/g	9.1	15.0	16.8	1.2
Amylograph Peak Viscosity, B.U.	180	105	80	385
Maltose Value, g/100 g	1.2	1.4	1.5	1.0
Starch Damage, Farrand units	9	9	9	9
AWRC, units	71	69	70	70
COOKIE				
Spread, mm	82	82	82	85
Ratio	9.8	9.6	9.5	9.0
FARINOGRAM				
Absorption, %	50.5	51.0	50.8	50.9
Development Time, min	0.75	0.75	0.75	1.00
M.T.I., B.U.	150	160	160	175
Stability, min	1.50	1.50	1.50	1.50
ALVEOGRAM				
Length, mm	184	170	166	116
P (height x 1.1), mm	20	21	18	19
W, x 10^3 ergs	61	63	56	43

FARINOGRAMS

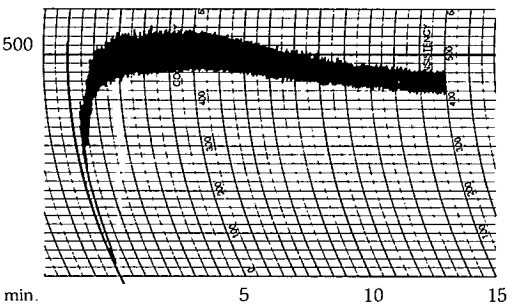
1986 Crop Composite Samples

No. 1 Canada Western 13.5 Red Spring Wheat

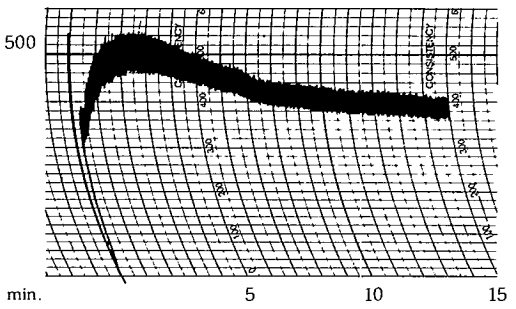
Western Prairie



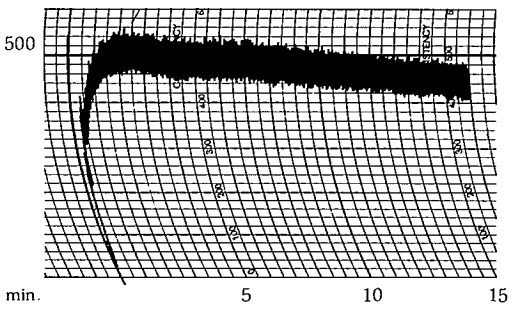
No. 1 Canada Western Red Winter Wheat



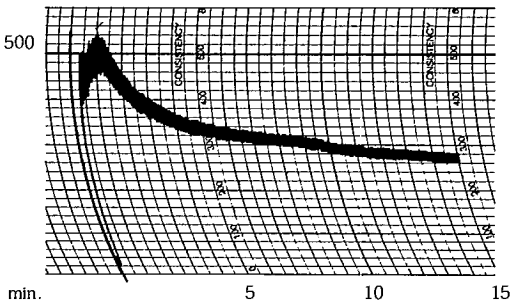
No. 1 Canada Prairie Spring Wheat



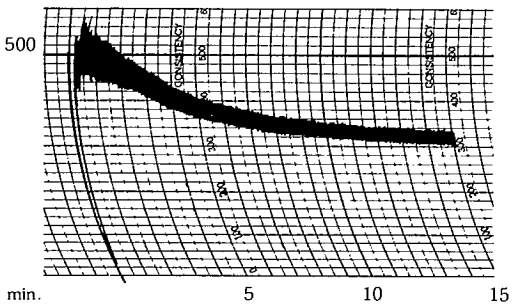
No. 1 Canada Utility Wheat



No. 1 Canada Western Soft White Spring Wheat



No. 2 Canada Eastern White Winter Wheat



METHODS

Notes on the methods used by the Laboratory are given below. 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).

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 the AACC method. 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.

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 semlina 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 the A.A.C.C. method. 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 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 the AACC method.

Collection of Samples. The samples of Canada Eastern White Winter Wheat are obtained from the Grain Inspection Division office at Chatham, Ontario, and the samples of the other classes of wheat 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 25 - No. 2, 3 and 4 C.E. White Winter Wheat.
September 30 - No. 1 C.W. Red Spring Wheat.
October 2 - No. 1 Canada Utility Wheat.
October 10 - No. 1 Canada Prairie Spring Wheat, No. 1 and 2 C.W. Amber Durum Wheat, No. 1 C.W. Soft White Spring Wheat and all grades of Canada Western Red Winter Wheat.

ACKNOWLEDGEMENTS

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