Canadian Grain Commission Commission canadienne des grains

ISSN 1498-9654

Quality of western Canadian wheat 2007

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Summary

Wet spring weather patterns have had a great influence on the growing seasons during the past two years and 2007 continued this trend. Central Alberta and north-eastern Saskatchewan received heavy rains during the spring planting season which resulted in significant reduction in sown area. The southern Prairies, conversely, were dry during the spring, which resulted in early planting of spring wheat and durum in the region. Crop conditions at the end of June were mostly good to excellent. Above normal temperatures moved into the western areas of the Prairies during early July and migrated to eastern regions by the middle of the month. Temperature records were set in a number of locations in Alberta and Saskatchewan during July. Cooler weather returned to the Prairies by the middle of August, with some scattered frosts reported in Alberta and Saskatchewan before the end of the month.

The spring wheat harvest was underway by the middle of August. Harvesting was complete in the southern Prairies by the first week of September, due to mostly dry weather during the month of August. Central and northern areas of the Prairies received cooler temperatures and more rainfall during August and September, which caused harvesting delays. The northern growing areas finished the harvest by mid-October. The hot dry weather during July resulted in below average yields for wheat and durum.

Spring wheat production levels are estimated at 13.9 million tonnes by Statistics Canada[1], a dramatic decrease from 18.8 million tonnes last year. Durum wheat production is estimated at 3.6 million tonnes, an increase of 268,000 tonnes over 2006.

Overall protein content of Canada Western Red Spring wheat, at 14.2 %, is 0.8% higher than last year. High grade Canada Western Red Spring wheat shows lower test weight, smaller seed size, similar wheat falling number, lower absorption and slightly weaker farinograph dough properties relative to last year. Extensograph and alveograph show strength slightly lower than last year, but generally comparable to the 10-year average values. Overall protein content of Canada Western Amber Durum wheat is considerably higher this year at 14.1%. High grade Canada Western Amber Durum wheat shows good falling number values indicative of sound kernel characteristics, semolina yield comparable to last year and improved gluten strength relative to the long term average.

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

[1] Statistics Canada, *Field Crop Reporting Series,* Vol. 86, No. 7, Oct. 7, 2007

Eight classes of Canadian wheat

This report presents information on the quality of the top grades of Canada Western Red Spring, Canada Western Amber Durum and Canada Western Hard White Spring wheat for the 2006 crop. Further information on other classes of western Canadian wheat is not reported for the 2006 crop where insufficient material was available to provide statistically valid information.

Canada Western Red Spring (CWRS) wheat is a hard wheat with superior milling and baking quality. It is offered at various guaranteed protein levels. There are four milling grades in the CWRS class.

Canada Western Hard White Spring (CWHWS) wheat is a hard white spring wheat with superior milling quality producing flour with excellent colour. It is suitable for bread and noodle production. There are three milling grades in the CWHWS class.

Canada Western Amber Durum (CWAD) wheat is a durum wheat producing a high yield of semolina with excellent pasta-making quality. There are four milling grades in the CWAD class.

Canada Western Extra Strong (CWES) wheat is a hard red spring wheat with extra-strong gluten suitable for blending purposes and for special breads. There are two milling grades in the CWES class.

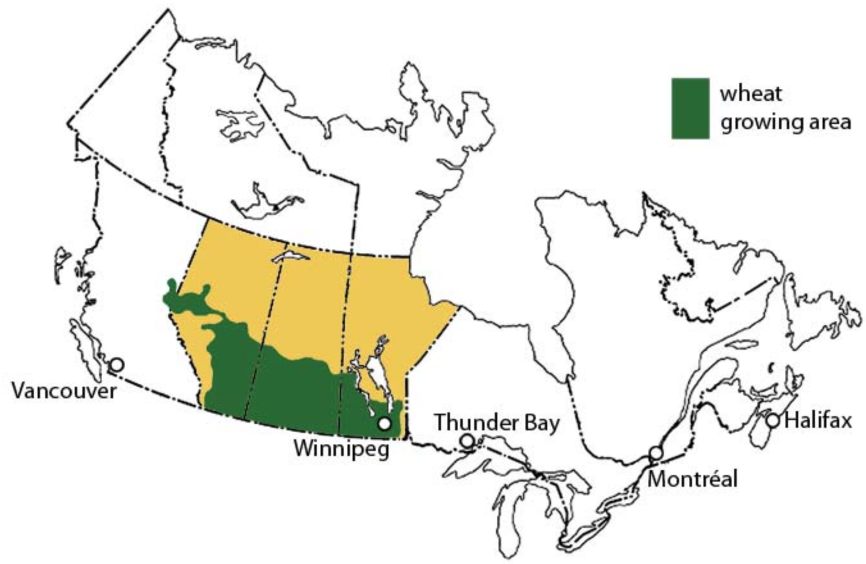
Canada Prairie Spring Red (CPSR) wheat is a medium protein content wheat, with medium to strong dough strength properties suitable for the production of a variety of products including hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

Canada Western Red Winter (CWRW) wheat is a hard wheat with very good milling quality suitable for the production of a wide variety of products including French breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CWRW class.

Canada Prairie Spring White (CPSW) wheat is a medium-strength wheat suitable for the production of various types of flat breads, noodles, chapatis and related products. There are two milling grades in the CPSW class.

Canada Western Soft White Spring (CWSWS) wheat is a soft wheat of low protein content suitable for the production of cookies, cakes and pastry as well as various types of flat breads, noodles, steamed breads and chapatis. There are three milling grades in the CWSWS class.

Figure 1 – Map of Canada showing major wheat producing areas in the Prairies



Introduction

What data in this report represent

Data presented in this report were generated from quality tests carried out on composites representing approximately 3300 individual samples submitted by producers and primary elevator managers from the three Prairie Provinces. Figure 1 highlights the wheat producing regions in the provinces of, from east to west, Manitoba, Saskatchewan and Alberta. These data are not quality specifications for Canadian wheat. Rather, they represent our best estimate of overall quality and provide information on relative performance among successive harvests. As with any estimate, some variation in the quality characteristics of wheat of any given grade exported during the coming year from the data presented here is to be expected. The amounts and relative quality of carryover stocks of each grade will contribute to this variation.

Background for the 2007 crop

The Canadian Wheat Board provided background information for the 2007 crop.

Seeding conditions

Wet spring weather patterns have had a great influence on the growing seasons during the past two years and 2007 continued this trend. Central Alberta and north-eastern Saskatchewan received heavy rains during the spring planting season which resulted in significant reduction in sown area. Late planting was also common in these areas, with significant acreage switched to earlier maturing crops such as oats and barley. Planting in the northern areas wrapped-up during the first weeks of June, with significant cropped area left fallow in certain areas. The southern Prairies, conversely, were dry during the spring, which resulted in early planting of spring wheat and durum in the region. The dryness also raised concerns about poor soil moisture levels, which have persisted since the 2006 growing season in the southern Prairies. Planting conditions in Manitoba were good across the province, with early planting reported in all areas except the north-western region.

Growing conditions

Precipitation during June was close to normal or above normal in most of the Prairie region, except in the southern areas of Alberta and Saskatchewan. These areas received enough moisture during June to sustain crop growth, but not enough to add to subsoil moisture reserves. Crop conditions at the end of June were mostly good to excellent. Above normal temperatures moved into the western areas of the Prairies during early July and migrated to eastern regions by the middle of the month. Temperature records were set in a number of locations in Alberta and Saskatchewan during July. The hot, dry conditions reduced yield expectations, especially in the southern growing areas of Alberta and Saskatchewan. In northern areas, the hot weather did help boost the development of crops that had been seeded later than normal. Cooler weather returned to the Prairies by the middle of August, with some scattered frosts reported in Alberta and Saskatchewan before the end of the month. The dry, hot conditions during July did help keep disease levels in check in most areas. Leaf rust was reported to be severe in southern Manitoba, while fusarium was found in only isolated pockets in the eastern Prairies. The dry conditions did not stop damage from the orange blossom wheat midge in the central growing areas of Saskatchewan and Manitoba. Later seeded wheat crops were very susceptible to midge damage.

Harvest conditions

The spring wheat harvest was underway by the middle of August. Harvesting was complete in the southern Prairies by the first week of September, due to mostly dry weather during the month of August. Central and northern areas of the Prairies received cooler temperatures and more rainfall during August and September, which caused harvesting delays. The northern growing areas finished the harvest by mid-October. The delays were most acute in the Peace River district, where cool, wet conditions persisted through the growing season and into the harvest.

Production and grade information

The hot dry weather during July resulted in below average yields for wheat and durum. Total wheat production for Western Canada is estimated at 19.0 million tonnes, with spring wheat production levels are estimated at 13.9 million tonnes by Statistics Canada[1], a significant decrease of 26% over last year. Durum wheat production is estimated at 3.6 million tonnes, slightly higher than the 2006 production. Winter wheat production in Western Canada is expected to be 1.5 million tonnes. Spring wheat yields are forecast to reach 2.4 tonnes per hectare, while durum yields are only 1.9 tonnes per hectare. Approximately 80% of CWRS graded No. 2 or better, and approximately 75% of CWAD graded No. 2 or better.

Overall protein content of Canada Western Red Spring wheat, at 14.2 %, is significantly higher than last year. High grade Canada Western Red Spring wheat shows lower test weight, smaller kernel size, similar wheat falling number, lower absorption and farinograph dough properties that are slightly weaker than last year, but are comparable to the long term average. Extensograph shows dough properties to be slightly less extensible and slightly weaker than last year, while the alveograph dough properties are comparable to the long term average. Overall protein content of Canada Western Amber Durum wheat at 14.1% is 1.3% higher than last year.

The lower grade CWRS resulted from a range of degrading factors including orange wheat blossom midge damage, hard vitreous kernels content, green and frost/heat damage. Lower grade CWAD resulted primarily from light weight kernels, hard vitreous kernel count and severe midge damage. Tight grading tolerances for these factors ensure that the high inherent quality of the top milling grades of Canada Western Red Spring, Canada Western Hard White Spring and Canada Western Amber Durum wheat are protected.

[1] Statistics Canada, Field Crop Reporting Series, Vol. 86, No. 7, Oct. 7, 2007

Protein

Table 1 compares available mean protein values for each of the eight classes of western Canadian wheat surveyed in 2007 to corresponding values obtained in the 2006 and 2005 harvest surveys as of October 25, 2007. Canada Western Red Spring (CWRS) wheat protein content is 0.7% higher for 2007 than for 2006. Canada Western Amber Durum (CWAD) show 1.3% higher protein values compared to 2006. Canada Western Hard White Spring (CWHWS) wheat is 13.6%, 0.4% higher than last year. Protein content for Canada Prairie Spring Red (CPSR), Canada Western Red Winter (CWRW), and Canada Western Soft White Spring (CWSWS) can be found in the table below. Insufficient sample was available at the time of writing this report to assess the protein content of Canada Western Extra Strong (CWES) and Canada Prairie Spring White (CPSW) wheat accurately.

Table 1 - Mean protein content of milling grades of western Canadian wheat classes, 2007, 2006 and 2005

Class	Protein content, %[1]		
	2007	2006	2005
CWRS	14.1	13.4	13.2
CWAD	14.1	12.8	12.3
CWHWS	13.6	13.2	12.9
CWES	N/A	N/A	N/A
CPSR	11.5	N/A	11.1
CWRW	10.8	N/A	10.6
CPSW	N/A	N/A	N/A
CWSWS	11.5	N/A	10.1

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

Canada Western Red Spring wheat

Protein and variety survey

Table 2 lists mean protein values for Canada Western Red Spring (CWRS) wheat by grade and province for 2007. Comparative values for western Canada by grade are shown for 2006 and for the previous 10 years (1997-2006). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of milling grades of the 2007 western Canadian wheat crop is 14.0%, 0.6% higher than 2006 and 0.2% higher than the ten year average protein content. Protein content is relatively constant across grades, ranging from 14.0% to 14.3%. Manitoba shows higher protein content than Saskatchewan and Alberta.

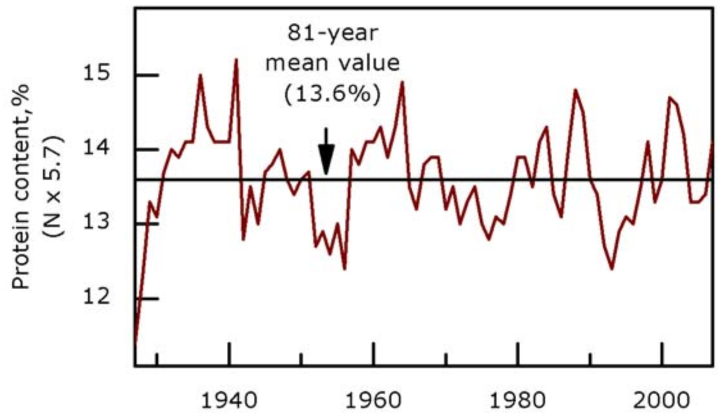
Results from the Canadian Wheat Board 2007 Variety Survey show that the variety Lillian has exceeded AC Barrie and Superb as the predominant variety in the CWRS class with 14.8% of the seeded acreage, versus 13.8% for AC Barrie and 12.8% for Superb. Lillian is a solid stem variety that is successful in reducing yield losses due to infestations of wheat stem sawfly that have been prevalent in southern Alberta and western Saskatchewan in recent years. The variety Harvest ranks fourth in production with 10.3% of the seeded acreage. The varieties McKenzie, Prodigy, and AC Eatonia combined account for more than 15% of the seeded acreage.

Table 2 - Mean protein content of 2007 Canada Western Red Spring wheat, by grade, year and province

	Protein content, %[1]					
	Western Canada			2007		
Grade	2007	2006	1997-2006	Manitoba	Saskatchewan	Alberta
Wheat, No. 1 CWRS	14.0	13.3	13.8	14.3	14.0	13.9
Wheat, No. 2 CWRS	14.0	13.5	13.9	14.6	14.1	13.5
Wheat, No. 3 CWRS	14.3	13.5	13.7	15.2	14.8	12.9
All milling grades	**14.0**	**13.4**	**13.8**	**14.5**	**14.2**	**13.6**

[1] N x 5.7%; 13.5% moisture basis

Figure 2 – Mean protein content of harvest survey Canada Western Red Spring wheat – 1927 to 2007



Milling and baking quality – Allis-Chalmers laboratory mill

To assess the quality of the 2007 CWRS wheat crop, composites were prepared from harvest survey samples representing the top two milling grades. The Wheat, No. 1 CWRS and Wheat No. 2 CWRS samples were segregated into composites having minimum protein levels of 14.5%, 14.0% and 13.5%.

Wheat, No. 1 Canada Western Red Spring

Table 3 summarizes quality data for the No. 1 CWRS composites. Corresponding data are provided at the 13.5% minimum protein level for both last year's composite and the ten-year average for 1997-2006.

Test weight of the 2007 No. 1 grade protein segregates is lower than last year, and the long term average, but is well within the guidelines for the grade. Similarly, kernel weight is lower than last year and the long term average. Wheat ash is higher compared to last year and compared to the long term average. The top grades show similar falling number values and α-amylase activities to last year, and slightly higher flour amylograph peak viscosities, indicative of sound kernel characteristics.

Wheat particle size index is similar to last year but starch damage is lower than last year and is comparable to the long term average. Flour yield, on clean wheat basis is similar to last year and is consistent with the long term average. However, on a constant 0.50% ash basis, flour yield is approximately 2% lower than last year and the long term average. Flour colour is similar to last year, and is superior to the long term average.

Farinograph absorption is 1.9% lower than 2006. Farinograph dough strength properties show slightly weaker than last year, however dough development time remains approximately 1 minute longer than the long term average and stability is similar to the long term average. Extensograph and alveograph results indicate slightly weaker dough strength properties compared with last year but are comparable to the long term average. CSP baking absorption is 2% lower than last year, and dough required a somewhat longer mixing time. However loaf volumes are unchanged from last year and are typical for the grade and protein content. The slightly weaker dough strength properties seen this year are probably the result of heat stress experienced during the grain filling stage.

Wheat, No. 2 Canada Western Red Spring wheat

Quality data for the 2007 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 1997-2006, are shown in Table 4. As seen with the No. 1 CWRS, test weight values and kernel weights are lower than last year and the long term average. Wheat ash also is higher than last year and the long term average value. Wheat falling number is similar to last year, α-amylase activity is slightly higher and amylograph peak viscosity is lower than last year, and all are indicating the soundness of this years' wheat crop.

Wheat particle size index is similar to 2006 however flour starch damage values are lower suggesting that the wheat is not as hard as last year. Milling extraction level of the No. 2 grade 13.5% protein composite is similar to last year and the long term average on a clean wheat basis, however, on constant 0.50% ash basis milling yield is lower than last year. Flour grade and AGTRON colour values are similar to last year, and are better than the long term values. Wet gluten content is 1.4% lower this year relative to 2006 and is lower than the long term average.

Farinograph absorption is lower than 2006 and is lower than the long term average. Dough strength is comparable to 2006 and stronger than the long term average. Extensograph values exhibit comparable dough properties to last year and the long term average. Alveograph shows slightly weaker dough properties this year. CSP baking absorption is marginally lower than last year while loaf volume is similar to last year and typical for the grade and protein content. Mixing energy and mixing time requirements are higher than last year.

Quality data can be found for Wheat, No. 3 CWRS in Table 5. Average protein content for Wheat, No. 3 CWRS is considerably higher this year at 14.4% wheat and 13.6% flour protein, than for 2006 or the longterm. There is some evidence of sprouting in the composite as seen by the falling number value of 305, amylograph peak viscosity of 225 BU and wheat and flour α-amylase activities of 18.0 and 6.0 units/g respectively. Milling extraction level for the Wheat, No. 3 CWRS is lower this year than it was for 2006 and the longterm. Farinograph absorption is comparable to last year, and considerably higher than the longterm average, but strength is slightly lower. CSP baking absorption is 2% lower compared with 2006, but loaf volumes are comparable.

Comparative Bühler laboratory mill flour data

Samples of 2007 and stored 2006 harvest survey No. 1 CWRS 13.5 and 14.5 composites and the No. 2 CWRS 13.5 and 14.5 composites were milled consecutively on the same day on the tandem Buhler laboratory mill into 74% extraction straight grade and 60% long patent flour to allow for direct comparisons. In general, the trends are in agreement with the Allis-Chalmers milling data.

Milling and baking quality

Wheat, No. 1 Canada Western Red Spring

Data are shown in Tables 6 and 7 for the Wheat, No. 1 CWRS 13.5% and 14.5% minimum protein segregates, respectively. Straight grade flours from the 2007 composites for 13.5% and 14.5% protein segregates show higher ash content this year compared with 2006, and the 13.5% segregate exhibits lower wet gluten content. Patent flours show slightly lower wet gluten content and starch damage values, and ash content 0.01% higher relative to the composite flours from last year. Softer kernels texture is indicated by lower starch damage, which also has an impact on flour water absorption capability. Flour grade and AGTRON colour values for straight grade and patent flours are comparable to last year. Amylograph peak viscosities are similar to last year.

Farinograph absorption for this year's straight grade flours are 1.5% and 1.2% lower than last year for the 13.5% and 14.5% protein segregates, respectively. The corresponding patent flour absorptions are 1.6% and 1.2% lower than for 2006. The 2007 straight grade and 60% patent flours for the 13.5% protein segregate exhibit greater farinograph dough strength than the corresponding 2006 flours (Table 6), while the 2007 14.5% protein segregate flours are generally comparable to the corresponding 2006 flours (Table 7).

Data are shown in Table 6 for sponge and dough and CSP baking quality of the 13.5% protein segregate and in Table 7 for the 14.5% protein segregate. Sponge and dough baking absorptions are lower for the 2007 straight grade flour milled from the 13.5% protein segregate and for 60% patent flour from both the 13.5% and 14.5% protein segregates compared with the re-milled 2006 flour. Sponge and dough mixing times for this year's crop are comparable to 2006 at both protein levels. Sponge and dough loaf volumes are comparable to the 2006 straight grade and 60% patent flours.

CSP baking absorptions for 2007 are similar to last year for both the 13.5% (Table 6) and 14.5% protein (Table 7) straight grade flours and for the 13.5% protein patent flours. The 2007 14.5% protein segregate patent flour had 3% lower CSP baking absorption than last year. The mixing times at both levels of protein were longer when comparing the 2007 flours with their corresponding 2006 flours. Loaf volumes are comparable for both the 2007 13.5% and 14.5% protein segregate straight grade and patent flours compared to the 2006 flours.

Yellow alkaline noodles

Yellow alkaline noodles were prepared using Wheat, No. 1 CWRS at both protein segregates (13.5% and 14.5%) for straight grade and 60% patent flour with a 1% *kansui* reagent (9:1 sodium and potassium carbonates) at a 32 % water absorption level.

Yellow alkaline noodles from the 2007 crop 13.5% protein composite (Table 8), for both patent (60%) and straight grade flours were generally comparable in raw noodle colour at both 2 and 24 hours after production to that of 2006. While L* and b* were equivalent, a modest increase in a* was detected in both patent and straight grade flour noodles. Cooked noodle colour was also comparable to last year in all samples with no detectable difference in a* being observed. The 2007 patent and straight grade flours yielded equivalent cooked noodle texture characteristics to 2006.

The colour characteristics of both the 2007 14.5% composite patent and straight grade raw noodles (Table 9) were equivalent to those of the 2006 crop. As observed in the 13.5% protein segregation a modest increase in a* was detected in both flours' a* values at 2 and 24 hrs post production. With the exception of 2007 straight grade flour cooked noodle MCS (bite), no differences were observed with the 2006 crop for both flours. A reduction in MCS in the straight grade noodles was detected but no other texture parameter displayed this difference.

White salted noodles

White salted noodles were prepared using Wheat, No. 1 CWRS at both protein segregation levels (13.5% and 14.5%) for straight grade and 60% patent flour using a 1% sodium chloride solution at a 30% water absorption level in order to maintain proper dough crumb and sheeting characteristics.

White salted noodle colour, prepared from the 2007 No. 1 CWRS 13.5 patent flour displayed equivalent raw noodle colour to the 2006 material. A slight reduction in L* and higher b* values at both 2 and 24 hrs were observed in noodles prepared from the straight grade flour when compared to 2006 material. No differences in cooked noodle L* or b* colour values were observed although a slightly higher a* was noted compared to the respective 2006 samples. Texture characteristics of the 2007 cooked noodles prepared from both patent and straight grade flours were equivalent with those of the previous year (Table 8).

White salted noodles prepared from either 2007 No. 1 CWRS 14.5 straight grade or patent flours exhibited equivalent raw noodle colour attributes to their respective corresponding 2006 samples. A slight elevation in 2007 cooked noodle a* was detected in straight grade noodles but this was not evident in those prepared from patent flour. A modest reduction in 2007 cooked patent noodle texture characteristics was observed compared to 2006 but this was not consistent in those noodles prepared from straight grade flour (Table 9).

Milling and baking quality

Wheat, No. 2 Canada Western Red Spring wheat

Data are shown in Tables 10 and 11 for the Wheat, No. 2 CWRS 13.5% and 14.5% minimum protein segregates, respectively. The No. 2 CWRS 13.5 straight grade flour, and the No. 2 CWRS 14.5 straight grade and patent flour exhibit wet gluten contents that are slightly lower this year compared with 2006, while the No. 2 CWRS 13.5 60% patent flour is 1.8% lower this year. The straight grade flours at both protein levels have slightly higher ash contents this year. All flours show similar flour grade colour and Agtron colour. Amylograph peak viscosity is somewhat lower for all No. 2 CWRS 2007 flours, but is still indicative of sound wheat. Starch damage is slightly lower for the 2007 13.5% and 14.5% straight grade and patent flours this year.

Farinograph absorption is lower for the 2007 No. 2 CWRS 13.5% and 14.5% straight grade and patent flours relative to the corresponding 2006 flours. The differences range from 1.3% to 1.8% lower this year. The 13.5% and 14% straight grade flours from 2007 have slightly shorter dough development times than the 2006 straight grade flours, but have generally comparable stabilities. The 2007 No. 2 CWRS 13.5 and 14.5 60% patent flours are both slightly stronger than 2006, with slightly longer dough development time and stability.

Sponge and dough baking quality of the 2007 No. 2 CWRS 13.5 patent flour (Table 10) and No. 2 CWRS 14.5 straight grade and patent flours (Table 11) exhibited slightly lower bake absorption compared to 2006. The 13.5% straight grade flour bake absorptions were comparable for 2007 and 2006. Mixing time and energy requirements are higher this year for the No. 2 CWRS 13.5 flours, while the No. 2 CWRS 14.5 flours have similar mixing requirements to last year. Loaf volume for the No. 2 CWRS 13.5 60% patent flour was lower for 2007 compared to the corresponding flour from 2006. The 2007 and 2006 No. 2 CWRS 13.5 and 14.5 straight grade flours and the No. 2 CWRS 14.5 patent flours had comparable loaf volumes.

CSP baking results can be seen in Tables 10 and 11. The 2007 and 2006 straight grade and 60% patent flours show comparable bake absorption at both protein levels. This year the straight grade and patent flours at both protein levels have slightly longer mixing requirements. CSP loaf volumes for the No. 2 CWRS 13.5 for 2007 and 2006 were comparable for both straight grade and patent flours. Loaf volume for the 2007 14.5% patent flour was slightly higher than 2006, while 14.5% straight grade flours were comparable for both years.

Yellow alkaline noodles

Yellow alkaline noodles were prepared using Wheat, No. 2 CWRS at both protein segregates (13.5% and 14.5%) for straight grade and 60% patent flour with a 1% *kansui* reagent (9:1 sodium and potassium carbonates) at a 32 % water absorption level. The results for Wheat, No. 2 CWRS 13.5 can be found in Table 12, and for 14.5% protein segregate can be found in Table 13.

Evaluation of patent and straight grade yellow alkaline noodles indicated a modest reduction in L* compared with last year. A slight elevation in straight grade noodle a* values was also observed at both 2 and 24 hrs. However, these differences were not observed in the corresponding cooked noodles. A general reduction in 2007 No. 2 CWRS 13.5 cooked noodle texture was observed in all attributes, most noticeably MCS, for both patent and straight grade flour noodles relative to 2006. The 2007 No. 2 CWRS 14.5 straight grade and patent flours exhibited similar textural characteristics to last years corresponding flours.

White salted noodles

Raw white salted patent flour noodles prepared from the No. 2 CWRS 13.5 and 14.5 2007 crop were equivalent in noodle colour to the corresponding 2006 crop material. Cooked noodle colour values were also equivalent to 2006. A reduction in MCS was noted in cooked noodle texture measurements for all 2007 flours with the exception of the No. 2 CWRS 14.5 straight grade flour.

Table 3 - Wheat, No. 1 Canada Western Red Spring
Quality data for 2007 harvest survey grade composite samples compared to 2006 and 1997-06 mean

Quality parameter[1]	Minimum protein content 14.5	14.0	13.5	No. 1 CWRS 13.5 2006	1997-06 mean
Wheat					
Test weight, kg/hL	79.7	79.6	80.2	81.5	81.7
Weight per 1000 kernels, g	29.4	30.1	30.0	31.1	31.7
Protein content, %	14.8	14.2	13.8	13.8	13.8
Protein content, % (dry matter basis)	17.2	16.4	16.0	15.9	16.0
Ash content, %	1.63	1.64	1.65	1.55	1.56
α-amylase activity, units/g	3.0	3.5	4.0	3.0	4.4
Falling number, s	420	410	410	400	390
PSI,%	53	52	51	52	52
Milling					
Flour yield					
Clean wheat basis, %	75.4	75.0	75.4	75.3	75.4
0.50% ash basis, %	74.4	73.5	74.4	76.3	76.4
Flour					
Protein content, %	14.3	13.7	13.2	13.2	13.2
Wet gluten content, %	37.9	35.8	35.5	35.8	35.6
Ash content, %	0.52	0.53	0.52	0.48	0.48
Grade colour, Satake units	-2.0	-2.0	-2.3	-2.4	-2.0
AGTRON colour, %	72	74	74	79	76
Starch damage, %	7.5	7.5	7.6	8.1	7.7
α-amylase activity, units/g	1.0	1.0	1.0	1.5	1.2
Amylograph peak viscosity, BU	695	720	710	670	658
Maltose value, g/100g	2.3	2.3	2.4	2.5	2.5
Farinogram					
Absorption, %	66.2	65.2	65.0	66.9	66.1
Development time, min	7.50	7.50	7.00	8.50	5.89
Mixing tolerance index, BU	25	25	25	20	26
Stability, min	11.5	14.0	10.5	13.5	11.0
Extensogram					
Length, cm	20	21	19	20	21
Height at 5 cm, BU	330	350	350	340	327
Maximum height, BU	560	620	610	680	614
Area, cm^2	155	170	155	170	172
Alveogram					
Length, mm	125	114	111	116	112
P (height x 1.1), mm	111	114	114	131	121
W, x 10^{-4} joules	458	458	445	517	466
Baking (Canadian short process baking test)					
Absorption, %	69	68	68	70	N/A[2]
Mixing energy, W-h/kg	6.2	6.3	6.2	6.1	N/A[2]
Mixing time, min	4.7	4.7	4.7	3.8	N/A[2]
Loaf volume, cm^3/100 g flour	1140	1100	1105	1105	N/A[2]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Not available due to change in method. See http://grainscanada.gc.ca/Quality/Methods/wheatmethods-e.htm

Table 4 - Wheat, No. 2 Canada Western Red Spring
Quality data for 2007 harvest survey grade composite samples
compared to 2006 and 1997-06 mean

	Minimum protein level			No. 2 CWRS 13.5	
Quality parameter[1]	14.5	14.0	13.5	2006	1997-06 mean
Wheat					
Test weight, kg/hL	78.8	79.1	79.6	80.7	80.6
Weight per 1000 kernels, g	31.1	30.6	31.3	36.7	32.8
Protein content, %	14.8	14.2	13.7	13.7	13.7
Protein content, % (dry matter basis)	17.1	16.5	15.9	15.9	16.0
Ash content, %	1.71	1.70	1.68	1.60	1.63
α-amylase activity, units/g	7.0	7.5	7.0	3.5	6.3
Falling number, s	395	385	395	390	380.5
PSI, %	54	53	54	53	53
Milling					
Flour yield					
Clean wheat basis, %	75.1	74.8	75.2	75.1	75.4
0.50% ash basis, %	74.1	74.8	74.7	75.1	75.4
Flour					
Protein content, %	14.3	13.6	13.2	13.1	13.1
Wet gluten content, %	37.6	36.0	34.6	36.0	35.9
Ash content, %	0.52	0.50	0.51	0.50	0.50
Grade colour, Satake units	-1.8	-2.0	-2.2	-2.0	-1.7
AGTRON colour, %	69	72	74	75	73
Starch damage, %	7.3	7.4	7.7	8.4	7.5
α-amylase activity, units/g	2.0	2.0	2.0	1.0	2.0
Amylograph peak viscosity, BU	495	535	490	620	553
Maltose value, g/100g	2.2	2.3	2.4	2.6	2.5
Farinogram					
Absorption, %	66.0	65.7	65.4	67.3	66.1
Development time, min	6.50	6.00	7.25	6.75	5.70
Mixing tolerance index, BU	20	15	30	15	30
Stability, min	11.5	11.5	10.0	12.0	9.0
Extensogram					
Length, cm	20	23	21	21	22
Height at 5 cm, BU	320	320	330	315	307
Maximum height, BU	570	580	580	620	566
Area, cm^2	155	175	175	165	165
Alveogram					
Length, mm	139	132	132	127	119
P (height x 1.1), mm	106	108	112	130	117
W, x 10^{-4} joules	470	451	477	530	466
Baking (Canadian short process baking test)					
Absorption, %	69	69	69	70	N/A[2]
Mixing energy, W-h/kg	5.7	6.5	6.6	5.2	N/A[2]
Mixing time, min	4.4	4.8	4.7	3.6	N/A[2]
Loaf volume, cm^3/100 g flour	1140	1130	1115	1120	N/A[2]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Not available due to change in method. See http://grainscanada.gc.ca/Quality/Methods/wheatmethods-e.htm

Table 5 - Wheat, No. 3 Canada Western Red Spring
Quality data for 2007 harvest survey grade composite samples compared to 2006 and 1997-06 mean

Quality parameter[1]	No. 3 CWRS 2007	2006	1997-06 mean
Wheat			
Test weight, kg/hL	79.0	80.5	79.4
Weight per 1000 kernels, g	32.5	38.6	33.4
Protein content, %	14.4	13.6	13.7
Protein content, % (dry matter basis)	16.6	15.7	15.9
Ash content, %	1.72	1.61	1.60
α-amylase activity, units/g	18.0	9.0	13.5
Falling number, s	305	350	347
PSI,%	53	53	53
Milling			
Flour yield			
Clean wheat basis, %	74.4	75.5	74.8
0.50% ash basis, %	73.4	75.0	74.8
Flour			
Protein content, %	13.6	13.0	13.0
Wet gluten content, %	37.3	35.4	35.3
Ash content, %	0.52	0.51	0.50
Grade colour, Satake units	-1.4	-1.9	-1.4
AGTRON colour, %	64	75	71
Starch damage, %	8.1	8.4	7.4
α-amylase activity, units/g	6.0	2.0	4.9
Amylograph peak viscosity, BU	225	450	391
Maltose value, g/100g	3.0	2.7	2.6
Farinogram			
Absorption, %	67.8	67.5	65.9
Development time, min	4.75	6.25	5.25
Mixing tolerance index, BU	30	35	33
Stability, min	7.00	8.25	8.28
Extensogram			
Length, cm	21	22	22
Height at 5 cm, BU	260	320	303
Maximum height, BU	420	580	536
Area, cm^2	115	175	159
Alveogram			
Length, mm	133	140	124
P (height x 1.1), mm	114	124	114
W, x 10^{-4} joules	450	517	449
Baking (Canadian short process baking test)			
Absorption, %	69	71	N/A[2]
Mixing energy, W-h/kg	4.9	5.9	N/A[2]
Mixing time, min	3.9	3.7	N/A[2]
Loaf volume, cm^3/100 g flour	1130	1100	N/A[2]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Not available due to change in method in 2004. See http://grainscanada.gc.ca/Quality/Methods/wheatmethods-e.htm

Table 6 - Wheat, No. 1 Canada Western Red Spring - 13.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

	74% Straight grade		60% Patent	
Quality parameter	2007	2006	2007	2006
Flour[2]				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.2	13.1	12.7	12.7
Wet gluten content, %	34.7	35.7	33.9	34.5
Ash content, %	0.44	0.42	0.38	0.37
Grade colour, Satake units	-3.1	-3.4	-4.2	-4.3
AGTRON colour, %	80	83	90	92
Amylograph peak viscosity, BU	770	820	855	860
Starch damage, %	5.7	6.2	6.0	6.5
Farinogram				
Absorption, %	61.8	63.3	61.5	63.1
Development time, min	10.50	7.50	12.00	9.25
Mixing tolerance index, BU	20	20	5	10
Stability, min	25.0	23.0	33.0	28.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	62	64	64	65
Mixing energy dough stage, W-h/kg	4.1	4.1	4.8	3.9
Mixing time dough stage, min	3.0	2.9	3.5	3.1
Loaf volume, cm^3/100 g flour	1115	1110	1085	1115
Appearance	7.3	7.4	7.5	7.7
Crumb structure	6.2	6.1	6.2	6.0
Crumb color	8.0	8.0	7.8	7.9
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	65	66	65	65
Mixing energy, W-h/kg	6.8	5.6	6.4	6.8
Mixing time, min	4.9	4.0	4.9	4.4
Loaf volume, cm^3/100 g flour	1170	1155	1140	1125
Appearance	7.5	7.8	7.8	7.7
Crumb structure	6.2	6.2	6.2	6.2
Crumb color	7.9	8.0	7.8	7.9

[1] The 2006 composite was stored and milled the same day as the 2007
[2] Data reported on 14.0% moisture basis

Table 7 - Wheat, No. 1 Canada Western Red Spring - 14.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

	74% Straight grade		60% Patent	
Quality parameter	2007	2006	2007	2006
Flour[2]				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	14.2	14.1	13.7	13.7
Wet gluten content, %	37.8	38.0	36.8	37.2
Ash content, %	0.44	0.41	0.38	0.37
Grade colour, Satake units	-2.8	-3.0	-3.9	-4.1
AGTRON colour, %	81	82	89	90
Amylograph peak viscosity, BU	765	795	855	865
Starch damage, %	5.6	5.9	5.8	6.0
Farinogram				
Absorption, %	62.2	63.4	62.3	63.5
Development time, min	7.25	9.25	11.00	10.00
Mixing tolerance index, BU	10	10	10	10
Stability, min	30.5	29.5	29.5	26.5
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	64	64	62	65
Mixing energy dough stage, W-h/kg	4.9	4.2	4.3	4.2
Mixing time dough stage, min	3.0	2.7	3.2	3.1
Loaf volume, cm^3/100 g flour	1105	1135	1125	1165
Appearance	7.1	7.7	7.4	7.7
Crumb structure	6.2	5.9	6.0	5.9
Crumb color	8.0	7.8	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	65	65	64	67
Mixing energy, W-h/kg	6.0	5.6	6.5	6.1
Mixing time, min	4.5	4.0	4.7	4.3
Loaf volume, cm^3/100 g flour	1155	1175	1145	1150
Appearance	7.5	7.5	7.5	7.5
Crumb structure	6.2	5.9	6.2	6.0
Crumb color	7.8	7.8	7.9	7.9

[1] The 2006 composite was stored and milled the same day as the 2007
[2] Data reported on 14.0% moisture basis

Table 8 - Wheat, No. 2 Canada Western Red Spring - 13.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

	74% Straight grade		60% Patent	
Quality parameter[2]	2007	2006	2007	2006
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.1	13.1	12.5	12.7
Wet gluten content, %	34.9	35.3	33.2	35.0
Ash content, %	0.46	0.43	0.39	0.39
Grade colour, Satake units	-2.8	-3.0	-4.2	-3.9
AGTRON colour, %	80	83	92	91
Amylograph peak viscosity, BU	550	705	635	780
Starch damage, %	5.7	6.1	6.1	6.6
Farinogram				
Absorption, %	62.1	63.4	61.5	63.3
Development time, min	6.25	7.50	11.50	8.75
Mixing tolerance index, BU	20	20	20	15
Stability, min	13.0	12.0	33.0	28.5
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	64	64	62	64
Mixing energy dough stage, W-h/kg	4.3	3.4	4.2	3.8
Mixing time dough stage, min	3.1	2.6	3.1	2.9
Loaf volume, cm^3/100 g flour	1135	1125	1045	1100
Appearance	7.4	7.5	7.5	7.5
Crumb structure	6.0	6.0	6.2	6.2
Crumb color	7.8	7.9	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	65	66	65	66
Mixing energy, W-h/kg	6.2	5.8	6.7	5.9
Mixing time, min	4.9	4.3	5.0	4.1
Loaf volume, cm^3/100 g flour	1150	1110	1140	1145
Appearance	7.4	7.4	7.7	7.9
Crumb structure	6.0	6.2	6.2	6.1
Crumb color	7.8	7.8	7.8	7.8

[1] The 2006 composite was stored and milled the same day as the 2007
[2] Data reported on 14.0% moisture basis

Table 9 - Wheat, No. 2 Canada Western Red Spring - 14.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

Quality parameter	74% Straight grade		60% Patent	
	2007	2006	2007	2006
Flour[2]				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	14.1	14.1	13.5	13.6
Wet gluten content, %	38.1	38.5	36.8	37.3
Ash content, %	0.45	0.43	0.39	0.38
Grade colour, Satake units	-2.6	-2.7	-3.8	-3.7
AGTRON colour, %	79	79	88	89
Amylograph peak viscosity, BU	570	730	665	795
Starch damage, %	5.6	5.8	5.7	6.2
Farinogram				
Absorption, %	62.8	64.4	62.8	64.4
Development time, min	7.25	8.00	9.50	8.50
Mixing tolerance index, BU	20	15	15	5
Stability, min	13.0	16.0	30.0	27.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	64	66	64	65
Mixing energy dough stage, W-h/kg	4.3	3.7	4.4	4.7
Mixing time dough stage, min	2.8	2.6	3.1	3.1
Loaf volume, cm^3/100 g flour	1145	1185	1130	1135
Appearance	7.7	7.5	7.7	7.5
Crumb structure	6.2	6.0	6.0	6.2
Crumb color	7.9	7.9	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	65	66	66	67
Mixing energy, W-h/kg	6.3	5.5	6.0	5.8
Mixing time, min	4.6	4.0	4.8	4.3
Loaf volume, cm^3/100 g flour	1130	1140	1160	1110
Appearance	7.8	7.9	7.5	7.4
Crumb structure	6.2	6.2	6.2	6.2
Crumb color	7.8	7.7	7.9	7.8

1 The 2006 composite was stored and milled the same day as the 2007
2 Data reported on 14.0% moisture basis

Table 10 - Wheat, No. 1 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

	74% Straight grade				60% Patent			
Quality parameter	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	79.5	(73.1)	79.4	(73.4)	81.4	(76.5)	81.6	(76.7)
Redness, a*	0.02	(0.63)	-0.23	(0.41)	-0.03	(0.39)	-0.25	(0.05)
Yellowness, b*	27.5	(27.7)	27.4	(27.9)	27.3	(28.8)	26.7	(27.3)
Cooked colour								
Brightness, L*	70.3		70.0		71.2		71.0	
Redness, a*	-1.92		-1.91		-2.22		-2.22	
Yellowness, b*	27.5		28.1		28.0		28.3	
Texture								
Thickness, mm	2.35		2.33		2.32		2.33	
RTC, %	26.0		25.2		24.8		24.0	
Recovery, %	33.7		33.6		32.3		32.3	
MCS, g/mm^2	32.2		31.5		30.6		31.4	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	80.7	(74.0)	81.9	(75.8)	83.1	(77.7)	82.7	(77.8)
Redness, a*	2.81	(3.71)	2.54	(3.10)	2.29	(2.82)	2.21	(2.70)
Yellowness, b*	24.9	(25.5)	23.5	(24.7)	23.7	(25.7)	24.1	(25.7)
Cooked colour								
Brightness, L*	76.2		76.0		76.6		76.7	
Redness, a*	1.03		0.91		0.70		0.57	
Yellowness, b*	20.2		20.2		20.5		20.2	
Texture								
Thickness, mm	2.46		2.55		2.49		2.49	
RTC, %	20.7		19.4		19.6		19.1	
Recovery, %	24.9		24.3		23.8		24.0	
MCS, g/mm^2	27.5		27.4		26.7		26.8	

[1] The 2006 composite was stored and milled the same day as the 2007

Table 11 - Wheat, No. 1 Canada Western Red Spring - 14.5% protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

	74% Straight Grade				60% patent			
Quality parameter	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	78.7	(71.9)	78.9	(72.2)	80.3	(75.4)	80.7	(75.2)
Redness, a*	0.07	(0.58)	-0.12	(0.44)	0.01	(0.40)	-0.11	(0.05)
Yellowness, b*	28.1	(27.3)	27.7	(27.2)	27.6	(27.9)	27.4	(27.3)
Cooked colour								
Brightness, L*	70.6		70.3		70.9		70.7	
Redness, a*	-1.85		-1.84		-2		-2	
Yellowness, b*	26.6		27.0		27.3		27.6	
Texture								
Thickness, mm	2.43		2.42		2		2	
RTC, %	25.1		25.1		24.7		24.5	
Recovery, %	33.8		34.3		34.0		33.7	
MCS, g/mm^2	31.8		33.9		31.9		32.8	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	80.8	(75.3)	80.9	(75.4)	82.1	(77.5)	82.4	(77.3)
Redness, a*	2.81	(3.62)	2.80	(3.58)	2.45	(3.03)	2.38	(2.92)
Yellowness, b*	24.2	(25.3)	24.7	(25.8)	23.9	(25.8)	24.2	(25.9)
Cooked colour								
Brightness, L*	75.7		76.3		76.7		76.6	
Redness, a*	1.12		0.83		0.69		0.69	
Yellowness, b*	19.8		19.4		19.7		20.1	
Texture								
Thickness, mm	3		3		3		2.57	
RTC, %	19.9		19.5		19.2		19.8	
Recovery, %	24.7		25.2		24.3		25.2	
MCS, g/mm^2	27.1		27.3		26.7		28.1	

[1] The 2006 composite was stored and milled the same day as the 2007

Table 12 - Wheat, No. 2 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

Quality parameter	74% Straight grade				60% Patent			
	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	78.1	(71.9)	79.1	(72.9)	81.2	(76.0)	81.8	(76.2)
Redness, a*	0.06	(0.91)	-0.06	(0.54)	-0.1	(0.27)	-0.14	(0.33)
Yellowness, b*	27.6	(27.9)	27.5	(27.5)	26.2	(27.3)	26.1	(27.5)
Cooked colour								
Brightness, L*	69.1		69.8		71.1		70.8	
Redness, a*	-1.81		-1.89		-2.28		-2.16	
Yellowness, b*	27.0		27.4		27.5		27.9	
Texture								
Thickness, mm	2.34		2.34		2.29		2.35	
RTC, %	24.6		25.4		24.5		25.0	
Recovery, %	33.2		33.9		32.8		33.3	
MCS, g/mm^2	31.5		34.1		30.9		33.8	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	80.8	(74.5)	81.1	(75.2)	82.6	(78.3)	82.4	(77.8)
Redness, a*	2.60	(3.36)	2.61	(3.46)	2.13	(2.45)	2.22	(2.54)
Yellowness, b*	24.0	(24.7)	23.8	(25.6)	23.7	(25.2)	23.3	(25.1)
Cooked colour								
Brightness, L*	75.3		75.4		76.5		76.5	
Redness, a*	0.96		0.94		0.59		0.66	
Yellowness, b*	19.5		19.7		19.9		20.0	
Texture								
Thickness, mm	2.47		2.48		2.46		2.48	
RTC, %	19.5		19.7		19.0		19.3	
Recovery, %	24.9		25.0		24.4		24.9	
MCS, g/mm^2	27.3		28.3		27.4		28.9	

[1] The 2006 composite was stored and milled the same day as the 2007

Table 13 - Wheat, No. 2 Canada Western Red Spring - 14.5% protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

	74% Straight grade				60% Patent			
Quality parameter	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	77.8	(70.9)	79.1	(71.7)	80.3	(75.2)	81.3	(74.7)
Redness, a*	0.21	(0.91)	0.06	(0.75)	0.13	(0.56)	-0.08	(0.20)
Yellowness, b*	27.6	(27.2)	26.8	(27.4)	26.3	(27.6)	25.4	(26.7)
Cooked colour								
Brightness, L*	69.7		69.3		70.9		70.8	
Redness, a*	-1.71		-1.73		-2.05		-1.95	
Yellowness, b*	26.2		26.6		26.6		27.3	
Texture								
Thickness, mm	2.41		2.43		2.41		2.42	
RTC, %	25.3		25.2		25.2		25.2	
Recovery, %	33.9		34.1		34.0		34.4	
MCS, g/mm^2	35.2		35.3		34.1		34.7	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	80.3	(74.1)	80.8	(74.5)	81.8	(77.3)	82.1	(76.5)
Redness, a*	2.85	(3.59)	2.79	(3.50)	2.33	(2.83)	2.44	(2.97)
Yellowness, b*	23.8	(24.7)	24.6	(25.0)	23.7	(25.3)	23.9	(25.6)
Cooked colour								
Brightness, L*	75.4		76.1		76.6		76.5	
Redness, a*	1.09		1.00		0.70		0.73	
Yellowness, b*	19.3		19.4		19.3		19.7	
Texture								
Thickness, mm	2.55		2.53		2.52		2.55	
RTC, %	20.8		20.9		20.0		20.4	
Recovery, %	25.9		26.7		25.6		26.0	
MCS, g/mm^2	31.3		31.7		28.8		31.4	

[1] The 2006 composite was stored and milled the same day as the 2007

Canada Western Amber Durum wheat

Protein and variety survey

Table 14 lists the mean protein content values for Canada Western Amber Durum (CWAD) wheat by grade. Comparative values are shown for 2007 and for the previous 10 years (1997-2006). Figure 3 shows the variation in annual mean protein content since 1963.

The average protein content of the 2007 durum crop at 14.1% is 1.3% higher than 2006 and considerably higher than the 10-year average. Protein content for the top three milling grades increased significantly from last year and compared to the 10 year average (Table 14). Annual mean protein content values since 1963 (Figure 3) demonstrate that this quality factor is highly variable, primarily in response to environmental conditions.

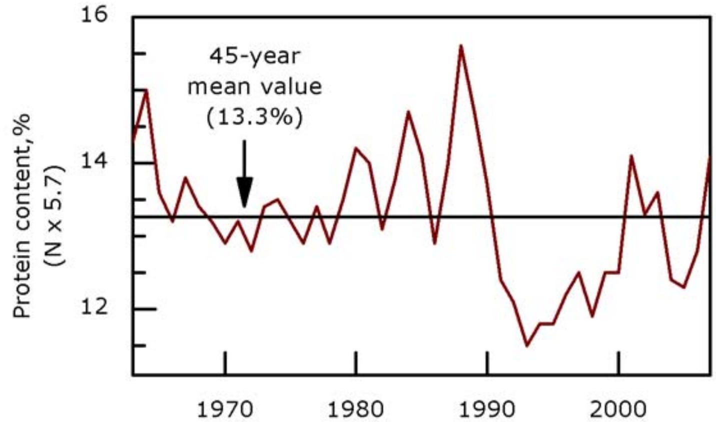
Canadian Wheat Board 2007 variety survey information indicates that production of the variety Strongfield has increased substantially from 18.5% last year to 41.5% of the seeded area this year, making it the most popular variety with western Canadian producers. AC Avonlea represents 22.7% of the seeded hectares. Kyle further declined in production, decreasing to 19.2% while AC Navigator remained constant at 11%. AC Morse and Napoleon combined account for less than 3% of the seeded hectares. Strongfield production has been encouraged for its low cadmium levels and it has gained rapid acceptance by producers in western Canada due to its strong agronomic performance. It has strong gluten characteristics similar to AC Navigator along with good protein potential and color similar to AC Avonlea.

Table 14 – Mean protein content of 2007 Canada Western Amber Durum wheat, by grade and year

	Protein content, %[1]		
Grade	2007	2006	1997-2006
Wheat, No. 1 CWAD	13.7	13.0	13.2
Wheat, No. 2 CWAD	14.1	12.7	12.7
Wheat, No. 3 CWAD	14.8	12.3	12.7
All milling grades	**14.0**	**12.8**	**12.8**

[1] N x 5.7; 13.5% moisture content basis

Figure 3 – Mean protein content of harvest survey Canada Western Amber Durum wheat – 1963-2007



Wheat and pasta processing quality

Data describing the quality characteristics for composite samples of Wheat, No. 1 and No. 2 CWAD for the 2007 crop are shown in Table 15**.** Corresponding data for 2006 composites and mean values for the previous ten years (1997-2006) are provided for comparison. Degrading factors in the 2007 crop include light weight, lower hard vitreous kernel count, midge and severe midge damage, frost/heat stress and green kernels. Test weight values are somewhat below those of 2006, 0.5 and 1.1 kg/hL lower than the long term average respectively for both grades. Weight per 1000 kernels also was lower for the top two milling grades as compared to 2006 and the 10-year average data (3.2 and 5.0 g/1000k, respectively). Lower test weight and kernel size values are symptomatic of the intense heat which affected most of the durum growing area during grain development. Hard vitreous kernel counts are the same as last year for No. 1 CWAD and 5% higher (86%) for No. 2 CWAD and the ten-year mean. Falling number values for both wheat and semolina are indicative of sound kernel characteristics for the top two grades and are equal to or better than the ten-year means.

Wet and dry gluten content for No. 1 and No. 2 CWAD are appreciably higher than values observed in 2006 in accordance with the higher protein content of this year's crop. Gluten characteristics are stronger than the 2006 crop as shown by higher SDS sedimentation volumes and Alveograph P and W values. These values, together with gluten index values, show an even greater increase in strength characteristics when compared to the 10-year mean values. The significant increase in gluten strength for both No.1 and No. 2 CWAD is indicative of the introduction of varieties including Strongfield, AC Navigator, and AC Morse that exhibit stronger gluten characteristics than earlier varieties such as Kyle and AC Avonlea.

Total milling yield for No. 1 CWAD is marginally lower than observed for last year and for the 10-year mean while semolina yield is essentially equivalent. No. 2 CWAD shows a more pronounced decrease of about 1% in total milling yield with a lesser decrease in semolina yield compared to 2006 but a 1% decrease over the long term mean. Wheat ash is higher than in 2006, by 0.06% and 0.09%, for No. 1 and No. 2 CWAD, respectively, concomitant with higher semolina ash values (0.03 and 0.04%, respectively) than the 2006 crop. Both grades also exhibit somewhat higher semolina ash contents (0.01 and 0.03%) than seen in the 10-year means. AGTRON values are poorer than last year's results and ten-year means for both No. 1 and No. 2 CWAD probably because of higher protein content. Speck counts for both grade composites are lower than in 2006 and the ten-year mean. On the whole, milling quality of the 2007 crop is slightly lower than seen in 2006 and when compared with the ten-year mean.

Both semolina and pasta brightness, as indicated by L* values, are lower for 2007 as compared to the previous crop and the 10-year mean. Wheat and semolina yellow pigment values for both No. 1 and No. 2 CWAD are comparable to the previous crop and represent a significant improvement over long term mean values as the result of continued breeding emphasis placed on increasing yellow pigment levels in new varieties. Semolina and dried spaghetti b* values also are comparable to 2006 and show significant improvement over the long term mean. Redness or a* values are slightly higher than seen in last year's crop and for the long term. This result suggests that pasta from the 2007 crop will have good yellow amber color but with a marginal increase in redness. Spaghetti cooking quality, as indicated by firmness (peak force) values, is excellent for No. 1 and 2 CWAD, showing improvement over last year and the ten–year mean. This result reflects increased protein content for the 2007 crop.

Data describing the quality of Wheat, No. 3 CWAD can be found in Table 16. Wheat protein content at 15.0% is 2.5% higher than last year. The high falling number value is indicative of sound wheat. Yellow pigment content is consistent with last year and is higher than the long term average. While total milling yield is slightly lower than last year, semolina yield is equivalent to 2006.

Semolina gluten index is comparable to last year and is considerably higher than the long term average, as is yellow pigment content. Semolina speck count is considerably lower than last year. Alveograph shows greater overall strength (W) than last year and over the long term. Spaghetti cooked firmness is improved over last year.

**Table 15 - Wheat, No. 1 and No. 2 Canada Western Amber Durum
Quality data for 2007 harvest survey grade
composite samples compared to 2006 and 1997-06 mean**

Quality parameter[1]	No. 1 CWAD 2007	No. 1 CWAD 2006	No. 1 CWAD 1997-06 mean	No. 2 CWAD 2007	No. 2 CWAD 2006	No. 2 CWAD 1997-06 mean
Wheat						
Test weight, kg/hL	82.0	82.7	82.5	80.9	81.9	82.0
Weight per 1000 kernels, g	38.5	39.8	41.7	37.4	41.9	42.4
Vitreous kernels, %	91	91	90	86	81	81
Protein content, %	13.7	13.0	13.1	14.2	12.6	12.7
Protein content, % (dry matter basis)	15.8	15.0	15.3	16.4	14.6	14.8
SDS sedimentation, mL	48	45	39	47	41	36
Ash content, %	1.55	1.49	1.54	1.64	1.55	1.59
Yellow pigment content, ppm	9.2	9.1	8.5	9.2	8.9	8.4
Falling number, s	405	425	410	415	400	382
Milling yield, %	74.2	74.7	74.5	73.9	75.0	74.8
Semolina yield, %	65.8	65.8	66.1	64.9	65.2	66.0
PSI, %	38	38	37	39	38	38
Semolina						
Protein content, %	12.7	12.0	12.1	13.2	11.6	11.6
Wet gluten content, %	31.3	30.3	31.9	31.8	28.9	30.5
Dry gluten content, %	11.2	10.3	11.2	11.0	9.8	10.8
Gluten index, %	61	58	32	58	60	32
Ash content, %	0.66	0.63	0.65	0.69	0.65	0.66
Yellow pigment content, ppm	8.7	8.8	8.1	8.6	8.5	7.9
AGTRON colour, %	78	82	82	73	81	80
CIELAB colour:						
Brightness, L*	87.2	87.7	87.8	86.8	87.8	87.7
Redness, a*	-3.0	-2.9	-3.1	-2.8	-3.0	-3.1
Yellowness, b*	34.1	34.3	33.3	33.8	33.6	32.6
Speck count per 50 cm^2	20	22	24	23	37	28
Falling number, s	510	500	482	505	480	455
Alveogram						
Length, mm	93	99	89	87	104	90
P (height x 1.1), mm	69	58	52	70	55	49
P/L	0.7	0.6	0.6	0.8	0.5	0.6
W, x 10^{-4} joules	191	156	125	183	146	114
Spaghetti						
Dried at 70°C						
CIELAB colour:						
Brightness, L*	76.7	77.9	77.9	76.0	77.7	77.7
Redness, a*	2.7	2.2	2.1	3.2	2.0	2.2
Yellowness, b*	67.2	67.4	66.8	65.9	65.6	66.8
Firmness, g-cm	1053	1011	958[2]	1048	958	896[2]

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

Table 16 - Wheat, No. 3 Canada Western Amber Durum
Quality data for 2007 harvest survey grade composite samples compared to 2006 and 1997-06 mean

Quality parameter[1]	No. 3 CWAD 2007	No. 3 CWAD 2006	No. 3 CWAD 1997-06 mean[2]
Wheat			
Test weight, kg/hL	79.7	81.2	81.3
Weight per 1000 kernels, g	36.3	39.9	41.8
Vitreous kernels, %	83	75	70
Protein content, %	15.0	12.5	12.6
Protein content, % (dry matter basis)	17.4	14.4	14.7
SDS sedimentation, mL	51	35	32
Ash content, %	1.69	1.59	1.62
Yellow pigment content, ppm	9.1	8.9	8.2
Falling number, s	390	395	358
Milling yield, %	74.2	74.9	74.9
Semolina yield, %	64.9	64.9	65.7
PSI, %	40	39	38
Semolina			
Protein content, %	13.8	11.4	11.6
Wet gluten content, %	33.9	28.8	30.3
Dry gluten content, %	12.0	9.7	10.6
Gluten index, %	55	52	28[3]
Ash content, %	0.74	0.65	0.67
Yellow pigment content, ppm	8.4	8.3	7.7
AGTRON colour, %	70	80	78
CIELAB colour:			
Brightness, L*	86.7	87.9	87.6
Redness, a*	-2.8	-3.0	-3.0
Yellowness, b*	33.1	33.0	31.6
Speck count per 50 cm^2	31	43	39
Falling number, s	465	460	415
Alveogram			
Length, mm	97	108	89
P (height x 1.1), mm	68	50	49
P/L	0.7	0.5	0.6
W, x 10^{-4} joules	187	129	108
Spaghetti			
Dried at 70°C			
CIELAB colour:			
Brightness, L*	75.1	77.6	76.8[3]
Redness, a*	3.5	2.1	2.7[3]
Yellowness, b*	63.3	64.9	63.5[3]
Firmness, g-cm	1102	906	868[3]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.
[2] No. 3 CWAD results are not available for 1998 and 2003
[3] Mean of data generated starting in 1999

Canada Western Hard White Spring wheat

Protein and variety survey

The mean protein content for CWHWS for 2007 and the previous year is shown in Table 17, below. A long term average protein is not available as this is a relatively new class of wheat. The mean protein content of the milling grades of the 2007 crop is estimated at 13.6%, 0.3% higher than for 2006. Snowbird remains the dominant variety in this class.

Table 17 - Mean protein content of 2007 Canada Western Hard White Spring wheat, by grade and year

	Protein content, %[1]		
Grade	2007	2006	1997-2006
Wheat, No. 1 CWHWS	13.5	13.1	N/A
Wheat, No. 2 CWHWS	13.5	13.7	N/A
Wheat, No. 3 CWHWS	13.9	14.0	N/A
All milling grades	**13.6**	**13.3**	**N/A**

Milling and baking quality - Allis-Chalmers laboratory mill

Wheat, No. 1 Canada Western Hard White

Table 18 summarizes the quality data for No. 1 and No. 2 CWHWS new crop composites with the 2006 13.5% data included for comparison. Test weight of the 2007 No. 1 CWHWS is slightly lower than 2006, as is kernel weight. High wheat falling number and flour amylograph peak viscosity values indicate a high degree of soundness in this year's crop. Both wheat ash and flour ash content are higher this year. Wet gluten content is lower than last year. Kernel hardness (PSI) is similar to 2006 however starch damage is 0.6% lower. Allis Chalmers flour milling yield on a clean wheat basis is comparable to last year, but when corrected to constant ash content of 0.50% the 2007 flour yield is 0.9% lower than last year. Although flour ash content is slightly higher than last year, flour colour is similar for No. 1 CWHWS for both years.

Farinograph absorption for No. 1 CWHWS is 2.1% lower this year compared to 2006. Dough development time is slightly shorter and stability is slightly longer than last year. Extensograph and alveograph tests show strong yet extensible dough properties. Canadian short process baking results exhibit equivalent water absorption for 2007 and 2006, and comparable loaf volumes. The 2007 dough has longer mixing requirements than last year.

Wheat, No. 2 Canada Western Hard White

Wheat, No. 2 CWHWS composite data along with the 2006 13.5% protein segregate for comparison can be seen in Table 18.

Test weight, kernel weight and PSI for the 2007 No. 2 CWHWS are comparable to 2006. Falling number values and amylograph peak viscosities for 2007 are indicative of sound wheat. As seen in the No. 1 CWHWS composite, wheat ash is higher in this year's No. 2 CWHWS composite. Milling yield on a clean wheat basis is similar to 2006, but when corrected to constant ash content of 0.50% yield is 1.3% lower than in 2006.

Farinograph properties of the Wheat, No. 2 CWHWS are exhibiting lower absorption than last year, but comparable stability. Extensograph results exhibit similar dough strength as seen in 2006. Alveograph data for 2007 appears slightly weaker than last year and is probably related to the lower water absorpbing capacity of the 2007 CWHWS wheat. CSP baking absorption is 2% lower than the 2006 2 CWHWS and loaf volume is slightly lower, however, mixing time and mixing energy are higher.

Comparative Bühler laboratory mill flour data

Milling and baking quality

Samples of 2007 and stored 2006 harvest survey Wheat, No. 1 CWHWS 13.5 and Wheat, No. 2 CWHWS 13.5 composites were milled consecutively on the same day on the tandem Bühler laboratory mill into 74% extraction straight grade and 60% long patent flour. Flour analytical and physical dough properties of the composites, and baking data are shown in Table 19 for the Wheat, No. 1 CWHWS 13.5% minimum protein segregates. Wheat, No. 1 CWHWS 13.5% noodle data using the straight grade and 60% patent flours are shown in Table 21. Flour analytical, physical dough properties and baking quality for Wheat, No. 2 CWHWS 13.5% protein segregate are shown in Table 20, and the corresponding noodle data can be seen in Table 22.

Wet gluten content of the 2007 Wheat, No. 1 and No. 2 CWHWS 13.5 straight grade and 60% patent flour was lower than the corresponding 2006 flour. Flour grade colour and AGTRON values were comparable to 2006 for the No. 1 CWHWS 13.5 straight grade and 60% patent flours, while the 2007 No. 2 CWHWS 13.5 flours were lower than last year. Ash content of the 2007 No. 1 CWHWS 13.5 patent flour was similar to last year, while the No. 1 and No. 2 CWHWS straight grade flours were marginally higher than 2006. The No. 2 CWHWS 13.5 straight grade flour was 0.03% higher than last year. There were no significant differences among corresponding 2007 and 2006 amylograph peak viscosities.

Farinograph data exhibit lower absorption in the 2007 Wheat, No. 1 CWHWS 13.5 straight grade and patent flours compared to 2006, and slightly weaker dough strength for the straight grade flour, but longer stability for the patent flour. The 2007 Wheat, No. 2 CWHWS 13.5 farinograph absorption values for the patent flour were comparable to last year, while the 2007 straight grade flour had lower absorption than last year. The 2007 No. 2 CWHWS 13.5 flours both exhibited marginally lower dough strength than the corresponding 2006 flours.

The 2007 sponge-and-dough baking absorption for the Wheat, No. 1 CWHWS 13.5 straight grade and patent flour, and the No. 2 CWHWS 13.5 straight grade flour is slightly lower than 2006, while the No. 2 CWHWS 13.5 is comparable to last year. The No. 1 CWHWS 13.5 60% patent flour had slightly shorter mixing requirements than the corresponding 2006 flour, while mixing strength of the straight grade flours was comparable for both years. The No. 2 CWHWS 13.5 flours exhibit mixing time requirements at the dough stage that are somewhat longer than seen for 2006. Loaf volumes for sponge-and-dough bread are similar to last year.

No. 1 CWHWS 13.5 had similar mixing time requirements and mixing energy requirements for both straight grade and patent flour using the CSP baking formulation. The straight grade and patent flours exhibited lower baking absorption than last year. The No. 1 CWHWS straight grade flour produced larger volume loaves this year compared to 2006, and the patent flour were comparable for both years. Straight grade and patent flour produced using Wheat, No. 2 CWHWS 13.5 showed similar CSP baking absorption, mixing requirements and loaf volumes for 2007 and 2006.

Yellow alkaline noodles

Wheat, No. 1 Canada Western Hard White Spring

Yellow alkaline noodles were prepared using the 13.5% protein segregate for straight grade and 60% patent flour with a 1% *kansui* reagent (9:1 sodium and potassium carbonates) at a 32 % water absorption level.

Yellow alkaline noodles from the 2007 crop composite, straight grade (74%) flour (Table 21) was essentially equivalent in raw noodle color at both 2 and 24 hours after production to that of 2006. A modest decrease in L* at both time intervals was observed with a minimal increase in a* detected. A desirable increase in b* was noted in the noodles at 2 hrs but by 24hrs it was equal to that of the 2006 crop. Cooked noodle colour characteristics were equivalent across the two years. Cooked noodles prepared from the straight grade flour offered comparable noodle thickness, resistance to compression (RTC) and recovery (REC) values. A decrease in noodle bite, as determined by MCS, was observed.

Raw yellow alkaline noodles prepared from the patent (60%) flour were equivalent to the comparable 2006 crop sample with very similar L* and b* values at both 2 and 24 hrs. A very minor increase in a* was detected at both time periods compared to the 2006 material. Cooked patent noodle color attributes (2007) were equal to the previous year sample. Cooked noodles prepared from the patent flour were equivalent to the 2006 sample in terms of noodle thickness and chewiness as assessed by RTC and REC. The decrease in

MCS present in the 2007 straight grade noodles was also detected in noodles prepared from the 2007 patent flour.

Wheat, No. 2 Canada Western Hard White Spring

Raw yellow alkaline noodles from the 2007 No. 2 CWHWS straight grade (74%) flour (Table 22) displayed lower L* and higher a* values at both 2 and 24 hrs relative to the 2006 straight grade noodles. Noodle yellowness, b*, remained equivalent to the 2006 material. A decline in cooked noodle L* was observed but an improved a* value was noted compared to the corresponding 2006 noodle. Cooked noodles prepared from the straight grade flour offered similar noodle thickness, resistance to compression (RTC) and recovery (REC) values to the corresponding 2006 sample. A decrease in MCS (noodle bite) was detected in the 2007 straight grade noodles as compared to the 2006 crop material.

Raw yellow alkaline noodles prepared from the No. 2 CWHWS 60% patent flour also showed a lower L* and higher a* value as compared to the 2006 sample. Yellowness, b*, values were essentially equivalent at both time periods. Cooked patent noodle color (2007) displayed lower L* and higher a* values than the corresponding 2006 noodles. Cooked noodles prepared from the patent flour (2007) were equivalent to the 2006 sample in terms of noodle thickness and chewiness (RTC and REC) however a decrease in MCS was noted in the 2007 noodles relative to the 2006 material.

White salted noodles

Wheat, No. 1 Canada Western Hard White Spring

White salted noodles were prepared using a 1% sodium chloride solution at a 30% water absorption level in order to maintain proper dough crumb and sheeting characteristics.

Raw white salted noodle color, prepared from the 2007 No. 1 CWHWS straight grade flour (Table 21) displayed equivalent L* and b* noodle color attributes to the 2006 material. A slight increase in a* at both time periods (2 and 24 hrs) was observed. No significant differences were observed between the cooked noodle color characteristics for either straight grade or patent flour, compared to their 2006 counterparts. No differences in cooked straight grade noodle thickness, RTC or REC values were detected compared to the comparable 2006 material. A decline, relative to last year, was detected in noodle bite as determined by MCS.

The 2007 patent flour white salted noodles offered a slightly higher L* at 2 hrs compared to the corresponding 2006 noodle, however by 24 hrs, the noodles were equivalent. No meaningful differences were observed in either a* or b* color components in the 2007 material values relative to the 2006 noodles at either time interval. Cooked noodle texture characteristics of the 2007 noodles prepared from the patent flour were equivalent with those of the previous year in terms of noodle thickness, RTC and REC. As observed in the straight grade noodles a modest decline in bite (MCS) was observed.

Wheat, No. 2 Canada Western Hard White Spring

Raw white salted noodle color, prepared from the 2007 straight grade flour (Table 22) displayed a lower L* at 2 and 24 hrs when compared to the 2006 straight grade noodle. Noodle redness, a*, was equivalent to the 2006 noodle at 2 hrs but did display a higher a* value at 24 hrs. Yellowness, b*, at both time intervals were equal to that of the 2006 sample. The 2007 straight grade cooked noodle displayed a lower L* and b* value with a higher a* than the 2006 noodle. Differences in cooked straight grade noodle thickness, RTC or REC values were minimal when compared to the 2006 straight grade material. A decline in noodle bite was detected in the 2007 straight grade noodles.

The 2007 patent(60%) flour white salted noodles were equivalent to the 2006 patent noodles in all color attributes at 2 hrs after production. Aging the samples for 24 hrs indicated a decline in 2007 noodle L* values relative to 2006 although both a* and b* characteristics remained equivalent. A slightly lower L* was detected in the 2007 patent (60%) cooked noodle relative to the 2006 sample, although both a* and b* remained essentially equivalent. The cooked patent flour noodle texture characteristics of the 2007 crop were equivalent to that of the previous year in all texture characteristics.

Table 18 - Wheat, No. 1 and No. 2 Canada Western Hard White Spring
Quality data for 2007 harvest survey grade composite samples compared to 2006

Quality parameter[1]	No. 1 CWHWS 2007	No. 1 CWHWS 2006	No. 2 CWHWS 2007	No. 2 CWHWS 2006
Wheat				
Test weight, kg/hL	80.3	81.5	79.8	80.1
Weight per 1000 kernels, g	28.5	29.7	31.2	31.7
Protein content, %	14.0	13.9	13.7	13.9
Protein content, % (dry matter basis)	16.2	16.0	15.9	16.0
Ash content, %	1.61	1.51	1.61	1.52
α-amylase activity, units/g	3.0	2.0	5.5	3.0
Falling number, s	430	415	415	415
PSI,%	53	52	52	53
Milling				
Flour yield				
Clean wheat basis, %	75.0	74.9	75.0	74.8
0.50% ash basis, %	75.0	75.9	74.5	75.8
Flour				
Protein content, %	13.3	13.4	13.3	13.4
Wet gluten content, %	34.6	36.0	35.1	36.0
Ash content, %	0.50	0.48	0.51	0.48
Grade colour, Satake units	-2.8	-2.8	-2.0	-2.5
AGTRON colour, %	79	80	73	79
Starch damage, %	7.6	8.2	8.1	8.1
α-amylase activity, units/g	0.5	0.5	1.0	1.0
Amylograph peak viscosity, BU	1065	890	950	985
Maltose value, g/100g	2.5	2.5	2.5	2.5
Farinogram				
Absorption, %	64.8	66.9	66.5	67.1
Development time, min	5.50	6.75	6.25	6.00
Mixing tolerance index, BU	20	30	30	25
Stability, min	10.0	9.0	9.0	8.5
Extensogram				
Length, cm	20	20	21	19
Height at 5 cm, BU	335	310	290	330
Maximum height, BU	580	595	490	560
Area, cm^2	160	160	140	135
Alveogram				
Length, mm	105	103	102	105
P (height x 1.1), mm	120	133	123	133
W, x 10^{-4} joules	440	507	420	503
Baking (Canadian short process baking test)				
Absorption, %	68	68	68	70
Mixing energy, W-h/kg	6.7	6.3	6.1	6.0
Mixing time, min	5.7	4.2	5.1	4.1
Loaf volume, cm^3/100 g flour	1105	1105	1050	1110

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

Table 19 - Wheat, No. 1 Canada Western Hard White Spring - 13.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

	74% Straight grade		60% Patent	
Quality parameter[2]	2007	2006	2007	2006
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.0	13.2	12.7	12.9
Wet gluten content, %	33.9	35.5	33.6	34.6
Ash content, %	0.42	0.41	0.36	0.36
Grade colour, Satake units	-3.3	-3.4	-4.4	-4.3
AGTRON colour, %	85	84	96	95
Amylograph peak viscosity, BU	1225	1225	1265	1270
Starch damage, %	5.7	6.1	5.9	6.1
Farinogram				
Absorption, %	61.3	62.4	61.3	62.7
Development time, min	6.75	10.00	13.25	14.25
Mixing tolerance index, BU	20	25	10	15
Stability, min	13.5	14.8	24.8	18.5
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	63	64	63	65
Mixing energy dough stage, W-h/kg	4.6	4.2	4.3	4.8
Mixing time dough stage, min	3.5	3.5	3.7	4.1
Loaf volume, cm^3/100 g flour	1100	1085	1060	1095
Appearance	7.7	7.3	7.4	7.4
Crumb structure	6.0	6.2	6.2	6.2
Crumb color	8.0	8.0	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	63	65	63	66
Mixing energy, W-h/kg	6.5	6.7	7.0	6.9
Mixing time, min	5.5	5.3	5.9	6.1
Loaf volume, cm^3/100 g flour	1150	1080	1100	1145
Appearance	8.0	7.7	7.5	7.7
Crumb structure	6.2	6.0	6.6	6.3
Crumb color	7.9	7.8	8.0	8.0

[1] The 2006 composite was stored and milled the same day as the 2007
[2] Data reported on 14.0% moisture basis

Table 20 - Wheat, No. 2 Canada Western Hard White Spring - 13.5% protein segregate
Analytical data, physical dough properties and baking quality data
Buhler mill flour data - 2007 and 2006 harvest survey composites[1]

	74% Straight grade		60% Patent	
Quality parameter[2]	2007	2006	2007	2006
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.1	13.2	12.6	12.9
Wet gluten content, %	34.8	35.4	33.9	34.8
Ash content, %	0.45	0.42	0.37	0.36
Grade colour, Satake units	-2.3	-3.2	-3.7	-4.1
AGTRON colour, %	79	85	91	93
Amylograph peak viscosity, BU	1020	1120	1090	1190
Starch damage, %	6.2	6.3	6.0	6.2
Farinogram				
Absorption, %	61.9	62.5	62.2	62.4
Development time, min	6.00	6.75	9.75	9.75
Mixing tolerance index, BU	25	20	25	25
Stability, min	9.5	11.0	14.0	17.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	63	64	64	64
Mixing energy dough stage, W-h/kg	4.3	3.9	3.9	3.8
Mixing time dough stage, min	3.6	2.9	3.2	2.9
Loaf volume, cm^3/100 g flour	1070	1085	1065	1090
Appearance	7.5	7.2	7.4	7.7
Crumb structure	6.3	6.0	6.3	6.2
Crumb color	8.0	8.0	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	64	65	65	65
Mixing energy, W-h/kg	6.1	5.5	5.6	5.6
Mixing time, min	5.0	4.7	5.2	4.9
Loaf volume, cm^3/100 g flour	1130	1120	1095	1125
Appearance	7.9	7.5	7.5	7.5
Crumb structure	6.2	6.0	6.2	6.2
Crumb color	7.8	7.9	8.1	8.0

[1] The 2006 composite was stored and milled the same day as the 2007
[2] Data reported on 14.0% moisture basis

Table 21 - Wheat, No. 1 Canada Western Hard White Spring - 13.5 % protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

Quality parameter	74% Straight grade				60% Patent			
	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	79.0	(73.0)	79.9	(73.9)	81.5	(77.3)	81.8	(77.3)
Redness, a*	-0.12	(0.46)	-0.28	(0.36)	-0.23	(0.06)	-0.32	(-0.02)
Yellowness, b*	28.4	(28.1)	27.8	(28.3)	27.6	(28.4)	27.3	(28.2)
Cooked colour								
Brightness, L*	70.7		70.6		71.2		71.3	
Redness, a*	-2.30		-2.34		-2.56		-2.59	
Yellowness, b*	28.0		28.1		28.1		28.5	
Texture								
Thickness, mm	2.28		2.31		2.27		2.32	
RTC, %	25.1		25.2		23.4		24.0	
Recovery, %	35.9		36.5		34.0		34.4	
MCS, g/mm²	33.5		35.3		31.1		33.1	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	80.7	(76.0)	81.3	(76.0)	83.1	(77.9)	82.3	(78.1)
Redness, a*	2.44	(3.21)	2.37	(2.96)	2.12	(2.53)	2.08	(2.47)
Yellowness, b*	23.4	(24.2)	23.5	(24.0)	22.9	(24.3)	23.3	(24.3)
Cooked colour								
Brightness, L*	76.4		76.5		77.1		77.4	
Redness, a*	0.58		0.60		0.29		0.24	
Yellowness, b*	18.5		19.0		18.7		18.8	
Texture								
Thickness, mm	2.44		2.46		2.44		2.43	
RTC, %	21.1		21.0		20.3		19.7	
Recovery, %	28.9		29.3		27.4		28.1	
MCS, g/mm²	30.2		32.0		27.9		29.7	

[1] The 2006 composite was stored and milled the same day as the 2007

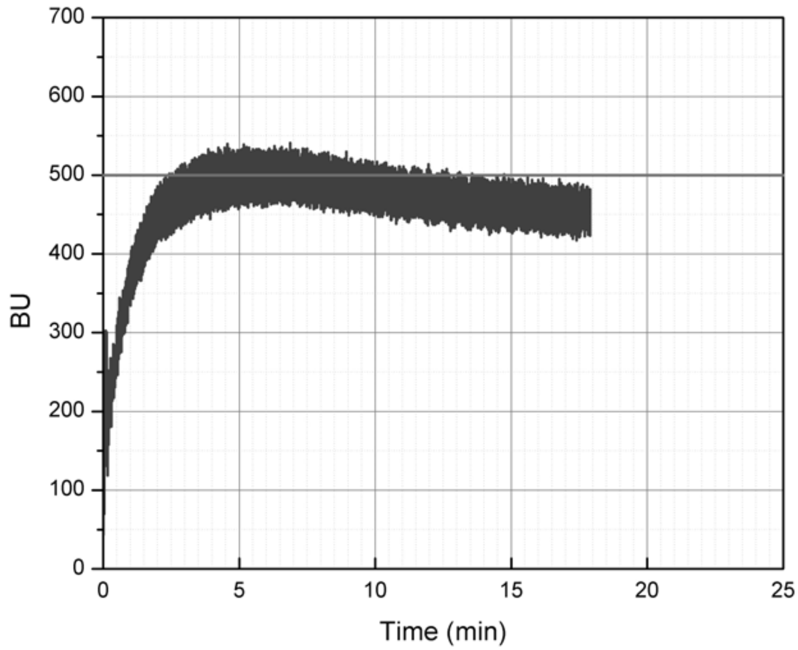
Table 22 - Wheat, No. 2 Canada Western Hard White Spring - 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data for the 2007 and 2006 harvest survey composite samples[1]

	74% Straight grade				60% Patent			
Quality parameter	2007		2006		2007		2006	
Fresh alkaline noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	77.0	(70.1)	78.9	(72.5)	78.7	(74.7)	80.7	(75.5)
Redness, a*	0.16	(1.03)	-0.27	(0.56)	0.02	(0.61)	-0.27	(0.24)
Yellowness, b*	26.5	(27.1)	26.6	(27.6)	25.8	(27.4)	26.2	(27.7)
Cooked colour								
Brightness, L*	68.7		70.5		70.2		71.6	
Redness, a*	-1.84		-2.27		-2.30		-2.59	
Yellowness, b*	26.0		26.8		26.8		27.3	
Texture								
Thickness, mm	2.35		2.38		2.24		2.28	
RTC, %	24.9		25.5		24.0		24.5	
Recovery, %	36.1		36.7		34.7		35.2	
MCS, g/mm^2	33.9		37.2		31.8		34.0	
Fresh white salted noodles								
Raw colour at 2 hrs (24 hrs)								
Brightness, L*	79.4	(74.0)	81.4	(74.9)	81.6	(76.1)	82.0	(77.6)
Redness, a*	2.31	(3.03)	2.31	(2.88)	2.01	(2.22)	2.03	(2.26)
Yellowness, b*	22.1	(23.0)	22.1	(23.2)	22.3	(23.4)	22.8	(23.4)
Cooked colour								
Brightness, L*	75.4		76.5		76.8		77.6	
Redness, a*	0.62		0.55		0.28		0.23	
Yellowness, b*	17.6		18.4		18.0		18.5	
Texture								
Thickness, mm	2.50		2.52		2.44		2.41	
RTC, %	20.3		20.9		19.9		19.9	
Recovery, %	28.8		29.5		28.1		28.3	
MCS, g/mm^2	30.1		31.4		29.4		28.8	

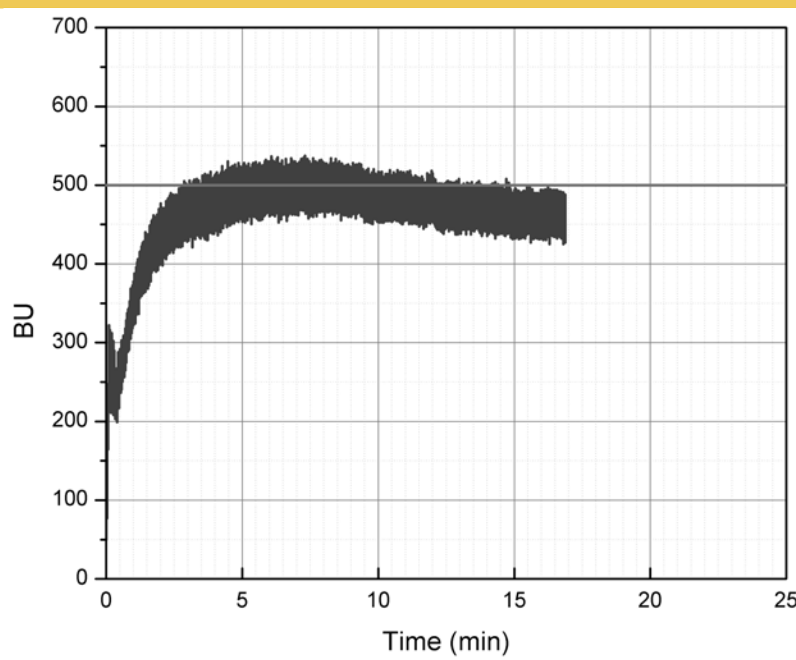
[1] The 2006 composite was stored and milled the same day as the 2007

Farinograms
2007 crop composite samples

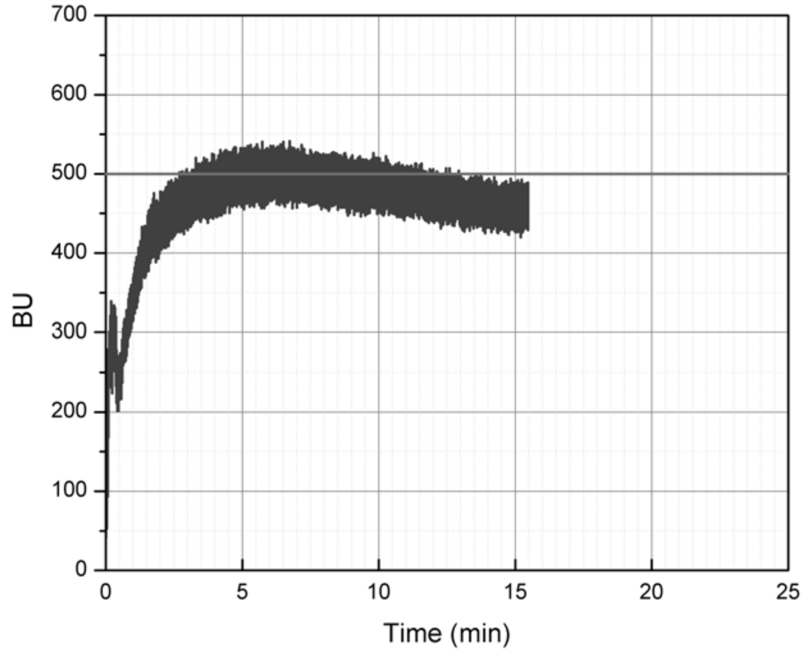
Wheat, No. 1 Canada Western Red Spring wheat – 13.5% protein segregate



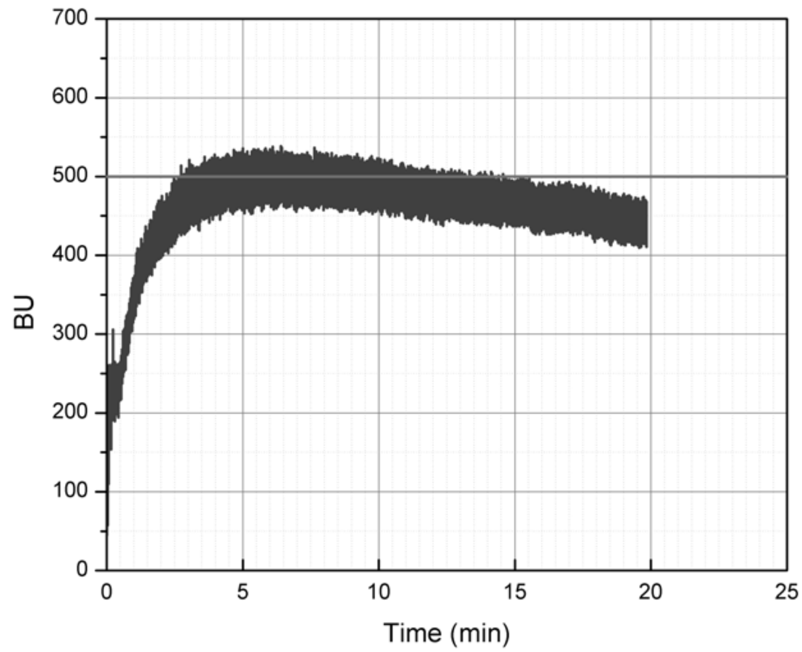
Wheat, No. 1 Canada Western Red Spring wheat – 14.5% protein segregate



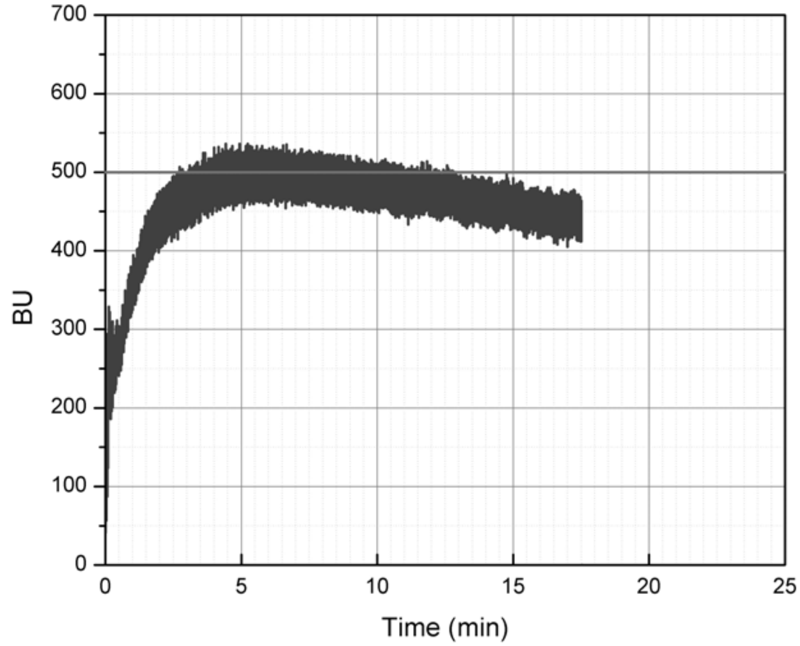
Wheat, No. 2 Canada Western Red Spring – 13.5% protein segregate



Wheat, No. 2 Canada Western Red Spring – 14.5% protein segregate



Wheat, No. 1 Canada Western Hard White Spring – 13.5% protein segregate



Wheat, No. 2 Canada Western Hard White Spring – 13.5% protein segregate