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Quality of western Canadian wheat 2008

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Summary

Poor soil moisture conditions in the southern half of the growing region in Western Canada presented the largest threat to crop production during the early spring of 2008. The early spring season was characterized by very cool temperatures which delayed planting in the south and slowed the snowmelt in the northern growing areas. Cool soil temperatures delayed crop germination and early seeded regions reported poor crop emergence. Precipitation during June was close to normal or above normal in most of the Prairie region, which helped boost crop prospects. Temperatures during the month of May and June were significantly below normal, which delayed crop development. By the end of June, growth was 10 days to two weeks behind normal, but the crop condition was rated as mostly good to excellent. In July, moderate temperatures were reported resulting in little stress to the developing plants. Above normal temperatures in August across the Prairies helped boost crop development, however, frost was reported in parts of Alberta and western Saskatchewan with some crop damage occurring.

The spring wheat harvest was underway in the southern Prairies by the third week of August. Persistent rains in the last week in August and the first ten days of September slowed the harvest. Temperatures remained mild during September, with many areas reporting their first fall frost one to two weeks later than normal, allowing late developing crops to mature without significant quality damage. Drier, warmer conditions returned to the entire Prairie region during the mid-September to mid-October period, which allowed for a rapid completion of the harvest.

Spring wheat production levels were 18.0 million tonnes as reported by Statistics Canada[1], a dramatic increase of approximately 24% over last year. Durum wheat production is estimated at 5.5 million tonnes, an increase of 1.9 million tonnes over 2007.

Overall protein content of Canada Western Red Spring wheat, at 13.4%, is 0.7% lower than last year. High grade Canada Western Red Spring wheat shows higher test weight, larger seed size, similar wheat falling number, higher starch damage, significantly higher absorption and slightly weaker farinograph dough properties relative to last year. Extensograph exhibits strength lower than last year. Alveograph exhibits less extensibility, but similar overall strength to last year and the 10 year average. Overall protein content of Canada Western Amber Durum wheat is 0.9% lower this year at 13.2%. High grade Canada Western Amber Durum wheat shows good falling number values indicative of sound kernel characteristics, semolina yield slightly higher than 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/wheat-ble/method-methode/wmtm-mmab-eng.htm

[1] Statistics Canada, *Field Crop Reporting Series,* http://www.statcan.gc.ca/pub/22-002-x/22-002-x2008008-eng.pdf Vol. 87, No. 8, Nov. 2008

Eight classes of Canadian wheat

This report presents information on the quality of the top grades of Canada Western Red Spring and Canada Western Amber Durum wheat for the 2008 crop. Further information on other classes of western Canadian wheat is not reported for the 2008 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 (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.

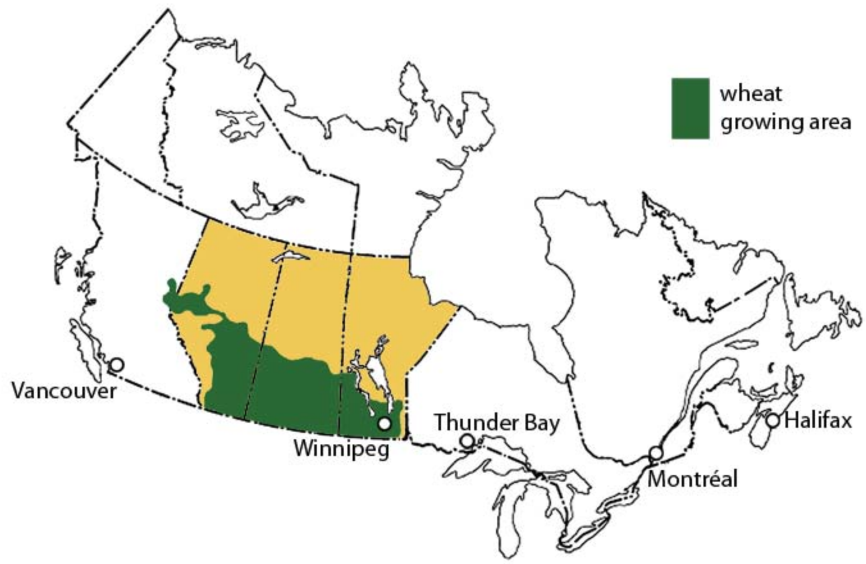
Canada Prairie Spring Red (CPSR) wheat is a medium-strength wheat suitable for the production of certain types of hearth breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CPSR class.

Canada Western Red Winter (CWRW) wheat is a hard wheat 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 2008 crop

The Canadian Wheat Board provided background information for the 2008 crop.

Seeding conditions

Poor soil moisture conditions in the southern half of the growing region in Western Canada presented the largest threat to crop production during the early spring of 2008. The poor soil moisture reserves were the direct result of the drought conditions experienced during the 2007 growing season. Winter precipitation was significantly below normal in the southern Prairies, especially in southern Alberta and Saskatchewan. In many parts of the southern Prairies, early spring rains were needed to encourage planting. The situation in the northern regions was slightly different, as moderate rainfall during the fall season and normal to above normal winter precipitation resulted in average to above average soil moisture reserves.

The early spring season was characterized by very cool temperatures which delayed planting in the south and slowed the snowmelt in the northern growing areas. Cool soil temperatures delayed crop germination and early seeded regions reported poor crop emergence. Moderate to heavy precipitation fell in the southern growing regions during the late-April to mid-May period, which provided much needed moisture for the seeding and germination of the crop. Northern areas of the Prairies were mostly dry, which allowed regions that had received heavy snowfall to plant most of the crop by the end of May. The dry trend in the northern growing areas would persist through the first half of growing season.

Growing conditions

Precipitation during June was close to normal or above normal in most of the Prairie region, which helped boost crop prospects. Temperatures during the month of May and June were significantly below normal, which delayed crop development. By the end of June, growth was 10 days to two weeks behind normal, but the crop condition was rated as mostly good to excellent. In July, moderate temperatures were reported, with many stations in the western

Prairies reporting monthly averages that were 2 to 5 degrees Celsius below those observed in July, 2007. The cooler temperatures allowed crops to move through the reproductive stage without significant stress. Dry conditions persisted in the northern growing areas during July, which caused some crop deterioration. The Peace River region of Alberta and British Columbia was dry throughout the month, with above normal temperatures that caused significant crop stress. The hot, dry conditions in the Peace River region significantly reduced yield expectations in the region. In northern areas of Alberta and Saskatchewan, the cooler than normal temperatures in July helped maintain crop conditions until rains arrived in late July and early August.

Harvest conditions

Above normal temperatures were reported in August across the Prairies, which helped boost crop development. However, frost was reported during the month in parts of Alberta and western Saskatchewan with some crop damage occurring. The warmer temperatures allowed the harvest of winter wheat to begin by the middle of August. The spring wheat harvest was underway in the southern Prairies by the third week of August. Persistent rains in the last week in August and the first ten days of September slowed the harvest. Temperatures remained mild during September, with many areas reporting their first fall frost one to two weeks later than normal. This allowed late developing crops to mature without significant quality damage. Drier, warmer conditions returned to the entire Prairie region during the mid-September to mid-October period, which allowed for a rapid completion of the harvest. The dry weather helped preserve crop quality, which resulted in a higher than normal portion of the spring wheat and durum crop falling into the top two grades.

Production and grade information

The cool dry weather during July resulted in minimal stress to the crop and average to below average yields for wheat and durum. Total wheat production for Western Canada was 25.5 million tonnes, with spring wheat production levels at 18.0 million tonnes as reported by Statistics Canada[1], a significant increase of approximately 24% over last year. Durum wheat production was 5.5 million tonnes, an increase of more than 40% compared to 2007 production. Winter wheat production in Western Canada was 1.98 million tonnes. Spring wheat yields reached 2.8 tonnes per hectare, while durum yields were 2.3 tonnes per hectare. Approximately 75% of CWRS graded No. 2 or better, and approximately 55% of CWAD graded No. 2 or better.

Overall protein content of Canada Western Red Spring wheat, at 13.4 %, is 0.7% lower than last year. High grade Canada Western Red Spring wheat shows higher test weight, larger kernel size, similar wheat falling number, higher starch damage, significantly higher absorption and farinograph dough properties that are slightly weaker than last year. Extensograph shows dough properties to be slightly more extensible and weaker than last year, while the alveograph dough properties are somewhat less extensible with overall comparable strength to last year and to the long term average. Overall protein content of Canada Western Amber Durum wheat at 13.2% is 0.9% lower than last year.

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[1] Statistics Canada, *Field Crop Reporting Series,* http://www.statcan.gc.ca/pub/22-002-x/22-002-x2008008-eng.pdf Vol. 87, No. 8, Nov. 2008

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

Protein

Table 1 compares available mean protein values for each of the eight classes of western Canadian wheat surveyed in 2008 to corresponding values obtained in the 2007 and 2006 harvest surveys as of November 7, 2008. Canada Western Red Spring (CWRS) wheat protein content is 0.7% lower than 2007 and equal to 2006. Canada Western Amber Durum (CWAD) shows 0.9% lower protein value compared to 2007 and 0.4% higher than 2006. Canada Western Hard White Spring (CWHWS) wheat is 13.3%, 0.3% lower than last year. Protein content for 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), Canada Prairie Spring Red (CPSR) and Canada Prairie Spring White (CPSW) wheat accurately.

Table 1 - Mean protein content of western Canadian wheat classes, 2008, 2007 and 2006

	Protein content, %[1]		
Class	2008	2007	2006
CWRS	13.4	14.1	13.4
CWAD	13.2	14.1	12.8
CWHWS	13.3	13.6	13.2
CWES	N/A	N/A	N/A
CPSR	N/A	11.5	N/A
CWRW	10.7	10.8	N/A
CPSW	N/A	N/A	N/A
CWSWS	10.9	11.5	N/A

[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 2008. Comparative values for western Canada by grade are shown for 2007 and for the previous 10 years (1998-2007). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of milling grades of the 2008 western Canadian wheat crop is 13.4%, 0.6% lower than 2007 and 0.4% lower than the ten year average protein content. Protein content is relatively constant across grades, ranging from 13.3% to 13.7%. Manitoba exhibits higher protein content than Saskatchewan and Alberta.

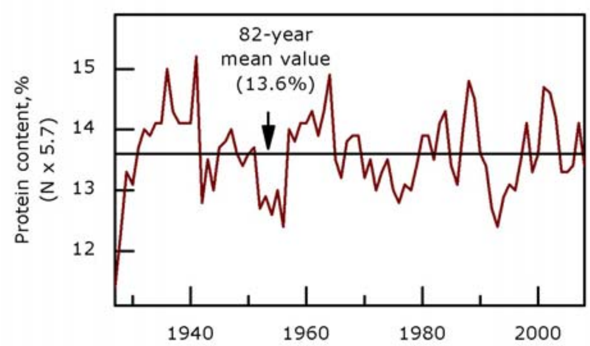
Results from the Canadian Wheat Board 2008 Variety Survey show that the variety Lillian was again the predominant variety in the CWRS class with 16.4% of the seeded acreage, with the variety Harvest comprising 13.2% of seeded acres. Superb and AC Barrie have continued to decline in production, making up 11.5% and 10.2% of the seeded area. 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 McKenzie accounted for 6.9%. The varieties CDC Imagine, AC Intrepid, Infinity, AC Domain, AC Eatonia, 5602HR and Prodigy each accounted for 3.8% to 3.0% of the seeded acreage.

Table 2 - Mean protein content of 2008 Canada Western Red Spring wheat, by grade, year and province

	Protein content, %[1]					
	Western Canada			2008		
Grade	2008	2007	1998-2007	Manitoba	Saskatchewan	Alberta
Wheat, No. 1 CWRS	13.3	14.0	13.8	14.1	13.5	13.1
Wheat, No. 2 CWRS	13.4	14.0	13.9	14.0	13.3	12.9
Wheat, No. 3 CWRS	13.7	14.3	13.9	14.2	13.5	13.1
All milling grades	**13.4**	**14.0**	**13.8**	**14.1**	**13.4**	**13.0**

[1] N x 5.7%; 13.5% moisture basis, as of Nov. 7, 2008

Figure 2 – Mean protein content of harvest survey Canada Western Red Spring wheat – 1927 to 2008



Allis-Chalmers laboratory mill – Milling and baking quality

To assess the quality of the 2008 CWRS wheat crop, composites were prepared from harvest survey samples representing the top two milling grades. The No. 1 and No. 2 CWRS samples were segregated into composites having minimum protein levels of 13.5%, 13.0% and 12.5%. Wheat, No. 3 CWRS was composited on an as is protein content basis, milled and tested.

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 1998-2007.

Test weight of the 2007 No. 1 grade protein segregate is higher than last year, and is slightly lower than the ten year average. Kernel weight is higher than last year and the long term average. Wheat ash is down considerably compared to last year and compared to the long term average, with correspondingly lower flour ash than last year. The top grades show similar falling number values and α-amylase activities to last year, and flour amylograph peak viscosities comparable to the long term average, indicative of sound kernel characteristics.

Wheat particle size index is similar to last year but starch damage is higher than last year and the long term average. Flour yield, on clean wheat basis is 0.5% higher than last year and is consistent with the long term average. However, on a constant 0.50% ash basis, flour yield is 2.5% higher than last year. Flour colour is showing improvement over last year and the long term average. Wet gluten content is approximately 1% higher than last year and the ten year average.

Farinograph absorption is 3.6% higher than 2007 for the 13.5% protein segregate. Farinograph dough strength properties for the 13.5% protein segregate appear slightly weaker than last year. Extensograph results indicate weaker dough strength properties compared with last year. This may be related to the higher starch damage levels seen this year, which would result in release of water back into the dough during the long rest period prior to stretching thereby giving weaker, slightly sticky dough for this test. Alveograph curves exhibit slightly less dough extensibility and greater resistance to deformation than last year, but with similar overall strength as indicated by high W value. Because the Alveograph dough is prepared at constant 50% absorption, the 2008 composite dough would be more under-hydrated than the 2007 composite, contributing to reduced extensibility and greater resistance to deformation. CSP baking absorption is the same as last year, and dough required a shorter mixing time. Loaf volumes are not significantly different from last year and are typical for the grade and protein content.

Wheat, No. 2 Canada Western Red Spring

Quality data for the 2008 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 1998-2007 are shown in Table 4. As seen with the No. 1 CWRS, test weight values and kernel weights are higher than last year, with kernel weights considerably higher. Wheat ash is lower than last year and the long term average value. Wheat falling number is similar to last year, α-amylase activity is slightly lower and amylograph peak viscosity is comparable to last year; all indicating the soundness of this year’s wheat crop.

Wheat particle size index is similar to last year, while starch damage is marginally higher. Milling extraction level of the No. 2 grade 13.5% protein composite shows improvement at 1.4% higher than last year on a clean wheat basis and on constant 0.50% ash basis milling yield. Flour grade and AGTRON colour values are slightly improved over last year, and are better than the long term values. Wet gluten content is 2.3% higher this year relative to 2007 and is 1.0% higher than the long term average.

Farinograph absorption is more than 2% higher than 2007 and is higher than the long term average. Dough strength is lower than 2007 but comparable to the long term average. Extensograph values appear to give weaker dough properties than last year and the long term average. Alveograph curves for No. 2 CWRS 13.5 have slightly lower W values than last 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 time requirements are higher than last year.

Wheat, No. 3 Canada Western Red Spring

Quality data can be found for Wheat, No. 3 CWRS in Table 5. Similar to the No. 1 and No. 2 CWRS grades, the No. 3 CWRS exhibits higher than average test weight and 1000 kernel weight, and low wheat ash content. Wheat protein content is lower than last year, but similar to the longterm average. This year, No. 3 CWRS is generally sound, with low α-amylase activity, high falling number, and higher than average amylograph peak viscosity.

Milling yield is 1.6% higher than last year on a constant ash basis, and is slightly higher than the longterm average. The flour has very good colour this year, with slightly higher than average starch damage and higher than average wet gluten content. Flour ash content is similar to the longterm average.

Farinograph absorption is similar to last year, but 1.7% higher than the longterm average. This is partly attributable to the higher starch damage level. Dough strength, as measured by farinograph, is slightly better than last year and comparable to the longterm average. Extensograph is exhibiting strength similar to last year, but somewhat weaker than the longterm average. Alveograph extensibility is less than last year and the longterm average, but overall strength is similar to last year and greater than seen in the longterm. CSP bake absorption is lower than last year, while loaf volume is comparable to 2007.

Comparative Bühler laboratory mill flour data

Samples of 2008 and stored 2007 harvest survey No. 1 CWRS 13.5 and 12.5 composites and the No. 2 CWRS 13.5 and 12.5 composites were milled consecutively on the same day on the tandem Bühler laboratory mill into 74% extraction straight grade and 60% long patent flour to allow for direct comparisons.

Wheat, No. 1 Canada Western Red Spring

Milling and baking quality

Data are shown in Table 6 for the No. 1 CWRS 13.5% and 12.5% minimum protein segregates. In general, the trends are in agreement with the Allis-Chalmers milling data.

Straight grade and patent flours from the 2008 composites for 13.5% protein segregates exhibit higher wet gluten content and starch damage values, and lower ash content relative to the composite flours from last year. The harder kernels texture as indicated by higher starch damage has a positive impact on flour water absorption capability. Flour grade and AGTRON colour values for straight grade and patent flours indicate brighter, whiter flour than last year. Amylograph peak viscosities are indicative of sound wheat.

Farinograph data show absorption in this year's straight grade flour that is 1.7% higher than last year and patent flour that is 2.5% higher. Dough development time for the 13.5% protein content straight grade flour is 0.5 minute faster than the 2007 flour, and stability is 8.5 minutes longer for the 2008 flour. The 2008 60% patent flour exhibits good strength with a 26 minute stability time.

Data are shown in Table 7 for sponge-and-dough and CSP baking quality of the No. 1 CWRS 13.5% protein segregate. Sponge-and-dough baking absorption is 2% higher for both the 2008 straight grade and 60% patent flour compared with the re-milled 2007 flour. Sponge-and-dough loaf volumes for 2008 and 2007 are similar for both straight grade and 60% patent flours. The 2008 flours show slightly shorter mixing times and slightly lower energy input during mixing.

CSP baking absorptions for 2008 are 2% higher than last year for both straight grade and patent flours. Mixing energy requirements are slightly lower this year for the straight grade flour, but slightly higher for the 60% patent, and both 2008 flours required slightly shorter mixing times. Loaf volumes for both the 2008 straight grade and patent flours are comparable to the 2007 flours.

Analytical data for the 2008 1 CWRS 12.5% protein segregate are seen in Table 6, and are in general agreement with the trends seen for the 13.5% protein segregate of higher wet gluten and starch damage, lower flour ash and improved flour colour. As with the 13.5% protein segregate, the 2008 12.5% protein segregate straight grade and patent flours have higher farinograph absorption and exhibit strength characteristics similar to 2007.

Sponge-and-dough bake absorptions for the 2008 1 CWRS 12.5 straight grade and patent flours are both 2% higher than for 2007 (Table 7). The 2008 patent flour has lower mixing energy requirements and shorter mixing time. Loaf volumes are comparable to last year for both straight grade and patent flours.

CSP baking absorption for the 2008 1 CWRS 12.5 patent flour is 4% higher than last year (Table 7). Mixing energy requirements and mixing times are considerably lower for 2008 straight grade and patent flours, while loaf volumes are comparable to last year for both straight grade and patent flours.

Noodle quality

Yellow alkaline noodles

Yellow alkaline noodles were prepared using both protein segregates (12.5% and 13.5%) 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 2008 1 CWRS 13.5 composite, for patent (60%) and straight grade flours, offered improved noodle brightness, L*, for their raw noodle colour at both 2 and 24 hours after production compared to that of 2007 crop flours (Table 8). A modest but desirable reduction in noodle redness, a*, compared to 2007 was noted, reflecting a return to normal noodle colours experienced in previous years. Noodle yellowness, b*, was equivalent to that observed in 2007 at 2 hours with a slight improvement detected by 24 hours after production for both patent and straight grade flour noodles. Cooked noodle colour was also comparable to last year in all samples with a desirable, slightly higher b* retention. The 2008 patent flour noodles yielded a slightly thicker noodle than their 2007 counterpart and exhibited a modest improvement in their cooked noodle texture. Noodles made from the straight grade flour yielded equivalent cooked noodle texture characteristics to the 2007 crop.

The colour characteristics of the 2008 1 CWRS 12.5 patent raw yellow alkaline noodles were equivalent to those of the 2007 crop. A modest improvement in 1 CWRS 12.5 straight grade raw noodle brightness, L*, was observed in this year's material as compared to the 2007 crop (Table 9).

Cooked patent flour noodles displayed a modest reduction in brightness, but an improved b* when compared to their 2007 counterparts. Cooked noodle texture for both 2008 patent and straight grade flour noodles offered slight improvements with the most notable being noodle MCS (bite). This improvement reflected a general return to longer established trends for this class as the 2007 material MCS had exhibited a slightly lower value.

White salted noodles

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.

White salted noodle colour, prepared from the 2008 1 CWRS 13.5 patent flour displayed equivalent raw noodle colour, L* and b*, to the 2007 material with a desirable, modest reduction in redness, a*, detected (Table 8). An improvement in raw noodle brightness, L*, and redness, a*, was observed in the 2008 straight grade flour noodles at both 2 and 24 hrs when compared to 2007 material. Minimal differences in cooked noodle colour values were observed although a slight improvement in 2008 straight grade noodle brightness, L*, was detected. Texture characteristics of the 2008 cooked noodles prepared from both 1 CWRS 13.5 patent and straight grade flours were equivalent to those of the previous year.

White salted noodles prepared from either 2008 1 CWRS 12.5 straight grade or patent flours yielded generally equivalent raw noodle colour attributes to their respective corresponding 2007 samples (Table 9). However, a modest improvement in 24 hour noodle redness, a*, was observed in noodles prepared from the 2008 straight grade flours compared to the corresponding 2007 flour. Cooked noodle colour was generally equivalent to the 2007 flour noodles, with no significant change in either patent noodle or straight grade noodle texture characteristics.

Wheat, No. 2 Canada Western Red Spring wheat

Milling and baking quality

The Buhler milled 2008 and 2007 No. 2 CWRS 13.5% protein segregate analytical and farinograph data can be found in Table 10. Wet gluten content is 1.9% higher for 60% patent flour, and 1.6% higher for the straight grade flour this year relative to 2007. Ash content of the 2008 60% patent flours is 0.02% lower this year, while the 2008 straight grade flour is 0.04% lower. Flour grade colour and Agtron colour show an improvement this year for both straight grade and 60% patent flours. Starch damage is higher for both the 2008 straight grade and patent flours. Amylograph peak viscosities are similar when comparing the respective straight grade and 60% patent flour for this year and last. Farinograph absorption is higher for both flours for 2008. The 2008 straight grade flour has a slightly shorter dough development time and slightly shorter stability than the 2007 straight grade flour. The 2008 60% patent flour has a 21.5 minute stability, somewhat shorter than last year.

Sponge-and-dough baking absorption for both the No. 2 CWRS 13.5 straight grade and 60% patent flour remains unchanged from last year (Table 11). Mixing energy requirement for the 2008 60% patent flour is lower than for the corresponding 2007 flour, while mixing time requirements are similar to last year for both the straight grade and patent flours. Loaf volumes for the 2008 straight grade and patent flours are not significantly different from their corresponding 2007 flours.

CSP baking absorption for the 2008 2 CWRS 13.5 straight grade flour is showing a 2% increase over the 2007 straight grade flour, while the two 60% patent flours both had baking absorptions of 64%. The 2008 straight grade and patent flours both exhibit lower mixing energy requirements, shorter mixing times and significantly improved loaf volume potential compared with the corresponding 2007 flours.

The Buhler milled 2008 and 2007 No. 2 CWRS 12.5% protein segregate analytical and farinograph data can be found in Table 10. Consistent with the 2008 2 CWRS 13.5 data, the 2 CWRS 12.5% protein segregate exhibits higher wet gluten and starch damage, lower flour ash, brighter flour colour and higher farinograph absorption this year for both straight grade and patent flours. The 60% patent flour is significantly stronger than the straight grade flour, as measured by farinograph.

The sponge-and-dough baking quality for the 2 CWRS 12.5 straight grade and 60% patent flours can be found in Table 11. Bake absorption is within 1% difference from last year for both flours. Loaf volume for the 2008 2 CWRS 12.5 is comparable to last year for straight grade flour, but is significantly higher for this year's patent flour.

CSP baking absorption is 2% higher for the 2008 2 CWRS 12.5 patent flour relative to 2007, and 1% higher for the straight grade flour (Table 11). The 2008 straight grade flour produced significantly higher loaf volumes than the corresponding 2007 flour.

Noodle quality

Yellow alkaline noodles

Evaluation of both 2 CWRS 13.5 patent and straight grade raw yellow alkaline noodles (Table 12) indicated an improvement in L* at 2 hours after production, with noodles prepared from straight grade flour offering superior brightness even after 24 hours as compared to their 2007 counterpart. However, these differences were not observed in their corresponding cooked noodles. A modest, overall improvement in 2008 cooked noodle texture was observed in all attributes, most notably MCS, for both patent and straight grade flour noodles.

Raw yellow alkaline noodle brightness (L*) of both 2 CWRS 12.5 patent and straight grade flours was improved over last year at 2 hours after production (Table 13). A significant improvement, compared to 2007, was also noted in raw, straight grade flour noodles when aged for 24 hours. Improved noodle yellowness, b*, was observed for both straight grade and patent noodles prepared using 2008 CWRS 12.5 as compared to 2007. This beneficial increase was observed at both 2 hours and upon aging for 24 hours. Modest increases in 2008 straight grade cooked texture were detected while more significant desirable increases were observed in 2008 noodles prepared using the patent flour.

White salted noodles

While minimal differences were observed in 2 CWRS 13.5 patent white salted noodle raw colour at 2 or 24 hours when compared to the 2007 crop noodles, a significant improvement in straight grade noodle brightness, L*, was detected at both 2 and 24 hours (Table 12). Cooked noodle colour values were found to be equivalent to the 2007 crop year. Cooked noodle texture from both patent and straight grade 2008 flours were equivalent to those of 2007 although a reduction in cooked noodle bite (MCS) was detected in both patent and straight grade flour noodles.

Fresh white salted raw noodles prepared from 2008 2 CWRS 12.5 patent and straight grade flour offered higher L* values than their 2007 counterparts at 2 hours post production and maintained this benefit with aging (Table 13). Noodles made from the 2008 crop were slightly creamier in colour, higher b* values, than those prepared with their corresponding 2007 flours. A very minor decrease in the various cooked noodle texture characteristics was generally observed as compared to the corresponding 2007 noodles with only one exception, MCS, being noted.

Table 3 - Wheat, No. 1 Canada Western Red Spring
Quality data for 2008 harvest sample grade composites compared to 2007 and 1998-07 mean

	Minimum protein content			No. 1 CWRS 13.5	
	13.5	13.0	12.5	2007	1998-07 mean
Wheat					
Test weight, kg/hL	81.1	81.2	81.5	80.2	81.6
Weight per 1000 kernels, g	34.5	34.4	35.3	30.0	31.7
Protein content, %	13.7	13.3	12.7	13.8	13.8
Protein content, % (dry matter basis)	15.8	15.4	14.7	16.0	16.0
Ash content, %	1.49	1.48	1.47	1.65	1.57
α-amylase activity, units/g	4.0	3.5	4.0	4.0	4.1
Falling number, s	400	415	390	410	390
PSI,%	52	51	50	51	52
Milling					
Flour yield					
Clean wheat basis, %	75.9	76.0	76.1	75.4	75.5
0.50% ash basis, %	76.9	77.5	77.1	74.4	76.5
Flour					
Protein content, %	13.1	12.6	12.1	13.2	13.2
Wet gluten content, %	36.7	34.7	33.3	35.5	35.7
Ash content, %	0.48	0.47	0.48	0.52	0.48
Grade colour, Satake units	-2.5	-2.4	-2.6	-2.3	-2.1
AGTRON colour, %	78	77	78	74	76
Starch damage, %	8.5	8.6	9.0	7.6	7.7
α-amylase activity, units/g	1.0	1.0	0.5	1.0	1.2
Amylograph peak viscosity, BU	655	645	665	710	665
Maltose value, g/100g	2.7	2.8	2.9	2.4	2.5
Farinogram					
Absorption, %	68.6	67.9	68.4	65.0	66.1
Development time, min	6.00	6.75	6.25	7.00	6.25
Mixing tolerance index, BU	30	20	25	25	25
Stability, min	8.5	11.5	10.5	10.5	10.5
Extensogram					
Length, cm	21	19	19	19	21
Height at 5 cm, BU	260	290	300	350	335
Maximum height, BU	460	490	480	610	620
Area, cm^2	125	115	115	155	170
Alveogram					
Length, mm	96	81	78	111	112
P (height x 1.1), mm	139	139	144	114	121
W, x 10^{-4} joules	454	397	401	445	468
Baking (Canadian short process baking test)					
Absorption, %	68	66	67	68	N/A[1]
Mixing energy, W-h/kg	8.1	7.9	8.5	N/A[1]	N/A[1]
Mixing time, min	3.7	3.7	4.0	4.7	N/A[1]
Loaf volume, cm^3/100 g flour	1090	1065	1050	1105	N/A[1]

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

1 Not available due to change in method. See http://grainscanada.gc.ca/wheat-ble/method-methode/wmthm-mmab-eng.htm

Table 4 - Wheat, No. 2 Canada Western Red Spring
Quality data for 2008 harvest sample grade composites compared to 2007 and 1998-07 mean

	Minimum protein level			No. 2 CWRS 13.5	
	13.5	13.0	12.5	2007	1998-07 mean
Wheat					
Test weight, kg/hL	80.4	80.6	80.6	79.6	80.6
Weight per 1000 kernels, g	36.5	35.1	35.4	31.3	32.9
Protein content, %	13.7	13.3	12.7	13.7	13.7
Protein content, % (dry matter basis)	15.8	15.4	14.7	15.9	15.9
Ash content, %	1.58	1.58	1.57	1.68	1.63
α–amylase activity, units/g	5.5	4.5	6.5	7.0	5.6
Falling number, s	395	395	390	395	384
PSI, %	54	53	52	54	53
Milling					
Flour yield					
Clean wheat basis, %	76.6	76.2	76.1	75.2	75.3
0.50% ash basis, %	76.1	76.2	76.1	74.7	75.3
Flour					
Protein content, %	13.1	12.6	12.1	13.2	13.1
Wet gluten content, %	36.9	34.2	33.1	34.6	35.8
Ash content, %	0.51	0.50	0.50	0.51	0.50
Grade colour, Satake units	-2.4	-2.5	-2.7	-2.2	-1.8
AGTRON colour, %	77	80	80	74	73
Starch damage, %	7.9	7.9	8.2	7.7	7.7
α–amylase activity, units/g	2.0	2.5	1.5	2.0	1.8
Amylograph peak viscosity, BU	515	535	535	490	554
Maltose value, g/100g	2.5	2.4	2.5	2.4	2.5
Farinogram					
Absorption, %	67.5	66.6	66.6	65.4	66.2
Development time, min	5.25	5.25	5.75	7.25	5.90
Mixing tolerance index, BU	25	25	30	30	29
Stability, min	8.5	8.5	8.0	10.0	9.1
Extensogram					
Length, cm	21	22	18	21	22
Height at 5 cm, BU	245	245	290	330	312
Maximum height, BU	390	440	460	580	575
Area, cm^2	110	125	105	175	166
Alveogram					
Length, mm	113	109	91	132	119
P (height x 1.1), mm	121	123	126	112	119
W, x 10^{-4} joules	432	427	385	477	474
Baking (Canadian short process baking test)					
Absorption, %	68	67	65	69	N/A[1]
Mixing energy, W-h/kg	8.7	8.4	8.0	N/A[1]	N/A[1]
Mixing time, min	3.8	3.8	3.8	4.7	N/A[1]
Loaf volume, cm^3/100 g flour	1135	1115	1055	1115	N/A[1]

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

[1] Not available due to change in method. See http://grainscanada.gc.ca/wheat-ble/method-methode/wmthm-mmab-eng.htm

Table 5 - Wheat, No. 3 Canada Western Red Spring
Quality data for 2008 harvest sample grade composites compared to 2007 and 1998-07 mean

	No. 3 CWRS		
	2008	2007	1998-07 mean
Wheat			
Test weight, kg/hL	80.4	79.0	79.5
Weight per 1000 kernels, g	36.9	32.5	33.6
Protein content, %	13.6	14.4	13.8
Protein content, % (dry matter basis)	15.7	16.6	16.0
Ash content, %	1.59	1.72	1.63
α-amylase activity, units/g	7.0	18.0	12.6
Falling number, s	405	305	344
PSI,%	53	53	53
Milling			
Flour yield			
Clean wheat basis, %	75.5	74.4	74.8
0.50% ash basis, %	75.0	73.4	74.8
Flour			
Protein content, %	13.2	13.6	13.2
Wet gluten content, %	37.6	37.3	35.8
Ash content, %	0.51	0.52	0.50
Grade colour, Satake units	-1.8	-1.4	-1.4
AGTRON colour, %	73	64	70
Starch damage, %	8.4	8.1	7.6
Amylograph peak viscosity, BU	415	225	379
Maltose value, g/100g	2.8	3.0	2.7
Farinogram			
Absorption, %	68.0	67.8	66.3
Development time, min	5.75	4.75	5.25
Mixing tolerance index, BU	25	30	33
Stability, min	8.50	7.00	8.08
Extensogram			
Length, cm	22	21	22
Height at 5 cm, BU	240	260	301
Maximum height, BU	405	420	532
Area, cm^2	115	115	157
Alveogram			
Length, mm	114	133	126
P (height x 1.1), mm	123	114	115
W, x 10^{-4} joules	442	450	417
Baking (Canadian short process baking test)			
Absorption, %	67	69	N/A[1]
Mixing energy, W-h/kg	8.0	N/A[1]	N/A[1]
Mixing time, min	3.7	3.9	N/A[1]
Loaf volume, cm^3/100 g flour	1135	1130	N/A[1]

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

[1] Not available due to change in method. See http://grainscanada.gc.ca/wheat-ble/method-methode/wmthm-mmab-eng.htm

Table 6 - Wheat, No. 1 Canada Western Red Spring - 13.5% and 12.5% protein segregates
Analytical data and physical dough properties
Comparative Bühler mill flour data - 2008 and 2007 harvest sample composites[1]

	13.5% protein segregate			
	74% Straight-grade		60% patent	
	2008	2007	2008	2007
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.9	13.1	12.5	12.6
Wet gluten content, %	36.1	35.1	35.4	34.1
Ash content, %	0.41	0.45	0.36	0.38
Grade colour, Satake units	-3.4	-2.9	-4.2	-4.0
AGTRON colour, %	88	83	94	92
Amylograph peak viscosity, BU	770	830	850	925
Starch damage, %	6.5	6.0	6.6	6.1
Farinogram				
Absorption, %	64.5	62.8	64.6	62.1
Development time, min	6.75	7.25	7.75	10.50
Mixing tolerance index, BU	20	15	5	10
Stability, min	20.5	12.0	26.0	32.5

	12.5% protein segregate			
	74% Straight-grade		60% patent	
	2008	2007	2008	2007
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.3	12.0	11.7	11.6
Wet gluten content, %	33.1	32.1	32.4	31.3
Ash content, %	0.40	0.44	0.37	0.38
Grade colour, Satake units	-3.3	-3.2	-4.4	-4.2
AGTRON colour, %	87	85	95	94
Amylograph peak viscosity, BU	735	765	805	835
Starch damage, %	6.9	6.4	7.0	6.5
Farinogram				
Absorption, %	64.1	61.9	64.3	61.5
Development time, min	6.50	6.50	16.75	12.00
Mixing tolerance index, BU	20	20	5	10
Stability, min	15.0	15.0	28.5	30.0

[1] The 2007 composite was stored and milled the same day as the 2008
Data reported on 14.0% moisture basis

Table 7 - Wheat, No. 1 Canada Western Red Spring - 13.5% and 12.5% protein segregates
Baking quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	13.5% protein segregate			
	74% Straight-grade		60% Patent	
	2008	2007	2008	2007
Sponge-and-dough baking test	(40 ppm ascorbic acid)		(40 ppm ascorbic acid)	
Absorption, %	65	63	64	62
Mixing energy dough stage, W-h/kg	5.4	6.6	5.9	6.5
Mixing time dough stage, min	2.5	3.0	2.9	3.3
Loaf volume, cm^3/100 g flour	1085	1075	1100	1075
Appearance	7.3	7.4	7.4	7.0
Crumb structure	5.9	5.8	5.9	6.0
Crumb colour	7.9	7.9	8.0	7.9
Canadian short process baking test	(150 ppm ascorbic acid)		(150 ppm ascorbic acid)	
Absorption, %	65	63	65	63
Mixing energy, W-h/kg	7.4	9.4	10.6	9.8
Mixing time, min	3.8	4.1	4.2	4.8
Loaf volume, cm^3/100 g flour	1105	1115	1130	1115
Appearance	7.4	7.7	7.4	7.5
Crumb structure	6.2	6.2	6.0	6.3
Crumb colour	8.0	7.9	8.0	8.0

	12.5% protein segregate			
	74% Straight-grade		60% Patent	
	2008	2007	2008	2007
Sponge-and-dough baking test	(40 ppm ascorbic acid)		(40 ppm ascorbic acid)	
Absorption, %	64	62	63	61
Mixing energy dough stage, W-h/kg	5.4	5.4	7.1	8.0
Mixing time dough stage, min	2.5	2.9	2.9	3.7
Loaf volume, cm^3/100 g flour	1005	1015	1005	1005
Appearance	7.2	7.4	7.4	7.3
Crumb structure	5.8	6.1	5.8	6.0
Crumb colour	7.8	7.9	7.8	7.9
Canadian short process baking test	(150 ppm ascorbic acid)		(150 ppm ascorbic acid)	
Absorption, %	64	63	66	62
Mixing energy, W-h/kg	8.3	11.8	8.6	10.1
Mixing time, min	4.0	4.9	4.2	5.0
Loaf volume, cm^3/100 g flour	1070	1075	1115	1110
Appearance	7.5	7.7	7.7	7.7
Crumb structure	6.2	6.2	5.9	6.2
Crumb colour	7.9	7.9	7.9	8.0

[1] The 2007 composite was stored and milled the same day as the 2008
Data reported on 14.0% moisture basis

Table 8 - Wheat, No. 1 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	74% Straight grade		60% Patent	
	2008	2007	2008	2007
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	79.3 (73.4)	78.7 (72.1)	81.8 (76.3)	80.3 (76.0)
Redness, a*	-0.15 (0.41)	-0.04 (0.69)	-0.24 (0.04)	-0.13 (0.08)
Yellowness, b*	28.3 (28.6)	27.9 (27.7)	27.3 (28.2)	27.0 (27.4)
Cooked colour				
Brightness, L*	69.1	68.4	69.8	70.2
Redness, a*	-1.69	-1.68	-1.83	-1.91
Yellowness, b*	28.8	27.6	28.7	28.2
Texture				
Thickness, mm	2.32	2.30	2.34	2.24
RTC, %	23.3	23.2	23.4	22.8
Recovery, %	33.9	33.3	34.0	33.6
MCS, g/mm^2	29.4	28.9	30.0	28.0
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.7 (75.3)	79.9 (74.8)	82.3 (77.3)	82.0 (77.0)
Redness, a*	2.56 (3.45)	2.79 (3.76)	2.22 (2.70)	2.33 (2.90)
Yellowness, b*	24.6 (26.0)	24.6 (25.8)	24.3 (25.5)	24.4 (25.6)
Cooked colour				
Brightness, L*	76.1	75.1	76.8	76.6
Redness, a*	0.76	0.98	0.53	0.60
Yellowness, b*	19.8	19.6	20.1	19.7
Texture				
Thickness, mm	2.49	2.48	2.55	2.50
RTC, %	19.5	20.6	19.8	19.7
Recovery, %	26.4	26.4	26.0	26.1
MCS, g/mm^2	25.6	26.6	26.8	26.2

[1] The 2007 composite was stored and milled the same day as the 2008.

Table 9 - Wheat, No. 1 Canada Western Red Spring - 12.5% protein segregate
Noodle quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	74% Straight Grade		60% patent	
	2008	2007	2008	2007
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.1 (74.0)	79.0 (73.4)	82.4 (76.9)	82.2 (77.4)
Redness, a*	-0.32 (0.33)	-0.31 (0.44)	-0.36 (-0.04)	-0.43 (-0.02)
Yellowness, b*	28.2 (28.7)	27.6 (27.8)	27.7 (28.6)	27.0 (27.6)
Cooked colour				
Brightness, L*	68.6	69.1	69.9	70.9
Redness, a*	-1.76	-2.01	-2.00	-2.23
Yellowness, b*	29.3	29.0	29.9	28.9
Texture				
Thickness, mm	2.27	2.20	2.25	2.25
RTC, %	24.4	23.6	23.5	23.4
Recovery, %	33.6	32.6	33.0	32.5
MCS, g/mm^2	29.7	27.9	29.2	27.9
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.4 (75.4)	81.1 (74.7)	83.0 (77.6)	82.7 (77.6)
Redness, a*	2.34 (2.88)	2.40 (3.27)	1.99 (2.56)	2.03 (2.36)
Yellowness, b*	23.8 (24.4)	23.6 (24.6)	24.3 (25.9)	23.7 (24.5)
Cooked colour				
Brightness, L*	75.0	75.6	76.6	76.6
Redness, a*	0.84	0.83	0.51	0.45
Yellowness, b*	20.2	19.6	20.5	19.9
Texture				
Thickness, mm	2.40	2.42	2.43	2.43
RTC, %	18.7	19.3	17.9	18.9
Recovery, %	25.0	25.5	24.0	24.7
MCS, g/mm^2	25.8	25.4	24.7	24.3

[1] The 2007 composite was stored and milled the same day as the 2008.

Table 10 - Wheat, No. 2 Canada Western Red Spring - 13.5% and 12.5% protein segregates
Analytical data and physical dough properties
Comparative Bühler mill flour data - 2008 and 2007 harvest sample composites[1]

	13.5% protein segregate			
	74% Straight-grade		60% patent	
	2008	2007	2008	2007
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.9	12.9	12.2	12.4
Wet gluten content, %	36.6	35.0	35.1	33.2
Ash content, %	0.42	0.46	0.38	0.40
Grade colour, Satake units	-3.3	-2.7	-4.2	-3.8
AGTRON colour, %	85	78	92	91
Amylograph peak viscosity, BU	625	630	710	705
Starch damage, %	6.3	5.8	6.5	5.9
Farinogram				
Absorption, %	64.2	61.9	64.0	61.7
Development time, min	5.75	7.50	7.75	9.50
Mixing tolerance index, BU	20	25	20	10
Stability, min	11.0	12.5	21.5	33.0

	12.5% protein segregate			
	74% Straight-grade		60% patent	
	2008	2007	2008	2007
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	11.9	11.9	11.7	11.4
Wet gluten content, %	33.7	32.4	32.9	31.1
Ash content, %	0.41	0.46	0.37	0.39
Grade colour, Satake units	-3.7	-2.7	-4.6	-4.0
AGTRON colour, %	88	82	95	92
Amylograph peak viscosity, BU	595	555	660	655
Starch damage, %	6.5	6.2	6.7	6.4
Farinogram				
Absorption, %	63.4	61.9	63.5	61.5
Development time, min	6.75	7.00	18.75	7.75
Mixing tolerance index, BU	30	25	5	15
Stability, min	12.5	10.5	26.5	36.0

[1] The 2007 composite was stored and milled the same day as the 2008
Data reported on 14.0% moisture basis

Table 11 - Wheat, No. 2 Canada Western Red Spring - 13.5% and 12.5% protein segregates
Baking quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	13.5% protein segregate			
	74% Straight grade		60% Patent	
	2008	2007	2008	2007
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	62	62	62	62
Mixing energy dough stage, W-h/kg	5.2	5.1	5.8	6.6
Mixing time dough stage, min	2.6	2.5	2.8	3.1
Loaf volume, cm^3/100 g flour	1080	1075	1070	1075
Appearance	7.2	7.5	7.1	7.2
Crumb structure	5.9	6.2	5.9	6.0
Crumb colour	8.0	8.0	7.9	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	64	62	64	64
Mixing energy, W-h/kg	8.5	9.1	6.4	9.6
Mixing time, min	3.9	4.5	3.8	5.0
Loaf volume, cm^3/100 g flour	1155	1105	1165	1130
Appearance	7.8	7.9	7.9	7.7
Crumb structure	6.0	6.2	6.0	6.3
Crumb colour	7.7	7.9	7.9	8.0

	12.5% protein segregate			
	74% Straight grade		60% Patent	
	2008	2007	2008	2007
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	62	61	61	62
Mixing energy dough stage, W-h/kg	6.0	5.1	6.8	7.2
Mixing time dough stage, min	2.6	2.7	3.0	3.3
Loaf volume, cm^3/100 g flour	1010	1030	1035	990
Appearance	6.9	7.5	7.2	6.9
Crumb structure	5.9	5.9	6.0	6.0
Crumb colour	7.9	7.9	8.0	8.0
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	64	63	64	62
Mixing energy, W-h/kg	10.0	9.6	8.0	9.3
Mixing time, min	4.1	4.6	4.0	5.1
Loaf volume, cm^3/100 g flour	1125	1070	1070	1090
Appearance	8.0	7.7	7.7	7.8
Crumb structure	6.2	6.0	6.0	6.2
Crumb colour	7.8	7.8	8.0	8.0

[1] The 2007 composite was stored and milled the same day as the 2008

Table 12 - Wheat, No. 2 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	74% Straight grade		60% Patent	
	2008	2007	2008	2007
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	78.8 (73.6)	77.4 (71.0)	81.0 (75.5)	80.1 (75.4)
Redness, a*	-0.10 (0.48)	0.02 (0.84)	-0.11 (0.16)	-0.13 (0.33)
Yellowness, b*	27.7 (28.6)	27.1 (27.6)	26.6 (28.1)	27.2 (27.6)
Cooked colour				
Brightness, L*	68.9	68.3	69.9	70.2
Redness, a*	-1.94	-1.71	-1.95	-2.12
Yellowness, b*	27.5	26.9	28.3	27.5
Texture				
Thickness, mm	2.29	2.25	2.32	2.25
RTC, %	23.0	23.9	23.5	22.5
Recovery, %	32.1	33.2	32.4	31.7
MCS, g/mm^2	28.1	27.5	29.1	27.3
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.8 (74.9)	79.7 (74.1)	81.8 (76.7)	81.8 (77.1)
Redness, a*	2.45 (3.41)	2.52 (3.58)	2.18 (2.82)	2.05 (2.60)
Yellowness, b*	24.3 (25.5)	23.5 (25.2)	23.8 (25.6)	23.3 (25.0)
Cooked colour				
Brightness, L*	76.0	76.1	76.9	76.7
Redness, a*	0.75	0.78	0.45	0.42
Yellowness, b*	19.1	18.6	19.3	18.9
Texture				
Thickness, mm	2.48	2.46	2.47	2.47
RTC, %	19.2	20.3	19.0	19.2
Recovery, %	25.3	25.8	24.6	24.9
MCS, g/mm^2	24.8	26.6	24.4	26.2

[1] The 2007 composite was stored and milled the same day as the 2008.

Table 13 - Wheat, No. 2 Canada Western Red Spring - 12.5% protein segregate
Noodle quality data
Comparative Bühler mill data - 2008 and 2007 harvest sample composites[1]

	74% Straight grade		60% Patent	
	2008	2007	2008	2007
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.6 (74.7)	79.0 (73.0)	82.8 (77.7)	81.3 (77.1)
Redness, a*	-0.26 (0.26)	-0.21(0.64)	-0.37 (-0.05)	-0.36 (0.02)
Yellowness, b*	27.7 (28.6)	26.4 (27.2)	26.5 (27.9)	25.5 (26.9)
Cooked colour				
Brightness, L*	69.1	67.6	69.9	69.8
Redness, a*	-1.97	-1.80	-2.06	-2.19
Yellowness, b*	28.9	27.3	28.9	28.0
Texture				
Thickness, mm	2.25	2.28	2.27	2.20
RTC, %	23.6	22.9	23.0	22.3
Recovery, %	32.4	31.9	31.8	31.9
MCS, g/mm^2	28.3	28.3	28.4	27.0
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.9 (74.9)	81.0 (73.3)	83.3 (78.2)	82.8 (77.1)
Redness, a*	2.27 (3.02)	2.33 (3.12)	1.97 (2.36)	1.88 (2.43)
Yellowness, b*	24.0 (23.9)	22.5 (23.3)	23.3 (24.3)	22.5 (23.9)
Cooked colour				
Brightness, L*	75.9	75.6	77.2	75.9
Redness, a*	0.68	0.82	0.44	0.35
Yellowness, b*	19.6	18.7	19.9	19.0
Texture				
Thickness, mm	2.42	2.44	2.46	2.47
RTC, %	18.8	19.3	18.7	19.1
Recovery, %	24.9	25.3	24.9	25.2
MCS, g/mm^2	25.2	26.2	25.8	25.1

[1] The 2007 composite was stored and milled the same day as the 2008.

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 2008, 2007 and for the previous 10 years (1998-2007). Figure 3 shows the variation in annual mean protein content since 1963.

The average protein content of the 2008 durum crop at 13.2% is 0.8% lower than 2007 and is comparable to the 10-year average. Protein content for the top three milling grades is considerably lower than last year and marginally higher than 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.

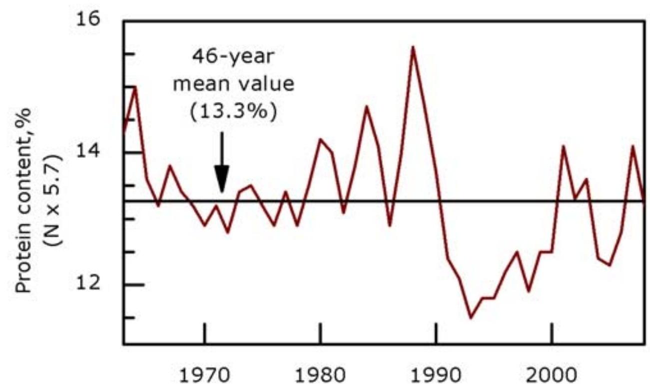
Canadian Wheat Board 2008 variety survey information indicates that production of the variety Strongfield has increased substantially. It is the most popular variety with western Canadian producers representing almost 52% of the seeded area. AC Avonlea represents 18.7% of the seeded hectares. Kyle continued to decline in production, decreasing to 16.1%. AC Navigator production dropped slightly to 9.1% from 11.1%. AC Morse and Napoleon combined account for less than 2% of the seeded hectares. The extra-strong durum variety Commander accounted for 1.9% of the seeded area. 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 colour similar to AC Avonlea.

Table 14 – Mean protein content of 2008 Canada Western Amber Durum wheat, by grade and year

	Protein content, %[1]		
Grade	2008	2007	1998-2007
Wheat, No. 1 CWAD	13.5	13.7	13.2
Wheat, No. 2 CWAD	13.0	14.1	12.9
Wheat, No. 3 CWAD	13.0	14.8	13.0[2]
All milling grades	**13.2**	**14.0**	**13.0**

1 N x 5.7; 13.5% moisture content basis
2 3CWAD results not available for 1998 or 2003

Figure 3 – Mean protein content of harvest survey Canada Western Amber Durum wheat – 1963-2008



Wheat and pasta processing quality

Data describing the quality characteristics for composite samples of No. 1 and No. 2 CWAD for the 2008 crop are shown in Table 15**.** Corresponding data for 2007 composites and mean values for the previous ten-years (1998-2007) are provided for comparison. Degrading factors in the 2008 crop include lower hard vitreous kernel count, ergot, frost/heat stress, mildew and smudge. Test weight values are comparable to 2007 for both grades. Weight per 1000 kernels is considerably higher for the top two milling grades as compared to 2007 and the 10-year mean data. Hard vitreous kernel counts are the same as last year for No. 1 CWAD and 11% lower than last year for No. 2 CWAD. Falling number values for both wheat and semolina are indicative of sound kernel characteristics for the top two grades and are equal to the ten-year means.

Wet and dry gluten content for No. 1 CWAD are similar to values observed in 2007 even though the semolina protein content is 0.4% lower. No. 2 CWAD exhibits lower wet and dry gluten than last year, as expected given the lower protein content this year. Gluten characteristics of No. 1 CWAD are comparable the 2007 crop as shown by similar SDS sedimentation volumes and Alveograph P and W values while at a slight protein content disadvantage. Gluten characteristics of the No.2 CWAD are, as expected, slightly weaker than 2007 due to 1.2% lower protein content of the composite. Gluten index values are somewhat lower for both No. 1 and No.2 CWAD this year, but they are significantly higher than the 10 year average. The superior gluten strength for both No.1 and No. 2 CWAD is a reflection of the newer 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 both No. 1 and No.2 CWAD is showing a significant improvement over last year. Semolina yield is 0.5% and 1.0% better this year for the No.1 and No. 2 CWAD, respectively. Wheat ash is lower than in 2007 by 0.09% and 0.10%, for No. 1 and No. 2 CWAD, respectively, while semolina ash is lower by 0.02% and 0.03% relative to last year for the No. 1 and No. 2 grades. Both grades exhibit semolina ash contents similar to the 10-year means. Agtron values are comparable to last year's results for No. 1 CWAD. No. 2 CWAD semolina exhibits significantly higher agtron values this year that can be attributed to the lower protein content of this year's composite. Speck counts for both grade composites are higher than in 2007 and for the ten-year mean. On the whole, milling quality of the 2008 crop is slightly better than seen in 2007 and is generally consistent with the ten-year average.

Semolina brightness, as indicated by L* values, is lower for 2008 for No. 1 CWAD and slightly better for No. 2 CWAD as compared to 2007, but both are lower than the 10 year average. Pasta brightness is generally equivalent to last year for both grades, but lower than the 10 year average. Wheat and semolina yellow pigment values for No. 1 CWAD show a slight increase over the previous crop, while the No. 2 CWAD is equivalent to last year. Both exhibit a significant improvement over long term average values, which is the result of continued breeding emphasis placed on increasing yellow pigment levels in new varieties. Semolina b* values also are comparable to 2007 and show significant improvement over the long term mean, however, pasta b* values are lower than last year and lower than the long term. Redness or a* values are marginally lower than seen in last year's crop and for the long term mean. This result suggests that pasta from the 2008 crop will have good yellow amber colour but with marginally less redness.

Spaghetti cooking quality, as indicated by firmness (peak force) values, is excellent for No. 1 and 2 CWAD, comparable to last year and showing improvement over the ten year mean. This result reflects increased protein content for the 2008 crop.

Data describing the quality of Wheat, No. 3 CWAD can be found in Table 16. Wheat test weight is higher than last year, while 1000 kernel weight is significantly higher. Wheat protein content, on the other hand, is more than 2% lower than last year, but is comparable to the 10 year average. Falling number values are lower than average at 290 s for the wheat and 370 for semolina. Yellow pigment content is comparable to last year and higher than the 10 year average. Semolina milling yield is 1.6% higher than last year and is higher than the longterm average.

Semolina gluten index is comparable to last year and is considerably higher than the longterm average, as is yellow pigment content. Alveograph shows extensibility (L) values comparable to the 10 year average, but greater overall strength (W) and spaghetti cooked firmness that exceeds the 10 year average. The improvements seen in strength and cooking quality are largely due to the improvements seen in the durum varieties released over the past several years.

Table 15 - Wheat, No. 1 and No. 2 Canada Western Amber Durum
Quality data for 2008 harvest sample grade composites compared to 2007 and 1998-07 mean

	No. 1 CWAD			No. 2 CWAD		
	2008	2007	1998-07 mean	2008	2007	1998-07 mean
Wheat						
Test weight, kg/hL	82.5	82.0	82.5	81.6	80.9	81.9
Weight per 1000 kernels, g	44.4	38.5	41.5	45.4	37.4	41.9
Vitreous kernels, %	90	91	91	75	86	83
Protein content, %	13.3	13.7	13.2	13.0	14.2	12.9
Protein content, % (dry matter basis)	15.4	15.8	15.3	15.0	16.4	15.0
SDS sedimentation, mL	47	48	40	42	47	37
Ash content, %	1.46	1.55	1.54	1.54	1.64	1.60
Yellow pigment content, ppm	9.5	9.2	8.6	9.1	9.2	8.5
Falling number, s	390	405	408	360	415	385
Milling yield, %	75.2	74.2	74.5	75.2	73.9	74.8
Semolina yield, %	66.3	65.8	66.1	65.9	64.9	66.0
PSI, %	38	38	37	39	39	38
Semolina						
Protein content, %	12.3	12.7	12.2	12.0	13.2	11.8
Wet gluten content, %	31.8	31.3	31.4	30.3	31.8	30.2
Dry gluten content, %	11.1	11.2	10.9	10.8	11.0	10.5
Gluten index, %	52	61	35	52	58	36
Ash content, %	0.64	0.66	0.65	0.66	0.69	0.66
Yellow pigment content, ppm	9.0	8.7	8.2	8.6	8.6	7.9
AGTRON colour, %	77	78	81	78	73	80
CIELAB colour:						
Brightness, L*	86.9	87.2	87.7	87.2	86.8	87.6
Redness, a*	-2.9	-3.0	-3.0	-2.7	-2.8	-3.0
Yellowness, b*	34.5	34.1	33.2	33.6	33.8	32.5
Speck count per 50 cm^2	25	20	24	35	23	28
Falling number, s	450	510	488	430	505	462
Alveogram						
Length, mm	82	93	90	89	87	89
P (height x 1.1), mm	71	69	55	65	70	52
P/L	0.9	0.7	0.6	0.7	0.8	0.6
W, x 10^{-4} joules	178	191	132	171	183	122
Spaghetti						
Dried at 70°C						
CIELAB colour:						
Brightness, L*	76.7	76.7	77.8	76.5	76.0	77.5
Redness, a*	2.8	2.7	2.4	2.7	3.2	2.5
Yellowness, b*	65.3	67.2	66.8	64.2	65.9	66.6
Firmness, g-cm	1088	1053	967	1047	1048	911

Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.

Table 16 - Wheat, No. 3 Canada Western Amber Durum
Quality data for 2008 harvest sample grade composites compared to 2007 and 1998-07 mean

	No. 3 CWAD		
	2008	2007	1998-07 mean[1]
Wheat			
Test weight, kg/hL	81.3	79.7	81.2
Weight per 1000 kernels, g	45.6	36.3	41.3
Vitreous kernels, %	70	83	74
Protein content, %	12.9	15.0	13.0
Protein content, % (dry matter basis)	14.9	17.4	15.1
SDS sedimentation, mL	35	51	34
Ash content, %	1.53	1.69	1.63
Yellow pigment content, ppm	8.9	9.1	8.3
Falling number, s	290	390	361
Milling yield, %	75.8	74.2	74.8
Semolina yield, %	66.5	64.9	65.7
PSI, %	39	40	38
Semolina			
Protein content, %	11.9	13.8	11.9
Wet gluten content, %	30.3	33.9	30.2
Dry gluten content, %	10.6	12.0	10.4
Gluten index, %	52	55	32
Ash content, %	0.67	0.74	0.67
Yellow pigment content, ppm	8.5	8.4	7.7
AGTRON colour, %	74	70	77
CIELAB colour:			
Brightness, L*	86.9	86.7	87.4
Redness, a*	-2.9	-2.8	-2.9
Yellowness, b*	32.7	33.1	31.5
Speck count per 50 cm^2	43	31	39
Falling number, s	370	465	424
Alveogram			
Length, mm	89	97	88
P (height x 1.1), mm	63	68	52
P/L	0.7	0.7	0.6
W, x 10^{-4} joules	163	187	118
Spaghetti			
Dried at 70°C			
CIELAB colour:			
Brightness, L*	75.6	75.1	76.5[2]
Redness, a*	3.2	3.5	3.1[2]
Yellowness, b*	62.8	63.3	63.1[2]
Firmness, g-cm	1026	1102	897[2]

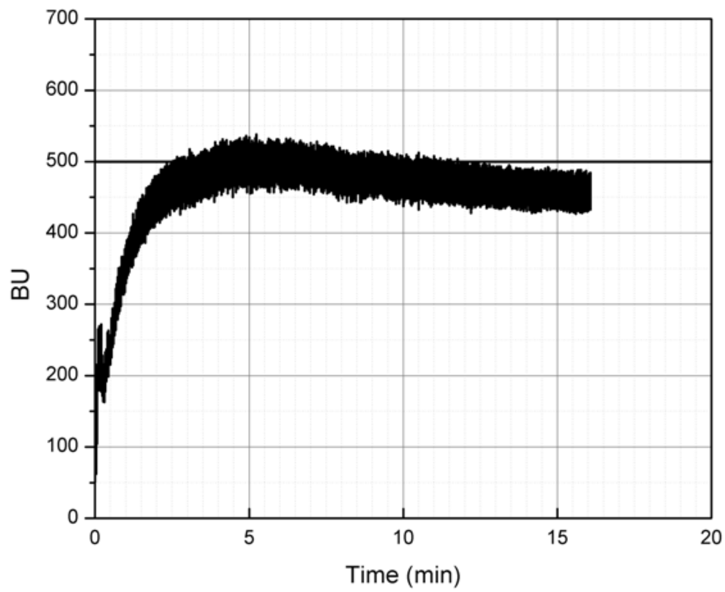
Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.

[1] No data were available for 1998 or 2003.

[2] Mean of data generated starting in 1999.

Farinograms
2008 crop composite samples

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



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