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Quality of western Canadian wheat 2010

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Summary

Cool and wet conditions delayed seeding in much of the prairies. Record amounts of rainfall throughout the growing season combined with harvest delays because of continued wet weather resulted in downgrades for a large portion of the 2010 crop.

Spring wheat production estimated at 17.148 million tonnes by Statistics Canada¹, is slightly lower than last year. Durum wheat production is estimated at 3.0 million tonnes, a decrease of more than 40% from 2009. Overall wheat production for western Canada is estimated at 21.041 million tonnes compared with 22.36 million tonnes in 2009. Considerably lower proportions of both spring wheat and durum are expected to make the top milling grades compared with 2009.

Overall protein content of Canada Western Red Spring wheat, at 13.4%, is 0.2% higher than last year. High grade Canada Western Red Spring wheat shows similar test weight and wheat falling number, slightly lower starch damage, lower absorption and similar dough strength properties relative to last year. Extensograph exhibits strength similar to last year, but lower than the long term average. Alveograph is comparable to last year and the 10 year average. Overall protein content of Canada Western Amber Durum wheat is comparable to last year at 12.7%.

Methodology

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-x2010008-eng.pdf> Vol. 89, No. 8, Dec. 3, .2010

Nine 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 Red Winter wheat for the 2010 crop. Further information on other classes of western Canadian wheat is not reported for the 2010 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-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.

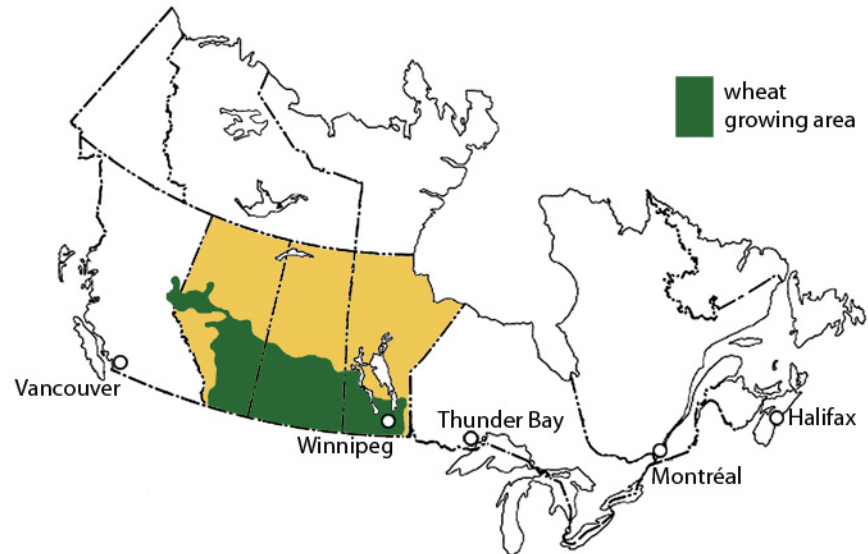
Canada Western Red Winter (CWRW) wheat is a hard wheat with very good milling quality suitable for the production of a wide variety of products including French breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CWRW class.

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.

Canada Western General Purpose (CWGP) wheat is lower protein wheat suitable for animal feed and industrial processing; it is not intended for milling.

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



Introduction

What data in this report represent

Figure 1 highlights the wheat producing regions in the Prairie provinces of, from east to west, Manitoba, Saskatchewan and Alberta. Data presented in this report were generated from quality tests carried out on composites representing approximately 3000 individual samples submitted by producers and primary elevator managers from the three Prairie provinces. These data are not quality specifications for Canadian wheat. Rather, they represent our best estimate of overall quality. How closely they represent the exact quality characteristics of wheat of any given grade exported during the coming crop year depends on

1. The amounts and relative quality of carryover stocks of each grade
2. The degree to which the harvest survey composites are representative of 2010 production.

Background for the 2010 crop

The Canadian Wheat Board provided background information for the 2010 crop.

Seeding conditions

The 2010 planting season began on a positive note with above-normal temperatures and an early start to planting in the southern and western growing areas. Dryness in central and northern Alberta and in west central Saskatchewan was of greatest concern as the region had not recovered from an extensive drought in 2009. Temperatures were one to five degrees above normal on the eastern Prairies and close to normal in western regions. The warm temperatures allowed planting to start in mid-to-late April. A series of late season rain and snowstorms helped replenish moisture in previously dry areas in early May. Seeding progress was ahead of normal by the beginning of May, with 15 per cent of the overall crop planted by May 3. Progress continued in most areas through the third week of May, with about 64 per cent of the crop planted by May 25. A series of storms during late May and early June dropped between 50 and 200 millimetres of precipitation over most of Saskatchewan and Manitoba, delaying planting and causing flooding in fields that had been previously planted. Overall planting progress stopped with just over 80 per cent of the Western Canadian crop sown.

Growing conditions

Wet, cool conditions persisted through July and August, with slow crop development of later planted crops of most concern. Temperatures were the coolest in the western areas of the Prairies, while Manitoba and parts of eastern Saskatchewan were closer to normal. Crops entered the reproductive stage in late July and early August, which is about 3 to 4 weeks behind normal. The cooler temperatures allowed crops to move through the reproductive stage without significant stress to the crop. Dry conditions persisted in the northern

growing areas of Alberta during July, which caused stress to crops in the Peace River region. The Peace River region of Alberta and British Columbia experienced drought conditions for most of the growing season and was the only western region to report above normal temperatures.

Harvest conditions

The wet, cool conditions continued into September, further delaying the onset of harvest and causing quality degradation in eastern regions that had just started harvest activity. A severe frost was reported in the middle of September in Alberta and western Saskatchewan, which caused damage to immature crops. The frost date was close to average, but the temperatures were extremely cold (-2 to -5C) during the event. Dry, warmer weather during the last week of September allowed the harvest to resume in the eastern Prairies, while western areas continued to mature and dry-down for harvest. Mostly dry conditions and above normal temperatures were reported across the entire Prairie region during October, which allowed for a rapid completion of the harvest. The dry weather allowed harvest to near completion by the end of the month.

Production and grade information

The loss of area due to excess moisture has resulted in a significant drop in production of the major crops from 2010. Despite the heavy rains during the year, crop yields have been average to slightly above average for wheat and durum. Total wheat production for Western Canada is estimated at 21.04 million tonnes¹. Spring wheat production is estimated at 17.1 million tonnes, while durum production is expected to decline to 3.0 million tonnes. Spring wheat yields estimates are 2.7 tonnes per hectare, which is significantly lower than last year. Durum yields are expected to be similar to last year at 2.4 tonnes per hectare. The quality of the wheat crop is below average, due to poor weather during the growing season. The main quality concerns have been downgrading due to frost damage and green, mildew and fusarium damage. Most of the downgrading is directly linked to the delayed development of the crop and the excessive moisture present through most of the growing season.

Overall protein content of Canada Western Red Spring wheat, at 13.4 %, is 0.2% lower than last year. High grade Canada Western Red Spring wheat shows similar test weight and wheat falling number, slightly lower starch damage, lower farinograph absorption and farinograph dough strength properties that are comparable to last year. Extensograph shows dough properties to be similar to last year, but weaker than seen over the long term. Alveograph dough properties appear comparable to last year and the long term. Overall protein content of Canada Western Amber Durum wheat at 12.7% is comparable to last year.

¹ Statistics Canada, *Field Crop Reporting Series*, <http://www.statcan.gc.ca/pub/22-002-x/22-002-x2010008-eng.pdf> Vol. 89, No. 8, Dec. 3, 2010

The lower grade CWRS resulted from a range of degrading factors including mildew, fusarium damage, frost damage, green and ergot. Lower grade CWAD resulted primarily from mildew, frost damage, green, fusarium damage and smudge. 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 the milling grades of each of the eight classes of western Canadian wheat surveyed in 2010 to corresponding values obtained in the 2009 and 2008 harvest surveys as of November 4, 2010. Canada Western Red Spring (CWRS) wheat protein content is 0.2% higher than 2009 and equivalent to 2008. Canada Western Amber Durum (CWAD) protein values are unchanged compared to 2009 and 0.4% lower than 2008. Canada Western Hard White Spring (CWHWS) wheat is 12.7%, 0.4% lower than last year. Canada Prairie Spring Red (CPSR) wheat at 11.6% is 0.5% 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) and Canada Prairie Spring White (CPSW) wheat accurately.

Table 1 – Mean protein content of milling grades of western Canadian wheat classes, 2010, 2009 and 2008

Class	Protein content, % ¹		
	2010	2009	2008
CWRS	13.4	13.2	13.4
CWAD	12.7	12.8	13.2
CWHW	12.7	13.2	13.3
CWES	N/A	N/A	N/A
CPSR	11.6	12.1	N/A
CWRW	10.2	10.9	10.8
CPSW	N/A	N/A	N/A
CWSWS	10.7	10.4	10.9

¹ 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 2010. Comparative values for western Canada by grade are shown for 2009 and for the previous 10 years (2000-2009). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of milling grades of the 2010 western Canadian wheat crop is 13.4%, 0.2% higher than 2009 and 0.6% lower than the ten year average protein content. Protein content is relatively constant across grades, ranging from 13.2% to 13.5%. Manitoba exhibits higher protein content than Saskatchewan and Alberta.

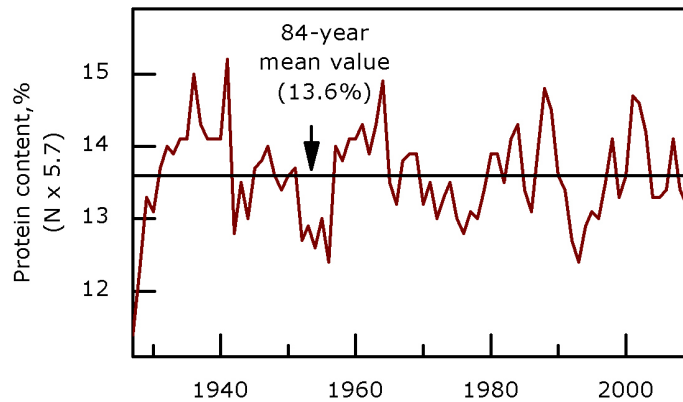
Results from the Canadian Wheat Board 2010 Variety Survey show that the variety Lillian was again the predominant variety in the CWRS class with 18.9% of the seeded acreage, with the variety Harvest coming in second with 16.8%. AC Barrie and Superb continue to decline in production, making up 4.7% and 6.0% of the seeded area. Production of Kane has increased to 6.3%. 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 CDC Go accounted for 5.7%. The varieties McKenzie, Glenn and AC Eatonia each accounted for 4.1% to 3.2% of the seeded acreage.

Table 2 – Mean protein content of 2010 Canada Western Red Spring wheat, by grade and province, with comparisons to 2009 and the 10-year mean

Grade	Protein content, % ¹					
	Western Canada			2010		
	2010	2009	2000-2009	Manitoba	Saskatchewan	Alberta
Wheat, No. 1 CWRS	13.2	13.2	13.8	13.4	13.2	13.1
Wheat, No. 2 CWRS	13.4	13.2	13.8	13.6	13.4	13.2
Wheat, No. 3 CWRS	13.5	13.4	13.8	13.8	13.5	13.2
All milling grades	13.4	13.2	13.8	13.7	13.4	13.2

¹ N x 5.7%; 13.5% moisture basis

Figure 2 – Mean protein content of Canada Western Red Spring wheat – 1927 to 2010



Milling and baking quality – Allis-Chalmers laboratory mill

To assess the quality of the 2010 CWRS wheat crop, composites were prepared from harvest survey samples representing the top two milling grades and No. 3 CWRS. The Wheat, No. 1 CWRS and Wheat No. 2 CWRS samples were segregated into composites having minimum protein levels of 13.5% and 12.5%. Wheat, No. 3 CWRS was tested at medium-high and medium-low protein levels.

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 2000-2009.

Test weight of the 2010 No. 1 grade protein segregates is comparable to last year and to the ten year average. Kernel weight is lower than last year but is similar to the long term average. Wheat ash is marginally lower compared to last year, but is 0.04% lower than the long term average. Flour ash is marginally higher than last year and the long term average. The No. 1 CWRS composites show a high degree of soundness with high falling number values and flour amylograph peak viscosities and low α -amylase activities.

Flour starch damage is slightly lower than last year but continues to be higher than the long term average. Flour yield, on clean wheat basis is 0.5% lower than last year and is consistent with the long term average. However, on a constant 0.50% ash basis, flour yield is 1.0% lower than last year and the long term average. Flour colour is comparable to last year and the long term average. Wet gluten content continues to remain higher than the ten year average.

Farinograph absorption is 2.0% lower than in 2009, but is still 0.6% higher than the long term average for the 13.5% protein segregate. Farinograph dough strength properties for the 13.5% protein segregate appear similar to last year.

Extensograph results indicate dough strength properties that are similar to those seen last year, but weaker than seen over the long term. Alveograph curves are comparable to last year and the ten year average. CSP baking absorption is 1% lower than last year and 2% lower than the ten year average. 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 wheat

Quality data for the 2010 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 2000-2009 are shown in Table 4. As seen with the No. 1 CWRS, test weight values are similar to last year. Kernel weights are considerably lower than 2009 and the ten year average. Wheat ash is slightly higher than last year but consistent with the long term average value. Wheat falling number, α -amylase activity and amylograph peak viscosity values are all indicative of the soundness of this year's wheat crop.

Milling extraction level of the No. 2 grade 13.5% protein composite is comparable to last year on clean wheat basis, but is slightly lower on constant 0.50% ash basis. Overall, milling yields are similar to the ten year average values. Flour grade colour value indicates slightly less brightness than 2009, but is similar to the long term values. Wet gluten content is 0.7% lower this year compared to last but shows a slight improvement over the long term average. Flour starch damage is similar to 2009.

Farinograph absorption is 1.2% lower than 2009 but is equivalent to the long term average. Dough development time is slightly longer than 2009, while stability is slightly shorter. Extensograph values indicate stronger dough properties than last year, with strength closer to the long term average. Alveograph curves for No. 2 CWRS 13.5 have lower W values than last year, but it is important to bear in mind that the higher water absorbing capacity of the 2009 crop may have affected the results. Alveograph values are comparable to the ten year average. The No. 2 CWRS 13.5 tested using the CSP bake method had lower bake absorption than last year and was 4% lower than the ten year average. Mixing requirements were similar to last year, but loaf volume was lower this year by 55 cm³.

Wheat, No. 3 Canada Western Red Spring wheat

Wheat, No. 3 CWRS is not segregated by protein content by the CGC, however, due to the prevalence of this grade two composites were prepared: one at medium-high (13.7%, 13.5% mb) protein content and a second at medium-low (12.8%, 13.5% mb) protein content. The medium-high protein content composite was of comparable protein content to the ten year average for No. 3 CWRS. The data may be found in Table 5.

Both composite samples had test weight of greater than 78 kg/hL. The medium-high protein composite exhibited soundness with falling number of 395 sec, while the medium-low protein composite was somewhat lower at 340 sec. On a

constant 0.50% ash basis both composites suffered reduced milling yields compared with the ten year average for No. 3 CWRS. The 2010 composites both exhibited marginal improvement in flour colour compared to the ten year average. Amylograph peak viscosities of the 2010 composites were consistent with the ten year average value.

Farinograph absorption was 0.7% higher than the long term average for both 2010 composites. The medium-high protein composite showed improved mixing strength over the ten year average at the same flour protein content while the lower protein content of the medium-low protein content composite resulted in shorter dough development time. The 2010 composites both exhibited reduced extensibility and lower maximum height as measured by extensograph. Alveograph results appear to exhibit slightly greater strength than the ten year average, but it is important to consider the impact of the greater water absorbing capacity of the 2010 composites in interpretation of these data.

The 2010 composites both exhibited lower baking absorptions than the ten year average even though they both had higher farinograph absorptions. At comparable protein content, the medium-high protein composite and the ten year average produced loaves with similar mixing requirements and similar volume. As expected, the medium-low composite produced a smaller loaf volume than the ten year average.

Comparative Bühler laboratory mill flour data

Samples of 2010 and cold-stored 2009 harvest survey No. 1 CWRS and No. 2 CWRS 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.

Wheat, No. 1 Canada Western Red Spring

Milling and baking quality

Wheat, No. 1 CWRS 13.5 and 12.5 flour analytical, physical dough properties and baking quality of the straight grade and 60% patent composites are shown in Tables 6 and 7, respectively.

Straight grade and patent flours at both protein levels show lower wet gluten content and starch damage values relative to the composite flours from last year. Flour ash shows an advantage this year, particularly in the patent flours. Flour grade and AGTRON colour values are comparable to those obtained from the 2009 composites.

Farinograph absorption is considerably lower for the 2010 No. 1 CWRS 13.5 and 12.5 flours at both extraction rates. The dough development time and stability for the 2010 No. 1 CWRS 13.5 straight grade flour and patent flour are generally consistent with the 2009 flour. The No. 1 CWRS 12.5 farinograph dough strength for the 2010 straight grade flour and patent flour is also similar to last year.

Sponge-and-dough and CSP baking absorptions for both the 13.5% and 12.5% protein segregates are running 2 to 3% lower than last year. The No. 1 CWRS

13.5 straight grade and patent flours exhibit greater strength using the CSP method with longer mixing times and higher energy requirements this year relative to 2009, while the patent flour also exhibited stronger mixing requirements in the sponge-and-dough formulation. The 2010 No. 1 CWRs 12.5 flours show similar characteristics but to a lesser extent. Loaf volumes for the 13.5% protein segregate showed no significant difference from last year under both baking formulations. The straight grade flour from the 12.5% protein segregate showed significant improvement in loaf volume in the sponge-and – dough formulation.

Noodle Quality

Yellow alkaline noodles

Yellow alkaline noodles were prepared with a 1% *kansui* reagent (9:1 sodium and potassium carbonates) at a 34 % water absorption level. Noodles were prepared in a temperature and humidity controlled laboratory maintained at 23° C +/-2.0°C with relative humidity at 50% +/-2.0%.

Noodles prepared from the 2010 No. 1 13.5% protein patent (60%) flour displayed a slightly improved raw noodle brightness, L*, at both 2 and 24 hours after production, compared to those of 2009 crop (Table 8). Redness or a* values for the 2010 flour were slightly higher than those observed previously. A significant desirable increase in yellowness, b*, was observed in this year's crop as compared to last year at both time periods.

Noodles prepared from the 2010 straight grade flour (74%) exhibited comparable noodle brightness at both 2 and 24 hours to the 2009 straight grade flour noodles (Table 8). As observed for the patent flour noodles, a slight elevation in redness, a*, was detected in the 2010 straight grade flour noodles while the significant improvement in yellowness, b*, was again observed at both time intervals. All 2010 13.5% protein 60% patent cooked noodle colour attributes were found to be equivalent to those of the 2009 crop sample. This year's straight grade (74%) cooked noodles did display a noticeable improvement in brightness as compared to 2009.

Cooked patent noodle texture measurements indicated that the 2010 crop yielded a slight reduction in resistance to compression (RTC) but otherwise was comparable to the 2009 crop year. The 2010 straight grade noodles offered improved recovery compared to 2009 but were consistent with 2009 for all other textural attributes.

Noodles prepared from 2010 No. 1 12.5% patent flour exhibited a slight decrease in brightness, L*, at 2 hours that was more noticeable at 24 hours post production relative to their 2009 counterpart (Table 9). Redness, a*, of the noodle was also slightly higher than 2009 while no difference in yellowness, b* was detected between crop years at either time period. Noodles prepared using the 2010 No. 2 12.5% straight grade flour also reflected the decline in noodle brightness at 2 and 24 hours (Table 9). As observed in the No. 1 flours, elevated redness, a*, was observed in the 2010 straight grade flour noodles compared to 2009 values. This was consistent at both time periods examined. Similar to the No. 1 flours, No. 2 straight grade noodles exhibited improved yellowness, b*, at both 2 and 24 hours compared to their 2009 counterparts.

Examination of cooked patent flour noodle colour indicated that 2010 noodles were significantly brighter than those of 2009, slightly less red, and equivalent in yellowness. The 2010 straight grade noodles also displayed the improved cooked noodle brightness but remained equivalent to 2009 for both a^* and b^* values.

Cooked patent noodles prepared from the 2010 crop material displayed modest improvements in textural attributes to those of 2009. Noodles prepared from the 2010 straight grade flour also yielded improvements in all three texture parameters as compared to 2009.

White salted noodles

Examination of the 2010 No. 1 13.5% wheat protein noodles prepared from the 60% patent flour indicated a reduction in their raw noodle colour brightness, L^* , increased redness, a^* , and elevated yellowness, b^* , values at both 2 and 24 hours after production as compared to the 2009 sample (Table 8).

Noodles prepared from the 2010 straight grade flour (74%) exhibited the same phenomena with a very noticeable increase in b^* as compared to the 2009 noodles (Table 8).

It was of interest to note that both 2010 patent and straight grade cooked noodle colour attributes were essentially comparable to those observed from the 2009 crop material.

Noodle texture characteristics of the white salted noodles prepared from the patent flour were essentially similar, with a modest reduction observed in the 2010 RTC value. Noodles prepared from the 2010 straight grade flour were similar for thickness, RTC and recovery; however, a reduction in noodle bite, MCS, was detected in the 2010 material compared to 2009.

White salted raw noodles prepared with 2010 No. 1 CWRS 12.5 patent (60%) flour displayed reduced noodle brightness at both 2 and 24 hours compared to the 2009 counterpart (Table 9). At both 2 and 24 hours the 2010 noodles displayed higher b^* values than those noodles prepared from 2009 patent flour.

Raw noodles prepared using the 2010 No. 1 CWRS 12.5 straight grade flour also displayed reduced brightness relative to the 2009 noodles at both 2 and 24 hours after production (Table 9). As observed in the patent flours, 2010 raw straight grade noodles showed higher b^* values and a^* values at both time intervals than those prepared from 2009 crop material.

Overall, cooked 2010 noodles, either patent or straight grade displayed equivalent or improved noodle colour attributes as compared to their 2009 counterparts.

Examination of the cooked 2010 noodle texture characteristics of patent noodles indicated similar thickness, RTC and recovery although a slight reduction in noodle bite, MCS, was observed. Straight grade noodles (2010) displayed a modest improvement in all texture characteristics relative to the 2009 material.

Wheat, No. 2 Canada Western Red Spring wheat

Milling and baking quality

Wheat, No. 2 CWRS 13.5 and 12.5 flour analytical, physical dough properties and baking quality of the 74% straight grade and 60% patent composites are shown in Tables 10 and 11, respectively.

Wet gluten content for the 13.5% protein segregate is 0.9% lower for the 2010 60% patent flour, while the 2010 straight grade flour wet gluten is similar to 2009. For the 12.5% protein segregate both the straight grade and 60% patent flours are 0.5% lower than last year. Ash contents are unchanged from last year with the exception of the No. 2 CWRS 13.5 60% patent flour, which is 0.01% higher than last year. Flour grade colour and Agtron colour are similar to last year for straight grade flour but show considerable improvement over 2009 for the No. 2 CWRS 13.5 60% patent flours. Consistent with trends seen in the Allis Chalmers millings, starch damage is lower for the 2010 straight grade and patent flours compared with the corresponding 2009 flours. Amylograph peak viscosities are indicative of sound wheat again this year. Farinograph absorptions are running 2.2% to 3.0% lower this year, partially as the result of lower starch damage. In all cases, there is improvement in farinograph stability over last year.

Sponge and dough bake tests were conducted to compare the 2010 and 2009 No. 2 CWRS straight grade and patent flours. Both the straight grade and patent flours from the 2010 crop exhibited slightly lower bake absorptions compared with 2009. The 2010 flours, however, had bake absorptions that deviated considerably less from farinograph absorption than the corresponding 2009 flours. The 2010 and 2009 13.5% protein straight grade flours and 12.5% patent flours had similar dough mixing characteristics and produced similar loaf volumes. The 2010 No. 2 CWRS 13.5 60% patent flour and 2010 No. 2 CWRS 12.5 straight grade flour demonstrated somewhat stronger dough mixing characteristics, but similar loaf volume to the 2009.

Bake absorptions obtained using the CSP formulation were lower than last year by 1% to 3%. In general, the 2010 flours were stronger mixing than their corresponding 2009 flours and produced loaves with improved appearance. Loaf volumes were not significantly different from last year with the exception that the 60% patent flour from the 13.5% protein segregate produced larger volume loaves. All flours exhibited excellent crumb colour.

Noodle Quality

Yellow alkaline noodles

Raw alkaline noodles prepared from the 2010 No. 2 CWRS 13.5 60% patent flour displayed a loss in noodle brightness, L^* at both 2 and 24 hours after production as compared to their 2009 counterparts (Table 12). Redness, a^* , was slightly elevated at 2 hrs but was comparable with the 2009 noodles at 24 hours. Yellowness, b^* , of the 2010 patent flour noodles displayed a desirable higher b^* value 2 hours after production, which then was comparable to the 2009 noodle after aging for 24 hours. Noodles prepared from the 2010 No. 2 CWRS 13.5 straight grade flour also displayed a significant reduction in noodle brightness at both 2 and 24 hours when assessed against the 2009 control noodles. A

modest increase in redness a^* was observed at 2 hours which increased significantly by 24 hours after production relative to the 2009 material. Similar to the patent flour noodles, the straight grade flour noodles displayed a desirable increase in noodle yellowness, b^* , at 2 hours, which was significantly better than the 2009 noodles upon aging for 24 hours.

Cooked No. 2 CWRS 13.5 patent noodles showed a slight improvement in noodle brightness and a modest increase in noodle redness, while exhibiting a comparable b^* value relative to their 2009 counterpart. Straight grade noodles were similar to the 2009 noodles for all three colour attributes. Patent flour cooked noodle texture was comparable to the 2009 noodles although an improvement in noodle bite, MCS, was observed in the 2010 sample. The improved cooked 2010 noodle texture was also evident in the straight grade flours with higher recovery and bite attributes.

Alkaline noodles prepared from the 2010 No. 2 CWRS 12.5% protein 60% patent flour exhibited a decrease in noodle brightness, L^* at both 2 and 24 hours after production when compared to their 2009 counterparts (Table 13). Redness, a^* , was comparable with the 2009 noodles at both time periods. Yellowness, b^* , of the 2010 No. 2 CWRS 12.5 patent flour noodles also displayed a desirable significantly higher, b^* value 2 hours after production and when aged for 24 hours. Noodles prepared from the 2010 No. 2 CWRS 12.5 straight grade flour displayed a modest reduction in noodle brightness at 2 hours but were slightly better than the 2009 noodles at 24 hours after production. An increase in noodle redness, a^* , was observed at 2 and 24 hours after production. The straight grade flour noodles displayed a desirable, slightly elevated noodle yellowness, b^* , at 2 hours but remained comparable to the 2009 noodles after aging.

The 2010 No. 2 CWRS 12.5 cooked patent flour noodles showed improved brightness and redness while remaining comparable to the 2009 noodles in yellowness. The 2010 straight grade flour cooked noodles also exhibited a slight improvement in brightness but remained comparable to the 2009 material for cooked noodle redness and yellowness. Cooked 2010 No. 2 CWRS 12.5 patent flour noodle texture exhibited improvement in all three texture attributes when compared to 2009 material. A more modest improvement in 2010 straight grade noodle cooked texture attributes was observed, particularly in recovery, relative to the 2009 noodle counterpart.

White salted noodles

Raw white salted noodles prepared from the 2010 13.5% protein 60% patent flour displayed comparable noodle brightness, L^* , at 2 hours after production and a slight improvement at 24 hours compared to their 2009 counterpart (Table 12). Redness, a^* , and yellowness, b^* , were almost identical to the 2009 noodles at both time periods.

Noodles prepared from the 2010 straight grade flour displayed a significant reduction in noodle brightness at both 2 and 24 hours when assessed against the 2009 control noodles while redness was similar to the 2009 material. No difference was found in noodle yellowness at 2 hours but a desirable, slightly lower b^* was detected in the 2010 noodles 24 hours after production.

Cooked patent noodles showed a similar noodle brightness, a modest improvement in noodle redness, while exhibiting a comparable b^* value relative to their 2009 counterpart. Straight grade noodles were similar to the 2009 noodles for all three colour attributes although a slight increase in redness was observed.

Patent flour cooked noodle texture was generally comparable to the 2009 noodles however a decrease in RTC was observed in the 2010 sample. Surprisingly, the cooked 2010 straight grade white salted noodle texture was significantly better than that of the 2009 noodles for all three texture attributes.

White salted raw noodles prepared from the 2010 No. 2 12.5% protein 60% patent flour exhibited a similar brightness, L^* , at 2 and 24 hours after production when compared to their 2009 counterparts (Table 13). Redness, a^* , was comparable with the 2009 noodles at both time periods while yellowness, b^* , of the No. 2 2010 patent flour noodles displayed a more desirable, lower, b^* value immediately after production, becoming comparable to the 2009 noodles when aged for 24 hours.

Noodles prepared from the 2010 straight grade flour displayed a modest reduction in noodle brightness at both 2 and 24 hours. A slight increase in redness was observed at 24 hours after production while the 2010 straight grade flour noodle yellowness remained comparable to the 2009 noodles at both time periods studied.

The 2010 cooked patent flour noodles showed identical noodle brightness and a modest improvement in both redness and yellowness relative to the 2009 noodles. The 2010 straight grade flour cooked noodles also exhibited a slight improvement in brightness but remained comparable to the 2009 material for cooked noodle redness and yellowness.

Cooked patent 2010 noodle texture exhibited improvement for all three texture attributes when compared to 2009 material. This trend was also observed for the 2010 straight grade noodle cooked texture attributes, most noticeably in noodle bite, MCS.

Table 3 - Wheat, No. 1 Canada Western Red Spring
Quality data for 2010 harvest sample grade composites compared to 2009 and 2000-2009 mean

Quality parameter ¹	Minimum protein content		No. 1 CWRS 13.5	
	13.5	12.5	2009	2000-09 mean
Wheat				
Test weight, kg/hL	81.3	81.4	82.1	81.6
Weight per 1000 kernels, g	32.9	34.1	35.3	32.0
Protein content, %	13.9	12.9	13.8	13.8
Protein content, % (dry matter basis)	16.1	15.0	15.9	16.0
Ash content, %	1.52	1.51	1.53	1.56
α -amylase activity, units/g	3.0	4.0	2.0	4.0
Falling number, s	465	445	425	397
PSI, %	50	50	50	52
Milling				
Flour yield				
Clean wheat basis, %	75.5	75.7	76.0	75.5
0.50% ash basis, %	75.5	75.2	76.5	76.5
Flour				
Protein content, %	13.3	12.2	13.3	13.2
Wet gluten content, %	36.7	33.5	37.3	35.9
Ash content, %	0.50	0.51	0.49	0.48
Grade colour, Satake units	-2.4	-2.7	-2.2	-2.2
AGTRON colour, %	76	78	74	77
Starch damage, %	8.5	9.1	8.9	8.0
α -amylase activity, units/g	0.5	1.0	1.0	1.2
Amylograph peak viscosity, BU	735	670	600	646
Maltose value, g/100g	2.6	2.8	2.8	2.6
Farinogram				
Absorption, %	67.4	67.0	69.4	66.8
Development time, min	6.00	5.25	6.00	6.32
Mixing tolerance index, BU	15	30	20	26
Stability, min	10.0	9.5	9.5	10.3
Extensogram				
Length, cm	20	19	21	21
Height at 5 cm, BU	280	300	260	326
Maximum height, BU	465	470	425	601
Area, cm ²	125	115	115	163
Alveogram				
Length, mm	109	84	105	111
P (height x 1.1), mm	138	150	150	127
W, x 10 ⁻⁴ joules	486	432	493	476
Baking (Canadian short process baking test)				
Absorption, %	67	67	68	69 ²
Mixing energy, W-h/kg	7.0	7.0	8.5	6.6 ²
Mixing time, min	4.3	4.4	3.6	3.9 ²
Loaf volume, cm ³ /100 g flour	1110	1030	1120	1110 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 Mean of data generated starting in 2004.

Table 4 – Wheat, No. 2 Canada Western Red Spring
Quality data for 2010 harvest sample grade composites compared to 2009 and 2000-2009 mean

Quality parameter ¹	Minimum protein content		No. 2 CWRS 13.5	
	13.5	12.5	2009	2000-2009 mean
Wheat				
Test weight, kg/hL	80.0	80.3	81.0	80.5
Weight per 1000 kernels, g	31.7	34.1	35.3	33.5
Protein content, %	13.9	13.0	13.7	13.7
Protein content, % (dry matter basis)	16.1	15.0	15.9	15.9
Ash content, %	1.61	1.63	1.56	1.62
α -amylase activity, units/g	5.5	5.0	3.0	5.2
Falling number, s	430	430	410	388
PSI, %	52	52	51	53
Milling				
Flour yield				
Clean wheat basis, %	75.8	75.7	76.0	75.5
0.50% ash basis, %	75.3	75.2	76.0	75.5
Flour				
Protein content, %	13.3	12.3	13.1	13.2
Wet gluten content, %	36.6	33.0	37.3	35.9
Ash content, %	0.51	0.51	0.50	0.50
Grade colour, Satake units	-1.8	-2.2	-2.2	-1.9
AGTRON colour, %	75	78	75	74
Starch damage, %	8.2	8.7	8.3	8.0
α -amylase activity, units/g	1.5	1.0	1.0	1.8
Amylograph peak viscosity, BU	610	635	520	520
Maltose value, g/100g	2.7	2.7	2.6	2.6
Farinogram				
Absorption, %	66.8	66.3	68.0	66.8
Development time, min	6.00	5.00	5.50	6.00
Mixing tolerance index, BU	35	25	20	27
Stability, min	8.5	8.5	10.0	9.4
Extensogram				
Length, cm	20	19	21	21
Height at 5 cm, BU	305	300	250	305
Maximum height, BU	515	500	435	555
Area, cm ²	130	125	120	160
Alveogram				
Length, mm	109	98	126	120
P (height x 1.1), mm	133	141	140	124
W, x 10 ⁻⁴ joules	477	464	527	488
Baking (Canadian short process baking test)				
Absorption, %	66	66	68	70 ²
Mixing energy, W-h/kg	7.0	6.2	8.2	6.8 ²
Mixing time, min	4.2	4.3	3.7	3.9 ²
Loaf volume, cm ³ /100 g flour	1080	1050	1135	1120 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 Mean of data generated starting in 2004.

Table 5 – Wheat, No. 3 Canada Western Red Spring
Quality data for 2010 harvest sample grade composites compared to 2009 and 2000-2009 mean

Quality parameter ¹	Medium-high protein	Medium-low protein	2000-2009 mean
Wheat			
Test weight, kg/hL	78.3	78.8	79.5
Weight per 1000 kernels, g	31.4	33.5	34.3
Protein content, %	13.7	12.8	13.8
Protein content, % (dry matter basis)	15.9	14.7	16.0
Ash content, %	1.65	1.66	1.63
Falling number, s	395	340	351
PSI, %	54	51	53
Milling			
Flour yield			
Clean wheat basis, %	74.4	74.7	74.9
0.50% ash basis, %	73.4	74.2	74.9
Flour			
Protein content, %	13.1	12.1	13.1
Wet gluten content, %	36.5	33.3	36.0
Ash content, %	0.52	0.51	0.50
Grade colour, Satake units	-1.7	-1.9	-1.4
AGTRON colour, %	73	74	71
Starch damage, %	8.6	9.0	8.0
Amylograph peak viscosity, BU	365	350	366
Maltose value, g/100g	2.8	3.0	2.8
Farinogram			
Absorption, %	67.6	67.6	66.9
Development time, min	6.25	4.75	5.40
Mixing tolerance index, BU	30	30	32
Stability, min	9.0	8.0	8.0
Extensogram			
Length, cm	19	19	22
Height at 5 cm, BU	300	280	296
Maximum height, BU	475	440	519
Area, cm ²	120	110	152
Alveogram			
Length, mm	105	89	124
P (height x 1.1), mm	138	152	121
W, x 10 ⁻⁴ joules	472	452	432
Baking (Canadian short process baking test)			
Absorption, %	67	67	69 ²
Mixing energy, W-h/kg	6.5	6.0	6.8 ²
Mixing time, min	4.0	4.0	3.8 ²
Loaf volume, cm ³ /100 g flour	1085	1010	1104 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 Mean of data generated starting in 2004.

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 - 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Flour¹				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.0	13.0	12.6	12.6
Wet gluten content, %	36.4	37.3	35.9	37.0
Ash content, %	0.39	0.40	0.35	0.37
Grade colour, Satake units	-3.7	-3.6	-4.2	-4.2
AGTRON colour, %	89	88	96	95
Amylograph peak viscosity, BU	800	750	855	815
Starch damage, %	6.3	7.3	6.6	7.3
Farinogram				
Absorption, %	63.0	66.3	63.3	66.4
Development time, min	8.25	8.25	11.50	10.25
Mixing tolerance index, BU	15	20	15	0
Stability, min	22.0	21.5	27.0	26.0
Sponge-and-dough baking test (40 ppm ascorbic acid)				
Absorption, %	61	64	62	65
Mixing energy dough stage, W-h/kg	4.9	4.9	5.5	4.6
Mixing time dough stage, min	2.8	2.8	3.3	2.8
Loaf volume, cm ³ /100 g flour	1085	1075	1055	1040
Appearance	7.5	7.4	7.5	7.4
Crumb structure	6.0	5.6	6.0	5.9
Crumb colour	7.8	7.8	7.8	7.8
Canadian short process baking test (150 ppm ascorbic acid)				
Absorption, %	64	66	64	66
Mixing energy, W-h/kg	6.3	5.3	7.1	5.6
Mixing time, min	4.0	3.6	4.4	3.8
Loaf volume, cm ³ /100 g flour	1080	1065	1095	1065
Appearance	7.4	7.4	7.2	7.4
Crumb structure	6.0	6.0	6.2	6.2
Crumb colour	7.9	7.8	7.9	7.9

* The 2009 composite was stored and milled the same day as the 2010.

1 Data reported on 14.0% moisture basis.

**Table 7 – Wheat, No. 1 Canada Western Red Spring – 12.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data – 2010 and 2009 harvest sample composites***

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Flour¹				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.0	11.9	11.7	11.7
Wet gluten content, %	33.1	34.0	32.5	33.2
Ash content, %	0.40	0.41	0.36	0.38
Grade colour, Satake units	-3.7	-3.7	-4.4	-4.4
AGTRON colour, %	91	91	98	97
Amylograph peak viscosity, BU	785	710	850	785
Starch damage, %	6.8	7.7	7.0	7.8
Farinogram				
Absorption, %	62.9	65.5	62.7	65.6
Development time, min	5.75	6.50	8.25	8.75
Mixing tolerance index, BU	20	20	15	5
Stability, min	20.5	22.5	33.0	29.5
Sponge-and-dough baking test (40 ppm ascorbic acid)				
Absorption, %	61	63	62	63
Mixing energy dough stage, W-h/kg	4.7	4.2	5.1	4.0
Mixing time dough stage, min	2.9	2.7	3.4	2.8
Loaf volume, cm ³ /100 g flour	1040	985	990	955
Appearance	7.4	7.2	7.2	7.3
Crumb structure	5.7	5.9	6.0	6.0
Crumb colour	7.8	7.8	7.8	7.8
Canadian short process baking test (150 ppm ascorbic acid)				
Absorption, %	63	65	62	65
Mixing energy, W-h/kg	6.2	5.6	6.3	5.7
Mixing time, min	4.1	3.6	4.4	3.7
Loaf volume, cm ³ /100 g flour	1000	1030	1020	995
Appearance	7.1	7.4	7.4	7.2
Crumb structure	6.2	6.2	6.0	6.0
Crumb colour	7.8	7.8	7.8	7.8

* The 2009 composite was stored and milled the same day as the 2010.

¹ Data reported on 14.0% moisture basis.

Table 8 – Wheat, No. 1 Canada Western Red Spring – 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.0 (75.1)	81.3 (75.4)	82.4 (77.8)	81.7 (77.1)
Redness, a*	-0.12 (0.34)	-0.24 (0.08)	0.01 (0.24)	-0.16 (-0.12)
Yellowness, b*	27.6 (28.5)	26.4 (27.2)	27.2 (28.2)	26.3 (27.0)
Cooked colour				
Brightness, L*	69.9	68.9	70.4	70.6
Redness, a*	-2.04	-1.94	-2.07	-2.20
Yellowness, b*	28.0	28.3	28.4	28.1
Texture				
Thickness, mm	2.31	2.34	2.33	2.30
RTC, %	22.4	22.6	22.1	23.3
Recovery, %	34.0	33.3	33.4	33.5
MCS, g/mm ²	30.5	30.9	30.8	30.8
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.4 (76.0)	82.7 (76.3)	83.0 (77.1)	83.7 (78.2)
Redness, a*	2.61 (3.27)	2.37 (3.13)	2.29 (2.91)	2.16 (2.61)
Yellowness, b*	24.2 (25.3)	21.6 (24.0)	23.4 (26.4)	22.1 (25.0)
Cooked colour				
Brightness, L*	76.0	75.7	76.9	76.5
Redness, a*	0.80	0.74	0.52	0.54
Yellowness, b*	20.0	19.5	20.0	19.8
Texture				
Thickness, mm	2.46	2.49	2.41	2.50
RTC, %	18.1	18.4	17.8	18.3
Recovery, %	26.1	26.6	26.1	26.3
MCS, g/mm ²	26.9	27.8	27.9	27.9

* The 2009 composite was stored and milled the same day as the 2010.

Table 9 – Wheat, No. 1 Canada Western Red Spring – 12.5% protein segregate
Noodle quality data
Comparative Buhler mill data – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.6 (75.0)	81.9 (76.2)	83.4 (78.1)	83.9 (79.4)
Redness, a*	-0.23 (0.14)	-0.36 (0.03)	-0.29 (-0.03)	-0.54 (-0.42)
Yellowness, b*	27.8 (28.5)	26.8 (28.0)	26.6 (28.0)	26.5 (27.6)
Cooked colour				
Brightness, L*	69.7	68.5	70.8	69.5
Redness, a*	-1.99	-1.91	-2.15	-1.88
Yellowness, b*	29.4	29.1	29.3	29.5
Texture				
Thickness, mm	2.25	2.34	2.24	2.30
RTC, %	21.6	21.0	22.0	21.4
Recovery, %	32.6	32.2	32.9	32.3
MCS, g/mm ²	27.4	28.3	28.3	27.7
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.8 (75.7)	83.7 (77.6)	83.6 (78.5)	85.0 (79.5)
Redness, a*	2.40 (2.81)	2.24 (2.76)	1.97 (2.52)	1.89 (2.41)
Yellowness, b*	24.9 (24.4)	22.8 (24.0)	23.0 (25.5)	22.0 (24.7)
Cooked colour				
Brightness, L*	76.4	75.3	76.3	76.6
Redness, a*	0.63	0.63	0.43	0.41
Yellowness, b*	20.1	20.1	20.5	20.2
Texture				
Thickness, mm	2.41	2.48	2.45	2.49
RTC, %	18.1	17.4	16.9	17.1
Recovery, %	26.2	25.9	25.5	25.4
MCS, g/mm ²	24.7	23.8	24.8	25.8

* The 2009 composite was stored and milled the same day as the 2010.

Table 10 – 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 – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Flour¹				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	13.0	12.8	12.6	12.6
Wet gluten content, %	36.5	36.6	35.2	36.1
Ash content, %	0.40	0.40	0.36	0.35
Grade colour, Satake units	-3.4	-3.4	-4.3	-4.1
AGTRON colour, %	87	88	98	93
Amylograph peak viscosity, BU	700	660	755	710
Starch damage, %	6.2	7.0	6.4	7.1
Farinogram				
Absorption, %	63.1	65.7	62.6	65.6
Development time, min	6.25	7.50	11.00	7.50
Mixing tolerance index, BU	15	30	10	15
Stability, min	12.5	11.0	34.5	23.5
Sponge-and-dough baking test (40 ppm ascorbic acid)				
Absorption, %	62	63	62	64
Mixing energy dough stage, W-h/kg	4.3	4.7	5.4	4.1
Mixing time dough stage, min	2.7	2.7	3.3	2.6
Loaf volume, cm ³ /100 g flour	1045	1075	1045	1035
Appearance	7.4	7.5	7.3	7.7
Crumb structure	6.0	6.0	6.0	6.0
Crumb colour	7.8	7.9	7.7	7.5
Canadian short process baking test (150 ppm ascorbic acid)				
Absorption, %	64	65	64	66
Mixing energy, W-h/kg	7.2	6.3	7.4	6.0
Mixing time, min	4.5	3.8	4.6	3.8
Loaf volume, cm ³ /100 g flour	1080	1055	1105	1050
Appearance	7.7	7.4	7.9	7.5
Crumb structure	6.3	6.2	6.0	6.2
Crumb colour	7.9	7.9	7.8	7.8

* The 2009 composite was stored and milled the same day as the 2010.

¹ Data reported on 14.0% moisture basis.

Table 11 – Wheat, No. 2 Canada Western Red Spring – 12.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Flour¹				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.0	11.9	11.7	11.7
Wet gluten content, %	32.7	33.2	32.3	32.8
Ash content, %	0.40	0.40	0.36	0.36
Grade colour, Satake units	-3.8	-3.7	-4.7	-4.4
AGTRON colour, %	90	89	98	97
Amylograph peak viscosity, BU	715	565	780	630
Starch damage, %	6.4	7.2	6.6	7.5
Farinogram				
Absorption, %	62.4	64.6	62.3	64.5
Development time, min	6.50	5.25	11.50	7.50
Mixing tolerance index, BU	20	30	10	20
Stability, min	14.5	9.5	33.0	27.0
Sponge-and-dough baking test (40 ppm ascorbic acid)				
Absorption, %	62	63	62	64
Mixing energy dough stage, W-h/kg	5.1	3.9	5.0	4.8
Mixing time dough stage, min	3.1	2.6	3.3	3.1
Loaf volume, cm ³ /100 g flour	1020	1010	1025	1010
Appearance	7.5	7.5	7.6	7.1
Crumb structure	6.2	5.7	6.2	5.9
Crumb colour	7.8	7.7	7.9	7.5
Canadian short process baking test (150 ppm ascorbic acid)				
Absorption, %	63	65	62	65
Mixing energy, W-h/kg	6.0	6.2	7.3	6.3
Mixing time, min	4.1	3.9	4.6	4.0
Loaf volume, cm ³ /100 g flour	1060	1025	1025	1000
Appearance	7.5	7.7	7.7	7.4
Crumb structure	6.2	6.0	6.0	6.0
Crumb colour	7.9	7.9	7.8	7.8

* The 2009 composite was stored and milled the same day as the 2010.

¹ Data reported on 14.0% moisture basis.

Table 12 – Wheat, No. 2 Canada Western Red Spring – 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.0 (74.7)	81.7 (75.9)	82.0 (76.7)	82.8 (77.6)
Redness, a*	0.03 (0.62)	-0.1 (0.25)	-0.03 (0.17)	-0.13 (0.15)
Yellowness, b*	26.8 (28.2)	26.0 (26.8)	26.3 (27.4)	25.5 (27.2)
Cooked colour				
Brightness, L*	69.5	69.2	71.7	70.9
Redness, a*	-2.09	-2.00	-2.37	-2.18
Yellowness, b*	27.6	28.0	28.3	28.5
Texture				
Thickness, mm	2.28	2.30	2.25	2.32
RTC, %	22.8	22.8	22.6	22.6
Recovery, %	33.5	32.8	33.1	33.1
MCS, g/mm ²	31.6	29.7	31.0	30.3
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.4 (74.4)	82.8 (75.8)	82.8 (77.7)	82.7 (76.3)
Redness, a*	2.53 (3.27)	2.52 (3.32)	2.22 (2.69)	2.27 (2.71)
Yellowness, b*	23.0 (23.7)	22.9 (24.5)	23.5 (24.6)	23.6 (24.8)
Cooked colour				
Brightness, L*	75.3	75.2	76.3	76.3
Redness, a*	0.87	0.80	0.52	0.64
Yellowness, b*	19.5	19.5	19.6	19.8
Texture				
Thickness, mm	2.49	2.49	2.47	2.48
RTC, %	18.9	16.5	16.9	18.1
Recovery, %	26.1	24.9	25.5	25.7
MCS, g/mm ²	29.9	24.2	27.3	27.0

* The 2009 composite was stored and milled the same day as the 2010.

Table 13 – Wheat, No. 2 Canada Western Red Spring – 12.5% protein segregate
Noodle quality data
Comparative Buhler mill data – 2010 and 2009 harvest sample composites*

Quality parameter	74% Straight grade		60% Patent	
	2010	2009	2010	2009
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	82.1 (77.2)	82.7 (76.4)	83.6 (79.4)	84.1 (79.7)
Redness, a*	-0.22 (0.20)	-0.37 (0.15)	-0.31 (-0.04)	-0.35 (-0.05)
Yellowness, b*	26.9 (28.0)	26.4 (28.0)	26.8 (27.9)	24.8 (27.0)
Cooked colour				
Brightness, L*	70.0	69.3	70.9	69.6
Redness, a*	-2.05	-2.05	-2.21	-2.10
Yellowness, b*	28.8	28.8	28.9	29.0
Texture				
Thickness, mm	2.19	2.29	2.25	2.33
RTC, %	21.6	21.1	21.2	20.4
Recovery, %	32.5	31.5	32.6	31.1
MCS, g/mm ²	27.0	27.1	28.3	26.9
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	82.0 (76.1)	82.7 (76.5)	83.7 (77.9)	83.5 (78.1)
Redness, a*	2.27 (2.95)	2.31 (2.88)	2.06 (2.42)	2.10 (2.38)
Yellowness, b*	23.0 (24.0)	23.1 (24.4)	22.5 (25.0)	23.2 (24.7)
Cooked colour				
Brightness, L*	75.9	75.3	76.6	76.6
Redness, a*	0.64	0.62	0.31	0.45
Yellowness, b*	19.6	19.6	19.7	20.1
Texture				
Thickness, mm	2.38	2.49	2.43	2.44
RTC, %	17.9	17.4	18.1	17.5
Recovery, %	26.6	25.6	26.3	25.2
MCS, g/mm ²	26.6	25.1	26.6	24.5

* The 2009 composite was stored and milled the same day as the 2010.

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 2009 and for the previous 10 years (2000-2009). Figure 3 shows the variation in annual mean protein content since 1963.

The average protein content of the 2010 durum crop at 12.7% is 0.1% lower than 2009 and 0.4% lower than the 10-year mean. Insufficient samples were available of No. 1 CWAD to provide reliable data, therefore no data are presented for No. 1 CWAD for the 2010 crop year. Wheat, No. 2 CWAD protein content is 0.1% lower than last year and 0.4% lower than the 10-year mean. 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 2010 variety survey information indicates that the variety Strongfield remains the most popular variety with western Canadian producers representing 61.2% of the seeded area. AC Avonlea represents 18% of the seeded hectares. Kyle continued to decline in production, decreasing to 6.2%. AC Navigator production increased to 12% from 9.9%. AC Morse accounts for 1% of the seeded hectares. The extra-strong durum variety Commander accounted for 0.4% 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 color similar to AC Avonlea.

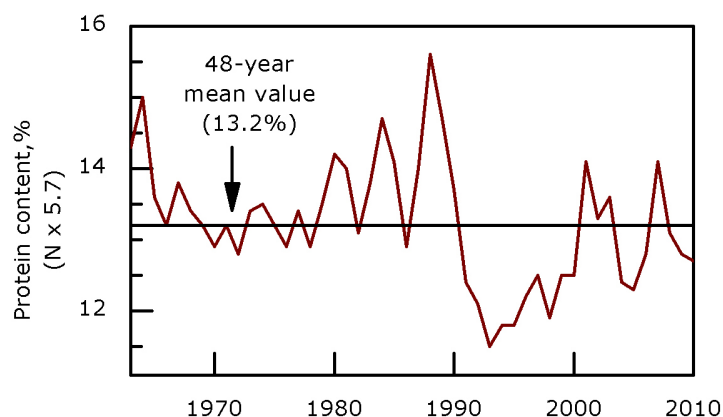
Table 14 – Mean protein content of 2010 Canada Western Amber Durum wheat, by grade with comparisons to 2009 and the 10-year mean

Grade	Protein content, % ¹		
	2010	2009	2000-2009
Wheat, No. 1 Canada Western Amber Durum	N/A	12.9	13.4
Wheat, No. 2 Canada Western Amber Durum	12.7	12.8	13.1
Wheat, No. 3 Canada Western Amber Durum	12.7	12.8	13.1
All milling grades	12.7	12.8	13.1

¹ N x 5.7; 13.5% moisture content basis

N/A = not available

Figure 3 – Mean protein content of Canada Western Amber Durum wheat – 1963-2010



Wheat and pasta processing quality

Insufficient samples were available of No. 1 CWAD to provide reliable data therefore no data are presented for No. 1 CWAD for the 2010 crop year. Data describing the quality characteristics for composite samples of Wheat, No. 2 and No. 3 CWAD for the 2010 crop are shown in Table 15. Corresponding data for 2009 No. 2 CWAD composites and mean values for the previous ten years (2000-2009) are provided for comparison.

Wheat, No. 2 Canada Western Amber Durum

The primary degrading factors in the 2010 No. 2 CWAD were mildew, frost, green, and smudge. No. 2 CWAD protein content was 12.7%, similar to last year. Test weight values are comparable to 2009 for the No. 2 grade. Weight per 1000 kernels is lower than 2009, and slightly lower than the 10-year mean data. Hard vitreous kernel count is lower than 2009, and is marginally higher than the ten year average. Falling number values for both wheat and semolina are indicative of sound kernel characteristics.

Total milling yield and semolina yield for No. 2 CWAD are similar to last year and show some improvement over the ten year average. Wheat ash is unchanged from 2009 for No. 2 CWAD and is lower than the ten year average. Semolina ash is marginally higher than last year but is lower than what has been seen over the long term. Speck counts are considerably lower than in 2009 and are comparable to the ten-year mean. This was unexpected given the predominant grading factors (mildew, frost, green) encountered this year. Overall milling quality of the 2010 crop is consistent with expectations for No. 2 CWAD.

Semolina protein content is slightly higher than last year due to reduced protein loss during milling. Wet and dry gluten content for No. 2 CWAD are slightly lower than values observed in 2009 even though the semolina protein content is 0.3% higher. Gluten index and Alveograph P and W values demonstrate improved strength characteristics compared to 2009 and the ten year average. The superior gluten strength of CWAD in recent years 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.

Agtron values are lower than last year's results for No. 2 CWAD semolina. Semolina brightness, as indicated by L* value, is comparable to 2009. Wheat yellow pigment values for No. 2 CWAD show a slight decrease this year over the previous crop as does the semolina yellow pigment, but both show slight improvement over the ten year average. Overall, CWAD exhibits a significant improvement over long term average values resulting from continued breeding emphasis placed on increasing yellow pigment levels in new varieties. Semolina b* values also are comparable to 2009 and represent an improvement over the long term mean. Semolina redness or a* values are comparable to the long term mean.

Spaghetti brightness for No. 2 CWAD is comparable to 2009. Spaghetti a* values are similar to last year for No. 2 CWAD indicating reduced redness development during drying. Spaghetti b* value has declined slightly relative to last year. These results suggest that pasta from the 2010 crop should have similar colour in terms of yellowness and redness.

Wheat, No. 3 Canada Western Amber Durum

Due to the poor weather during the growing season, a significant amount of 2010 durum cop was downgraded to No. 3 CWAD or lower. The primary degrading factors in the No. 3 CWAD are mildew, frost, fusarium, green, and smudge. Data describing the quality of No. 3 CWAD can be found in Table 15. Protein content of No. 3 CWAD is similar to that of No. 2 CWAD. Test weight of No. 3 CWAD was slightly lower than that of No. 2 CWAD. Weight per 1000 kernels is comparable for the two grades. Hard vitreous kernel count is lower in No. 3 CWAD at 75%, but still well above grade requirement (> 40%). The falling number value of No. 3 CWAD is 280 sec., indicating relatively sound kernel characteristics, however it is significantly lower than that of No. 2 CWAD due to the presence of grading factors related to the delayed development of the crop and excessive moisture present through most of the growing season.

Total milling yield and semolina yield for No. 3 CWAD are slightly lower than those of No. 2 CWAD. Both wheat ash and semolina ash are moderately higher than No. 2 CWAD. Speck counts are considerably higher than in No. 2 CWAD because of the higher tolerances allowed in No. 3 CWAD for grading factors affecting speckiness. Overall milling quality is consistent with expectations for No. 3 CWAD.

Semolina protein content, wet and dry gluten content are essentially the same as those of No. 2 CWAD. Gluten index values are the same for both grades.

Alveograph P and W values demonstrate somewhat weaker strength characteristics for No. 3 CWAD.

Agtron value is lower in No. 3 CWAD semolina. Semolina brightness (L^*) and redness (a^*) are comparable to No. 2 CWAD. Semolina yellowness (b^*) is slightly lower in No. 3 CWAD, although yellow pigment content in the semolina is the same for both grades.

Table 15 – Wheat, No. 2 and No. 3 Canada Western Amber Durum
Quality data for 2010 harvest sample grade composites compared to 2009 and 2000-2009
mean*

Quality parameter ¹	No. 2 CWAD			No. 3 CWAD
	2010	2009	2000-09 mean	2010
Wheat				
Test weight, kg/hL	82.0	82.3	81.9	80.5
Weight per 1000 kernels, g	41.4	46.3	42.6	42.0
Vitreous kernels, %	85	89	83	75
Protein content, %	12.7	12.6	13.0	12.6
Protein content, % (dry matter basis)	14.7	14.5	15.1	14.5
Ash content, %	1.55	1.55	1.58	1.64
Yellow pigment content, ppm	8.9	9.6	8.7	9.3
Falling number, s	350	390	381	280
Milling yield, %	75.5	75.3	75.1	74.7
Semolina yield, %	66.7	67.1	66.1	65.9
PSI, %	37	37	38	39
Semolina				
Protein content, %	11.9	11.6	12.0	11.8
Wet gluten content, %	29.8	31.4	30.6	29.6
Dry gluten content, %	10.5	11.0	10.7	10.5
Gluten index, %	64	42	39	65
Ash content, %	0.64	0.62	0.66	0.66
Yellow pigment content, ppm	8.5	8.9	8.2	8.5
AGTRON colour, %	74	78	79	70
CIELAB colour				
Brightness, L*	86.7	86.8	87.3	86.5
Redness, a*	-2.9	-3.0	-2.9	-3.0
Yellowness, b*	33.1	33.0	32.6	32.2
Speck count per 50 cm ²	34	43	32	45
Falling number, s	395	505	462	335
Alveogram				
Length, mm	86	86	89	90
P (height x 1.1), mm	73	65	56	63
P/L	0.9	0.8	0.6	0.7
W, x 10 ⁻⁴ joules	196	160	135	166
Spaghetti – Dried at 70°C				
CIELAB colour				
Brightness, L*	76.5	77.0	76.8	N/A
Redness, a*	2.3	2.2	2.8	N/A
Yellowness, b*	61.7	62.6	65.6	N/A

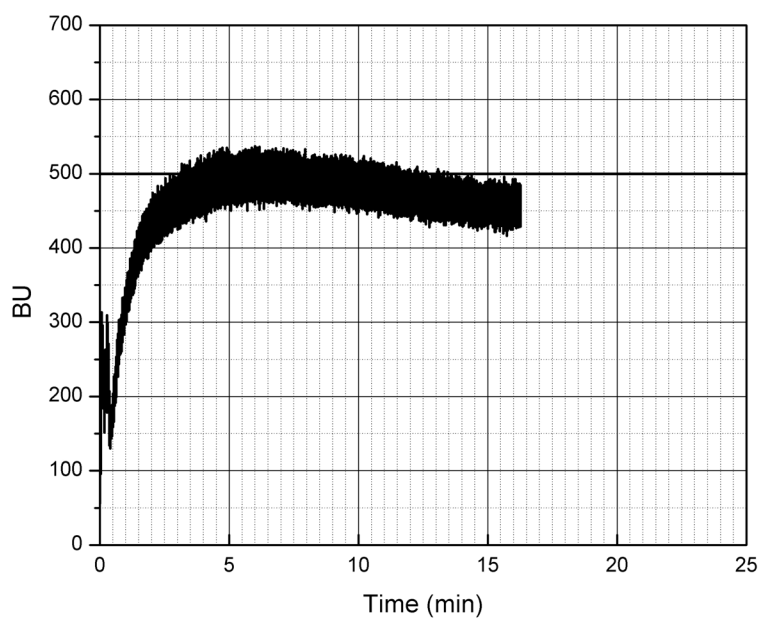
¹ Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.

N/A - Not available

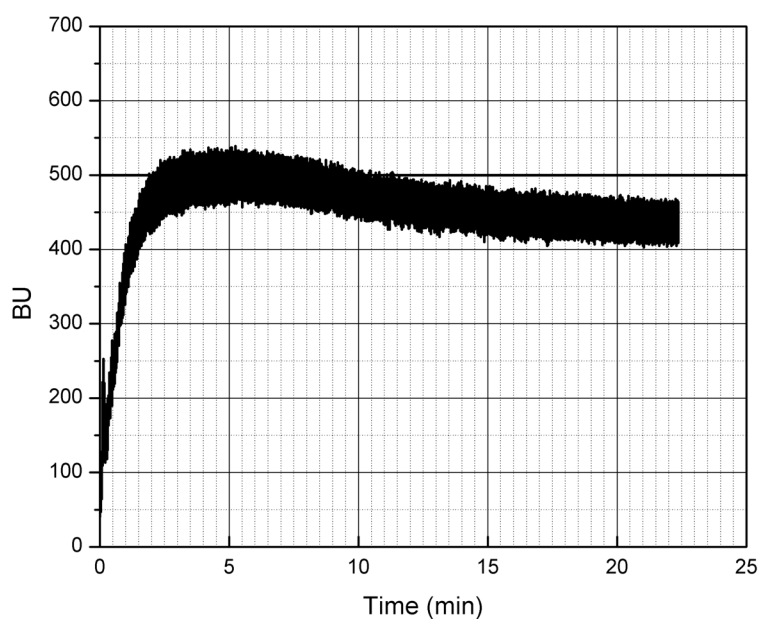
Farinograms

2010 crop composite samples

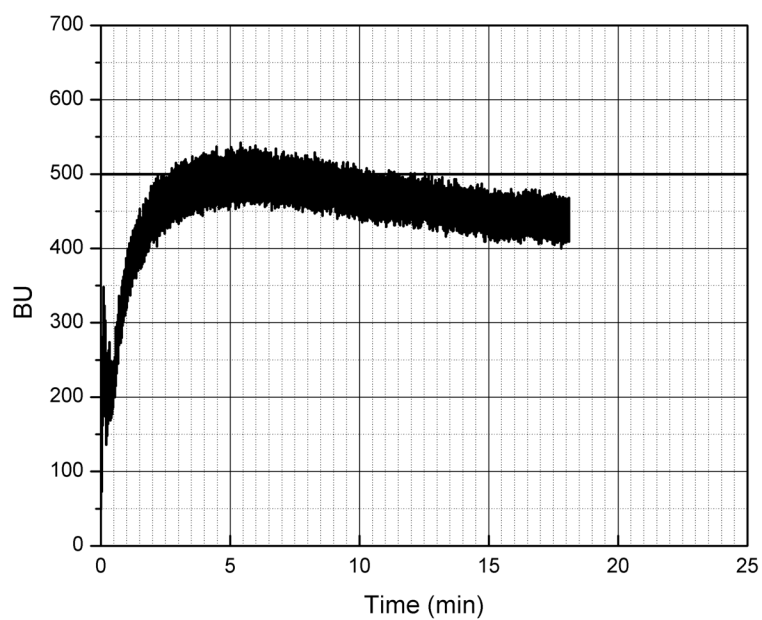
Wheat, No. 1 Canada Western Red Spring wheat – 13.5% protein segregate



Wheat, No. 1 Canada Western Red Spring wheat – 12.5% protein segregate



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



Wheat, No. 2 Canada Western Red Spring wheat – 12.5% protein segregate

