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Quality of western Canadian wheat 2011

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Summary

For the second consecutive year, a substantial area of the Prairies went unseeded due to excessive rainfall during May and June 2011. Abandoned acreage in Western Canada, although not as high as last year, will still be the second-largest since the early 1970s, when government programs intentionally idled acreage. Drier conditions in July and August, combined with favourable weather in September, have resulted in improved yield and quality prospects for wheat and durum when compared with last year.

Total wheat production for Western Canada is currently estimated at 21.6 million tonnes[1], with spring wheat production estimated at 17 million tonnes and durum production is expected to increase approximately 30% over last year to 3.7 million tonnes.

Overall protein content of Canada Western Red Spring wheat, at 13.1%, is 0.3% lower than last year. High grade Canada Western Red Spring wheat exhibits similar test weight, higher thousand kernel weight, similar wheat falling number, slightly higher starch damage and higher farinograph absorption this year. Again this year we are struggling with somewhat weak dough properties, both by farinograph and extensograph measurements relative to long term testing results. Baking quality is comparable to last year. Overall protein content of Canada Western Amber Durum wheat is slightly lower than last year at 12.3%. Gluten index and Alveograph P and W values demonstrate weaker gluten strength characteristics compared to 2010 crop. Semolina yellow pigment content is significantly higher than that of 2010 crop, as are the yellowness (b*) values.

Methodology

Methodology used to obtain quality data is described in a separate report available on the CGC website at http://www.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-x2011008-eng.pdf, Vol 90 No. 8, Dec. 2011

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 2011 crop. Further information on other classes of western Canadian wheat is not reported for the 2011 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.

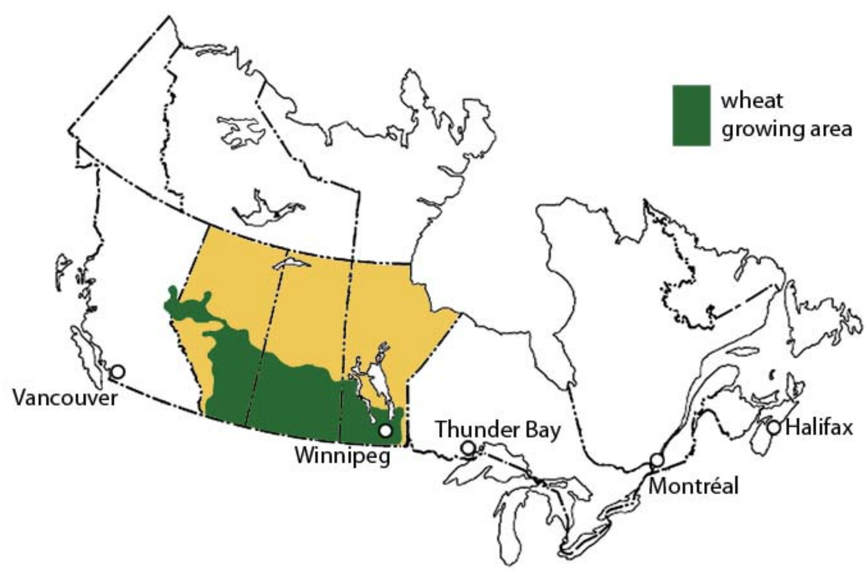
Canada Western Red Winter (CWRW) wheat is a hard wheat with very good milling quality suitable for the production of a wide variety of products including French breads, flat breads, steamed breads, noodles and related products. There are two milling grades in the CWRW class.

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

Data presented in this report were generated from quality tests carried out on composites representing approximately 4000 individual samples submitted by producers and primary elevator managers from the three Prairie provinces. Figure 1 highlights the wheat producing regions in the Prairie 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 2011 crop

The Canadian Wheat Board provided background information for the 2011 crop.

Production and grade information

The climate of the Canadian Prairies is one of extremes. For proof, look no further than weather conditions over the past two years. For the second consecutive year, a substantial area of the Prairies went unseeded due to excessive rainfall during May and June 2011. Abandoned acreage in Western Canada, although not as high as last year, will still be the second-largest since the early 1970s, when government programs intentionally idled acreage. Drier conditions in July and August, combined with favourable weather in September, have resulted in improved yield and quality prospects for wheat, durum and barley when compared with last year.

Concerns about excess moisture conditions were prevalent in the early spring as soils were still saturated from the heavy rains that fell in 2010. These fears were compounded by heavier than normal snowfall, in eastern and northern growing areas, during the winter period. Cool weather during April and May delayed the start of planting, with negligible amounts of the crop planted by the beginning of May. Dry weather in central and northern Alberta and northern Saskatchewan during May allowed farmers to make excellent progress during the remainder of the month. Northern regions remained very dry through the first weeks of June, which resulted in some emergence problems in later-planted fields.

Southern regions of the Prairies did not fare as well during May as heavy rains flooded fields and prevented farmers from planting their intended cropped area. Flooding and excessive moisture issues were reported from southern Alberta to Manitoba, with the heaviest flooding occurring in the south-eastern areas of Saskatchewan and south-western areas of Manitoba. Rivers in this region reported floods that were at levels that occur in only one of three hundred years. Temperatures during May were one to three degrees below normal in the southern regions and close to normal in the central and northern regions. Seeding progress inched forward in May, with only 75 per cent of the intended crop area planted by the end of the month. Sporadic progress was made during early June as rains continued to delay seeding and overall progress reached 86 per cent by the middle of the month. Planting of crops other than green feed stopped at that point, leaving an estimated 2.75 million hectares (6.8 million acres) unseeded.

The weather during July and August was almost the reverse of spring conditions, with southern regions turning dry and hot, while moderate to heavy rains covered the northern growing areas. Temperatures were significantly above normal in Manitoba and eastern Saskatchewan with deviations ranging between two and five degrees Celsius for the month. Western areas of the Prairies were cooler than normal, which slowed crop development. These conditions remained largely intact through August. Crops entered the reproductive stage in the middle of July in eastern growing areas, while western regions were delayed. The warm temperatures in the eastern Prairies helped boost crop development and significant harvest progress occurred during the last week of August in Manitoba.

The warm dry conditions continued in September, which allowed harvest to move ahead of normal in all areas of the Prairies. A severe frost was reported in the middle of September in parts of Alberta, Saskatchewan and Manitoba, but damage is expected to be minimal as most crops were mature. Mostly dry weather during the last half of September has allowed the harvest to progress to near completion. Crop quality for wheat, durum and barley is good, with the bulk of the wheat and durum crops meeting specifications for the top two grades.

Total wheat production for Western Canada is currently estimated at 21.6 million tonnes[1], up 3.0% from 2010. Barley output is expected to reach 7.4 million tonnes. Spring wheat production is estimated at 17 million tonnes, while durum production is expected to increase to 3.9 million tonnes, a 30% increase over 2010. Spring wheat yields are forecast to reach 2.8 tonnes per hectare, which is slightly higher than last year. Durum yields are expected to be similar to last year at 2.4 tonnes per hectare. Barley yields are also expected to be similar to last year at 3.4 tonnes per hectare.

Overall protein content of milling grades of Canada Western Red Spring wheat at 13.1% is 0.3% lower than last year. Protein content of Canada Western Amber Durum wheat at 12.3% is 0.4% lower than last year. The lower protein content seen this year is largely attributable to the high rainfalls experienced during the autumn of 2010 and again in the spring of 2011, in combination with high snow melt, leaching nitrogen from the soil.

The lower grade CWRS resulted primarily from ergot, midge damage and mildew with some downgrading resulting from fusarium damage, frost/heat stress, green and immature. Lower grade CWAD resulted primarily from hard vitreous kernel count, mildew and ergot. Frost/heat stress, green and fusarium

[1] Statistics Canada, *Field Crop Reporting Series*, http://www.statcan.gc.ca/pub/22-002-x/22-002-x2011008-eng.pdf Vol. 90, No. 8, Dec. 2011

damage accounted for some down grades. 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 for six of the eight classes of western Canadian wheat surveyed in 2011 to corresponding values obtained in the 2010 and 2009 harvest surveys as of October 27, 2011. Milling grades of all classes, with the exception of Canada Western Red Winter (CWRW), have lower average protein content than last year. Canada Western Red Spring (CWRS) wheat protein content is 0.3% lower than 2010 and 0.1% lower than 2009. Canada Western Amber Durum (CWAD) protein values are 0.4% lower than in 2010 and 0.5% lower than 2009. Canada Western Hard White Spring (CWHWS) wheat is 12.5%, 0.2% lower than last year. Canada Prairie Spring Red wheat at 11.1% is 0.5% lower than last year. Canada Western Red Winter (CWRW) is 1.4% higher than last year while Canada Western Soft White Spring (CWSWS) is 0.8% lower this year. Insufficient sample was available 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, 2011, 2010 and 2009

	Protein content, %[1]		
Class	2011	2010	2009
CWRS	13.1	13.4	13.2
CWAD	12.3	12.7	12.8
CPSR	11.1	11.6	12.1
CWRW[2]	11.6	10.2	10.9
CWSWS	9.9	10.7	10.4
CWHWS	12.5	12.7	13.1

[1] N x 5.7; 13.5% moisture content basis (mb) effective Nov 24/11
[2] Effective Aug 1/11 a minimum protein content of 11.0% (13.5 mb) was instituted for No. 1 and No. 2 CWRW

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 2011. Comparative values for western Canada by grade are shown for 2010 and for the previous 10 years (2001-2010). Figure 2 shows the fluctuations in annual mean protein content since 1927.

The average protein content of milling grades of the 2011 western Canadian wheat crop is 13.1%, 0.3% lower than 2010 and 0.6% lower than the ten year average protein content. Protein content exhibits a slight increase across grades, ranging from 13.0% for 1 CWRS to 13.2% for 3 CWRS. The range in protein content across provinces is wider than is seen most years.

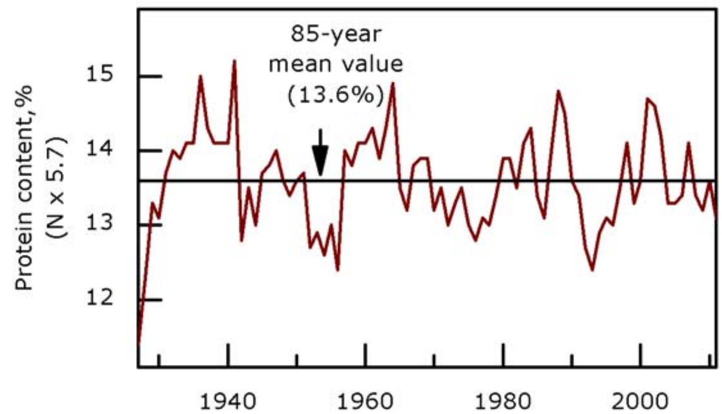
Results from the Canadian Wheat Board 2011 Variety Survey show that the varieties Harvest and Lillian were the predominant variety in the CWRS class with 17.6% and 17.4% of the seeded acreage, respectively. Unity VB, CDC Go, Superb and Kane each made up from 6.6% to 4.4% of seeded acres. Lillian is a 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. Unity VB is resistant to the orange wheat blossom midge, improving the possibility of maintaining yield and grade in areas where the insect is prevalent.

Table 2 – Mean protein content of 2011 Canada Western Red Spring wheat, by grade and province, with comparisons to 2010 and the 10-year mean

	Protein content, %[1]					
	Western Canada			2011		
Grade	2011	2010	2001-2010	Manitoba	Saskatchewan	Alberta
Wheat, No. 1 CWRS	13.0	13.2	13.7	13.6	12.9	12.5
Wheat, No. 2 CWRS	13.2	13.4	13.8	14.1	13.1	12.6
Wheat, No. 3 CWRS	13.2	13.5	13.8	14.3	13.4	12.8
All milling grades	**13.1**	**13.4**	**13.7**	**13.9**	**13.1**	**12.6**

[1] N x 5.7%; 13.5% moisture basis; as of Nov 24/11

Figure 2 – Mean protein content of Canada Western Red Spring wheat – 1927 to 2011



Milling and baking quality – Allis-Chalmers laboratory mill

To assess the quality of the 2011 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. 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 2001-2010.

Test weight of the 2011 No. 1 grade protein segregates is comparable to last year and to the ten year average. Kernel weight is higher than last year and higher than the long term average. Wheat ash is higher compared to last year and is 0.05% higher than the long term average. Flour ash is marginally higher than last year at 0.51% and 0.03% higher than 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 yield on clean wheat basis is 0.8% higher than last year and the long term average and is probably related to the higher kernel weights seen this year. However, on a constant 0.50% ash basis the flour yield advantage is not as high at 0.3% higher yield than last year and 0.6% lower than the long term average. Flour colour is comparable to last year and the long term average as measured by flour grade colour. This year we are including flour colour measured as L*, a* and b* on a wet slurry. The L* value is a measure of brightness or whiteness, a* indicates green (negative values) through red (positive values), b* is a measure of blue (negative values) through yellow (positive values). Wet gluten content continues to remain higher than the ten year average. Flour starch damage is slightly higher than last year and continues to be higher than the long term average.

Farinograph absorption is 1.1% higher than in 2010 and is 1.3% higher than the long term average for the 13.5% protein segregate. The relatively high starch damage is contributing to the higher absorption. Farinograph dough strength properties for the 13.5% protein segregate appear marginally weaker than last year, partially as a result of the higher water absorption. Extensograph results indicate dough strength properties that are similar to those seen last year, but continue to exhibit weaker properties than seen over the previous 10 year term. Alveograph results for the 2011 crop exhibit less extensibility (lower L value) than seen previously, but similar P values and slightly lower W values.

The improved farinograph absorption did not translate to improved CSP baking absorption which is consistent with last year and at 67% is 2% lower than the ten year average. Mixing requirements, both in terms of mixing times and work input measured as mixing energy, are lower than last year and 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

Quality data for the 2011 No. 2 CWRS composites and comparative data for the 13.5% minimum protein level for last year's composite and the ten-year average, 2001-2010 are shown in Table 4. As seen with the No. 1 CWRS, test weight values are slightly higher than last year and kernel weights are considerably higher than 2010 and the ten year average. Wheat ash is slightly higher than last year and higher than 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 on clean wheat basis for the No. 2 grade 13.5% protein composite is comparable to last year, but is 0.7% lower on constant 0.50% ash basis. Overall, milling yields on clean wheat basis are similar to the ten year average values. Flour grade colour value indicates significantly improved brightness over 2010 and compared with the long term values. Wet gluten content is almost 1% higher this year compared to last and shows a 1.5% improvement over the long term average. Flour starch damage is similar to 2010.

Farinograph absorption at 68.2% is 1.4% higher than last year and 1.2% higher than the ten year average value. Dough development time is slightly shorter than 2010, as is stability. This may be partly the result of the higher absorption which results in softer dough. Extensograph resistance to extension values (height at 5 cm and maximum height) are indicative of considerably weaker dough properties compared with both last year and the long term average. Alveograph curves for No. 2 CWRS 13.5 have lower W values than last year and the ten year average. The No. 2 CWRS 13.5 baked using the CSP bake method had higher bake absorption than last year but was 1% lower than the ten year average. Mixing requirements were lower than last year and loaf volume was significantly lower this year with a difference of 55 cm^3 at 13.5% protein compared to last year and 69 cm^3 lower than the ten year average.

Wheat, No. 3 Canada Western Red Spring

The average protein content for the No. 3 CWRS composite tested here is 13.3%; 0.1% higher than the overall average for the grade this year and 0.5% lower than the ten year average (Table 5). The No. 3 CWRS is sound this year, with high falling number, low α-amylase activity and high amylograph peak viscosity. Wheat ash and flour ash content are slightly higher than the ten year average, however, flour colour exhibits considerable improvement with lower flour grade colour. As seen with No.1 and 2 CWRS, farinograph absorption for No. 3 CWRS is higher than average this year. Dough development time is shorter than the ten year average, however stability is similar to the ten year average. Dough strength as measured by extensograph and alveograph appears weaker this year, and less extensible by both measurements. CSP bake absorption is 1% lower than the ten year average, and mixing requirements are lower. Loaf volume is less than the ten year average, partly as a result of slightly lower protein content, but also due to weaker and less extensible gluten properties.

Comparative Bühler laboratory mill flour data

Samples of 2011 and stored 2010 harvest survey No. 1 CWRS and No. 2 CWRS 13.5 and 12.5 composites were milled consecutively on the same day on the tandem Buhler laboratory mill to produce 74% extraction straight grade and 60% long patent flour, allowing for direct comparison between the performance of the 2011 and 2010 crops.

Analytical and baking quality

Wheat, No. 1 Canada Western Red Spring 13.5

Data are shown in Table 6 for the No. 1 CWRS 13.5% minimum protein segregate. The trends in quality characteristics are generally in agreement with the Allis-Chalmers milling data.

Straight grade and patent flours from the 2011 composites for No. 1 CWRS 13.5% protein segregates exhibit higher wet gluten content and similar starch damage values, but slightly higher ash content (straight grade) relative to the composite flours from 2010. Flour grade colour values for straight grade and patent flours indicate improved brightness and whiteness compared with last year. High amylograph peak viscosities are indicative of sound wheat.

Farinograph data show absorption in this year's No. 1 CWRS 13.5 straight grade flour that is 1.2% higher than last year and patent flour that is 0.8% higher. Weaker dough properties are evident in the 2011 No.1 CWRS 13.5 60% patent flour with shorter development time and shorter stability compared with 2010. Dough development time for the No.1 CWRS 13.5 straight grade flour is slightly shorter than for 2010 and the stability is considerably shorter at 9.5 minutes versus 19.0 minutes for 2010, also indicative of weaker dough properties. This may be partially attributable to the higher water absorption.

Sponge-and-dough baking absorption is 1% higher for the 2011 for the No. 1 CWRS 13.5 straight grade and 1% lower for the 60% patent flour compared with the re-milled 2010 flour. Sponge-and-dough loaf volumes for 2011 and 2010 are similar for 60% patent flour however the 2011 straight grade flour produces a slightly smaller loaf compared with 2010. Mixing requirements for the 2011 60% patent flour are slightly lower than for the re-milled 2010 flour. The 2011 CSP baking formulation had slightly lower mixing requirements for both the straight grade and 60% patent flour compared with 2010, however loaf volumes were similar for both years.

Wheat, No. 1 Canada Western Red Spring 12.5

Data are shown in Table 7 for the No. 1 CWRS 12.5% minimum protein segregate. The trends in quality characteristics are generally in agreement with the Allis-Chalmers milling data.

The 2011 No. 1 CWRS 12.5 straight grade and 60% patent flours exhibit higher wet gluten content, higher farinograph absorption and weaker dough properties than last year. Sponge-and-dough straight grade and CSP straight grade and 60% long patent bake absorptions are unchanged from last year. The 60% patent flour this year has 1% lower bake absorption in the sponge-and-dough formulation relative to the corresponding 2010 flour. The 2011 No. 1 CWRS 12.5 straight grade and 60% patent flours demonstrate mixing requirements similar to the corresponding 2010 flours under both baking formulations. Loaf volumes are comparable between 2011 and 2010 in all cases.

Wheat, No. 2 Canada Western Red Spring 13.5

Data are shown in Table 8 for the No. 2 CWRS 13.5% minimum protein segregate. Consistent with the trends seen for Wheat, No. 1 CWRS, the No. 2 CWRS 13.5 exhibits higher wet gluten content, higher farinograph absorption and weaker dough properties this year relative to last year for both the 74% straight grade and 60% long patent flour. There is a 1 to 2% bake absorption advantage this year for both the straight grade and patent flours under both the sponge-and-dough and the CSP baking formulations. Mixing requirements, however, are lower for the 2011 flours irrespective of baking formulation or milling extraction rate. Loaf volumes are comparable for the 2011 and 2010 straight grade flours and for the 2011 and 2010 60% patent flours using both baking formulations.

Wheat, No. 2 Canada Western Red Spring 12.5

Table 9 shows the data for No. 2 CWRS 12.5 minimum protein segregate. This year's composites both exhibit higher wet gluten content than last year along with slightly higher ash content, higher farinograph absorption and weaker dough properties. The 2.2% higher farinograph absorption corresponds with bake absorption advantage for the 2011 74% grade flour at 2% higher than the corresponding 2010 flour in the sponge-and-dough formulation while the 60% patent flour bake absorption is equivalent to 2010. In the CSP formulation the 2011 and 2010 74% straight grade flours have the same bake absorption requirement, but the 60% patent flour exhibits 1% higher absorption than last year. Mixing requirements in all cases are lower this year compared with their corresponding 2010 flour. With the exception of the 2011 60% patent flour baked using the CSP formulation, the loaf volumes for 2011 flours performed poorly ranging from 65 to 80 cm^3 smaller compared with the corresponding 2010 flours milled and baked under the same conditions.

Yellow alakline and white salted noodle quality

Noodle preparation

No. 1 CWRS from the 2010 and 2011 crop harvest composites, at both 13.5 and 12.5 % protein, were milled on the G.R.L. Tandem Buhler mill to produce a patent flour (60% yield on a clean wheat basis) and a straight grade flour (74% yield). Yellow alkaline noodles were prepared with a 1% w/w kansui reagent (9:1 sodium and potassium carbonates) at a 32 % water absorption level. White salted noodles were also prepared at the 32% absorption level with 1% NaCl w/w added to their respective flours. All noodles were prepared in a temperature and humidity controlled room maintained at 23° C +/-2.0°C with relative humidity at 50% +/-2.0%. Results are found in Tables 10 and 11. Texture was determined from optimally cooked noodles. The optimum cooking time was defined as the time at which the loss of the noodle's core in all three test strands occurred, when pressed between plexiglass plates.

Yellow alkaline noodles

Wheat, No. 1 Canada Western Red Spring 13.5

Yellow alkaline noodles prepared from the 2011 No.1 13.5% protein CWRS crop composite, patent (60%) flour, yielded equivalent brightness (L*) to their 2010 counterparts at 2 hours after production (Table 10). The 2011 straight grade flour's noodle raw noodle brightness at 2 hours was significantly brighter than that observed in the 2010 material. L* values of the raw noodles after aging for 24 hours revealed a slight decline in the 2011 patent flour noodle brightness relative to 2010. However a strong positive effect was observed in the 2011 straight grade flour noodles relative to last year. While the 2011 60% patent flour raw noodle exhibited equivalent redness, a* values, to 2010 at 2 hours, a minor reduction relative to 2010 was observed after aging 24 h. The 2011 straight grade noodles exhibited a very significant improvement in redness at both time periods relative to last year's crop. In general, no difference in raw noodle yellowness (b*) at 2 hours was observed in both noodles prepared using the 2011 13.5% protein patent flours relative to 2010. The straight grade flour noodle's b* exhibited a slight reduction in 2011 compared to 2010. Upon 24 hour storage, all alkaline raw noodles made from the 2011 flours did not increase as much in yellowness compared to the 2010.

Cooked noodle brightness revealed a modest reduction in the 2011 60% patent flour noodles relative to 2010, however a slight improvement was observed in the 2011 straight grade noodles. A modest increase in 2011 patent cooked noodle redness was detected relative to 2010 material although a minor improvement was shown in the noodles prepared from 2011 straight grade flours. Cooked noodle yellowness remained relatively equivalent to last year in both flours. Cooked noodle thickness for all noodles remained constant over the two years studied. A noticeable decrease in noodle "bite" (MCS) was observed for both patent and straight grade 13.5% protein noodles relative to 2010. A general decline in the textural attribute RTC for the 2011 cooked noodles was detected for both flours relative to the 2010 material. The 60 % patent flour noodles also exhibited a reduced REC value compared to their 2010 counterpart but the 74% straight grade noodle REC was equivalent to that of the previous year. The difference in the 2011 cooked noodle texture may be attributable to the flour quality due to unusual wheat growing conditions and the 30 sec longer cooking period than that of their 2010 counterparts.

Wheat, No. 1 Canada Western Red Spring 12.5

Fresh (raw) yellow alkaline noodles prepared from 2011 No. 1 12.5% protein (Table 11) displayed a modest reduction in L* for the patent noodles relative to 2010 flours at 2 hours although the corresponding straight grade flour noodles prepared from the CWRS 2011 crop composite were equivalent to those of 2010. Aging the noodles for 24 hours revealed that the 2011 patent flour noodles were much brighter than their 2010 counterpart, while a slight reduction was observed for the corresponding 2011 straight grade noodle relative to 2010. The 2011 patent raw noodles' redness, a*, at 2 hours was improved relative to 2010 but became equivalent when aged. Noodles prepared with the 2011 straight grade flour offered a modest improvement in a* at 2 hours but upon aging the redness was significantly higher than their 2010 counterparts. The 2011 60% patent noodle exhibited (Table 11) equivalent b* at 2 hours and had a slightly improved b* value at 24 hours as compared to last year. Straight grade flour noodles (2011) revealed a significant reduction in b* at both 2 and 24 hours relative to the 2010 material.

No appreciable difference was detected in cooked alkaline noodle colour (L* and b*) between years for the patent flours at the 12.5% protein level. An increase in the 2011 patent noodle redness, a*, upon cooking was detected however. Examination of the 2011 straight grade flour noodles showed a significant undesirable decline in L* and a* values relative to their 2010 counterpart. No difference was observed for b*. Cooked alkaline noodle texture prepared from the 2011 No.1 12.5% patent flour exhibited slight decline in bite (MCS) and chewiness (RTC) but was comparable in terms of REC to their 2010 counterpart. Examination of the 2011 No. 1 12.5% straight grade flour noodle also showed a significant decline in all texture parameters relative to the 2010 straight grade noodles. As observed in the 13.5% protein noodles, the reduction in cooked texture of the 2011 noodles relative to the 2010 material may be due in part to the slightly longer cooking period (30 sec) and also flour quality differences between years.

Wheat, No. 2 Canada Western Red Spring 13.5

Yellow alkaline noodles prepared from the 2011 No.2 CWRS 13.5% patent (60%) flour, were of equivalent raw noodle brightness (L*) to that of the 2010 counterparts at both 2 and 24 hours after production (Table 12). The 2011 straight grade flour noodle raw noodle brightness at 2 hours was also equivalent to that observed in the 2010 material. However, L* values of the raw noodles upon aging for 24 hours revealed a significant reduction in brightness compared to the 2010 straight grade noodles. The 2011 60% patent flour raw noodle exhibited a slightly poorer redness (a* values) to 2010 at 2 hours, but a significant improvement relative to the 2010 patent flours upon aging 24 hours. The 2011 straight grade noodles exhibited equivalent redness (a*) at 2 hours with a modest increase in redness after 24 hours. In general, a significant improvement in raw noodle yellowness, b*, was observed in both noodles prepared using the 2011 13.5% protein flours relative to 2010 at 2 hours. Upon aging, the 2011 patent flour noodles retained a higher b* value than its 2010 counterpart. The 2011 straight grade flour noodles exhibited minimal difference in b* values with the 2010 noodles by 24 hours.

Cooked 2011 noodle brightness L* was equivalent to the 2010 noodles for both patent and straight grade flours. A minor increase in 2011 patent cooked noodle redness was detected relative to 2010 material. Interestingly, a minor improvement was shown in the noodles prepared from 2011 straight grade flours relative to their 2010 counterpart in terms of a* values. Cooked noodle yellowness (b*) of the 2011 samples exhibited slight improvements relative to their 2010 counterparts for both patent and straight grade flour.

Cooked noodle thickness exhibited minor variations between the two years tested. The 2011 patent noodles were slightly thicker while the straight grade flour noodles were slightly thinner. In contrast with No. 1 CWRS a slight increase in noodle "bite" (MCS) was observed for the 2011 patent flour noodles relative to their 2010 counterparts. However the 2011 straight grade noodles did reflect the same general decline in bite relative to 2010 seen with the No. 1 CWRS. As observed for the 2011 No.1 CWRS, the No. 2 CWRS 13.5 flours displayed a general decline in the textural attributes RTC and REC for both flours relative to the 2010 material.

Wheat, No. 2 Canada Western Red Spring 12.5

Fresh (raw) yellow alkaline noodles prepared from 2011 No. 2 CWRS 12.5% protein flours revealed a significant improvement in L* for both the patent and straight grade noodles relative to 2010 flours at 2 hours and upon aging for 24 hours (Table 13). The 2011 patent and straight grade flour noodle redness (a*) was improved relative to 2010 at both 2 and 24 hours after production. The 2011 60% patent noodles exhibited equivalent b* at 2 hours and slightly improved b* value at 24 hours as compared to 2010. Straight grade flour noodles (2011) revealed a significant reduction in b* at 2 and 24 hours relative to the 2010 material.

The 2011 60% patent flour cooked alkaline noodle brightness (L*) was significantly better than the corresponding 2010 noodle. No difference however was detected between the two years when comparing cooked noodle brightness of the straight grade flour noodles. A significant improvement in the cooked 2011 patent noodle redness (a*) was detected although the 2011 straight grade flour noodles showed a modest undesirable decline in a* relative to their 2010 counterpart. No difference in b* was observed between years for noodles prepared from either flour.

No differences in cooked noodle thickness were detected between flours or years. Cooked texture of the 2011 No. 2 CWRS 12.5 patent flour noodles exhibited a slight decline in bite (MCS), REC and RTC to their 2010 counterpart. Examination of the 2011 No. 2 CWRS 12.5 straight grade flour noodles also showed a significant decline in all texture parameters relative to the 2010 straight grade noodles.

White salted noodles

Wheat, No. 1 Canada Western Red Spring 13.5

Evaluation of white salted noodles indicated that both the 2011 patent and straight grade noodles were brighter than the previous year at 2 hours after production (Table 10). Upon aging for 24 hours the 2011 patent flour noodles remained brighter than their 2010 counterpart, however noodles prepared using the 2011 straight grade flour displayed equivalent brightness to the 2010 material. No significant difference was detected in the patent flour's redness at 2 or 24 hours between years. The 2011 straight grade noodle redness was slightly higher than that of the 2010 noodle at 2 hours but offered a slight improvement over the 2010 noodle upon aging. A modest increase in noodle yellowness, b* was detected in the 2011 patent noodles at both time periods relative to the 2010 material. The 2011 straight grade white salted noodles displayed a significantly more yellow noodle at 2 hours as compared to the 2010 material, however upon aging, they became equivalent.

Cooked noodle brightness of the 2011 60% patent flour noodle was significantly brighter than the 2010 noodle however the 2011 straight grade noodle exhibited a slight reduction in their noodle brightness relative to the 2010 material. In both the 2011 patent and straight grade cooked noodles there was a desirable reduction in a* relative to 2010. A modest but desirable reduction in 2011 60% patent cooked noodle yellowness, b*, was observed relative to the corresponding 2010 noodle, although no appreciable difference was detected between years in noodles prepared using the straight grade flours.

White salted noodles prepared from the 2011 flours exhibited a slightly thinner noodle than those made from the corresponding 2010 flours. The textural attributes of the 2011 noodles, both patent and straight grade, were generally significantly reduced relative to their corresponding 2010 values.

Wheat, No. 1 Canada Western Red Spring 12.5

The 2 hour raw white salted noodles prepared from the 2011 60% patent flour displayed equivalent brightness to that of the 2010 material at 2 hours (Table 11), however, upon aging for 24 hours, they exhibited a brighter noodle than last year's flour. Noodles prepared using the 2011 straight grade flour displayed slightly brighter noodles than their 2010 counterparts at both 2 and 24 hours after production. While the 2011 patent flour noodles displayed improved noodle redness at both time periods relative to the 2010 material, noodles prepared using the 2011 straight grade flour were slightly redder than those of 2010. Noodles prepared using either 2011 60% patent or straight grade flours exhibited a greater yellowness, b*, at both 2 and 24 hours after production than those of 2010.

While the brightness of the cooked 2011 straight grade white salted noodle was equivalent to last year's, noodles prepared with the 2011 60% patent flour were significantly brighter than 2010. A slight improvement in both 2011 patent and straight grade cooked noodle redness was observed when compared to 2010 material. Noodle yellowness, b*, remained equivalent to the previous year for both flours.

Straight grade white salted noodle thickness was equivalent across years however those prepared with the 2011 60% patent flour were slightly thinner than those of 2010. As was observed previously, the textural parameters of the 2011 cooked noodles, prepared using either straight grade or 60% patent flour, were reduced relative to their 2010 counterparts.

Wheat, No. 2 Canada Western Red Spring 13.5

White salted noodles prepared using either the 2011 patent or straight grade flours yielded noodles equivalent in brightness to the previous year at 2 hours after production (Table 12). Aging for 24 hours revealed the 2011 patent flour noodles remained equivalent to their 2010 counterpart, however noodles prepared using the 2011 straight grade flour displayed significantly better brightness than the 2010 material. No significant difference was detected in the straight grade flour noodle redness at 2 hours between years although the 2011 patent noodle showed a modest increase in redness compared to the 2010 at 2 hours after production. Aging the 2011 patent flour noodles for 24 hours increased their redness relative to their 2010 counterpart while noodles prepared from the 2011 straight grade flour yielded an improved a* value compared to the 2010 noodles. A modest increase in noodle yellowness, b* was detected in the 2011 patent noodles at both time periods relative to the 2010 material which was consistent with what was observed in the No. 1 CWRS flours. The 2011 straight grade flour noodles reflected the same phenomena.

Cooked 2011 60% patent and straight grade flour noodles were significantly brighter than their corresponding 2010 noodles. As observed in No. 1 CWRS, the 2011 No. 2 CWRS 13.5 patent and straight grade cooked noodles exhibited a reduction in a* relative to 2010. No appreciable difference in cooked noodle yellowness (b*) was detected for either of the 2011 flour noodles relative to those from 2010.

White salted noodles prepared from the 2011 flours exhibited slightly thinner noodles than those made from the corresponding 2010 flours. The textural attributes of the 2011 noodles, both patent and straight grade, decreased relative to their corresponding 2010 values which was consistent with what had been observed for the No. 1 CWRS 13.5% flour noodles.

Wheat, No. 2 Canada Western Red Spring 12.5

The 2 hour raw white salted noodles prepared from the 2011 60% patent flour displayed lower noodle brightness (L*) as compared to that of the 2010 material (Table 13). However, upon aging for 24 hours they were equivalent to last year's flour. Noodles prepared using the 2011 straight grade flour displayed a significantly lower L* at 2 hours but upon aging became equivalent to the 2010 material. The 2011 patent flour noodles displayed equivalent noodle redness (a*) at 2 hours but exhibited a modest increase upon aging 24 hours relative to the 2010 material. Noodles prepared using the 2011 straight grade flour were redder than those of 2010 at 2 hours but approached equivalence upon aging. Noodles prepared using either 2011 60% patent or straight grade flours exhibited a greater yellowness (b*) at both 2 and 24 hours after production than those of 2010 which was consistent with what had been observed for the No. 1 CWRS 12.5 flour noodles.

The brightness (L*) of the cooked 2011 patent and straight grade white salted noodles was modestly improved relative to last year. A slight improvement in both 2011 patent and straight grade cooked noodle redness (a*) was also observed when compared to 2010 material. Cooked noodle yellowness (b*) remained equivalent to the previous year for both flours which was consistent with the corresponding No. 1 CWRS 12.5 flours.

A modest reduction in both straight grade and patent white salted noodle thickness was observed in the 2011 flour noodles as compared to those of 2010. The textural parameters of the 2011 cooked noodles, prepared using either straight grade or 60% patent flours, continued to reflect a reduction in all texture parameters relative to their 2010 counterparts.

Table 3 - Wheat, No. 1 Canada Western Red Spring
Quality data for 2011 harvest sample grade composites compared to 2010 and 2001-2010 mean

	Minimum protein content, %			No. 1 CWRS 13.5	
Quality parameter[1]	13.5	13.0	12.5	2010	2001-2010 mean
Wheat					
Test weight, kg/hL	81.9	82.3	82.4	81.3	81.6
Weight per 1000 kernels, g	34.6	34.0	33.7	32.9	32.2
Protein content, %	13.7	13.2	12.8	13.9	13.8
Protein content, % (dry matter basis)	15.8	15.3	14.8	16.1	16.0
Ash content, %	1.65	1.63	1.60	1.52	1.60
α-amylase activity, units/g	2.5	2.5	3.0	3.0	3.9
Falling number, s	425	420	430	465	406
PSI,%	54	55	54	55	N/A[3]
Milling Flour Yield					
Clean wheat basis, %	76.3	76.1	76.5	75.5	75.5
0.50% ash basis, %	75.8	76.1	76.0	75.5	76.4
Flour					
Protein content, %	13.1	12.6	12.1	13.3	13.2
Wet gluten content, %	37.2	35.8	34.0	36.7	36.1
Ash content, %	0.51	0.50	0.51	0.50	0.48
Grade colour, Satake units	-2.4	-2.6	-2.7	-2.4	-2.3
Brightness,[2] L*	85.4	85.4	86.1	N/A[3]	N/A[3]
Redness,[2] a*	-0.42	-0.51	-0.55	N/A[3]	N/A[3]
Yellowness,[2] b*	14.7	14.7	14.9	N/A[3]	N/A[3]
Starch damage, %	8.9	9.0	9.3	8.5	8.3
α-amylase activity, units/g	1.0	1.0	1.0	0.5	1.2
Amylograph peak viscosity, BU	615	635	605	735	647
Maltose value, g/100g	3.0	3.0	3.2	2.6	2.6
Farinogram					
Absorption, %	68.5	68.2	67.9	67.4	67.2
Development time, min	5.50	6.50	5.00	6.00	6.34
Mixing tolerance index, BU	20	25	35	15	24
Stability, min	9.5	10.0	7.5	10.0	10.5
Extensogram					
Length, cm	20	20	19	20	21
Height at 5 cm, BU	240	265	290	280	319
Maximum height, BU	415	425	445	465	583
Area, cm^2	105	110	110	125	157
Alveogram					
Length, mm	93	92	85	109	108
P (height x 1.1), mm	138	147	146	138	131
W, x 10^{-4} joules	420	443	412	486	481
Baking (Canadian short process baking test)					
Absorption, %	67	66	67	67	69[4]
Mixing energy, W-h/kg	5.7	5.4	5.7	7.0	6.7[4]
Mixing time, min	3.4	3.4	3.6	4.3	3.9[4]
Loaf volume, cm^3/100 g flour	1075	1040	1035	1110	1110[4]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[3] Not available due to change in method. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[4] Mean of data generated starting in 2004.

Table 4 - Wheat, No. 2 Canada Western Red Spring
Quality data for 2011 harvest sample grade composites compared to 2010 and 2001-2010 mean

	Minimum protein content, %			No. 2 CWRS 13.5	
Quality parameter[1]	13.5	13.0	12.5	2010	2001-2010 mean
Wheat					
Test weight, kg/hL	81.3	81.0	81.3	80.0	80.5
Weight per 1000 kernels, g	34.2	33.3	34.0	31.7	33.5
Protein content, %	13.7	13.2	12.7	13.9	13.7
Protein content, % (dry matter basis)	15.8	15.3	14.7	16.1	16.0
Ash content, %	1.64	1.65	1.68	1.61	1.60
α-amylase activity, units/g	4.0	4.5	4.0	5.5	5.0
Falling number, s	415	415	420	430	393
PSI,%	55	55	54	55	N/A[3]
Milling Flour Yield					
Clean wheat basis, %	75.6	75.3	75.5	75.8	75.6
0.50% ash basis, %	74.6	74.8	74.5	75.3	75.4
Flour					
Protein content, %	13.1	12.6	12.1	13.3	13.2
Wet gluten content, %	37.5	35.7	34.0	36.6	36.0
Ash content, %	0.52	0.51	0.52	0.51	0.50
Grade colour, Satake units	-2.6	-2.7	-2.9	-1.8	-2.0
Brightness,[2] L*	86.2	86.4	86.4	N/A[3]	N/A[3]
Redness,[2] a*	-0.53	-0.64	-0.67	N/A[3]	N/A[3]
Yellowness,[2] b*	14.7	14.8	14.8	N/A[3]	N/A[3]
Starch damage, %	8.6	8.9	9.2	8.2	8.1
α-amylase activity, units/g	1.5	1.0	1.0	1.5	1.6
Amylograph peak viscosity, BU	590	610	615	610	534
Maltose value, g/100g	2.8	2.8	2.9	2.7	2.6
Farinogram					
Absorption, %	68.2	67.9	67.9	66.8	67.0
Development time, min	5.25	5.25	5.00	6.00	6.08
Mixing tolerance index, BU	35	25	30	35	27
Stability, min	6.5	8.5	8.5	8.5	9.4
Extensogram					
Length, cm	21	19	19	20	21
Height at 5 cm, BU	225	260	275	305	306
Maximum height, BU	400	415	420	515	552
Area, cm^2	110	100	105	130	155
Alveogram					
Length, mm	103	95	84	109	118
P (height x 1.1), mm	130	137	143	133	128
W, x 10^{-4} joules	410	417	402	477	493
Baking (Canadian short process baking test)					
Absorption, %	68	67	66	66	69[4]
Mixing energy, W-h/kg	5.2	5.2	5.5	7.0	6.8[4]
Mixing time, min	3.4	3.4	3.6	4.2	4.0[4]
Loaf volume, cm^3/100 g flour	1025	1020	1045	1080	1114[4]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[3] Not available due to change in method. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[4] Mean of data generated starting in 2004.

Table 5 - Wheat, No. 3 Canada Western Red Spring
Quality data for 2011 harvest sample grade composites compared to 2001-2010 mean

	3 CWRS	
Quality parameter[1]	2011	2001-2010 mean
Wheat		
Test weight, kg/hL	80.8	79.7
Weight per 1000 kernels, g	34.1	34.6
Protein content, %	13.3	13.8
Protein content, % (dry matter basis)	15.4	16.1
Ash content, %	1.63	1.60
α-amylase activity, units/g	3.5	9.8
Falling number, s	420	359
PSI,%	54	N/A[3]
Milling Flour Yield		
Clean wheat basis, %	75.0	74.9
0.50% ash basis, %	70.5	75.0
Flour		
Protein content, %	12.7	13.1
Wet gluten content, %	36.6	36.1
Ash content, %	0.51	0.50
Grade colour, Satake units	-2.5	-1.5
Brightness,[2] L*	86.1	N/A[3]
Redness,[2] a*	-0.53	N/A[3]
Yellowness,[2] b*	14.4	N/A[3]
Starch damage, %	9.3	8.1
α-amylase activity, units/g	1.5	3.4
Amylograph peak viscosity, BU	535	390
Maltose value, g/100g	3.0	2.8
Farinogram		
Absorption, %	68.8	67.2
Development time, min	4.25	5.44
Mixing tolerance index, BU	20	30
Stability, min	8.0	8.1
Extensogram		
Length, cm	19	21
Height at 5 cm, BU	230	298
Maximum height, BU	360	520
Area, cm^2	90	151
Alveogram		
Length, mm	83	123
P (height x 1.1), mm	144	125
W, x 10^{-4} joules	393	435
Baking (Canadian short process baking test)		
Absorption, %	68	69[4]
Mixing energy, W-h/kg	5.6	6.8[4]
Mixing time, min	3.4	3.8[4]
Loaf volume, cm^3/100 g flour	1055	1104[4]

[1] Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[3] Not available due to change in method. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.
[4] 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 - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter[1]	2011	2010	2011	2010
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.9	13.1	12.6	12.7
Wet gluten content, %	36.7	36.0	36.1	35.2
Ash content, %	0.43	0.41	0.36	0.37
Grade colour, Satake units	-3.7	-3.3	-4.4	-4.2
Brightness,[2] L*	87.1	86.8	87.8	87.4
Redness,[2] a*	-0.70	-0.67	-0.89	-0.86
Yellowness,[2] b*	14.4	14.3	14.2	14.1
α-amylase activity, units/g	1.0	0.5	0.5	0.5
Amylograph peak viscosity, BU	740	820	800	905
Starch damage, %	7.0	6.8	7.1	6.8
Farinogram				
Absorption, %	64.4	63.2	64.4	63.6
Development time, min	6.00	8.00	8.00	25.00
Mixing tolerance index, BU	25	20	20	15
Stability, min	9.5	19.0	20.5	30.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	63	62	62	63
Mixing energy dough stage, W-h/kg	4.6	4.2	4.5	5.3
Mixing time dough stage, min	2.7	2.6	2.6	3.2
Loaf volume, cm^3/100 g flour	1070	1115	1040	1070
Appearance	7.7	7.8	7.5	7.1
Crumb structure	6.0	5.9	5.8	5.9
Crumb colour	7.7	7.8	7.8	7.8
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	64	63	64	64
Mixing energy, W-h/kg	5.7	6.3	5.6	6.9
Mixing time, min	3.4	3.9	3.6	4.5
Loaf volume, cm^3/100 g flour	1090	1115	1085	1125
Appearance	7.9	7.9	7.8	7.5
Crumb structure	6.2	6.0	6.2	6.0
Crumb colour	7.8	7.8	7.8	7.9

* The 2010 composite was stored and milled the same day as the 2011.

[1] Data reported on 14.0% moisture basis.

[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.

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 - 2011 and 2010 harvest sample composites*

Quality parameter[1]	74% Straight grade 2011	74% Straight grade 2010	60% Patent 2011	60% Patent 2010
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.1	12.0	11.7	11.8
Wet gluten content, %	33.7	32.4	33.0	31.9
Ash content, %	0.42	0.41	0.37	0.37
Grade colour, Satake units	-3.8	-3.8	-4.7	-4.4
Brightness,[2] L*	87.1	87.1	87.8	87.7
Redness,[2] a*	-0.83	-0.80	-1.03	-0.97
Yellowness,[2] b*	14.7	14.3	14.5	14.3
α-amylase activity, units/g	1.0	0.5	0.5	1.0
Amylograph peak viscosity, BU	690	755	765	840
Starch damage, %	7.2	7.1	7.5	7.3
Farinogram				
Absorption, %	63.6	62.7	63.4	62.8
Development time, min	4.75	6.00	5.25	7.75
Mixing tolerance index, BU	35	25	25	10
Stability, min	8.0	12.0	16.0	33.5
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	61	61	61	62
Mixing energy dough stage, W-h/kg	3.5	3.8	4.3	4.3
Mixing time dough stage, min	2.3	2.4	2.7	2.7
Loaf volume, cm^3/100 g flour	980	1005	945	985
Appearance	7.0	7.4	7.1	7.2
Crumb structure	5.9	6.0	6.0	5.9
Crumb colour	7.8	7.8	7.7	7.8
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	63	63	63	63
Mixing energy, W-h/kg	6.1	5.9	6.1	6.3
Mixing time, min	3.7	3.9	3.8	4.2
Loaf volume, cm^3/100 g flour	1065	1045	1010	1055
Appearance	8.1	7.7	7.4	7.5
Crumb structure	5.8	6.0	6.0	6.2
Crumb colour	7.9	7.9	8.0	7.9

* The 2010 composite was stored and milled the same day as the 2011.
[1] Data reported on 14.0% moisture basis.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.

Table 8 - Wheat, No. 2 Canada Western Red Spring - 13.5% protein segregate
Analytical data, physical dough properties and baking quality data
Comparative Buhler mill flour data - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter[1]	2011	2010	2011	2010
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	12.9	13.0	12.5	12.6
Wet gluten content, %	37.3	36.4	37.0	35.4
Ash content, %	0.43	0.44	0.38	0.36
Grade colour, Satake units	-3.4	-2.8	-4.5	-4.3
Brightness,[2] L*	86.7	86.2	87.5	87.3
Redness,[2] a*	-0.68	-0.61	-0.90	-0.87
Yellowness,[2] b*	14.3	13.7	14.1	13.7
α-amylase activity, units/g	1.5	1.5	1.0	1.0
Amylograph peak viscosity, BU	690	775	730	855
Starch damage, %	6.7	6.3	7.0	6.6
Farinogram				
Absorption, %	64.7	62.6	64.8	62.7
Development time, min	6.00	7.75	6.50	13.25
Mixing tolerance index, BU	30	15	20	10
Stability, min	8.5	21.0	16.5	32.0
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	63	62	63	62
Mixing energy dough stage, W-h/kg	3.2	4.5	3.4	5.1
Mixing time dough stage, min	1.9	2.5	2.1	2.8
Loaf volume, cm^3/100 g flour	1075	1110	1040	1050
Appearance	7.5	7.7	7.5	7.5
Crumb structure	5.6	6.0	5.9	6.0
Crumb colour	7.7	8.0	7.7	7.9
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	64	62	64	63
Mixing energy, W-h/kg	5.3	6.8	5.0	6.6
Mixing time, min	3.2	4.0	3.3	4.4
Loaf volume, cm^3/100 g flour	1065	1095	1065	1060
Appearance	7.5	8.0	7.9	8.0
Crumb structure	6.3	6.2	5.9	5.8
Crumb colour	7.9	7.8	7.8	7.7

* The 2010 composite was stored and milled the same day as the 2011.
[1] Data reported on 14.0% moisture basis.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.

Table 9 - 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 - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter[1]	2011	2010	2011	2010
Flour				
Yield, %	74.0	74.0	60.0	60.0
Protein content, %	11.9	12.0	11.5	11.7
Wet gluten content, %	34.8	33.0	33.5	32.1
Ash content, %	0.43	0.42	0.37	0.36
Grade colour, Satake units	-3.8	-3.5	-4.7	-4.4
Brightness,[2] L*	87.0	86.5	87.5	87.6
Redness,[2] a*	-0.86	-0.77	-1.04	-0.97
Yellowness,[2] b*	14.5	14.0	14.4	13.9
α-amylase activity, units/g	1.5	1.0	1.0	1.0
Amylograph peak viscosity, BU	710	740	770	810
Starch damage, %	7.1	6.5	7.5	6.9
Farinogram				
Absorption, %	64.2	62.0	63.8	62.2
Development time, min	4.25	6.25	7.00	9.25
Mixing tolerance index, BU	35	20	15	15
Stability, min	7.5	13.5	22.0	32.5
Sponge-and-dough baking test	**(40 ppm ascorbic acid)**		**(40 ppm ascorbic acid)**	
Absorption, %	63	61	62	62
Mixing energy dough stage, W-h/kg	4.1	5.2	4.1	5.2
Mixing time dough stage, min	2.4	2.9	2.4	3.1
Loaf volume, cm^3/100 g flour	975	1040	955	1035
Appearance	7.1	7.6	7.1	7.8
Crumb structure	5.8	5.9	6.3	5.7
Crumb colour	7.5	7.8	7.7	7.8
Canadian short process baking test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	62	62	63	62
Mixing energy, W-h/kg	5.6	6.4	5.1	7.3
Mixing time, min	3.3	4.3	3.3	4.7
Loaf volume, cm^3/100 g flour	1010	1080	1055	1040
Appearance	7.8	7.8	7.7	7.5
Crumb structure	6.2	6.2	6.0	6.0
Crumb colour	7.7	7.9	7.8	7.8

* The 2010 composite was stored and milled the same day as the 2011.
[1] Data reported on 14.0% moisture basis.
[2] Colour measured on flour/water slurry. See http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm.

Table 10 - Wheat, No. 1 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter	2011	2010	2011	2010
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.6 (73.5)	79.4 (72.5)	82.0 (76.2)	81.9 (76.9)
Redness, a*	-0.19 (0.39)	0.08 (0.67)	-0.11 (0.09)	-0.10 (0.11)
Yellowness, b*	28.0 (28.0)	28.4 (28.7)	27.3 (27.9)	27.2 (28.4)
Cooked colour				
Brightness, L*	69.0	68.2	69.2	70.1
Redness, a*	-1.85	-1.80	-2.00	-2.20
Yellowness, b*	27.3	27.7	28.2	28.1
Texture				
Thickness, mm	2.33	2.36	2.31	2.35
RTC, %	22.9	23.3	22.4	23.7
Recovery, %	33.9	33.5	33.3	33.3
MCS, g/mm^2	31.8	32.7	30.2	33.8
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.9 (74.1)	80.6 (74.2)	81.4 (77.9)	80.8 (76.8)
Redness, a*	2.62 (3.40)	2.54 (3.46)	2.22 (2.74)	2.22 (2.78)
Yellowness, b*	24.5 (25.6)	23.2 (25.4)	24.0 (26.0)	23.7 (25.7)
Cooked colour				
Brightness, L*	73.9	74.2	75.5	74.8
Redness, a*	0.86	0.94	0.51	0.72
Yellowness, b*	19.5	19.7	19.7	20.3
Texture				
Thickness, mm	2.43	2.46	2.30	2.44
RTC, %	19.1	19.1	17.0	18.5
Recovery, %	25.5	25.8	24.4	25.3
MCS, g/mm^2	26.8	28.0	24.6	27.9

* The 2010 composite was stored and milled the same day as the 2011.

Table 11 - Wheat, No. 1 Canada Western Red Spring - 12.5% protein segregate
Noodle quality data
Comparative Buhler mill data - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter	2011	2010	2011	2010
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.6 (74.2)	80.4 (74.9)	81.5 (76.3)	81.9 (75.3)
Redness, a*	-0.34 (0.43)	-0.29 (0.14)	-0.35 (0.09)	-0.30 (0.11)
Yellowness, b*	27.4 (27.4)	28.8 (28.8)	28 (28.9)	27.8 (28.3)
Cooked colour				
Brightness, L*	67.9	68.7	69.4	69.6
Redness, a*	-1.84	-2.14	-2.22	-2.40
Yellowness, b*	28.7	28.7	29.1	29.0
Texture				
Thickness, mm	2.26	2.24	2.24	2.19
RTC, %	22.1	23.0	22.1	23.2
Recovery, %	32.0	32.9	32.2	32.4
MCS, g/mm^2	26.3	29.1	29.0	29.8
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	81.5 (75.2)	81.1 (75.0)	82.8 (78.3)	82.7 (77.8)
Redness, a*	2.44 (3.16)	2.32 (3.11)	1.93 (2.29)	2.04 (2.38)
Yellowness, b*	24.6 (25.4)	23.3 (24.8)	24.1 (25.2)	23.7 (24.6)
Cooked colour				
Brightness, L*	74.6	74.7	76.3	74.6
Redness, a*	0.70	0.76	0.44	0.48
Yellowness, b*	20.0	20.3	20.4	20.3
Texture				
Thickness, mm	2.39	2.39	2.33	2.38
RTC, %	17.1	18.4	17.4	18.0
Recovery, %	24.6	25.0	24.6	25.0
MCS, g/mm^2	23.5	25.7	24.4	25.0

* The 2010 composite was stored and milled the same day as the 2011.

Table 12 - Wheat, No. 2 Canada Western Red Spring - 13.5% protein segregate
Noodle quality data
Comparative Buhler mill data - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter	2011	2010	2011	2010
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	78.4 (71.9)	78.5 (73.0)	81.1 (76.3)	80.9 (76.4)
Redness, a*	0.00 (0.68)	0.02 (0.60)	-0.11 (0.17)	-0.16 (0.50)
Yellowness, b*	28.0 (27.9)	27.0 (27.6)	27.3 (28.1)	25.6 (27.6)
Cooked colour				
Brightness, L*	67.8	67.7	69.0	69.1
Redness, a*	-1.81	-1.69	-2.07	-2.14
Yellowness, b*	27.6	27.0	28.2	27.9
Texture				
Thickness, mm	2.28	2.33	2.32	2.29
RTC, %	22.6	24.5	22.9	23.4
Recovery, %	33.0	33.9	32.2	33.2
MCS, g/mm^2	32.3	33.4	32.3	31.8
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	80.4 (74.9)	80.5 (73.6)	82.6 (77.6)	82.8 (77.7)
Redness, a*	2.66 (3.46)	2.67 (3.56)	2.25 (2.77)	2.18 (2.59)
Yellowness, b*	24.4 (25.7)	23.8 (24.5)	24.5 (26.2)	23.8 (24.9)
Cooked colour				
Brightness, L*	74.7	74.0	75.7	75.2
Redness, a*	0.90	1.04	0.52	0.55
Yellowness, b*	19.5	19.5	20.0	19.8
Texture				
Thickness, mm	2.41	2.45	2.41	2.45
RTC, %	17.3	18.2	16.9	17.6
Recovery, %	24.8	25.5	24.1	25.1
MCS, g/mm^2	24.5	27.9	24.2	26.7

* The 2010 composite was stored and milled the same day as the 2011.

Table 13 - Wheat, No. 2 Canada Western Red Spring - 12.5% protein segregate
Noodle quality data
Comparative Buhler mill data - 2011 and 2010 harvest sample composites*

	74% Straight grade		60% Patent	
Quality parameter	2011	2010	2011	2010
Fresh yellow alkaline noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	82.3 (75.7)	80.8 (74.4)	83.5 (77.7)	81.9 (76.5)
Redness, a*	-0.43 (0.20)	-0.28 (0.38)	-0.45 (-0.05)	-0.35 (0.08)
Yellowness, b*	26.5 (27.6)	27.4 (28.0)	27.6 (28.4)	27.6 (27.9)
Cooked colour				
Brightness, L*	69.1	69.0	69.5	68.7
Redness, a*	-1.93	-2.00	-2.05	-1.88
Yellowness, b*	28.8	28.2	29.4	29.0
Texture				
Thickness, mm	2.26	2.27	2.26	2.28
RTC, %	22.2	23.4	21.5	22.1
Recovery, %	32.3	33.1	32.1	32.4
MCS, g/mm^2	30.5	31.5	29.2	30.6
Fresh white salted noodles				
Raw colour at 2 hrs (24 hrs)				
Brightness, L*	79.7 (74.8)	80.9 (75.0)	82.7 (78.2)	83.8 (78.2)
Redness, a*	2.51 (3.27)	2.37 (3.22)	2.01 (2.51)	1.99 (2.42)
Yellowness, b*	24.4 (25.7)	23.3 (24.9)	23.9 (26.2)	22.5 (24.5)
Cooked colour				
Brightness, L*	74.8	74.3	76.3	75.5
Redness, a*	0.80	0.92	0.43	0.47
Yellowness, b*	20.1	20.1	20.5	20.2
Texture				
Thickness, mm	2.37	2.43	2.37	2.41
RTC, %	16.4	18.8	17.0	17.9
Recovery, %	24.3	25.4	24.2	24.9
MCS, g/mm^2	23.0	27.0	22.9	26.7

* The 2010 composite was stored and milled the same day as the 2011.

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 2011, 2010 and for the previous 10 years (2001-2010). Figure 3 shows the variation in annual mean protein content since 1963.

The average protein content of the 2011 durum crop at 12.3% is 0.4% lower than 2010 and 0.8% lower than the 10-year mean. Wheat, No. 1 CWAD protein content is 1.3% lower than the 10-year mean. No data were available for No. 1 CWAD for the 2010 crop year due to insufficient samples. Wheat, No. 2 CWAD protein content is 0.5% lower than last year and 0.9% 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.

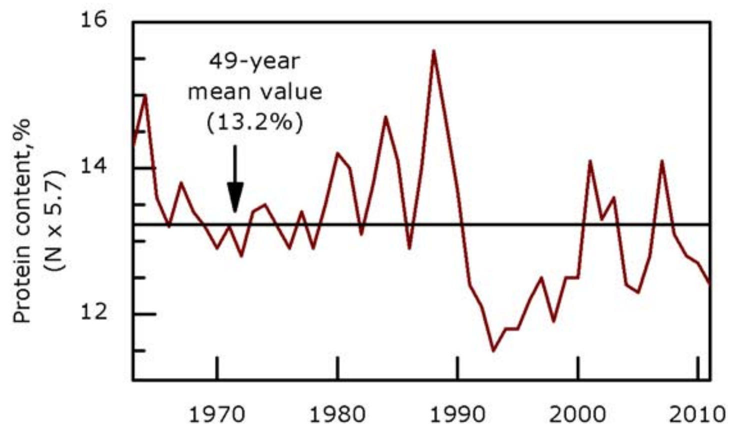
Canadian Wheat Board 2011 variety survey information indicates that the variety Strongfield remains the most popular variety with western Canadian producers representing 65.8% of the seeded area. AC Avonlea represents 12.8% of the seeded hectares. AC Navigator production decreased to 8.5% from 12.7%. Kyle continued to decline in production, decreasing to 5.7%. CDC Verona accounts for 5.4% of the seeded hectares. The extra-strong durum variety Commander accounted for 0.1% 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 good milling performance, strong and balanced gluten characteristics along with high protein potential and high yellow pigment content.

Table 14 – Mean protein content of 2011 Canada Western Amber Durum wheat, by grade and year.

	Protein content, %[1]		
Grade	2011	2010	2001-2010
Wheat, No. 1 Canada Western Amber Durum	12.2	N/A	13.5
Wheat, No. 2 Canada Western Amber Durum	12.2	12.7	13.1
Wheat, No. 3 Canada Western Amber Durum	12.5	12.7	13.1
All milling grades	**12.3**	**12.7**	**13.1**

[1] N x 5.7; 13.5% moisture content basis as of Nov. 24/11
N/A = not available

Figure 3 – Mean protein content of Canada Western Amber Durum wheat – 1963-2011



Wheat and pasta processing quality

Wheat, No. 1 and 2 Canada Western Amber Durum

Data describing the quality characteristics for composite samples of Wheat, No. 1 and No. 2 CWAD are shown in Table 15. Corresponding data for 2009 No. 1 CWAD (No. 1 CWAD composite of 2010 crop not available) and 2010 No. 2 CWAD are provided for comparison. The main degrading factors in the 2011 No. 2 CWAD are mildew and hard vitreous kernel count. Test weight is slightly higher than 2009 crop for No. 1 CWAD and higher than 2010 crop for No. 2 CWAD. Weight per 1000 kernels is slightly lower than 2009 crop for No. 1 CWAD and comparable to 2010 crop for No. 2 CWAD. Hard vitreous kernel count is slightly lower than 2009 for No. 1 CWAD, and is the same as 2010 for No. 2 CWAD. The wheat protein content is 12.3% for No. 1 CWAD, 0.6% lower than 2009 crop of the same grade. No. 2 CWAD has protein content of 12.2%; significantly lower than 12.8% of 2010 No. 2 CWAD. Falling number values for both wheat and semolina are indicative of sound kernel characteristics.

Several changes have been made in the procedures for assessment of CWAD quality this year. Firstly, all samples were made up to a constant extraction rate of 70% following milling in order to be consistent with current commercial practice. This was accomplished by taking the semolina and adding the highest quality flour streams until 70% extraction was attained. In order to be able to compare to previous years the 2009 No. 1 CWAD composite and the 2010 No. 2 CWAD composite samples were re-milled along side the 2011 composites in order to produce 70% extraction granulars. All semolina and spaghetti tests were conducted using the 70% extraction granulars. Speck counts are now conducted using a flatbed scanner and specially developed software. Specks are reported as total, dark and large specks per 50 cm^2. Changes have also been made to semolina and spaghetti colour measurements and we have included dough sheet colour measurements at 0.5 and 24 hrs. There were changes to the spaghetti extrusion and drying method, and textural analyses of the cooked spaghetti. All of these changes are explained at http://www.grainscanada.gc.ca/wheat-ble/method-methode/wmtm-mmab-eng.htm

Total milling yield and semolina yield for the top two grades are similar to last year. Ash contents of wheat and semolina are essentially the same as 2009 for No. 1 CWAD and 2010 for No. 2 CWAD. Total speck counts are considerably lower than 2009 for No. 1 CWAD, but comparable for dark speck counts and large speck counts. In terms of No. 2 CWAD, total, dark and large speck counts are all similar to those of 2010 crop. Overall the milling quality of the 2011 CWAD crop is consistent with expectations for top grades.

Semolina protein contents are lower by 0.6% for both No. 1 CWAD and No. 2 CWAD. Wet gluten contents are 2% lower for No. 1 CWAD and 1% lower for No. 2 CWAD. Gluten index and alveograph P and W values demonstrate weaker gluten strength characteristics compared to 2009 or 2010. The superior gluten strength of CWAD in recent years is mainly due to newer varieties including Strongfield, AC Navigator, and CDC Verona that exhibit stronger gluten characteristics than earlier varieties such as Kyle and AC Avonlea. The weaker than expected gluten strength of the current crop might be due to growing conditions of the 2011 season.

Semolina yellow pigment contents for the top two grades are significantly higher than those of 2009 or 2010 crops, so are the yellowness (b*) values of their resulting semolina samples. Overall, CWAD exhibits a significant improvement over the years resulting from continued breeding emphasis placed on increasing yellow pigment levels in new varieties. The significantly higher brightness (L*) and yellowness (b*) of semolina dough sheets prepared from 2011 CWAD crop indicated less discolouration and pigment degradation due to oxidation.

Spaghetti yellowness (b*) of both grades show significant improvement over the 2009 or 2010 crops. The brightness (L*) and redness (a*) values of the spaghetti are generally the same as the previous crop. This result suggests that pasta from the 2011 crop will have higher yellowness without elevation in redness and decrease in brightness. Spaghetti cooked texture, as indicated by cutting force at different compression depths, exhibits slightly softer texture for both 2011 No.1 and No. 2 CWAD compared to the 2009 or 2010 crop year reflecting the lower protein content of the 2011 crop.

Wheat, No. 3 Canada Western Amber Durum

Due to the favourable weather during harvest, less than one third of the 2011 durum crop was downgraded to No. 3 CWAD (~20%) or lower (~10%). The primary degrading factors in the No. 3 CWAD are ergot, fusarium damage, and hard vitreous kernel count. Data describing the quality of No. 3 CWAD can be found in Table 16. Corresponding data for the 2010 No. 3 CWAD are provided for comparison. Test weight is higher, weight per 1000 kernels and hard vitreous kernel count are slightly lower than those of the 2010 crop. The wheat protein content is 12.6%, same as the 2010 crop. The falling number value of 430 sec. is much higher than 280 sec. of the 2010 crop. This indicates that kernel characteristics of the 2011 crop were very sound due to the absence of grading factors related to excessive moisture during harvest.

Total milling yield and semolina yield are significantly higher. Ash contents of wheat and semolina are comparable to the 2010 No. 3 CWAD. Total and dark speck counts are lower even with the presence of ergot in the 2011 No. 3 CWAD composite. This is the result of the strict limit for ergot in the Canadian durum wheat milling grades, coupled with its relatively low presence in the current CWAD crop (only 27% of the No. 3 CWAD samples were downgraded due to ergot). Overall milling quality of No. 3 CWAD from the 2011 crop is significantly better than that of 2010 No. 3 CWAD.

Semolina protein content and wet gluten content are the same as those of the previous crop year. Gluten index and alveograph P and W values demonstrate weaker gluten strength characteristics compared to the 2010 crop. Semolina yellow pigment content is significantly higher than that of the 2010 crop, as is the yellowness (b*) of the semolina sample. The significantly higher brightness (L*) and yellowness (b*) of semolina dough sheets prepared from 2011 No. 3 CWAD crop indicated that there is less discolouration and pigment degradation due to oxidation.

Spaghetti yellowness (b*) is significantly higher than that of 2010 No. 3 CWAD. Spaghetti cooked texture, as indicated by cutting force at different compression depths, exhibits slightly higher surface firmness but lower core firmness compared to the 2010 No. 3 CWAD.

Table 15 - Wheat, No. 1 and 2 Canada Western Amber Durum
Quality data for 2011 harvest sample grade composites compared to 2009 and 2010*

Quality parameter[1]	No. 1 CWAD 2011	No. 1 CWAD 2009	No. 2 CWAD 2011	No. 2 CWAD 2010
Wheat				
Test weight, kg/hL	83.2	82.8	82.8	82.0
Weight per 1000 kernels, g	43.6	46.6	43.7	43.3
Vitreous kernels, %	88	93	82	83
Protein content, %	12.3	12.9	12.3	12.8
Ash content, %	1.49	1.48	1.52	1.54
Falling number, s	420	485	430	380
Milling				
Milling yield, %	75.8	75.7	75.4	75.1
Semolina yield, %	67.5	67.4	66.8	66.6
Semolina ash content, %	0.63	0.62	0.64	0.64
Speck count per 50 cm^2				
Total	25	34	38	39
Dark	7	9	12	10
Large (≥ 0.06 mm^2)	12	13	12	13
Semolina[2]				
Protein content, %	11.2	11.8	11.1	11.7
Wet gluten content, %	29.4	31.5	29.2	30.2
Gluten index, %	46	49	50	61
Alveogram				
Length, mm	96	86	97	87
P (height x 1.1), mm	52	70	51	70
P/L	0.54	0.81	0.53	0.80
W, x 10^{-4} joules	132	171	128	181
Yellow pigment content, ppm	9.5	8.1	9.1	8.4
Yellowness, b*	31.9	29.9	31.2	29.9
Dough sheet colour at (0.5 hrs) 24 hrs				
Brightness, L*	(80.9) 78.3	(80.6) 75.7	(81.1) 78.9	(80.2) 77.1
Redness, a*	(-1.9) -1.5	(-1.3) -0.8	(-1.8) -1.5	(-1.5) -0.9
Yellowness, b*	(37.3) 41.2	(34.3) 36.3	(36.4) 39.9	(33.5) 36.5
Falling number, s	465	580	490	420
Spaghetti - Dried at 85°C				
Brightness, L*	73.4	73.4	73.3	73.3
Redness, a*	4.2	4.3	4.2	4.6
Yellowness, b*	62.7	59.7	62.0	60.2
Strand diameter, mm				
Dry	1.69	1.70	1.69	1.69
Cooked	2.49	2.51	2.49	2.50
Texture Cutting force (g) at				
25% diameter	96	102	100	98
50% diameter	332	352	350	342
Peak	495	546	498	547

* The 2009 and 2010 composites were stored and milled the same day as the 2011.

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

[2] Semolina analysis is conducted using granular products with a constant extraction rate of 70%.

Table 16 - Wheat, No. 3 Canada Western Amber Durum
Quality data for 2011 harvest sample grade composites compared to 2010*

Quality parameter[1]	No. 3 CWAD 2011	No. 3 CWAD 2010
Wheat		
Test weight, kg/hL	82.1	81.1
Weight per 1000 kernels, g	41.8	43.1
Vitreous kernels, %	70	75
Protein content, %	12.6	12.6
Ash content, %	1.60	1.62
Falling number, s	430	280
Milling		
Milling yield, %	75.3	74.5
Semolina yield, %	66.9	65.6
Semolina ash content, %	0.67	0.65
Speck count per 50 cm^2		
Total	42	55
Dark	15	21
Large (≥ 0.06 mm^2)	18	18
Semolina[2]		
Protein content, %	11.5	11.6
Wet gluten content, %	30.1	30.1
Gluten index, %	38	56
Alveogram		
Length, mm	91	88
P (height x 1.1), mm	52	60
P/L	0.57	0.68
W, x 10^{-4} joules	121	151
Yellow pigment content, ppm	9.2	8.3
Yellowness, b*	31.1	29.2
Dough sheet colour at (0.5 hrs) 24 hrs		
Brightness, L*	(80.6) 78.9	(80.1) 77.7
Redness, a*	(-1.6) -1.3	(-1.4) -0.9
Yellowness, b*	(36.0) 39.8	(32.9) 36.6
Falling number, s	455	350
Spaghetti - Dried at 85°C		
Brightness, L*	72.5	72.6
Redness, a*	4.9	5.3
Yellowness, b*	61.8	59.6
Strand diameter, mm		
Dry	1.69	1.69
Cooked	2.50	2.50
Texture Cutting force (g) at		
25% diameter	100	96
50% diameter	348	335
Peak	504	546

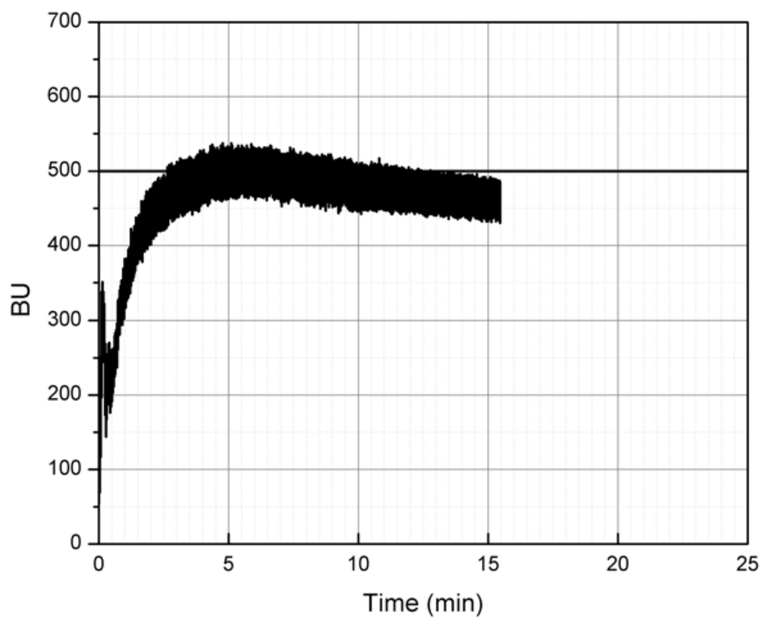
* The 2010 composite was stored and milled the same day as the 2011.

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

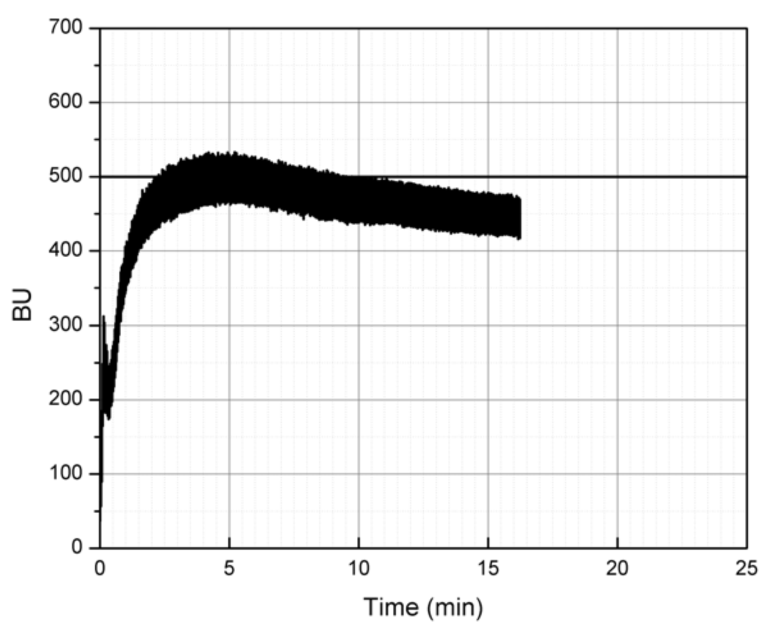
[2] Semolina analysis is conducted using granular products with a constant extraction rate of 70%.

Farinograms
2011 crop composite samples

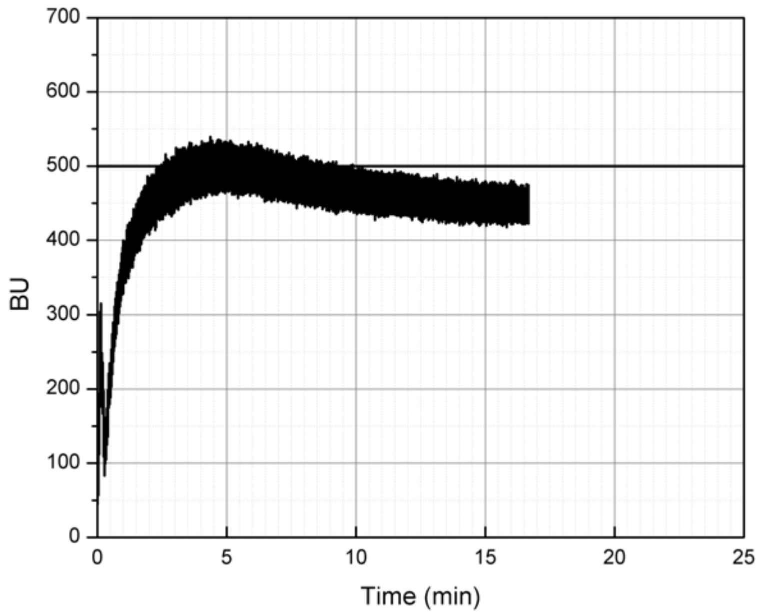
Wheat, No. 1 Canada Western Red Spring wheat – 13.5% protein segregate



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