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Quality of western Canadian pulse crops

2008

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Quality Innovation Service

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Introduction

This report presents the quality data for the 2008 harvest survey for western Canadian pulse crops (peas, lentils, chick peas and pea beans). Samples submitted by western Canadian producers to the Canadian Grain Commission's (CGC) Grain Research Laboratory (GRL) were collected for data analysis.

Weather review

The weather review for the 2008 crop year was provided by the Weather and Crop Surveillance department of the Canadian Wheat Board (CWB).

Seeding

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

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

Growing conditions

Precipitation during June was close to normal or above normal in most of the Prairie region, which helped boost crop prospects. Temperatures during the month of May and June were significantly below normal, which delayed crop development. By the end of June, growth was 10 days to two weeks behind normal, but the crop condition was rated as mostly good to excellent. In July, moderate temperatures were reported, with many stations in the western Prairies reporting monthly averages that were 2 to 5 degrees Celsius below those received in July, 2007. The cooler temperatures allowed crops to move through the reproductive stage without significant stress. Dry conditions persisted in the northern growing areas during July, which caused some crop deterioration. The Peace River region of Alberta and British Columbia was dry throughout the month, with above normal temperatures that caused significant

crop stress. The hot, dry conditions in the Peace River region significantly reduced yield expectations in the region. In northern areas of Alberta and Saskatchewan, the cooler than normal temperatures in July helped maintain crop conditions until rains arrived in late July and early August

Harvest conditions

Above normal temperatures were reported in August across the Prairies, which helped boost crop development. However, frost was reported during the month in parts of Alberta and western Saskatchewan with some crop damage occurring. Persistent rains in the last week in August and the first ten days of September slowed the harvest. Temperatures remained mild during September, with many areas reporting their first fall frost one to two weeks later than normal. This allowed late developing crops to mature without significant quality damage. Drier, warmer conditions returned to the entire Prairie region during the mid-September to mid-October period, which allowed for a rapid completion of the harvest.

Production review

Pea production for 2008 was estimated to be 3.6 million tonnes, which was up from 2007 and 29% higher than the 10-year average of 2.5 million tonnes (Table 1). The increase in production was due to an increase in harvested area and yield. Saskatchewan accounted for 77% of Canadian pea production, while Alberta and Manitoba accounted for 20% and 3%, respectively.

Lentil production in 2008 was 27% higher than production in 2007 and 22% higher than the 10-year average (Table 1). Both the harvested area and yield increased for 2008. Saskatchewan continues to dominate lentil production in Western Canada, accounting for about 100% of production.

In 2008, Manitoba accounted for 100% of western Canadian pea bean production. Production, harvested area and yield were slightly lower than 2007 and 46% lower than the 10-year average (Table 1).

Production of chick peas for 2008 was estimated at 67 thousand tonnes, which was down 70% from 2007 and was 65% lower than the 10-year average (Table 1). The decreased production in 2008 was a result of decreased harvested area. Saskatchewan accounted for approximately 100% of western Canadian chick pea production in 2008.

Table 1 – Production statistics for western Canadian pulses[1]

Province	Harvested area		Production		Yield		Mean production[2]
	2008	2007	2008	2007	2008	2007	1998-2007
	thousand hectares		thousand tonnes		kg/ha		thousand tonnes
Peas-dry							
Manitoba	44	39	108	98	2420	2540	138
Saskatchewan	1255	1164	2732	2310	2180	1990	1855
Alberta[3]	283	241	731	528	2580	2190	539
Western Canada	**1582**	**1443**	**3571**	**2935**	**2300**	**2030**	**2532**
Lentils							
Manitoba	-	-	-	-	-	-	5
Saskatchewan	631	534	920	674	1460	1250	708
Alberta[3]	-	-	-	-	-	-	9
Western Canada	**631**	**534**	**920**	**674**	**1460**	**1250**	**718**
Pea beans							
Manitoba	22	26	36	43	1630	1640	67
Saskatchewan	-	-			-	-	-
Alberta[3]	-	-	-	-	-	-	-
Western Canada	**22**	**26**	**36**	**43**	**1630**	**1640**	**67**
Chick peas							
Manitoba	-	-	-	-	-	-	-
Saskatchewan	42	154	67	198	1580	1290	174
Alberta[3]	-	20	-	27	-	1320	14
Western Canada	**42**	**174**	**67**	**225**	**1580**	**1290**	**189**

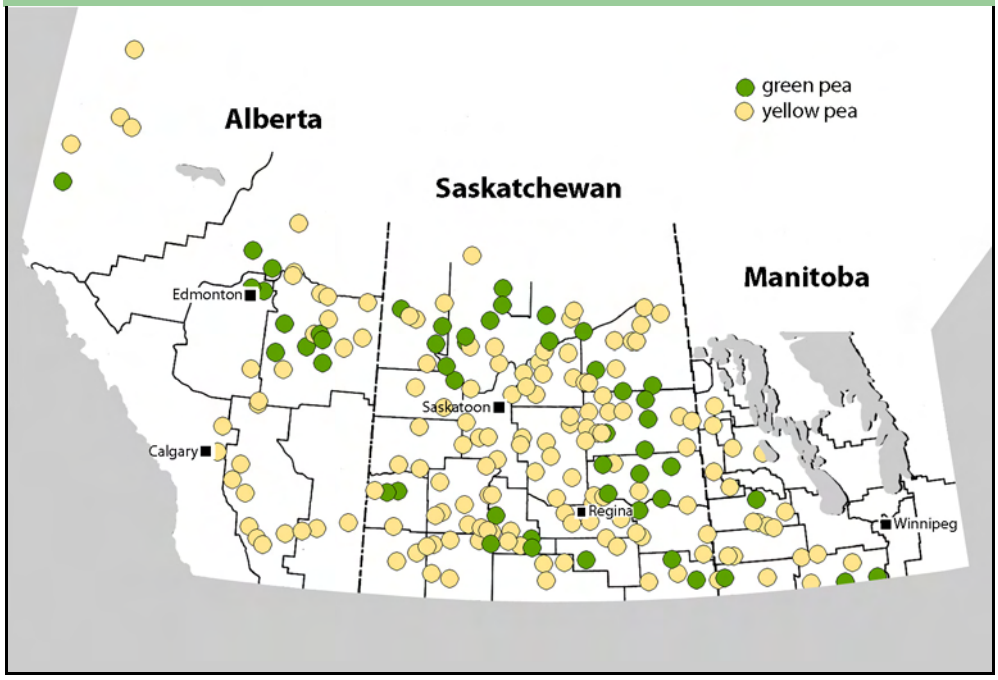
[1] Statistics Canada, *Field Crop Reporting Series, Vol. 87, No. 8.*
[2] Statistics Canada, *Field Crop Reporting Series*, 1998-2007.
[3] Includes the Peace River area of British Columbia.

Quality of western Canadian peas 2008

Harvest survey samples

Samples for the CGC's 2008 harvest survey were collected from producers across western Canada (Fig. 1). A total of 757 samples consisting of 616 yellow pea and 141 green pea samples were received at the CGC for analysis. All samples were graded and tested for protein content. Composites were prepared based on class (yellow and green), crop region and grade (No. 1 and No. 2). A total of 94 composite samples (62 yellow and 32 green pea composites) were obtained. All composites were tested for starch content, 100-seed weight, water absorption, cooking time and firmness of cooked peas. It is important to note that the samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 1 – Map of western Canada showing origin of 2008 harvest survey pea samples



Quality of 2008 western Canadian peas

Protein content ranged from 18.7% to 29.1% for 2008 western Canadian peas, including yellow and green peas (Table 2). The average protein for 2008 western Canadian peas was 23.2%, which was lower than 2007 and also lower than the five-year average of 24.0 % (Fig. 2). Grade level and province did not show much variation in protein content.

Table 3 shows the quality data for 2008 yellow peas. The average protein content for 2008 yellow peas in western Canada for both peas, No. 1 Canada yellow and peas, No. 2 Canada yellow were similar (22.7% and 23.0% respectively), and lower than that for 2007 yellow peas. Starch contents were also lower across western Canada in 2008 (44.3-45.6%) than in 2007 (45.6-48.2%).

Both 2008 peas, No. 1 Canada yellow (22.5 g) and peas, No. 2 Canada yellow (21.7 g), were heavier than those in 2007 (20.9 g and 20.5 g, respectively). However, water absorption of 2008 yellow peas (0.92 g H_2O/g seeds for No. 1 Canada and 0.94 g H_2O/g seeds for No. 2 Canada) was lower than that for 2007 (0.97 g H_2O/g seeds for No. 1 Canada and 0.99 g H_2O/g seeds for No. 2 Canada).

The cooking time for peas, No. 1 Canada yellow, was similar in 2008 to that in 2007 (20.5 min and 19.2 min respectively), while for peas, No. 2 Canada yellow, the cooking time for 2008 was longer than that for 2007 (18.4 min and 16.1 min, respectively). The methodology for determining the firmness of cooked seeds changed this year from a 20 min cooking time followed by compression force testing to the sample's cooking time followed by shear force testing. This prevents us from comparing the results from 2007 and 2008. Overall, 2008 peas, No. 1 Canada yellow (22.9 N/g cooked seeds) were slightly more firm than peas, No. 2 Canada yellow (21.3 N/g cooked seeds).

Green peas in 2008 had lower protein and starch contents than in 2007 (Table 4). The 2008 green peas (22.7 g for peas, No. 1 Canada green and 23.1 g for peas, No. 2 Canada green) were heavier than the 2007 green peas (21.8 g and 21.2 g, respectively). Water absorption for 2008 (0.90-0.93 g H_2O/g seeds) was slightly lower than 2007 (0.93-0.94 g H_2O/g seeds). Cooking times in 2008 (15.6-16.7 min) were slightly longer than those in 2007 (14.3-14.6 min). Again, the methodology for determining the firmness of cooked seeds changed this year; which prevents us from comparing the results from 2007 and 2008. Firmness results were similar between 2008 peas, No. 1 Canada green and peas, No. 2 Canada green (22.0 N/g cooked seeds and 22.8 N/g cooked seeds, respectively).

Table 2 – Mean protein content for 2008 western Canadian peas by grade[1]

Grade	Protein content, %			
	2008			2007
	mean	min.	max.	mean
Manitoba				
Peas, No. 1 Canada	24.4	21.5	26.7	24.2
Peas, No. 2 Canada	23.1	20.8	25.2	24.6
Peas, No. 3 Canada	22.9	20.2	24.8	24.8
All grades	**23.3**	**20.2**	**26.7**	**24.5**
Saskatchewan				
Peas, No. 1 Canada	23.1	19.2	27.4	25.0
Peas, No. 2 Canada	23.4	19.4	29.1	25.2
Peas, No. 3 Canada	24.0	20.7	27.3	24.9
All grades	**23.3**	**19.2**	**29.1**	**25.0**
Alberta				
Peas, No. 1 Canada	22.6	18.7	26.5	23.3
Peas, No. 2 Canada	22.8	18.8	25.3	24.1
Peas, No. 3 Canada	23.7	20.0	26.5	23.9
All grades	**22.9**	**18.7**	**27.0**	**23.8**
Western Canada				
Peas, No. 1 Canada	23.0	18.7	27.4	24.8
Peas, No. 2 Canada	23.3	18.8	29.1	25.0
Peas, No. 3 Canada	23.9	20.0	27.3	24.7
All grades	**23.2**	**18.7**	**29.1**	**24.7**

[1] Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Figure 2 – Mean protein content of western Canadian peas

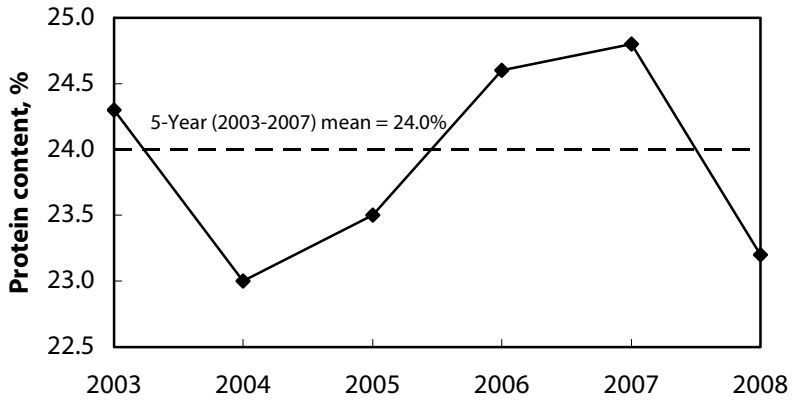


Table 3 – Quality data for 2008 western Canadian yellow peas

	Peas, No. 1 Canada Yellow		Peas, No. 2 Canada Yellow	
Quality parameter	2008	2007	2008	2007
Protein, % dry basis				
Number of samples	29	222	33	303
Mean	22.7	24.8	23.0	25.0
Standard deviation	1.1	2.1	1.1	1.9
Minimum	18.7	16.2	21.3	17.4
Maximum	24.6	30.5	25.4	29.5
Starch, % dry basis				
Number of samples	29	71	33	69
Mean	45.5	47.9	45.0	47.6
Standard deviation	0.9	1.9	0.9	2.2
Minimum	43.9	43.6	42.9	41.8
Maximum	47.5	52.5	47.0	51.5
100-seed weight, g/100 seeds				
Number of samples	29	219	33	292
Mean	22.5	20.9	21.7	20.5
Standard deviation	1.5	1.9	1.9	2.4
Minimum	19.5	16.5	18.3	9.7
Maximum	25.8	28.2	26.7	30.7
Water absorption, g H_2O/g seeds				
Number of samples	29	219	33	292
Mean	0.92	0.97	0.94	0.99
Standard deviation	0.08	0.10	0.07	0.11
Minimum	0.72	0.45	0.76	0.20
Maximum	1.06	1.14	1.08	1.20
Cooking time, min				
Number of samples	29	71	33	71
Mean	20.5	19.2	18.4	16.1
Standard deviation	8.6	11.7	8.0	8.3
Minimum	9.3	7.1	7.8	7.0
Maximum	39.8	40.0	40.0	40.0
Firmness, N/g cooked seeds				
Number of samples	29	53	33	NA
Mean	22.9	NA	21.3	NA
Standard deviation	2.8	NA	2.8	NA
Minimum	17.5	NA	16.5	NA
Maximum	30.2	NA	27.5	NA

Table 4 – Quality data for 2008 western Canadian green peas

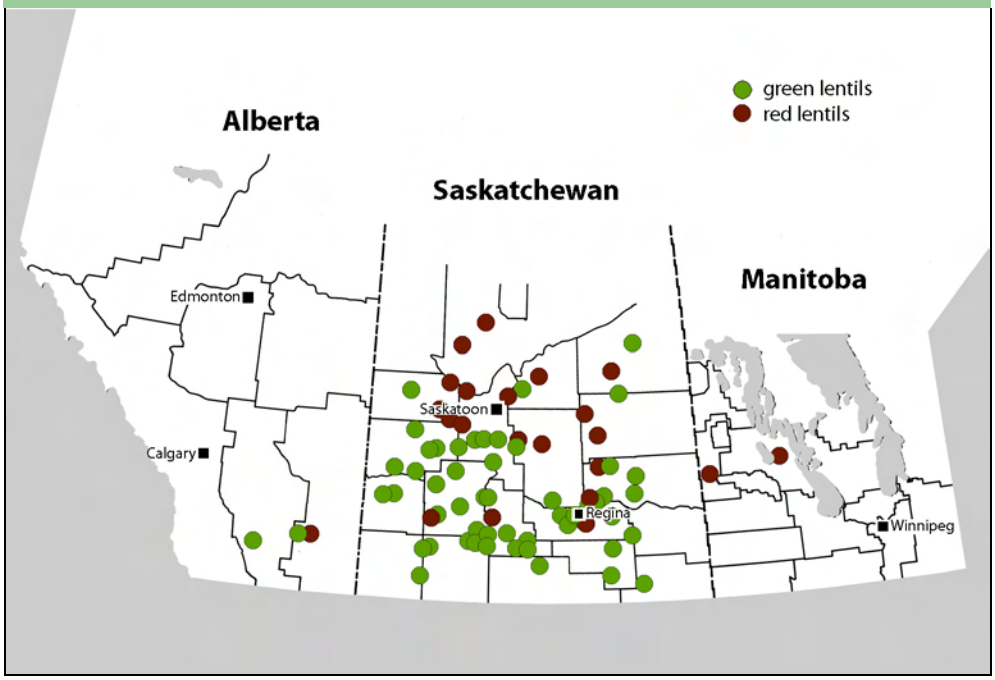
Quality parameter	Peas, No. 1 Canada Green		Peas, No. 2 Canada Green	
	2008	2007	2008	2007
Protein, % dry basis				
Number of samples	17	28	15	17
Mean	23.3	24.9	22.7	24.9
Standard deviation	1.0	1.6	0.9	1.6
Minimum	21.3	22.0	20.6	21.2
Maximum	24.9	28.0	24.2	27.4
Starch, % dry basis				
Number of samples	17	28	15	17
Mean	44.7	47.2	44.8	46.8
Standard deviation	0.6	1.9	0.9	1.7
Minimum	43.4	43.2	43.3	43.7
Maximum	45.6	49.9	46.5	49.5
100-seed weight, g/100 seeds				
Number of samples	17	28	15	17
Mean	22.7	21.8	23.1	21.2
Standard deviation	2.9	2.3	3.3	2.6
Minimum	17.7	17.0	16.6	16.8
Maximum	28.3	25.0	28.9	26.2
Water absorption, g H_2O/g seeds				
Number of samples	17	28	15	17
Mean	0.93	0.94	0.90	0.93
Standard deviation	0.09	0.15	0.11	0.13
Minimum	0.70	0.59	0.74	0.68
Maximum	1.06	1.14	1.07	1.12
Cooking time, min				
Number of samples	17	28	15	17
Mean	16.7	14.3	15.6	14.6
Standard deviation	9.9	8.8	8.4	8.6
Minimum	8.6	6.4	8.1	6.8
Maximum	40.0	40.0	35.0	40.0
Firmness, N/g cooked seeds				
Number of samples	17	NA	15	NA
Mean	22.0	NA	22.8	NA
Standard deviation	2.3	NA	2.6	NA
Minimum	16.2	NA	19.8	NA
Maximum	27.2	NA	30.2	NA

Western Canadian lentils 2008

Harvest survey samples

Samples for the CGC's 2008 harvest survey were collected from producers across western Canada (Fig. 3). A total of 331 lentil samples including 217 green lentils and 114 red lentils were received at the CGC for analysis. All samples were graded and tested for protein content and seed size distribution. Size distribution was determined using the image analysis technique developed at the CGC. Composites for green lentils were made based on size (small, medium and large), crop region and grade (No. 1 and No. 2). 23 composites for large lentils, 4 for medium lentils and 11 for small lentils were obtained. The composites were tested for starch content, 100-seed weight and water absorption. A total of 21 composites for red lentils were made based on variety and crop region. In addition to the quality evaluations done on green lentils, red lentils were also evaluated for their dehulling quality. It is important to note that the samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 3 – Map of western Canada showing origin of 2008 harvest survey lentil samples



Quality of 2008 western Canadian lentils

Protein content ranged from 24.1% to 31.2% for 2008 western Canada lentils, including green and red lentils (Table 5). The average protein content for 2008 was 27.9%, which was similar to the 2007 average of 27.6%, and higher than the five-year average of 27.1% (Fig. 4). Grade level and province did not show much variation of protein content.

Small green lentils (CDC Milestone, CDC Viceroy and Eston), medium green lentils (CDC Meteor, CDC Richlea and CDC Vantage) and large green lentils (CDC Glamis, CDC Grandora, CDC Plato, CDC Sedley, CDC Sovereign and Laird) had average protein contents of 28.7%, 26.5% and 27.3%, respectively, which were similar to their respective type of lentil in 2007 (Table 6). The mean starch contents for all sizes in 2008 were lower than those for 2007.

Small green lentils in 2008 had a mean 100-seed weight of 2.8 g, which was lower than that in 2007 (3.3 g). Medium and large green lentils in 2008 had mean 100-seed weights of 4.8 g and 6.4 g respectively, which were higher than the 2007 survey. The mean water absorption values were 0.88 g H_2O/g seeds for small green lentils, 0.93 g H_2O/g seeds for medium green lentils and 0.97 g H_2O/g seeds for large lentils. These results were lower than those for 2007 (0.91 g H_2O/g seeds, 1.06 g H_2O/g seeds and 1.04 g, respectively).

The seed size distribution for green lentils (Table 7) was determined by the image analysis technique developed at the CGC. The reported results may differ from those obtained by conventional sieving techniques. For small green lentils in 2008, 75% fell within 4.0 to 5.0 mm, which was similar to 2007. Medium green lentils in 2008 had 64% within 5.0-6.0 mm, which was lower than that in 2007 (68%). In 2007, about 58% of large green lentils fell within 6.0-7.0 mm, while in 2008, about 70% fell within this range, indicating that the large lentils in 2008 were larger than in 2007. This corresponds to the trend shown with the mean 100-seed weight.

Red lentils, including the varieties Crimson, CDC Blaze, CDC Impact, CDC Imperial, CDC Redberry, CDC Rouleau and CDC Robin, had a mean protein content of 28.6% (Table 8), which was similar to 2007. Red lentils in 2008 had lower mean starch content than in 2007 (44.1% and 45.5%, respectively). The mean 100-seed weight for 2008 (3.3 g) was similar to that in 2007 (3.1 g), while the mean water absorption (0.89 g H_2O/g seeds) for 2008 was lower than that for 2007 (0.95 g H_2O/g seeds).

In 2008, about 71% of the red lentils fell within 4.0-5.0 mm size range (Table 9), which is similar to the 68% that fell within this range in 2007. This indicates that red lentils in 2008 had similar mean seed size to 2007, which is also indicated with the mean seed size results (Table 8)

Table 10 shows the dehulling quality for 2008 western Canadian red lentils. The mean dehulling efficiency for 2008 red lentils was 79.3%, as compared to 82.1% in 2007. The dehulling efficiency was reduced in 2008 because of higher

powder (2.4%), broken seeds (1.3%) and undehulled whole seeds (6.8%). Colour of dehulled lentils was measured using a Hunterlab LabScan XE spectrocolorimeter with the CIE L*, a* and b* colour scale. Dehulled splits exhibited more brightness (L*), similar redness (a*) and more yellowness (b*) as compared to dehulled whole seeds (Table 10). There were no differences in L* values between 2008 and 2007 dehulled whole and split seeds. Redness (a*) and yellowness (b*) were higher for 2007 dehulled whole and split seeds than for those in 2008.

Table 5 – Protein content for 2008 western Canadian lentils by grade[1]

	Protein content, %			
Grade	2008			2007
	mean	min.	max.	mean
Manitoba				
Lentils, No. 1 Canada	-	-	-	-
Lentils, No. 2 Canada	-	-	-	-
Lentils, No. 3 Canada	30.3	30.3	30.3	-
All grades	**30.3**	**30.3**	**30.3**	**-**
Saskatchewan				
Lentils, No. 1 Canada	28.0	24.1	31.2	27.8
Lentils, No. 2 Canada	27.6	24.9	31.0	27.3
Lentils, No. 3 Canada	28.4	27.0	30.2	27.7
All grades	**27.9**	**24.1**	**31.2**	**27.6**
Alberta				
Lentils, No. 1 Canada	28.7	26.9	30.0	28.2
Lentils, No. 2 Canada	27.7	27.2	28.4	27.2
Lentils, No. 3 Canada	27.9	27.9	27.9	-
All grades	**28.3**	**26.9**	**30.0**	**28.0**
Western Canada				
Lentils, No. 1 Canada	28.0	24.1	31.2	27.8
Lentils, No. 2 Canada	27.6	24.9	31.0	27.3
Lentils, No. 3 Canada	28.5	27.0	30.3	27.8
All grades	**27.9**	**24.1**	**31.2**	**27.6**

[1] Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Figure 4 – Mean protein content of western Canadian lentils

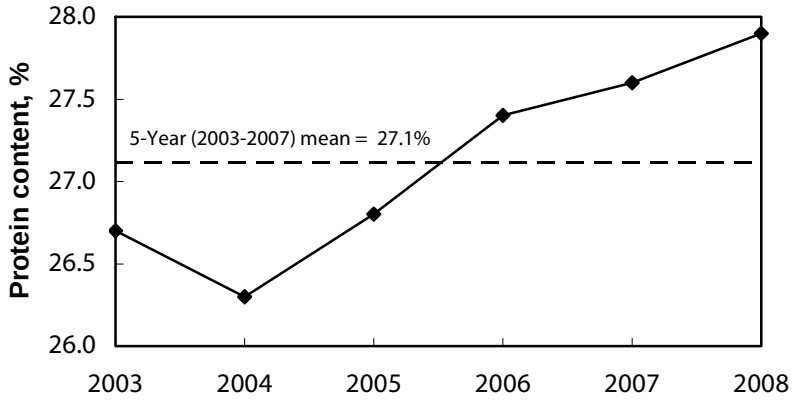


Table 6 – Quality data for 2008 western Canadian green lentils by size[1]

Quality parameter	2008			2007		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
Protein, % dry basis						
Number of samples	11	4	23	40	4	191
Mean	28.7	26.5	27.3	27.6	26.8	27.2
Standard deviation	0.8	1.5	0.6	1.3	1.4	1.2
Minimum	27.5	27.3	26.5	23.9	25.2	22.2
Maximum	30.1	28.1	28.2	30.8	28.4	29.8
Starch, % dry basis						
Number of samples	11	4	23	24	4	65
Mean	43.2	43.8	44.6	46.6	46.6	46.6
Standard deviation	0.9	0.7	0.8	1.5	1.8	1.4
Minimum	41.9	43.7	42.4	43.2	44.0	43.7
Maximum	44.6	44.4	45.7	50.6	48.1	49.4
100-seed weight, g/100 seeds						
Number of samples	11	4	23	39	4	191
Mean	2.8	4.8	6.7	3.3	4.4	5.9
Standard deviation	0.2	0.7	0.5	2.2	0.6	0.5
Minimum	2.4	4.2	5.5	2.4	3.9	4.8
Maximum	3.2	5.7	7.9	3.7	5.2	8.0
Water absorption, g H_2O/g seeds						
Number of samples	11	4	23	39	4	191
Mean	0.88	0.93	0.97	0.91	1.06	1.04
Standard deviation	0.11	0.06	0.04	0.07	0.08	0.09
Minimum	0.68	0.86	0.89	0.60	0.95	0.76
Maximum	1.01	0.99	1.05	1.04	1.12	1.21

[1] Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.
[2] SL=small lentils including Eston, Milestone and Viceroy.
[3] ML=medium lentils including CDC Meteor, Richlea and Vantage.
[4] LL=large lentils including CDC Glamis,CDC Grandora, Laird, CDC Plato, CDC Sedley and Sovereign.

Table 7 – Seed size distribution for 2008 western Canadian green lentils[1]

	2008			2007		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
	Number of samples			Number of samples		
Seed size distribution	29	6	167	42	4	213
<3.5 mm, %	3.3	0.3	0.1	3.9	0.2	0.2
3.5–4.0 mm, %	18.2	0.6	0.1	18.9	0.4	0.3
4.0–4.5 mm, %	45.5	2.7	0.3	44.2	4.4	0.8
4.5–5.0 mm, %	29.8	15.7	1.5	29.4	26.1	2.9
5.0–5.5 mm, %	3.2	29.9	5.4	3.2	45.4	9.8
5.5–6.0 mm, %	0.1	34.4	18.3	0.3	22.4	27.4
6.0–6.5 mm, %	-	15.4	43.2	0.1	1.0	41.7
6.5–7.0 mm, %	-	1.0	27.6	-	-	15.9
7.0–7.5 mm, %	-	-	3.5	-	-	1.0
>7.5 mm, %	-	-	0.1	-	-	-

[1] Seed size including all grades determined by the image analysis technique.
[2] SL=small lentils including the varieties Eston, Milestone and Viceroy.
[3] ML=medium lentils including the varieties Richlea and Vantage.
[4] LL=large lentils including the varieties Glamis, Grandora, Laird, Plato, Sedley and Sovereign.

Table 8 – Quality data for 2008 western Canadian red lentils[1]

Quality parameter	2008	2007
Protein, % dry basis		
Number of samples	21	68
Mean	28.6	28.8
Standard deviation	1.1	1.4
Minimum	26.3	25.5
Maximum	30.4	31.4
Starch, % dry basis		
Number of samples	21	47
Mean	44.1	45.5
Standard deviation	0.9	1.4
Minimum	41.5	43.4
Maximum	46.0	48.9
100-seed weight, g/100 seeds		
Number of samples	21	67
Mean	3.3	3.2
Standard deviation	0.6	0.5
Minimum	2.5	2.2
Maximum	4.8	4.2
Water absorption, g H_2O/g seeds		
Number of samples	21	67
Mean	0.89	0.95
Standard deviation	0.06	0.06
Minimum	0.76	0.78
Maximum	1.02	1.17

[1] Red lentils (Blaze, Crimson, impact, Imperial, CDC Redberry, CDC Rouleau and Robin). Lentils, No. 1 Canada Red and Lentils, No. 2 Canada Red combined.

Table 9 – Seed size distribution for 2008 western Canadian red lentils[1]

	2008	2007
	Number of samples	
Seed size distribution[2]	105	76
<3.5 mm, %	2.1	2.7
3.5–4.0 mm, %	13.2	15.4
4.0–4.5 mm, %	34.7	35.8
4.5–5.0 mm, %	36.4	32.5
5.0–5.5 mm, %	12.7	9.1
5.5–6.0 mm, %	0.8	1.9
6.0–6.5 mm, %	-	2.6
6.50–7.0 mm, %	-	-
>7.0 mm, %	-	-

[1] Red lentils including the varieties Blaze, Crimson, impact, Imperial, CDC Redberry, CDC Rouleau and Robin.
[2] Seed size including all grades determined by the image analysis technique.

Table 10 – Quality data on dehulling quality for 2008 western Canadian red lentils[1]

Quality parameter	2008	2007
Dehulling efficiency, %		
Number of samples	21	65
Mean	79.3	82.1
Standard deviation	7.6	5.1
Minimum	56.2	66.6
Maximum	88.4	87.9
Powder, %		
Number of samples	21	65
Mean	2.4	2.1
Standard deviation	0.3	0.4
Minimum	1.9	1.5
Maximum	3.4	3.2
Broken seeds, %		
Number of samples	21	65
Mean	1.3	0.5
Standard deviation	1.5	0.6
Minimum	0.3	0.1
Maximum	7.2	3.0
Undehulled whole seeds, %		
Number of samples	21	65
Mean	6.8	4.8
Standard deviation	6.4	3.6
Minimum	0.5	1.2
Maximum	28.7	16.3

Colour[2]	Whole	Splits	Whole	Splits
Brightness, L*				
Number of samples	21	21	65	65
Mean	60.0	61.6	59.4	61.1
Standard deviation	0.7	0.9	1.1	1.1
Minimum	58.7	60.2	57.4	60.0
Maximum	61.4	63.1	61.9	64.2
Redness, a*				
Number of samples	21	21	65	65
Mean	31.4	31.6	32.4	32.2
Standard deviation	1.0	1.4	1.3	1.5
Minimum	29.5	28.7	29.0	28.9
Maximum	32.8	33.6	34.7	32.5
Yellowness, b*				
Number of samples	21	21	65	65
Mean	37.6	39.5	40.6	42.5
Standard deviation	0.9	0.9	1.1	1.3
Minimum	36.2	38.4	38.2	39.4
Maximum	39.3	41.7	42.6	44.8

[1] Red lentils (Blaze, Crimson, impact, Imperial, Redberry, CDC Rouleau and Robin). Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.

[2] L*=darkness (0) to brightness (+); a*=greenness (-) to redness (+); b*=blueness (-) to yellowness (+).

Western Canadian pea beans 2008

Harvest survey samples

Samples for the CGC harvest survey were collected from producers across Manitoba, Canada (Fig. 5). For the 2008 harvest survey, 36 pea bean samples from Manitoba were received at the CGC for analysis. All samples were graded and analyzed for protein and total starch content. Only those samples receiving a grade of Pea beans, No. 1 Canada, Pea beans, No. 1 Canada Select, Pea beans, Extra Canada No. 1 or Pea beans, No. 2 Canada were tested for 100-seed weight, water absorption, cooking time and firmness of cooked beans. It is important to note that the samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 5 – Map of western Canada showing origin of 2006 harvest survey pea bean samples

Quality of 2008 western Canadian pea beans

Protein content for 2008 western Canadian pea beans (Table 11) ranged from 24.3% to 27.4% with a mean value of 25.8%. The average protein for 2008 western Canadian pea beans was similar to both the 2007 and the five-year average (25.5% and 25.6% respectively) (Fig. 6).

Pea beans, No. 1 Canada in 2008 had similar protein contents to those in 2007 (Table 12). Starch content and 100-seed weight was lower in 2008 (37.6% and 17.9 g respectively) than in 2007 (40.2% and 19.0 g respectively). The average water absorption value in 2008 was similar to that in 2007.

Pea beans, No. 1 Canada in 2008 and 2007 had similar mean cooking times. The methodology for determining the firmness of cooked seeds changed this year from a 20 min cooking time followed by compression force testing to the sample's cooking time followed by shear force testing. This prevents us from comparing the results from 2007 and 2008.

Table 11 – Mean protein content for 2008 western Canadian pea beans[1]

	Protein content, %			
Grade	2008			2007
	mean	min.	max.	mean
Manitoba				
Pea beans, Extra No. 1 Canada	25.2	24.7	25.7	-
Pea beans, No. 1 Canada Select	26.3	25.8	27.0	25.7
Pea beans, No. 1 Canada	25.8	24.8	27.4	25.4
Pea beans, No. 2 Canada	25.6	25.6	25.6-	-
Pea beans, No. 3 Canada	-	-	-	-
Pea beans, No. 4 Canada	25.0	24.2	25.6	-
All grades	**25.8**	**24.3**	**27.4**	**25.5**

[1] Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Figure 6 – Mean protein content of western Canadian pea beans

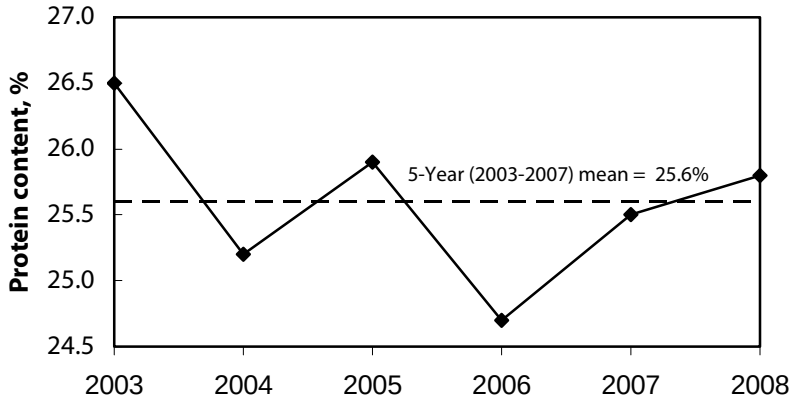


Table 12 – Quality data for 2008 western Canadian pea beans

Quality parameter	Pea beans, No. 1 Canada[1]		Pea beans, No. 2 Canada	
	2008	2007	2008	2007
Protein, % dry basis				
Number of samples	32	33	NA[2]	NA
Mean	25.9	25.5	NA	NA
Standard deviation	0.7	1.0	NA	NA
Minimum	24.7	23.0	NA	NA
Maximum	27.4	27.6	NA	NA
Starch, % dry basis				
Number of samples	32	32	NA	NA
Mean	37.6	40.2	NA	NA
Standard deviation	1.2	1.2	NA	NA
Minimum	35.5	37.9	NA	NA
Maximum	40.4	42.4	NA	NA
100-seed weight, g/100 seeds				
Number of samples	32	33	NA	NA
Mean	17.9	19.0	NA	NA
Standard deviation	0.8	1.0	NA	NA
Minimum	16.7	16.3	NA	NA
Maximum	19.8	21.1	NA	NA
Water absorption, g H_2O/g seeds				
Number of samples	32	33	NA	NA
Mean	0.92	0.95	NA	NA
Standard deviation	0.05	0.07	NA	NA
Minimum	0.77	0.80	NA	NA
Maximum	0.98	1.13	NA	NA
Cooking time, min				
Number of samples	32	33	NA	NA
Mean	15.9	15.5	NA	NA
Standard deviation	1.4	2.3	NA	NA
Minimum	12.6	11.7	NA	NA
Maximum	18.9	20.3	NA	NA
Firmness, N/g cooked seeds				
Number of samples	32	NA	NA	NA
Mean	26.1	NA	NA	NA
Standard deviation	1.7	NA	NA	NA
Minimum	21.8	NA	NA	NA
Maximum	29.4	NA	NA	NA

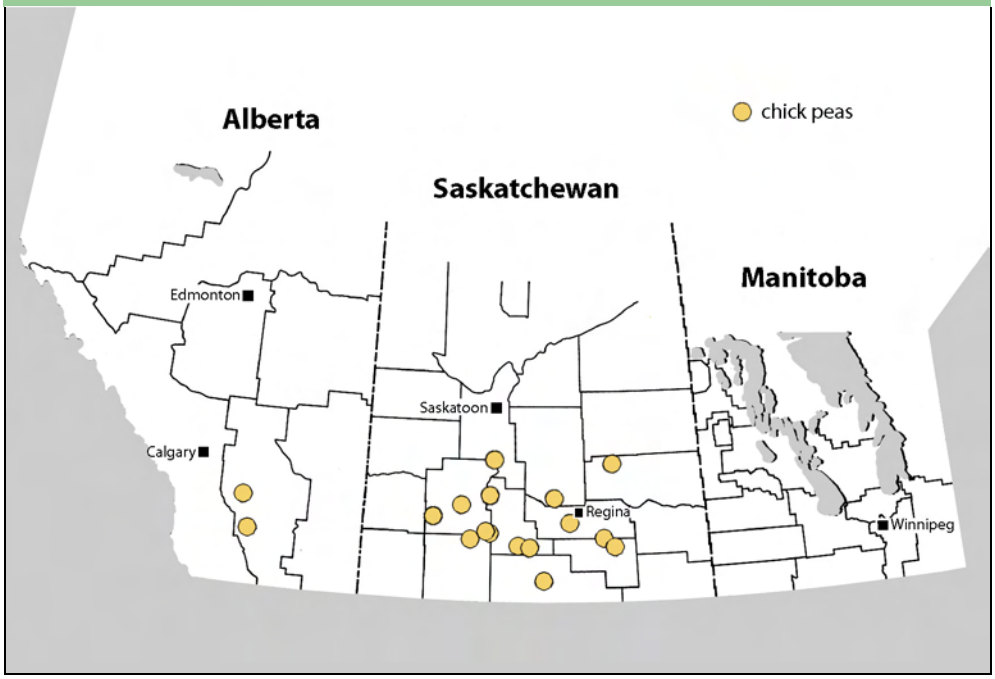
[1] Including Pea beans, Extra No. 1 Canada, Pea beans, Pea beans, No. 1 Canada and Pea beans, No. 1 Canada Select.
[2] NA=not available due to a small number of samples received.

Western Canadian chick peas 2008

Harvest survey samples

Samples for the CGC harvest survey were collected from producers in Saskatchewan and Alberta (Fig. 7). For the 2008 harvest survey, a total of 24 chick pea samples, consisting of 21 kabuli samples and 3 desi samples, were received at the CGC for analysis. All samples were graded and analyzed for protein and starch content. Due to the small number of desi chick pea samples received, only results for kabuli chick peas were included in the 2008 quality report. It is important to note that the samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 7 – Map of western Canada showing origin of 2008 harvest survey chick pea samples



Quality of 2008 western Canadian chick peas

Protein content ranged from 20.4% to 27.6% for 2008 western Canadian chick peas (Table 13). The average protein for 2008 was 24.1%, which was slightly lower than 2007, but higher than the five-year average of 23.3% (Fig. 8).

Protein contents for the 2008 No. 1 and No. 2 Canada western Kabuli Chick peas were similar to the 2007 crop (Table 14). The 2008 No. 1 and No. 2 Canada western kabuli Chick peas had similar starch contents (39.2% and 40.5% respectively), which were lower than in 2007. Kabuli Chick peas from 2008 had higher 100-seed weights than those in 2007, indicating a larger seed size for the 2008 crop. Water absorption values in 2008 for both the No. 1 and No. 2 Canada western Kabuli Chick peas were similar to their 2007 counterparts.

Table 13 – Mean protein content for 2008 western Canadian Kabuli chick peas by grade[1]

	Protein content, %			
Grade	2008			2007
	mean	min.	max.	mean
Saskatchewan				
Chick peas, Kabuli, Canada Western No. 1	24.6	22.1	27.6	24.7
Chick peas, Kabuli, Canada Western No. 2	24.1	22.5	27.0	24.3
Chick peas, Kabuli, Canada Western No. 3	23.7	23.7	23.7	20.1
All grades	**24.1**	**20.4**	**27.6**	**24.5**
Alberta				
Chick peas, Kabuli, Canada Western No. 1	-	-	-	24.0
Chick peas, Kabuli, Canada Western No. 2	23.6	23.6	23.6	-
Chick peas, Kabuli, Canada Western No. 3	-	-	-	-
All grades	**23.6**	**23.6**	**23.6**	**24.3**
Western Canada				
Chick peas, Kabuli, Canada Western No. 1	24.6	22.1	27.6	24.6
Chick peas, Kabuli, Canada Western No. 2	24.1	22.5	27.0	24.3
Chick peas, Kabuli, Canada Western No. 3	23.7	23.7	23.7	20.1
All grades	**24.1**	**20.4**	**27.6**	**24.5**

[1] Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Figure 8 – Mean protein content of western Canadian Kabuli chick peas

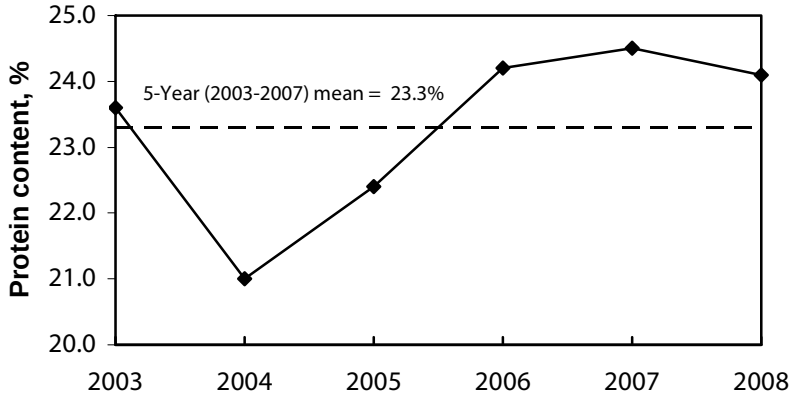


Table 14 – Quality data for 2008 western Canadian Kabuli chick peas

	Chick peas, Kabuli, No. 1 Canada Western		Chick peas, Kabuli, No. 2 Canada Western	
Quality parameter	2008	2007	2008	2007
Protein, % dry basis				
Number of samples	7	56	10	10
Mean	24.6	24.6	24.1	24.1
Standard deviation	1.9	1.9	1.4	2.2
Minimum	22.1	19.7	22.5	19.7
Maximum	27.6	28.8	27.0	27.7
Starch, % dry basis				
Number of samples	7	51	10	9
Mean	39.2	42.3	40.5	43.1
Standard deviation	2.9	2.6	2.6	2.5
Minimum	34.3	37.4	36.4	39.2
Maximum	42.1	47.3	43.3	47.6
100-seed weight, g/100 seeds				
Number of samples	7	56	10	10
Mean	31.3	30.1	32.1	29.9
Standard deviation	6.9	6.5	8.2	8.5
Minimum	22.5	20.6	36.4	21.0
Maximum	41.4	45.8	43.3	48.4
Water absorption, g H_2O/g seeds				
Number of samples	7	56	10	10
Mean	1.09	1.10	1.08	1.12
Standard deviation	0.03	0.09	0.06	0.06
Minimum	1.05	0.61	1.01	1.00
Maximum	1.13	1.23	1.19	1.20

Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.