Canadian Grain Commission | Commission canadienne des grains

ISSN 1712-8315

Quality of western Canadian pulse crops 2005

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Quality Innovation Service

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Introduction

This report presents the quality data for the 2005 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.

Summary

Pulse crops (peas, lentils, pea beans and kabuli chick peas) graded No. 1 Canada from the 2005 harvest survey had similar protein contents to their respective 2004 and 5-year averages (Table 1). Peas, lentils and pea beans from 2005 had slightly higher total starch contents than the 2004 crop. Seed weights for 2005 peas and lentils were lower than 2004 but were similar to the 5-year averages. Peas, lentils and pea beans from 2005 had slightly higher water absorption values compared to their respective 2004 and 5-year averages. Yellow peas exhibited shorter cooking time and softer cooked texture than in 2004, while green peas had slightly longer cooking time and firmer cooked texture. Pea beans from 2005 had similar cooking time and cooked texture to 2004. Red lentils in 2005 had a slightly higher mean dehulling efficiency than in 2004. Dehulled splits exhibited more brightness (L*), redness (a*) and yellowness (b*) than dehulled whole seeds. No differences in L* and b* values between 2005 and 2004 dehulled whole seeds were found, but dehulled whole seeds in 2005 exhibited more redness (a*) than the 2004 crop. Similar results were shown for dehulled splits.

Weather review

The weather review for the 2005 crop year was provided by the Weather and Crop Surveillance department of the Canadian Wheat Board (CWB).

Seeding

Precipitation by persistent rain in August and September of 2004, while making harvest difficult, improved the soil moisture levels. Above normal snowfall in all areas, except southern Alberta, also boosted soil moisture levels. Precipitation from the beginning of April to the end of May 2005 was normal to above-normal in the Prairie region. Planting progress during the spring was dependent on location; the general trend saw western regions planted more rapidly than the eastern growing areas. The overall planting pace in western Canada was two-to-five days ahead of normal during the first three weeks of May, but rains slowed progress in the latter half of the month. Heavy rains in June delayed the completion of pulse crops planting and caused some crop areas to be left unseeded.

Growing conditions

Persistent heavy rains throughout the southern Prairies in June caused flooding losses in Alberta and southern Manitoba. Manitoba was hardest hit by the wet conditions, with unseeded and drowned-out areas exceeding two million acres. The rest of the Prairies received normal to above-normal amounts of precipitation during the June period, which helped increase crop yield potential. Precipitation during July was mostly normal across the Prairie region, with temperatures slightly below normal in western regions and above normal in the east. The moderate temperatures boosted crop growth, without causing stress to the crop. Crop development was significantly ahead of last year in most regions, due to the warmer temperatures received throughout the growing season. Cooler temperatures and frequent rainfall slowed crop development in Alberta and western Saskatchewan in August. The cooler weather also resulted in a number of locations in northwestern Saskatchewan and northern Alberta reporting spotty frost events in the first two weeks of the month. Eastern regions reported warmer-than-normal temperatures, which increased stress to crops in the late filling stage. Warm temperatures boosted crop development in eastern Saskatchewan and Manitoba. Southeastern areas of the Prairies began harvesting in the middle of August.

Harvest conditions

Heavy rainfall during the spring of 2005 provided excellent moisture for the growth of crops over most of western Canada. The soil moisture, combined with moderate temperatures throughout the growing season, resulted in above-average production prospects. The harvest was delayed by wet conditions during late August and September, which reduced the highest-grading portion of the crop.

The last week of August and the first two weeks of September were unseasonably wet, with heavy downpours falling across southern Alberta and into northeastern Saskatchewan. Crops in the regions that received the heaviest rainfall were downgraded. Weather conditions in the southern Prairies were better, with most of the harvest in Manitoba and the southern areas of Saskatchewan complete by the end of September. Harvesting in the northern areas of Saskatchewan and Alberta stretched into October, with approximately 75 per cent of the harvest complete by the middle of the month.

Production review

Pea production for 2005 was estimated to be 3.1 million tonnes, which was down about 7.2% from 2004 but was 33% higher than the 10-year average of 2.1 million tonnes (Table 2). The decrease in production in 2005 was due to reduction in yield. Saskatchewan accounted for 80% of Canadian pea production, while Alberta and Manitoba accounted for 16% and 4%, respectively.

Lentil production in 2005 increased by 33% from 0.96 million tonnes in 2004 to 1.3 million tonnes in 2005, due to higher harvested area and increased yield (Table 2).

The production for 2005 was 55% higher than the 10-year average. Saskatchewan continues to dominate lentil production in Western Canada, accounting for about 99% of production.

In 2005, Manitoba accounted for 100% of western Canadian pea bean production, which increased 41% as compared to that in 2004 despite the wet conditions in June (Table 2). On the other hand, this was only about half of the 10-year average of 62 thousand tonnes. Harvested area decreased by 22% to 32 thousand hectares in 2005 from 41 thousand hectares in 2004, while yield increased by 15% from 0.91 tonnes per hectare in 2004 to 1.1 tonnes per hectare in 2005.

Production of chick peas for 2005 was estimated at 0.10 million tonnes (Table 2). This was twice as that in 2004 but was less than half of the 5-year average of 0.23 million tonnes. The increased production in 2005 was due to the increase in both harvested area and yield. Saskatchewan accounted for approximately 81% of western Canadian chick pea production in 2004, while Alberta accounted for 19%.

Table 1a – Canada western pulse crops quality data for 2005 harvest survey

Quality parameter	Mean for No. 1 Canada 2005	2004	2000-2004
Peas			
Peas, No. 1 Canada Yellow			
Protein content, %	23.7	23.2	23.9
Starch content, %	48.8	48.6	NA[6]
100-seed weight, g/100 seeds	23.5	24.7	23.3
Water absorption, g H_2O/g seeds	0.97	0.95	0.96
Cooking time, min	19.2	24.5	22.2
Firmness, kg/g cooked seeds	8.1	8.9	9.0
Peas, No. 1 Canada Green			
Protein content, %	23.3	23.0	24.3
Starch content, %	48.2	47.0	NA
100-seed weight, g/100 seeds	21.6	23.1	21.5
Water absorption, g H_2O/g seeds	0.99	0.93	0.97
Cooking time, min	23.1	20.3	19.4
Firmness, kg/g cooked seeds	8.4	7.2	9.1
Lentils[1]			
Lentils, No. 1 and No. 2 Canada Green Small [3]			
Protein content, %	26.0	25.1	25.9
Starch content, %	48.2	47.1	NA
100-seed weight, g/100 seeds	3.5	3.6	3.4
Water absorption, g H_2O/g seeds	0.94	0.69	0.80
Mean seed size[2], mm	4.6	4.9	4.9
Lentils, No. 1 and No. 2 Canada Green Medium [4]			
Protein content, %	25.4	25.9	25.7
Starch content, %	48.7	46.9	NA
100-seed weight, g/100 seeds	5.3	5.4	5.1
Water absorption, g H_2O/g seeds	0.97	0.78	0.88
Mean seed size[2], mm	5.6	6.0	5.8
Lentils, No. 1 and No. 2 Canada Green Large[5]			
Protein content, %	26.5	25.7	26.0
Starch content, %	47.9	46.4	NA
100-seed weight, g/100 seeds	6.7	7.3	6.9
Water absorption, g H_2O/g seeds	1.02	0.86	0.94
Mean seed size[2], mm	6.2	6.8	6.3

[1] Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.
[2] Seed size determined by the Image Analysis technique.
[3] Small lentils including the varieties Eston and Milestone.
[4] Medium lentils including the varieties Richlea and Vantage.
[5] Large lentils including the varieties Glamis, Grandora, Laird, Plato, Sedley and Sovereign.
[6] NA=not available due to a small number of samples.

Table 1b – Canada western pulse crops quality data for 2005 harvest survey

Quality parameter	Mean for No. 1 Canada 2005	2004	2000-2004
Lentils [1]			
Lentils, No.1 & No. 2 Canada Red [2]			
Protein content, %	28.7	28.1	27.2
Starch content, %	46.1	44.4	NA
100-seed weight, g/100 seeds	3.3	3.6	3.2
Water absorption, g H_2O/g seeds	0.95	0.81	0.91
Mean seed size[3], mm	4.2	4.8	5.0
Dehulling efficiency, %	79.7	77.6	NA
Colour (dehulled seeds)[4]			
L*	59.7 (61.9)	60.1 (62.0)	NA
a*	31.7 (32.6)	30.4 (31.4)	NA
b*	39.2 (41.3)	38.0 (40.9)	NA
Pea beans, No. 1 Canada White			
Protein content, %	25.8	24.6	25.0
Starch content, %	39.8	38.9	NA
100-seed weight, g/100 seeds	19.0	17.5	18.8
Water absorption, g H_2O/g seeds	0.96	0.82	0.89
Cooking time, min	15.9	16.2	20.1
Firmness, kg/g cooked seeds	9.5	10.9	13.4
Chick peas, No. 1 Canada Western Kabuli			
Protein content, %	22.5	23.9	23.9
Starch content, %	41.9	NA[5]	NA
100-seed weight, g/100 seeds	37.0	NA	39.0
Water absorption, g H_2O/g seeds	1.12	NA	1.07

[1] Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.

[2] Red lentils including the varieties Blaze, Crimson and Robin.

[3] Seed size determined by the Image Analysis technique.

[4] L*=darkness (0) to brightness (+); a*=greenness (-) to redness (+); b*=blueness (-) to yellowness (+). Values in parentheses are for dehulled splits; values outside parentheses are for dehulled whole seeds.

[5] NA=not available due to a small number of samples.

Table 2 – Production statistics for western Canadian pulses[1]

Province	Harvested area		Production		Yield		Mean production[2]
	2005	2004	2005	2004	2005	2004	1995-2004
	thousand hectares		thousand tonnes		kg/ha		thousand tonnes
Peas - dry							
Manitoba	43	59	63	160	1470	2730	158
Saskatchewan	1060	1020	2414	2477	2280	2430	1445
Alberta[3]	217	267	623	702	2871	2644	483
Western Canada	**1320**	**1346**	**3100**	**3340**	**2348**	**2481**	**2087**
Lentils							
Manitoba	-	2.0	-	0.8	-	400	9
Saskatchewan	854	741	1264	949	1480	1280	557
Alberta[3]	8.0	7.2	14	11.3	1760	1570	9
Western Canada	**862**	**750**	**1278**	**961**	**1480**	**1280**	**575**
Pea beans							
Manitoba	32	41	34	20	1050	910	62
Saskatchewan	-	-	-	-	-	-	-
Alberta[3]	-	-	-	-	-	-	-
Western Canada	**32**	**41**	**34**	**20**	**1050**	**910**	**62**
Chick peas							
Manitoba	-	-	-	-	-	-	-
Saskatchewan	61	32.4	84	43	1390	1310	2134
Alberta[3]	12	6.1	20	8.6	1620	1410	134
Western Canada	**73**	**38.5**	**104**	**51.2**	**1430**	**1330**	**2264**

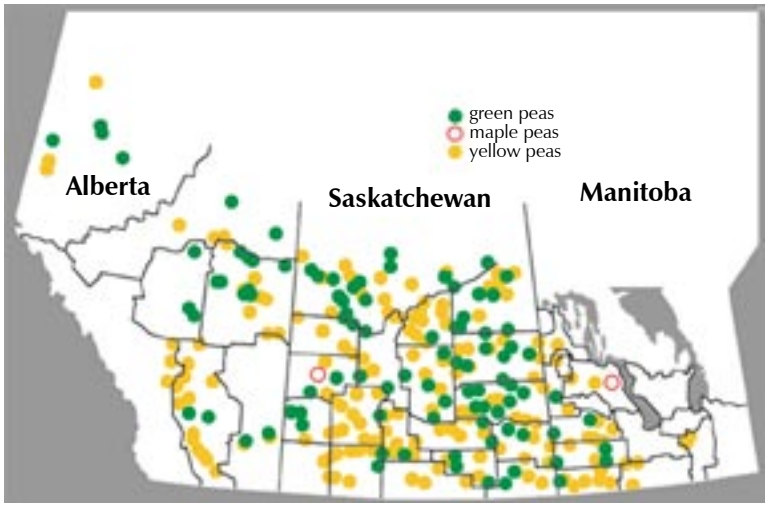
1 Statistics Canada, Field Crop Reporting Series, Vol. 84, No. 8.
2 Statistics Canada, Field Crop Reporting Series, 1995-2004.
3 Includes the Peace River area of British Columbia.
4 Statistics Canada, Field Crop Reporting Series, 2000-2004.

Quality of western Canadian peas 2005

Harvest survey samples

Samples for the CGC's 2005 harvest survey were collected from producers across western Canada (Fig. 1). A total of 1058 samples consisting of 741 yellow pea, 313 green pea, and 14 maple pea samples were received at the CGC for analysis. All samples were graded and tested for protein content. Only those samples receiving a grade of Peas, No.1 or Peas, No. 2 Canada were tested for 100-seed weight, water absorption, cooking time and firmness of cooked peas. Starch content was determined on selected samples. 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 2005 harvest survey pea samples



Quality of 2005 western Canadian peas

The mean protein content for 2005 western Canadian peas, including yellow and green peas, was 23.5% (Table 3), which was slightly higher than 2004 and slightly lower than the five-year average of 23.9 % (Fig. 2). The mean protein content did not change significantly between grades.

The mean protein contents for 2005 Peas, No. 1 Canada Yellow and Peas, No. 2 Canada Yellow were 23.7% and 23.4% (Table 4), respectively. These values were slightly higher than those for 2004. Yellow peas in 2005 had similar mean starch content to 2004 (Table 4). Grade appeared to have little effect on starch content.

Peas, No. 1 Canada Yellow and peas, No. 2 Canada Yellow had mean 100-seed weights of 23.5 g and 22.9 g (Table 4), respectively. The 2005 values were lower than those for 2004 Peas, No. 1 Canada Yellow and Peas, No. 2 Canada Yellow. The mean water absorption values for 2005 Peas, No.1 Canada Yellow and Peas, No. 2 Canada Yellow were 0.97 and 0.95 (g H_2O/g seeds), respectively, which were slightly higher than those for 2004. Grade appeared to have little effect on the mean seed weight and water absorption values.

The mean cooking times for Peas, No. 1 Canada Yellow and Peas, No. 2 Canada Yellow were 19.2 and 16.8 min, respectively. 2005 yellow peas had shorter cooking times than 2004. The mean firmness values of cooked yellow peas for 2005 Peas, No.1 Canada Yellow and Peas, No. 2 Canada Yellow were 8.1 and 7.8 kg/g cooked seeds, respectively (Table 4). These values were slightly lower than the respective grades in 2004.

The mean protein contents for Peas, No. 1 Canada Green and Peas, No. 2 Canada Green were 23.3 and 23.7% (Table 5), respectively. These values were slightly higher than those for 2004. Green peas in 2005 had slightly higher mean starch content than in 2004. Samples of 2005 Peas, No.1 Canada Green and Peas, No. 2 Canada Green had similar mean 100-seed weights. The seed weight for 2005 green peas was slightly lower than that for 2004. The mean water absorption values for Peas, No. 1 Canada Green and Peas, No. 2 Canada Green were slightly higher than 2004. 2005 green peas had slightly longer mean cooking time and firmer cooked texture than 2004.

Table 3 – Mean protein content for 2005 western Canadian peas by grade[1]

	Protein content		
Grade	2005	2004	2000-2004
	%	%	%
Peas, No. 1 Canada	23.6	23.1	23.9
Peas, No. 2 Canada	23.5	22.9	23.9
Peas, No. 3 Canada	23.4	22.9	23.9
All grades	23.5	23.0	23.9

[1] Protein content (Nx6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Figure 2 – Mean protein content of western Canadian peas

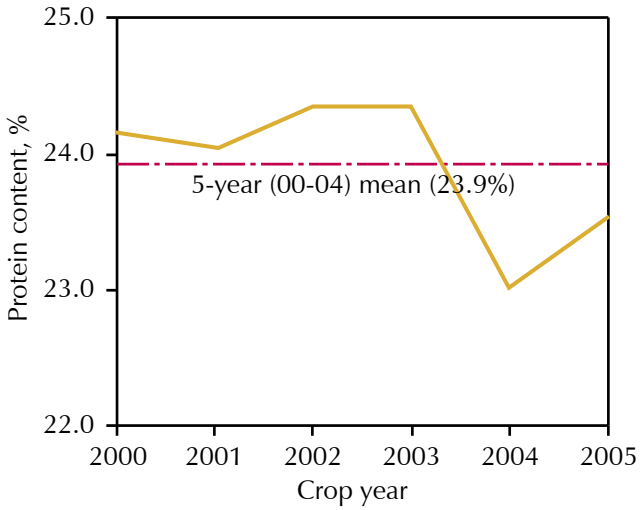


Table 4 – Quality data for 2005 western Canadian yellow peas

	Peas, No. 1 Canada Yellow		Peas, No. 2 Canada Yellow	
Quality parameter	2005	2004	2005	2004
Protein, % dry basis				
Number of samples	308	109	286	332
Mean	23.7	23.2	23.4	22.9
Standard deviation	1.3	1.7	1.4	1.4
Minimum	19.7	19.3	18.3	18.4
Maximum	28.5	27.5	28.0	27.5
Starch, % dry basis				
Number of samples	33	47	36	94
Mean	48.8	48.6	48.3	48.3
Standard deviation	1.7	1.7	2.2	1.7
Minimum	45.3	43.9	45.1	43.7
Maximum	52.5	51.9	53.0	52.0
100-seed weight, g/100 seeds				
Number of samples	308	109	286	330
Mean	23.5	24.7	22.9	24.3
Standard deviation	2.0	2.7	2.8	2.9
Minimum	16.3	18.6	9.3	12.0
Maximum	29.5	33.4	33.2	33.4
Water absorption, g H_2O/g seeds				
Number of samples	308	109	286	330
Mean	0.97	0.95	0.96	0.92
Standard deviation	0.11	0.11	0.13	0.12
Minimum	0.38	0.61	0.44	0.41
Maximum	1.28	1.14	1.22	1.26
Cooking time, min				
Number of samples	43	42	50	79
Mean	19.2	24.5	16.8	24.4
Standard deviation	8.5	9.1	7.9	9.1
Minimum	9.0	9.9	7.9	7.8
Maximum	38.5	37.8	38.1	38.6
Firmness, kg/g cooked seeds				
Number of samples	53	83	46	264
Mean	8.1	8.9	7.8	8.9
Standard deviation	2.2	2.2	3.3	2.5
Minimum	4.8	4.7	3.8	3.7
Maximum	13.1	14.4	21.3	16.7

Table 5 – Quality data for 2005 western Canadian green peas

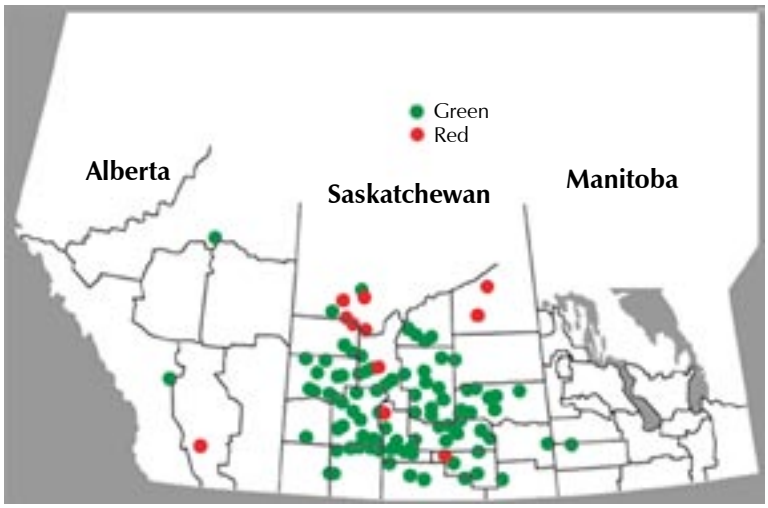
	Peas, No. 1 Canada Green		Peas, No. 2 Canada Green	
Quality parameter	2005	2004	2005	2004
Protein, % dry basis				
Number of samples	52	17	45	56
Mean	23.3	23.0	23.7	23.0
Standard deviation	1.4	1.5	1.3	1.3
Minimum	20.0	21.1	20.3	19.6
Maximum	26.8	25.6	26.0	26.3
Starch, % dry basis				
Number of samples	30	12	16	43
Mean	48.2	47.0	47.7	46.6
Standard deviation	2.3	2.1	2.6	2.0
Minimum	44.0	51.7	43.9	40.7
Maximum	52.6	43.4	52.3	50.6
100-seed weight, g/100 seeds				
Number of samples	52	14	44	58
Mean	21.6	23.1	21.5	22.5
Standard deviation	3.2	4.4	3.1	2.7
Minimum	14.9	17.3	15.5	16.1
Maximum	30.8	29.6	30.1	28.0
Water absorption, g H_2O/g seeds				
Number of samples	52	14	44	58
Mean	0.99	0.93	1.00	0.92
Standard deviation	0.17	0.11	0.11	0.17
Minimum	0.46	0.72	0.72	0.27
Maximum	1.22	1.07	1.25	1.15
Cooking time, min				
Number of samples	51	11	44	41
Mean	23.1	20.3	26.3	22.3
Standard deviation	11.1	8.3	5.0	8.7
Minimum	8.0	7.9	8.1	10.2
Maximum	39.5	32.2	39.4	38.4
Firmness, kg/g cooked seeds				
Number of samples	52	17	44	55
Mean	8.4	7.2	8.6	8.4
Standard deviation	2.6	1.7	2.4	2.6
Minimum	3.5	4.0	3.8	3.8
Maximum	13.9	10.3	15.3	14.3

Quality of western Canadian lentils 2005

Harvest survey samples

Samples for the CGC's 2005 harvest survey were collected from producers across western Canada (Fig. 3). A total of 541 lentil samples including 459 green lentils and 82 red lentils were received at the CGC for analysis. All samples were graded and tested for protein content and seed size distribution using the Image Analysis technique. Only those samples receiving a grade of Lentils, No. 1 Canada or Lentils, No. 2 Canada were tested for 100-seed weight and water absorption. Starch content was determined on selected samples. Dehulling quality of red lentils was also evaluated. 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 2005 harvest survey lentil samples



Quality of 2005 western Canadian lentils

The mean protein content for 2005 western Canadian lentils was 26.8% (Table 6). This was slightly higher than that for 2004 and the five-year average of 26.4% (Fig. 4).

Small green lentils (Eston and Milestone) had a mean protein content of 26.0%, which was higher than that for 2004 (Table 7). Medium green lentils (Richlea and Vantage) had similar mean protein content to that for 2004, while large green lentils (Glamis, Grandora, Laird, Plato, Sedley and Sovereign) showed slightly higher values than for 2004. The mean starch contents for small, medium and large green lentils were 48.2%, 48.7% and 47.9%, respectively. These values were slightly higher than those for the respective type of green lentils in 2004.

Small and medium green lentils had mean 100-seed weights of 3.5 g and 5.3 g (Table 7), respectively, while large green lentils had a mean 100-seed weight of 6.7 g. Large green lentils in the 2005 survey had slightly lower seed weight than in the 2004 survey, but small and medium green lentils had similar seed weights to the respective type of lentils in 2004. The mean water absorption values were 0.94 g H_2O/g seeds for small lentils, 0.97 H_2O/g seeds for medium lentils and 1.02 H_2O/g seeds for large lentils, respectively. 2005 green lentils had higher water absorption values than 2004.

The seed size distribution for green lentils (Table 8) was determined by the Image Analysis technique developed at the CGC. The reported results may differ from those obtained by the conventional sieving techniques. For small green lentils in 2005, 73% fell within 4.0 to 5.0 mm and 15% within 5.0 to 5.5 mm, while in 2004, 55% fell within 4.0 to 5.0 mm and 32% within 5.0 to 5.5 mm. In 2005, 59% of medium lentils fell in the range of 5.5-7.0 mm while in 2004, 69% were in this range. In 2005 survey, 69% of large lentils were within the range of 6.0 to 7.5 mm as compared to 65% in 2004.

Red lentils, including the varieties Blaze, Crimson and Robin, had a mean protein content of 28.7% (Table 9), which was similar to that in 2004. Red lentils in 2005 had a slightly higher mean starch content than in 2004. The mean 100-seed weight for 2005 red lentils was 3.3 g, which was slightly lower than in 2004. The mean water absorption value for 2005 was higher than for 2004.

In 2005, about 26% of the red lentils fell within 3.5 to 4.0 mm and 64% within 4.0 to 5.0 mm (Table 10), while in 2004, about 60% fell within 4.0 to 5.0 mm and 32% within 5.0 to 5.5 mm. This indicated that red lentils in 2005 had smaller mean seed sizes than in 2004.

Table 11 shows the dehulling quality for 2005 western Canadian red lentils. 2005 red lentils had a mean dehulling efficiency of 80% as compared to 78% in 2004. The powder and broken seeds produced during dehulling for 2005 were similar to that for 2004. In 2005, red lentils had less undehulled whole seeds after the dehulling process than in 2004. 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*), more redness (a*) and more yellowness (b*) as compared to dehulled whole seeds (Table 11). There were no differences in L* and b* values between 2005 and 2004 dehulled whole seeds. Dehulled whole seeds for 2005 red lentils exhibited more red colour than for 2004. Similar results were shown for dehulled splits.

Table 6 – Protein content for 2005 western Canadian lentils by grade[1]

	Protein content		
Grade	2005	2004	2000-2004
	%	%	%
Lentils, No. 1 Canada	26.8	26.2	26.1
Lentils, No. 2 Canada	26.7	25.9	26.3
Lentils, No. 3 Canada	27.3	27.0	26.6
All grades	26.8	26.4	26.4

[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

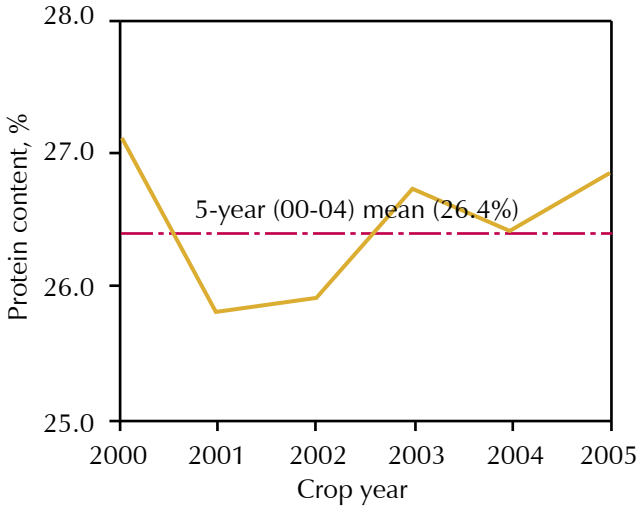


Table 7 – Quality data for 2005 western Canadian green lentils by size[1]

	2005			2004		
Quality parameter	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
Protein, % dry basis						
Number of samples	42	25	288	15	5	100
Mean	25.9	25.7	26.5	25.1	25.9	25.7
Standard deviation	1.2	1.3	0.9	1.1	0.9	0.9
Minimum	23.0	21.5	22.3	22.1	25.0	22.1
Maximum	28.6	27.9	29.0	26.7	27.2	27.8
Starch, % dry basis						
Number of samples	17	14	60	10	6	40
Mean	48.2	48.7	47.9	47.1	46.9	46.4
Standard deviation	1.9	2.2	1.5	1.4	1.6	1.6
Minimum	45.2	45.0	43.7	45.1	44.8	40.7
Maximum	53.2	52.2	51.5	49.8	48.5	48.9
100-seed weight, g/100 seeds						
Number of samples	41	24	287	15	6	103
Mean	3.5	5.3	6.7	3.6	5.4	7.3
Standard deviation	0.3	0.5	0.5	0.4	0.4	0.7
Minimum	2.9	4.6	5.1	3.0	4.7	5.6
Maximum	4.1	6.6	8.4	4.1	5.8	8.9
Water absorption, g H_2O/g seeds						
Number of samples	41	24	287	15	6	103
Mean	0.94	0.97	1.02	0.69	0.78	0.86
Standard deviation	0.13	0.16	0.12	0.19	0.97	0.14
Minimum	0.71	0.69	0.50	0.37	0.48	0.52
Maximum	1.23	1.26	1.28	0.98	1.05	1.10

[1] Lentils, No. 1 Canada Green and Lentils, No. 2 Canada Green combined.
[2] SL – Small lentils including the varieties Eston and Milestone.
[3] ML – Medium lentils including the varieties Richlea and Vantage.
[4] LL=large lentils including Glamis, Grandora, Laird, Plato, Sedley and Sovereign.

Table 8 – Seed size distribution for 2005 western Canadian green lentils[1]

	2005			2004		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
	Number of samples			Number of samples		
Seed size distribution	45	28	364	31	14	245
<3.5 mm, %	1.7	0.1	0.1	0.0	0.0	0.0
3.5–4.0 mm, %	8.6	0.4	0.2	1.3	0.0	0.0
4.0–4.5 mm, %	30.5	1.6	0.4	19.8	2.3	0.1
4.5–5.0 mm, %	42.4	10.1	1.9	35.2	7.5	0.8
5.0–5.5 mm, %	15.2	29.2	6.3	32.3	13.2	6.3
5.5–6.0 mm, %	1.6	41.6	19.9	8.4	21.6	11.0
6.0–7.0 mm, %	0.0	17.0	67.8	1.9	47.8	38.2
7.0–7.5 mm, %	0.0	0.0	0.9	0.8	6.6	26.6
>7.5 mm, %	0.0	0.0	0.0	0.4	0.9	16.3

[1] Seed size determined by an Image Analysis technique.
[2] SL – Small lentils including the varieties Eston and Milestone.
[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 9 Quality data for 2005 western Canadian red lentils[1]

Quality parameter	2005	2004
Protein, % dry basis		
Number of samples	57	11
Mean	28.7	28.1
Standard deviation	1.2	0.8
Minimum	24.9	26.7
Maximum	31.1	29.0
Starch, % dry basis		
Number of samples	28	17
Mean	46.1	44.4
Standard deviation	1.9	1.4
Minimum	43.1	42.0
Maximum	50.3	47.2
100-seed weight, g/100 seeds		
Number of samples	61	16
Mean	3.3	3.6
Standard deviation	0.5	0.5
Minimum	4.1	2.6
Maximum	3.9	4.1
Water absorption, g H_2O/g seeds		
Number of samples	61	16
Mean	0.95	0.81
Standard deviation	0.13	0.08
Minimum	0.76	0.65
Maximum	1.24	0.97

[1] Red lentils (Blaze, Crimson and Robin). Lentils, No. 1 Canada Red and Lentils, No. 2 Canada Red combined.

Table 10 Seed size distribution for 2005 western Canadian red lentils[1]

	2005	2004
	Number of samples	
Seed size distribution[2]	80	30
<3.5 mm, %	7.2	0.0
3.5–4.0 mm, %	25.5	1.3
4.0–4.5 mm, %	38.6	25.8
4.5–5.0 mm, %	25.1	34.5
5.0–5.5 mm, %	3.4	31.7
5.5–6.0 mm, %	0.1	6.5
6.0–7.0 mm, %	0.0	0.3
>7.0 mm, %	0.0	0.0

[1] Red lentils including the varieties Blaze, Crimson and Robin.
[2] Seed size including all grades determined by the Image Analysis technique.

Table 11 Quality data on dehulling quality for 2005 western Canadian red lentils[1]

Quality parameter	2005	2004
Dehulling efficiency, %		
Number of samples	58	16
Mean	79.7	77.6
Standard deviation	7.3	6.5
Minimum	60.2	57.9
Maximum	88.0	85.4
Powder, %		
Number of samples	58	16
Mean	46.1	44.4
Standard deviation	1.9	1.4
Minimum	43.1	42.0
Maximum	50.3	47.2
Broken seeds, %		
Number of samples	58	16
Mean	3.3	3.6
Standard deviation	0.5	0.5
Minimum	4.1	2.6
Maximum	3.9	4.1
Undehulled whole seeds, %		
Number of samples	58	16
Mean	0.95	0.81
Standard deviation	0.13	0.08
Minimum	0.76	0.65
Maximum	1.24	0.97

Colour[2]	**Dehulled seeds**		**Dehulled seeds**	
Brightness, L*	**Whole**	**Splits**	**Whole**	**Splits**
Number of samples	58	58	16	16
Mean	59.7	61.9	60.1	62.0
Standard deviation	0.9	0.9	0.7	0.9
Minimum	57.8	60.1	58.7	61.0
Maximum	61.6	64.3	61.1	63.2
Redness, a*				
Number of samples	58	58	16	16
Mean	31.7	32.6	30.4	31.4
Standard deviation	1.5	1.7	1.0	1.0
Minimum	27.4	28.9	28.8	29.8
Maximum	33.9	35.8	32.0	33.0
Yellowness, b*				
Number of samples	58	58	16	16
Mean	39.2	41.3	38.0	40.9
Standard deviation	1.1	1.2	1.7	1.5
Minimum	36.6	38.5	35.5	39.0
Maximum	41.0	43.6	41.6	44.1

[1] Red lentils (Blaze, Crimson and Robin). Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.

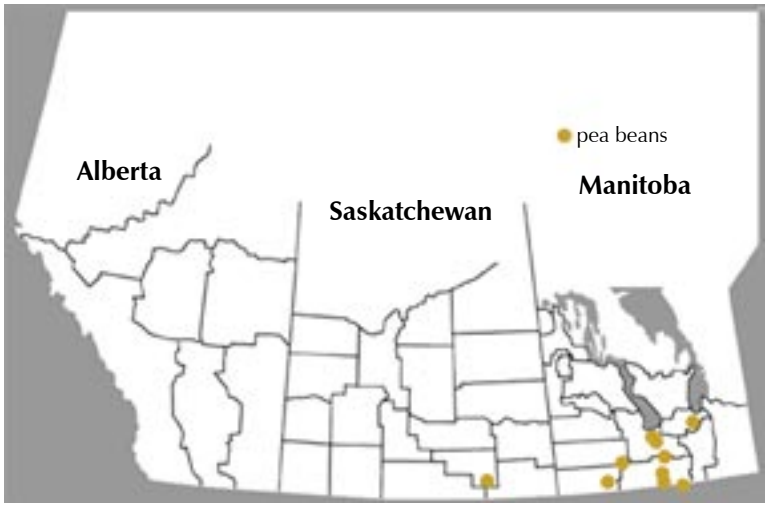
[2] L*=darkness (0) to brightness (+); a*=greenness (-) to redness (+); b*=blueness (-) to yellowness (+).

Quality of western Canadian pea beans 2005

Harvest survey samples

Samples for the CGC harvest survey were collected from producers across Manitoba, Canada (Fig. 5). For the 2005 harvest survey, only 31 pea bean samples from Manitoba were received at the CGC for analysis due to the wet weather. All samples were graded and analyzed for protein content. Only those samples receiving a grade of Pea beans, No. 1 Canada, Pea beans, Canada No. 1 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. Starch content was determined on selected samples. 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 2005 harvest survey pea bean samples



Quality of 2005 western Canadian pea beans

The mean protein content for 2005 was 25.8% (Table 12). This was close to that for 2004 and to the five-year average (Fig. 6). It seemed that grade had little effect on the mean protein content.

Pea beans, No. 1 Canada in 2005 had slightly higher protein content than in 2004 (Table 13). The mean starch content for 2005 pea beans was slightly higher than for 2004. The average seed weight and water absorption values for Pea beans, No. 1 Canada in 2005 were higher than those in 2004.

Pea beans, No. 1 Canada pea beans in 2005 had similar mean cooking time and firmness values of cooked seeds in 2004. Due to a small number of samples for Pea beans, No. 2 Canada results were not included.

Table 12 – Mean protein content for 2005 western Canadian pea beans[1]

	Protein content		
Grade	2005	2004	2000-2004
	%	%	%
Pea beans, Extra No. 1 Canada	-	24.5	25.1
Pea beans, Canada No. 1 Select	26.3	-	25.1
Pea beans, No. 1 Canada	25.6	24.6	25.0
Pea beans, No. 2 Canada	-	26.2	25.7
Pea beans, No. 3 Canada	26.9	25.1	25.8
Pea beans, No. 4 Canada	-	25.8	25.9
All grades	25.8	25.2	25.4

[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

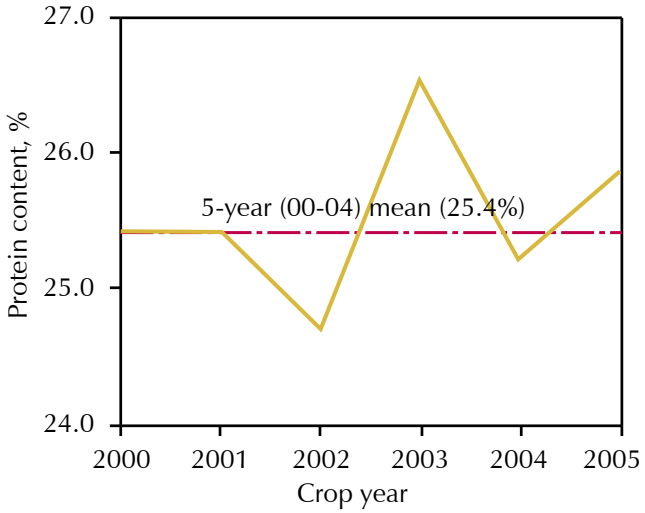


Table 13 – Quality data for 2005 western Canadian pea beans

Quality parameter	Pea beans, No. 1 Canada[1] 2005	Pea beans, No. 1 Canada[1] 2004	Pea beans, No. 2 Canada 2005	Pea beans, No. 2 Canada 2004
Protein, % dry basis				
Number of samples	29	14	NA[2]	12
Mean	25.8	24.6	NA	26.2
Standard deviation	0.8	1.2	NA	1.5
Minimum	24.5	22.7	NA	23.9
Maximum	27.8	26.5	NA	29.7
Starch, % dry basis				
Number of samples	28	14	NA	12
Mean	39.8	38.9	NA	36.6
Standard deviation	1.4	1.8	NA	1.8
Minimum	36.5	34.1	NA	32.2
Maximum	42.1	40.0	NA	38.8
100-seed weight, g/100 seeds				
Number of samples	27	14	NA	12
Mean	19.0	17.5	NA	17.3
Standard deviation	1.0	1.5	NA	1.1
Minimum	16.3	14.4	NA	14.9
Maximum	21.1	19.9	NA	18.9
Water absorption, g H_2O/g seeds				
Number of samples	27	14	NA	12
Mean	0.96	0.82	NA	0.82
Standard deviation	0.09	0.13	NA	0.16
Minimum	0.73	0.54	NA	0.49
Maximum	1.11	1.01	NA	1.03
Cooking time, min				
Number of samples	27	14	NA	12
Mean	15.9	16.2	NA	12.9
Standard deviation	1.4	4.4	NA	1.2
Minimum	13.8	11.5	NA	10.6
Maximum	18.8	29.5	NA	14.7
Firmness, kg/g cooked seeds				
Number of samples	27	14	NA	12
Mean	9.5	10.9	NA	9.2
Standard deviation	2.5	1.7	NA	2.4
Minimum	4.9	8.8	NA	5.8
Maximum	14.6	14.4	NA	13.4

[1] Including Pea beans, Extra No. 1 Canada, Pea beans, No. 1 Canada and Pea beans, No. 1 Canada Select.

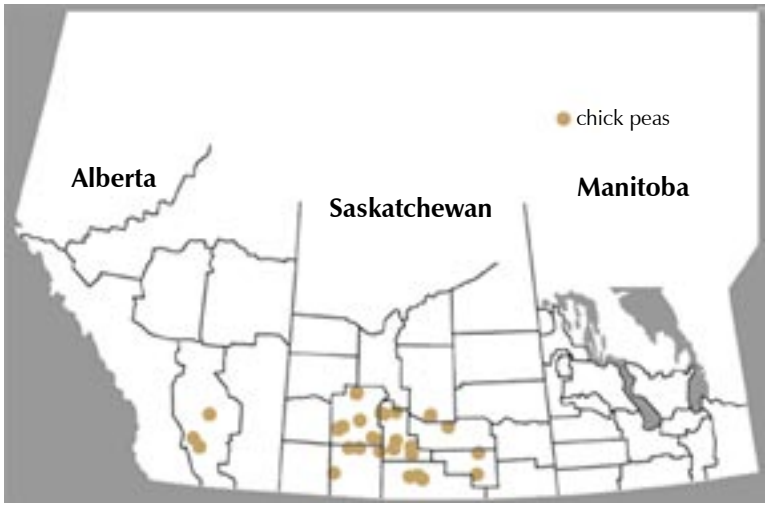
[2] NA=not available due to a small number of samples received.

Quality of western Canadian chick peas 2005

Harvest survey samples

Samples for the CGC harvest survey were collected from producers across western Canada (Fig. 7). For the 2005 harvest survey, 64 chick pea samples were received at the CGC for analysis. All samples were graded and analyzed for protein content. Due to the small number of Desi chick pea samples received, only results for Kabuli chick peas were included in the 2005 quality report. Starch content was determined on selected samples. 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 2005 harvest survey chick pea samples



Quality of 2005 western Canadian chick peas

The mean protein content for 2005 western Canadian chick peas was 22.7% (Table 14). This was higher than that for 2004 but was the same as the four-year average (Fig. 8).

The starch content was 41.9% for Chick peas, Kabuli, No. 1 Western Canada and 41.6% for Chick peas, Kabuli, No. 2 Western Canada, respectively. It appeared that grade had little effect on starch content in chick peas (Table 15). The mean 100-seed weight and water absorption values were similar for Chick peas, Kabuli, No.1 and No. 2 Western Canada.

Table 14 – Mean protein content for 2005 western Canadian Kabuli chick peas by grade[1]

	Protein content		
Grade	2005	2004	2000-2004
	%	%	%
Chick peas, Kabuli, Canada Western No. 1	22.5	23.9	23.9
Chick peas, Kabuli, Canada Western No. 2	22.6	20.9	22.6
Chick peas, Kabuli, Canada Western No. 3	23.1	20.7	22.0
All grades	22.7	21.0	22.7

[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

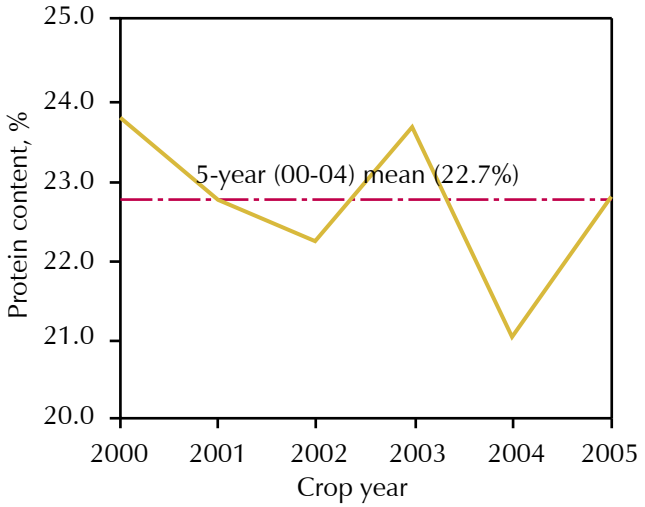


Table 15 – Quality data for 2005 western Canadian Kabuli chick peas

Quality parameter	Chick peas, Kabuli, No. 1 Canada Western		Chick peas, Kabuli, No. 2 Canada Western	
	2005	2004	2005	2004
Protein, % dry basis				
Number of samples	19	2	21	3
Mean	22.5	23.9	22.6	20.9
Standard deviation	1.1	0.4	1.0	0.9
Minimum	19.0	23.6	20.5	20.4
Maximum	24.2	24.1	24.5	21.9
Starch, % dry basis				
Number of samples	18	NA[1]	20	NA
Mean	41.9	NA	41.6	NA
Standard deviation	1.5	NA	1.2	NA
Minimum	38.9	NA	39.5	NA
Maximum	44.4	NA	44.4	NA
100-seed weight, g/100 seeds				
Number of samples	18	NA	21	NA
Mean	37.0	NA	38.2	NA
Standard deviation	8.4	NA	7.2	NA
Minimum	23.4	NA	23.5	NA
Maximum	50.4	NA	44.9	NA
Water absorption, g H_2O/g seeds				
Number of samples	18	NA	21	NA
Mean	1.12	NA	1.13	NA
Standard deviation	0.04	NA	0.14	NA
Minimum	1.01	NA	0.60	NA
Maximum	1.19	NA	1.29	NA

[1] NA=not available due to a small number of samples received.