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Quality of western Canadian lentils

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Introduction

This report presents the quality data for 2016 western Canadian lentils from Canadian Grain Commission's Harvest Sample Program. Samples were submitted by western Canadian producers to the Canadian Grain Commission's Grain Research Laboratory for analysis.

Production

Lentil production in 2016 was estimated to be 3.2 million tonnes, which was 28% higher than in 2015, and more than two times higher than the 10-year average of 1.5 million tonnes (Table 1). Increase in production was due to a 43% increase in harvested area in 2016 from 2015. Saskatchewan continues to dominate lentil production in western Canada, accounting for about 84% of production, while Alberta accounts for about 16%.

Table 1 – Production statistics for western Canadian lentils (green and red combined)[1]

	Harvested area		Production		Yield		Mean production
Province	2016	2015	2016	2015	2016	2015	2006–2015
	thousand hectares		thousand tonnes		kg/ha		thousand tonnes
Lentils							
Manitoba	-	-	-	-	-	-	-
Saskatchewan	2096	1516	2742	2364	1310	1560	1480
Alberta[2]	227	115	506	176	2230	1540	92
Western Canada	**2323**	**1630**	**3248**	**2540**	**1400**	**1560**	**1545**

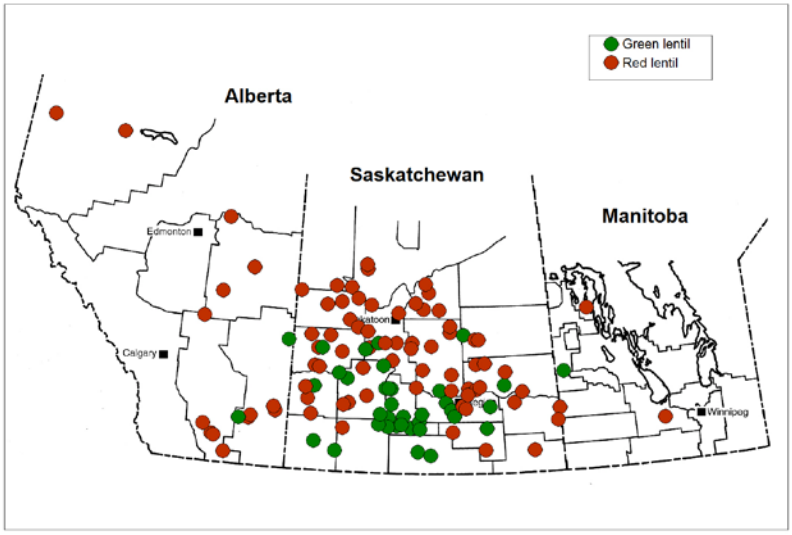
[1]Statistics Canada.
[2]Includes the Peace River area of British Columbia.

Western Canadian lentils _____ 2016

Lentil samples

Samples for the Canadian Grain Commission's Harvest Sample Program were collected from producers across western Canada (Figure 1). The Canadian Grain Commission received a total of 713 lentil samples including 253 green and 460 red lentils for analysis. All samples were graded and tested for protein content and seed size distribution. Size distribution was determined using the image analysis technique. Composites for green lentils (No. 1 and No. 2 Canada combined) were prepared based on seed size (small, medium and large) and crop region, while composites for red lentils were prepared based on crop region and variety (No. 1 and No. 2 Canada combined). The composite samples were tested for moisture content, protein content, starch content, total dietary fiber, ash content, mineral content, 100-seed weight and water absorption. In addition, 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 1 – Map of western Canada showing origin of 2016 lentil samples from CGC's Harvest Sample Program



Quality of 2016 western Canadian lentils

Protein content for green and red lentils in 2016 ranged from 21.7% to 30.4% (Table 2). The mean protein content was 27.1%, which was higher than the mean for 2015 (25.9%), and similar to the 10-year mean of 27.1% (Figure 2). Table 3 represents the mean protein content for green and red lentils by crop region (Figure 3).

Table 4 shows quality characteristics for green lentil composites by seed size. Mean protein content for small-size green lentils (CDC Imvincible, CDC Viceroy, and Eston) was 27.8%, which was higher than the mean for 2015. Mean protein content for medium-size green lentils (CDC Imigreen, CDC Impress, and CDC Richlea) was 25.5%, which was higher than the mean for 2105. Protein content for large-size green lentils (CDC Glamis, CDC Grandora, CDC Greenland, CDC Greenstar, CDC Impower, CDC Improve, CDC Plato, CDC Sovereign, and Laird) was 26.5%, slightly higher than the mean for 2015. Mean starch contents for medium-size and large-size green lentils were similar to the means for 2015, while the mean for small-size green lentils was lower than the mean for 2015. Mean total dietary fiber contents for small-size, medium-size and large-size green lentils were higher than the means for all 3 sizes of lentils in 2015. Mean ash content for all 3 green lentil sizes was similar to levels in 2015. Potassium (K) was the most abundant macroelement present in green lentils, followed by phosphorus (P), magnesium (Mg) and calcium (Ca) (Table 4). Among microelements, iron (Fe) was the highest, followed by zinc (Zn), manganese (Mn), and copper (Cu).

Mean 100-seed weights for small, medium and large-size green lentils were 2.5 g, 4.7 g and 6.1 g, respectively (Table 4). Mean 100-seed weights for all 3 sizes of lentils were lower than the means for 2015. Mean water absorption values were 0.97 g H_2O per g seeds for small-size lentils, 1.01 g H_2O per g seeds for medium-size lentils and 1.01 g H_2O per g seeds for large-size lentils, which were higher than the means for 2015.

Seed size distribution for green lentils was determined by the image analysis technique (Table 5). The reported results may differ from those obtained by conventional sieving techniques. For small-size green lentils, approximately 70% of the seeds fell within 4.0 to 5.0 mm. For medium-size green lentils, 72% fell within 5.0 to 6.0 mm. For large-size green lentils, 82% fell within 5.5 to 7.0 mm.

Table 6 shows 2016 quality data for red lentil composites. Mean protein content for red lentils, including the varieties CDC Dazil, CDC Imax, CDC Impact, CDC Impala, CDC Imperial, CDC King Red, CDC Maxim, CDC Redberry and CDC Rouleau, was 26.5%, which was higher than the mean (26.0%) for 2015. Mean starch content (46.6%) was slightly higher than the mean for 2015. Mean total dietary fiber content was 15.6%, higher than the mean for 2015. Mean ash content was 2.9%, higher than the mean (2.7%) for 2015. Results for both macroelements and

microelements observed in red lentils had similar trends to those observed in green lentils (Table 6).

Mean 100-seed weight was 3.1 g per 100 seeds, which was lower than the mean (3.8 g per 100 seeds) for 2015 and the mean water absorption was 0.96 g H_2O per g seeds, which were higher than the means for 2015.

The mean dehulling efficiency for red lentils was 80.3%, which was slightly lower than the mean for 2015 (Table 6). 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*) and more yellowness (b*) as compared to dehulled whole seeds (Table 6). Approximately 75% of red lentils fell within the 4.0 to 5.0 mm range, which was higher than that (68%) for 2015 (Table 7).

Table 2 – Protein content for 2016 western Canadian lentils (green and red combined) by grade[1]

Grade	Protein content, % dry basis			
	2016			2015
	Mean	Min.	Max.	Mean
Saskatchewan				
Lentils, No. 1 Canada	26.7	21.7	29.3	25.8
Lentils, No. 2 Canada	26.9	22.9	30.2	26.0
Lentils, Extra No. 3 Canada	27.4	24.2	30.1	26.2
Lentils, No. 3 Canada	27.3	24.5	29.3	26.3
All grades	**27.1**	**21.7**	**30.2**	**25.9**
Alberta				
Lentils, No. 1 Canada	26.3	24.5	28.6	25.1
Lentils, No. 2 Canada	27.0	24.5	30.4	25.5
Lentils, Extra No. 3 Canada	26.8	25.0	28.4	NS
Lentils, No. 3 Canada	NS[2]	NS	NS	NS
All grades	**26.7**	**24.5**	**30.4**	**25.3**
Western Canada				
Lentils, No. 1 Canada	26.6	21.7	29.3	25.7
Lentils, No. 2 Canada	27.0	22.9	30.4	26.0
Lentils, Extra No. 3 Canada	27.4	24.2	30.1	26.2
Lentils, No. 3 Canada	27.3	24.5	29.3	26.3
All grades	**27.1**	**21.7**	**30.4**	**25.9**

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

[2]NS=insufficient number of samples to generate a representative value.

Figure 2 – Mean protein content of western Canadian lentils

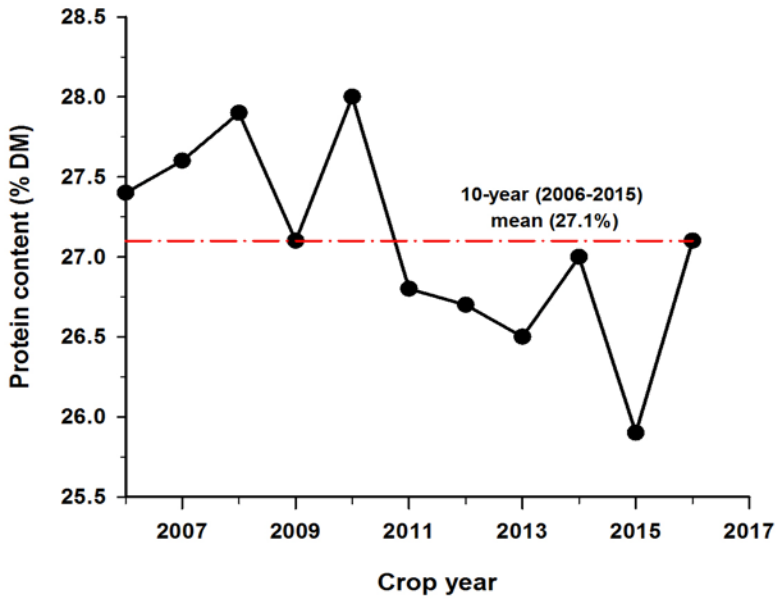


Figure 3 – Crop regions in western Canada

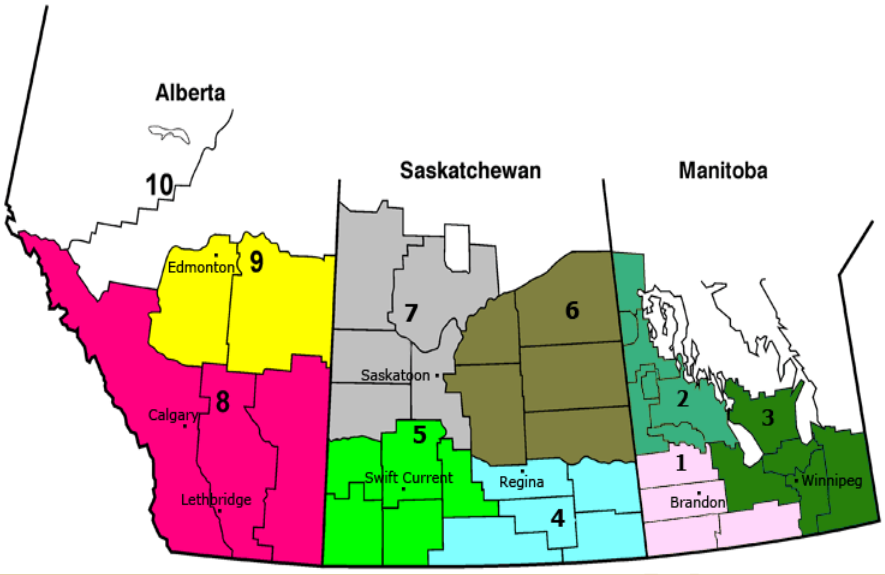


Table 3 – Mean protein and starch content for 2016 western Canadian lentils (green and red combined) by crop region

	Protein content, % dry basis		Starch content, % dry basis	
Crop region[1]	2016	2015	2016	2015
4	26.7	25.8	46.9	47.0
5	26.5	25.6	46.7	46.7
6	27.0	27.1	45.5	45.1
7	26.8	26.4	45.6	46.1
8	26.2	25.0	47.6	47.4

[1]Saskatchewan crop regions (Figure 3): 4 (South East Saskatchewan), 5 (South West Saskatchewan), 6 (North East Saskatchewan), and 7 (North West Saskatchewan); Alberta crop regions: 8 (Southern Alberta).

Table 4 – Quality data for 2016 western Canadian green lentil composite by seed size[1]

Quality parameter	2016			2015		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
Chemical composition						
Moisture content, %	10.0	9.8	10.5	9.4	9.9	8.9
Protein content, % dry basis (DM)	27.8	25.5	26.5	26.3	24.1	26.0
Starch content, % DM	44.7	48.9	47.2	47.1	48.5	46.8
Total dietary fiber content, % DM	15.6	15.2	14.1	12.3	12.0	12.4
Ash content, % DM	2.8	3.0	2.9	2.8	2.8	2.9
Mineral (mg/100 g dry basis)						
Calcium (Ca)	67.9	79.6	83.4	75.6	85.4	79.2
Copper (Cu)	1.3	0.97	1.0	0.93	0.93	0.86
Iron (Fe)	9.0	6.9	8.1	7.8	6.7	6.8
Potassium (K)	1092.2	1019.3	1079.2	905.5	971.6	968.7
Magnesium (Mg)	116.3	115.4	123.7	99.7	113.5	110.9
Manganese (Mn)	1.7	1.9	1.8	1.6	1.7	1.7
Phosphorus (P)	445.8	369.2	437.9	352.2	350.9	364.9
Zinc (Zn)	3.8	4.4	4.5	3.8	3.9	4.0
Physical characteristic						
100-seed weight, g/100 seeds	2.5	4.7	6.1	3.0	5.7	6.7
Water absorption, g H_2O/g seeds	0.97	1.01	1.01	0.91	0.93	0.97

[1]Lentils, No. 1 Canada and Lentils, No. 2 Canada combined.
[2]SL=small lentils including CDC Imvincible, CDC Viceroy and Eston.
[3]ML=medium lentils including CDC Imigreen, CDC Impress, and CDC Richlea.
[4]LL=large lentils including CDC Glamis, CDC Grandora, CDC Greenland, CDC Greenstar, CDC Impower, CDC Improve, CDC Plato, CDC Sovereign, and Laird.

Table 5 – Seed size distribution for 2016 western Canadian green lentils[1]

Seed size distribution	2016			2015		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
<3.5 mm, %	4.8	0.6	0.0	1.6	0.2	0.1
3.5–4.0 mm, %	24.3	1.4	0.4	9.0	0.3	0.2
4.0–4.5 mm, %	50.9	4.2	1.1	30.5	0.8	0.5
4.5–5.0 mm, %	19.2	13.3	4.3	47.8	4.1	1.8
5.0–5.5 mm, %	0.7	31.5	11.1	10.9	19.3	5.0
5.5–6.0 mm, %	0.0	40.9	24.9	0.2	47.5	15.2
6.0–6.5 mm, %	0.0	7.8	40.5	0.0	26.4	39.3
6.5–7.0 mm, %	0.0	0.4	16.8	0.0	1.4	34.8
7.0–7.5 mm, %	0.0	0.0	0.8	0.0	0.0	3.2
>7.5 mm, %	0.0	0.0	0.0	0.0	0.0	0.0

[1]Seed size including all grades determined by the image analysis technique.
[2]SL=small lentils including CDC Imvincible, CDC Viceroy, and Eston.
[3]ML=medium lentils including CDC Imigreen, CDC Impress, and CDC Richlea.
[4]LL=large lentils including CDC Glamis, CDC Grandora, CDC Greenland, CDC Impower, CDC Improve, CDC Plato, CDC Sovereign, and Laird.

Table 6 – Quality data for 2016 western Canadian red lentil composite[1]				
Quality parameter		2016	2015	
Chemical composition				
Moisture content, %		10.6	8.9	
Protein content, % dry basis (DM)		26.5	26.0	
Starch content, % DM		46.6	46.2	
Total dietary fiber content, % DM		15.6	13.6	
Ash content, % DM		2.9	2.7	
Mineral (mg/100 g dry basis)				
Calcium (Ca)		74.6	81.9	
Copper (Cu)		1.1	0.92	
Iron (Fe)		8.9	8.1	
Potassium (K)		1043.3	947.1	
Magnesium (Mg)		133.3	109.4	
Manganese (Mn)		1.8	1.7	
Phosphorus (P)		432.2	342.5	
Zinc (Zn)		4.2	3.8	
Physical characteristic				
100-seed weight, g/100 seeds		3.1	3.8	
Water absorption, g H_2O/g seeds		0.96	0.88	
Dehulling quality				
Dehulling efficiency, %		80.3	81.0	
Powder, %		2.1	2.3	
Broken seeds, %		1.3	0.79	
Undehulled whole seeds, %		5.4	5.1	
Colour of dehulled seeds	**Whole**	**Splits**	**Whole**	**Splits**
Brightness, L*	60.4	62.2	60.5	62.3
Redness, a*	28.8	28.8	29.2	29.0
Yellowness, b*	38.3	39.9	37.2	38.5

[1]Lentils, No. 1 Canada and Lentils, No. 2 Canada combined. Red lentils including CDC Dazil, CDC Imax, CDC Impact, CDC Impala, CDC Imperial, CDC King Red, CDC Maxim, CDC Redberry and CDC Rouleau.
[2]L*=darkness (0) to brightness (+); a*=greenness (-) to redness (+); b*=blueness (-) to yellowness (+).

Table 7 – Seed size distribution for 2016 western Canadian red lentils[1]

Seed size distribution[2]	2016	2015
<3.5 mm, %	3.0	1.0
3.5–4.0 mm, %	15.3	6.3
4.0–4.5 mm, %	40.6	24.7
4.5–5.0 mm, %	33.9	43.3
5.0–5.5 mm, %	6.3	21.7
5.5–6.0 mm, %	0.8	2.9
6.0–6.5 mm, %	0.1	0.2
6.5–7.0 mm, %	0.0	0.0
>7.0 mm, %	0.0	0.0

[1]Red lentils including CDC Dazil, CDC Imax, CDC Impact, CDC Impala, CDC Imperial, CDC King Red, CDC Maxim, CDC Redberry and CDC Rouleau.
[2]Seed size determined by the image analysis technique.