Canadian Grain Commission | Commission canadienne des grains

ISSN 1920-9037

Quality of western Canadian lentils

2019

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Table of contents

Tables

Figures

Introduction

This report presents the quality data for 2019 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.

Growing and harvesting conditions

Figures 1a and 1b show monthly mean temperature difference from normal (Prairie Region) during 2019 growing season (June and July). Figures 2a and 2b display total precipitation (Prairie Region) from April 1 to June 30, 2019 and from April 1 to October 31, 2019.

Figure 1a – Monthly mean temperature difference from normal (Prairie Region) during growing season (June 2019)

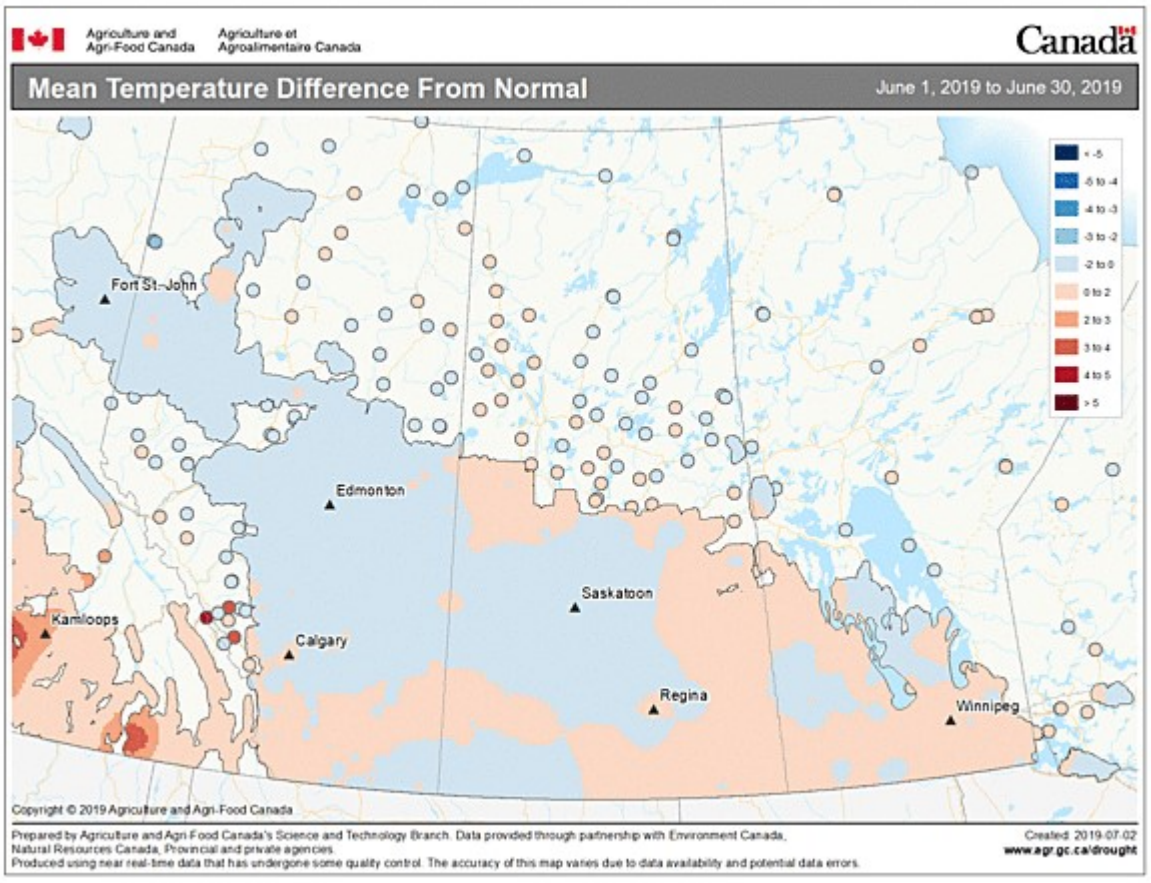


Figure 1b – Monthly mean temperature difference from normal (Prairie Region) during growing season (July 2019)

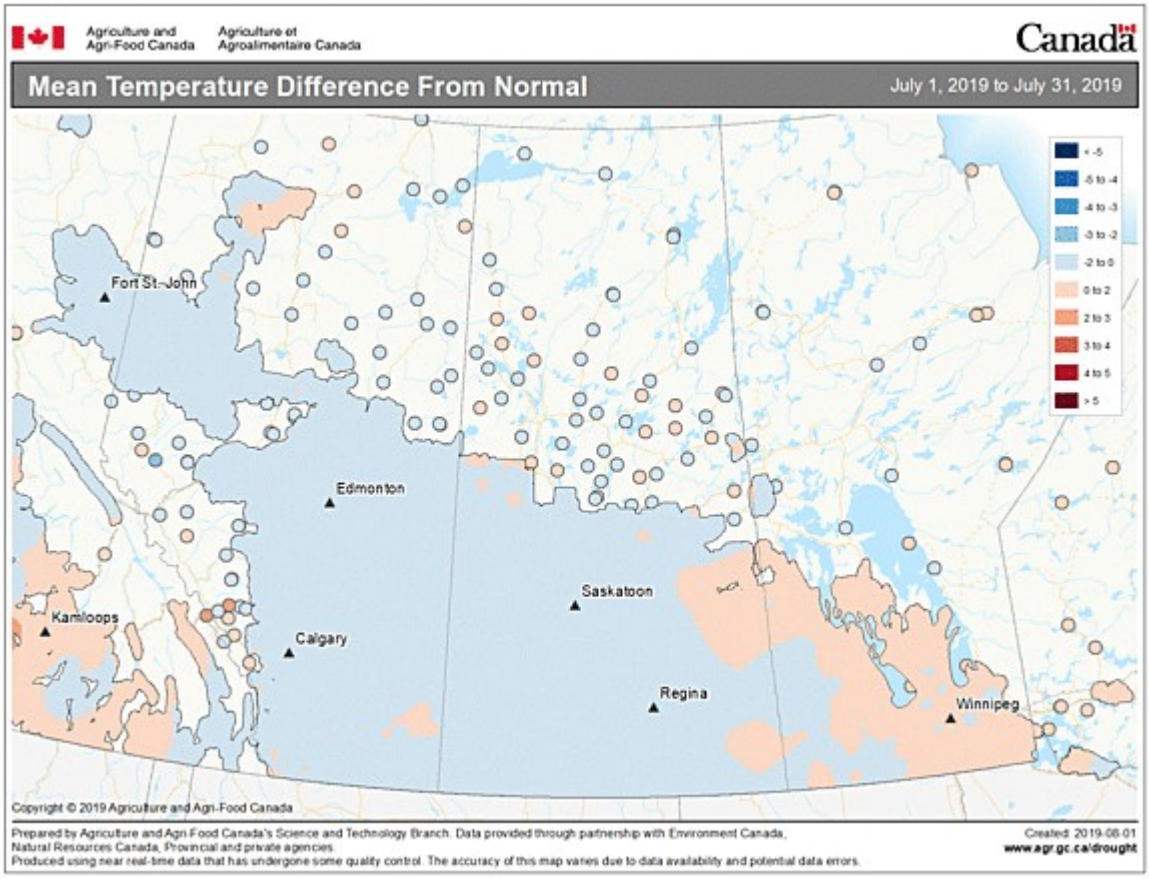


Figure 2a – Total precipitation (Prairie Region) during growing season (April 1 to June 30, 2019)

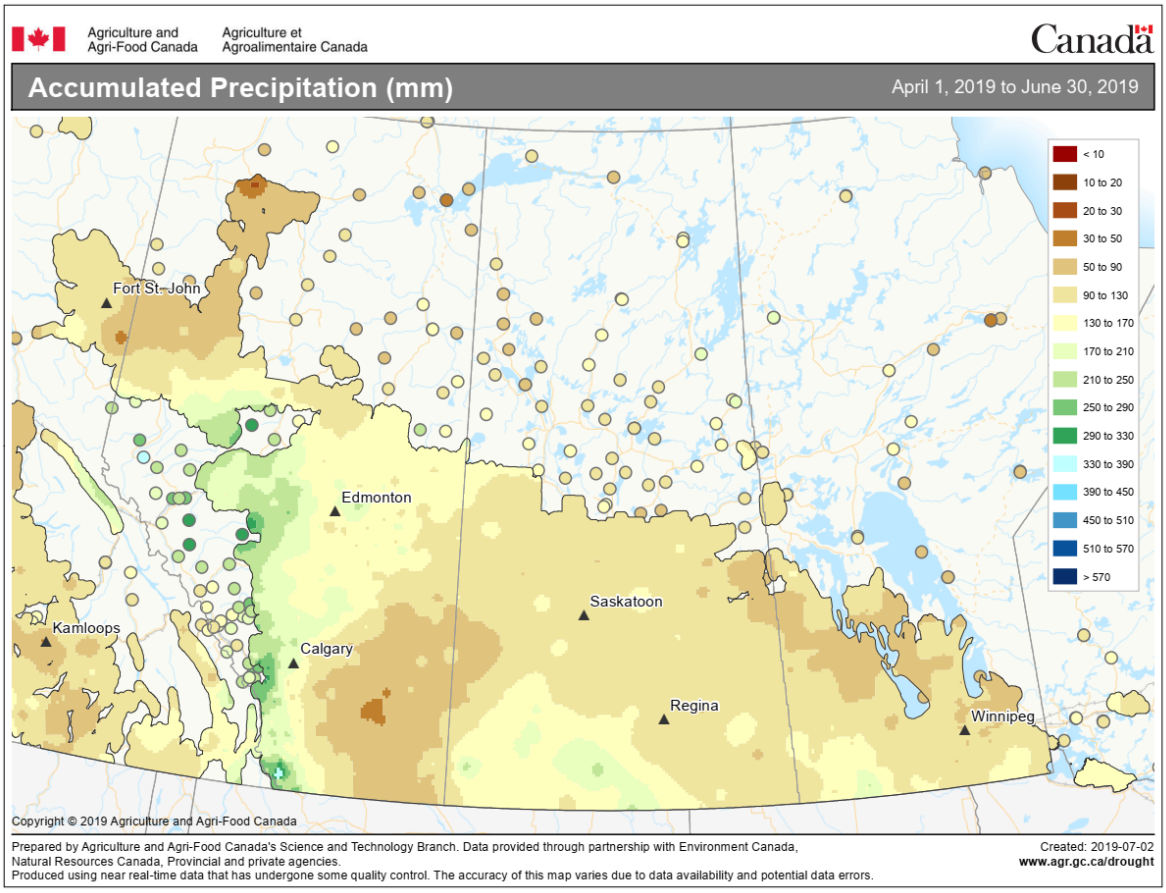
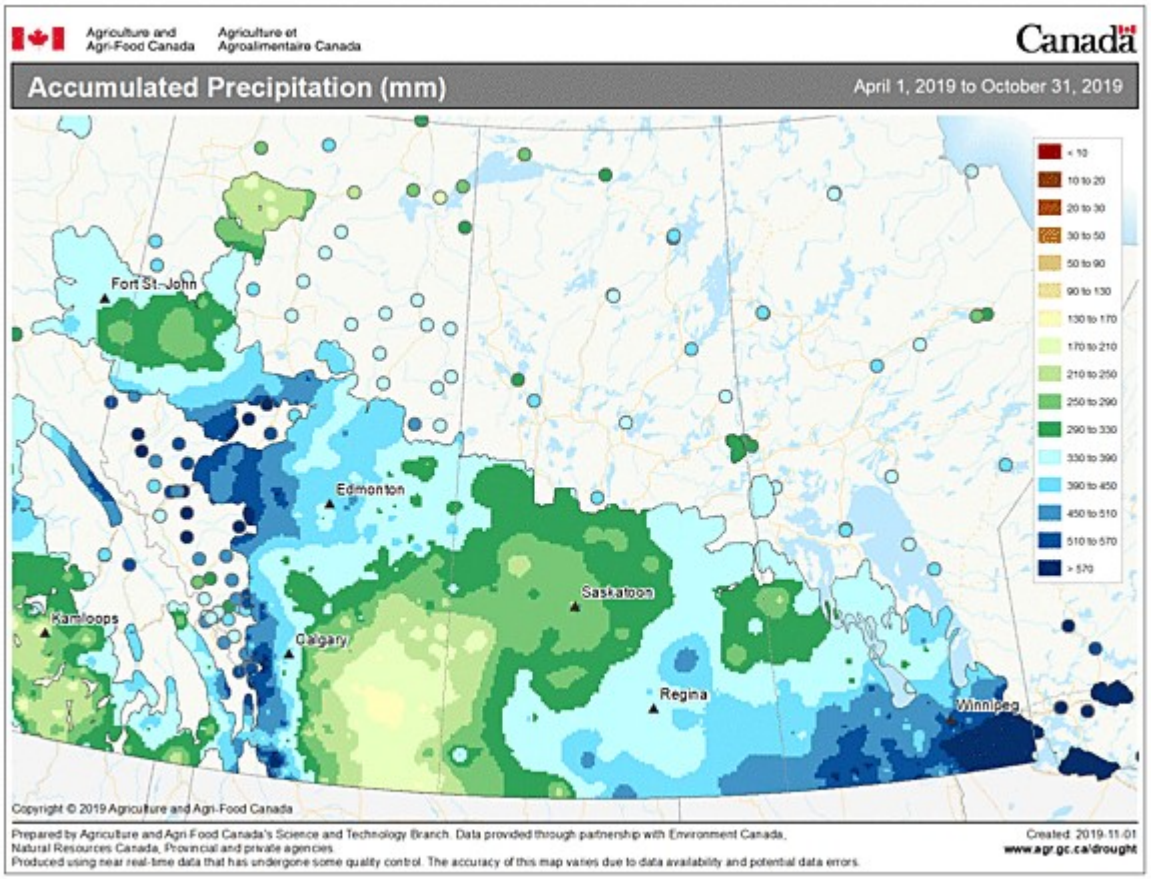


Figure 2b – Total precipitation (Prairie Region) during growing season (April 1 to October 31, 2019)



Seeding started in late April to early May in Manitoba, Saskatchewan and Alberta and was completed in early June for all 3 Prairie Provinces. Some crops were behind their normal development due to cooler temperatures (Figure1a) and/or lack of moisture across the Prairies in the spring (Figure 2a). Weather was warmer in Manitoba compared to other Prairie Provinces (Figure 1b). The timely rainfalls in July helped the crop to develop across the Prairies. However, Central, Eastern and Interlake regions of Manitoba, southern Alberta and the northern half of the Peace River region remained below average moisture, affecting seed filling of later maturing crops and causing premature ripening. Contrarily, a higher than normal precipitation along the foothills and northwest region of Alberta caused root rotting, crop yellowing and crop drowning. Harvest began by mid-August in the three provinces. Harvest was delayed in September due to wet conditions in the three provinces and an early-winter storm brought heavy snow to parts of Alberta and Saskatchewan. Southern Manitoba also had a heavy snowfall during Thanksgiving weekend causing crop damage and extended power outages, affecting the grain dryers and aeration bins from operation (Figure 2b). Nevertheless, harvest of lentils continued across the Prairies as weather and field conditions permitted. Lentil harvest was completed by end of October in Alberta but late-November in Saskatchewan. Crops came off damp and required drying and/or aeration. Quality of the late harvested crops was below average due to sprouting, bleaching and staining.

Production

Lentil production in 2019 was estimated to be 2.2 million tonnes, which was 3.3% higher than in 2018, and 1.6% higher than the 10-year average of 2.1 million tonnes (Table 1). Growth in production was due to a 4% increase in yield from 2018. Saskatchewan continues to dominate lentil production in western Canada, accounting for about 92% of production, while Alberta accounts for about 8%.

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

	Harvested area		Production		Yield		Mean production
Province	2019	2018	2019	2018	2019	2018	2009–2018
	thousand hectares		thousand tonnes		kg/ha		thousand tonnes
Lentils							
Manitoba	-	0.8	-	0.7	-	897	-
Saskatchewan	1335	1329	2000	1892	1498	1424	1976
Alberta[2]	151	170	163	200	1074	1175	155
Western Canada	**1486**	**1499**	**2163**	**2093**	**1455**	**1396**	**2128**

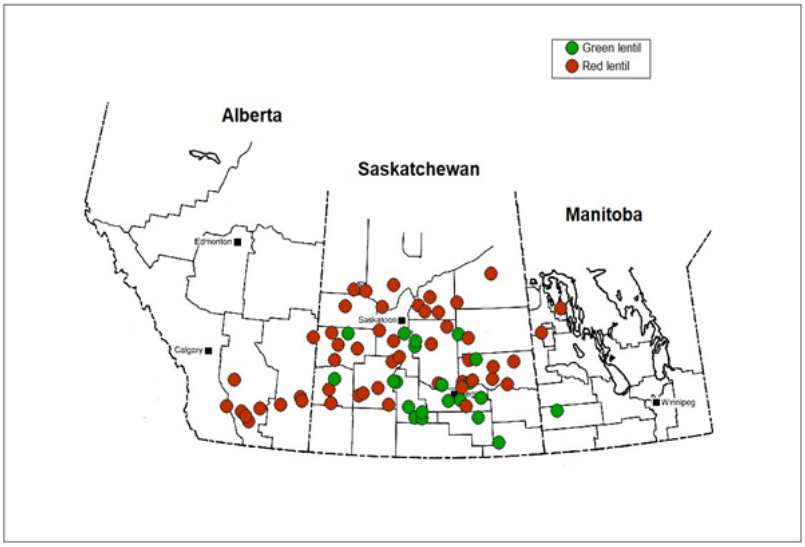
[1]Statistics Canada.
[2]Includes the Peace River area of British Columbia.

Western Canadian lentils _____ 2019

Lentil samples

Samples for the Canadian Grain Commission's Harvest Sample Program were collected from producers across western Canada (Figure 3). The Canadian Grain Commission received a total of 674 lentil samples including 303 green and 371 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 3 – Map of western Canada showing origin of 2019 lentil samples from CGC's Harvest Sample Program



Quality of 2019 western Canadian lentils

Protein content for green and red lentils in 2019 ranged from 24.5% to 31.7% (Table 2). The mean protein content was 27.1%, which was higher than the mean for 2018 and the 10-year mean of 26.7% (Figure 4). Table 3 represents the mean protein content for green and red lentils by crop region (Figure 5).

Table 4 shows quality characteristics for green lentil composites by seed size. Mean protein content for small-size green lentils (CDC Imvincible, CDC Kermit, and Eston) was 28.2%, which was higher than the mean for 2018. Mean protein content for medium-size green lentils (CDC Richlea) was 26.1%, similar to the 2018 value. Protein content for large-size green lentils (CDC Greenstar, CDC Greenland, CDC Impower, CDC Improve, CDC Lima, CDC Glamis and Laird) was the same as the mean for 2018 (26.8%).

Mean starch content for small, medium and large-size green lentil was 43.5%, 45.9%, and 44.5% respectively. All values were lower than the mean starch contents for 2018. (Table 4).

Mean total dietary fiber content for small-size green lentils was 13.4% (Table 4), higher than the 2018 value, whereas mean total dietary fiber contents for medium (12.6%) and large-size green lentils (11.9%) were lower than the means for 2018. Mean ash content for the small-size green lentils was higher than the 2018 value, while for the medium and large-size green lentils were similar to the mean ash contents of 2018.

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 2.8 g, 4.9 g and 6.4 g, respectively (Table 4). Mean 100-seed weights for all three sizes of green lentils were slightly lower than the means for 2018. Mean water absorption content of the small-size lentils was 0.93 g H_2O per g seeds, which was the same as the 2018 value. Mean water absorption value for medium-size green lentils was 1.02 g H_2O per g seeds, which was slightly higher than the mean for 2018. Mean water absorption value for large-size green lentils was 1.03 g H_2O per g seeds, similar to the mean for 2018.

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 85% of the seeds fell within 4.0 to 5.0 mm and 13% of the seeds fell within 3.5 to 4.0 mm. For medium-size green lentils, 85% fell within 5.0 to 6.0 mm. For large-size green lentils, 95% fell within 5.5 to 7.0 mm.

Table 6 shows 2019 quality data for red lentil composites. Mean protein content of red lentils was 27.1%, which was higher than the mean for 2018. Mean starch content was 45.6% and mean total dietary fiber content was 12.5%. Both values were lower than the means for 2018. Mean ash content was 2.7%, slightly higher than the mean for 2018. 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 for red lentils was 3.7 g per 100 seeds, and mean water absorption was 0.96 g H_2O per g seeds. Both were similar to the values for 2018.

The mean dehulling efficiency for red lentils was 83.5%, which was lower than the mean for 2018 (Table 6). Colour of dehulled lentils was measured using a Hunterlab LabScan XE spectrocolorimeter using the CIE L*, a* and b* colour scale with D65 illuminant. Dehulled splits exhibited more brightness (L*) and more yellowness (b*) as compared to dehulled whole seeds (Table 6). Overall, dehulled whole seeds were less red (a*) in colour and dehulled splits were more yellow (b*) compared to the 2018 values. Approximately 60% of red lentils fell within the 4.0 to 5.0 mm range, which was lower than that for 2018 (Table 7).

Table 2 – Protein content for 2019 western Canadian lentils (green and red combined) by grade[1]

Grade	Protein content, % dry basis			
	2019			2018
	Mean	Min.	Max.	Mean
Saskatchewan				
Lentils, No. 1 Canada	27.2	24.5	31.7	26.3
Lentils, No. 2 Canada	27.1	24.5	29.6	26.3
Lentils, Extra No. 3 Canada	26.8	25.0	29.1	26.9
Lentils, No. 3 Canada	27.0	25.3	28.6	27.3
All grades	**27.1**	**24.5**	**31.7**	**26.4**
Alberta				
Lentils, No. 1 Canada	27.6	26.1	29.7	26.5
Lentils, No. 2 Canada	27.3	25.0	30.2	27.5
Lentils, Extra No. 3 Canada	28.1	27.3	28.5	28.3
Lentils, No. 3 Canada	NS[2]	NS	NS	NS[2]
All grades	**27.5**	**25.0**	**30.2**	**26.9**
Western Canada				
Lentils, No. 1 Canada	27.3	24.5	31.7	26.3
Lentils, No. 2 Canada	27.1	24.5	30.2	26.3
Lentils, Extra No. 3 Canada	26.9	25.0	29.1	27.0
Lentils, No. 3 Canada	27.0	25.3	28.6	27.3
All grades	**27.1**	**24.5**	**31.7**	**26.4**

[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 4 – Mean protein content of western Canadian lentils

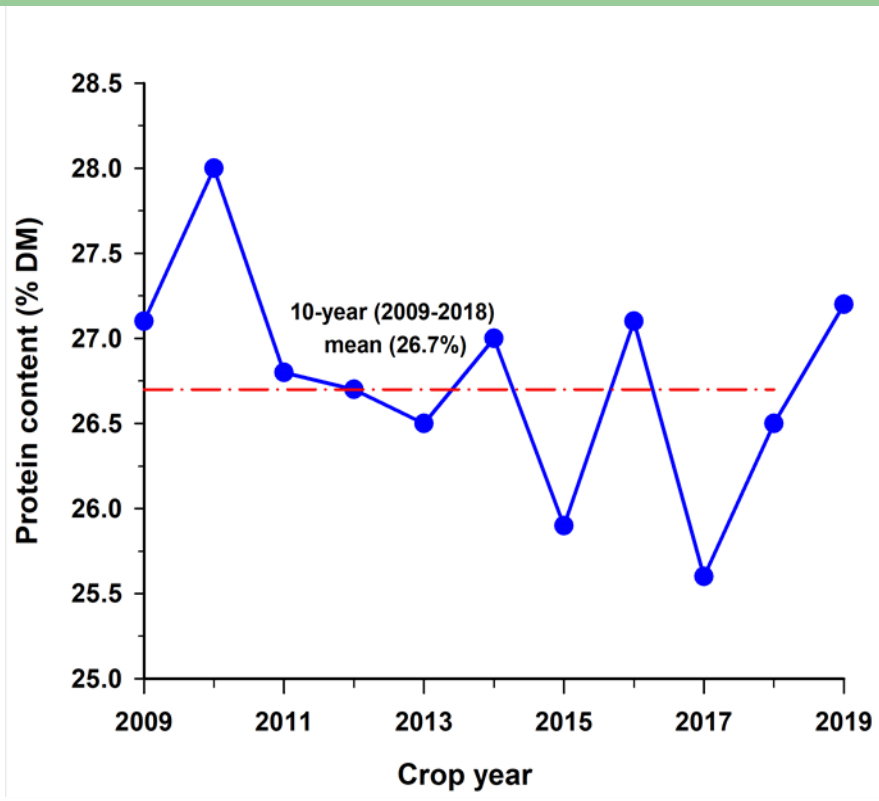


Figure 5 – Crop regions in western Canada

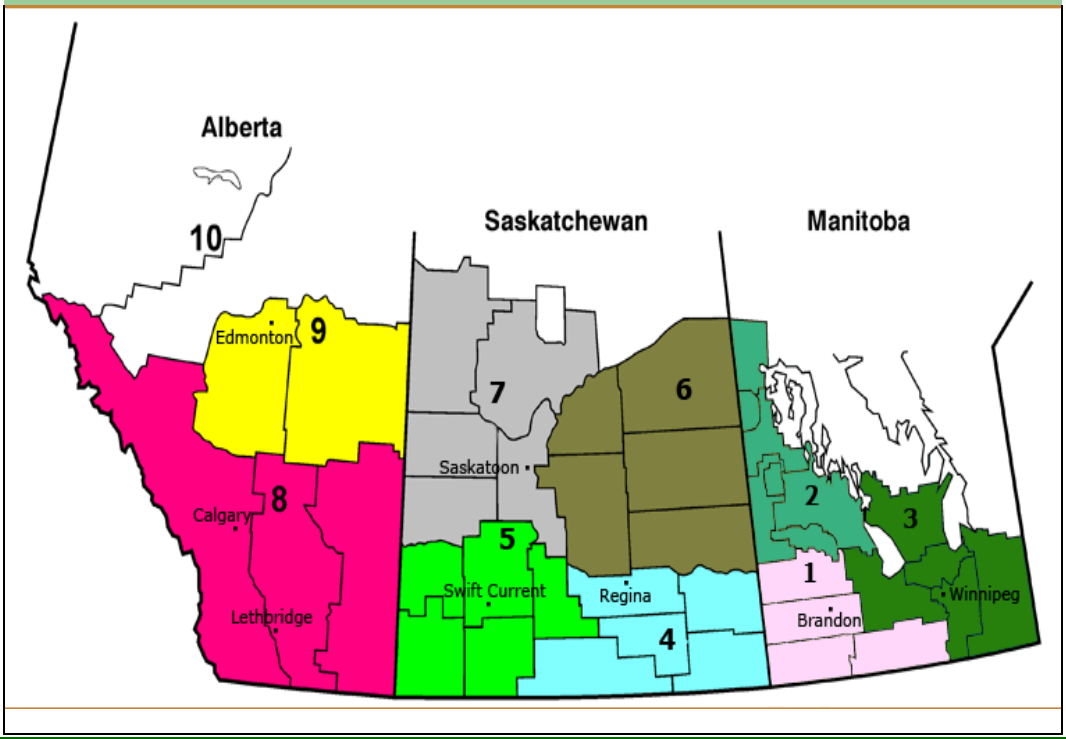


Table 3 – Mean protein and starch content for 2019 western Canadian lentils (green and red combined) by crop region

	Protein content, % dry basis		Starch content, % dry basis	
Crop region[1]	2019	2018	2019	2018
4	27.0	26.8	44.1	47.4
5	27.2	26.7	45.2	45.7
6	26.8	26.6	45.8	47.0
7	26.6	26.3	46.6	47.7
8	27.6	27.3	45.8	47.2

[1]Saskatchewan crop regions (Figure 5): 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 2019 western Canadian green lentil composite by seed size[1]						
	2019			2018		
Quality parameter	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
Chemical composition						
Moisture content, %	10.0	10.0	10.1	9.7	9.7	10.1
Protein content, % dry basis (DB)	28.2	26.1	26.8	27.4	26.2	26.8
Starch content, % DB	43.5	45.9	44.5	47.0	48.4	46.3
Total dietary fiber content, % DB	13.4	12.6	11.9	12.9	14.8	13.8
Ash content, % DB	2.8	2.6	2.7	2.5	2.5	2.6
Mineral (mg/100 g dry basis)						
Calcium (Ca)	59.1	66.7	60.2	64.8	71.8	66.4
Copper (Cu)	1.2	1.0	1.1	1.0	0.9	1.0
Iron (Fe)	7.8	6.6	7.3	7.1	6.1	6.7
Potassium (K)	1065.6	994.5	1031.7	941.8	998.9	942.2
Magnesium (Mg)	113.1	117.8	118.0	98.8	111.9	108.2
Manganese (Mn)	1.4	1.6	1.4	1.5	1.3	1.4
Phosphorus (P)	419.2	330.0	395.4	367.0	363.2	358.7
Zinc (Zn)	3.3	3.6	3.8	3.6	4.0	4.0
Physical characteristic						
100-seed weight, g/100 seeds	2.8	4.9	6.4	3.2	5.2	6.8
Water absorption, g H_2O/g seeds	0.93	1.02	1.03	0.93	0.94	0.98

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

Table 5 – Seed size distribution for 2019 western Canadian green lentils[1]

Seed size distribution	2019			2018		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
<3.5 mm, %	1.0	0.0	0.0	15.1	0.4	0.0
3.5–4.0 mm, %	13.1	0.0	0.0	20.6	0.6	0.0
4.0–4.5 mm, %	53.0	0.2	0.0	24.8	2.0	0.1
4.5–5.0 mm, %	31.6	6.4	0.6	21.8	7.9	0.8
5.0–5.5 mm, %	0.9	32.4	3.8	10.6	28.6	4.0
5.5–6.0 mm, %	0.0	52.9	20.0	7.2	42.0	13.9
6.0–6.5 mm, %	0.2	8.2	51.8	0.0	17.8	39.7
6.5–7.0 mm, %	0.1	0.0	22.7	0.0	0.8	37.5
7.0–7.5 mm, %	0.0	0.0	1.0	0.0	0.0	4.0
>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 and CDC Kermit and Eston.
[3]ML=medium lentils including CDC Richlea.
[4]LL=large lentils including CDC Greenstar, CDC Greenland, CDC Impower, CDC Improve, CDC Lima, CDC Glamis and Laird.

Table 6 – Quality data for 2019 western Canadian red lentil composite[1]				
Quality parameter		2019	2018	
Chemical composition				
Moisture content, %		10.0	9.8	
Protein content, % dry basis (DB)		27.1	26.6	
Starch content, % DB		45.6	46.7	
Total dietary fiber content, % DB		12.5	14.3	
Ash content, % DB		2.7	2.5	
Mineral (mg/100 g dry basis)				
Calcium (Ca)		66.01	72.3	
Copper (Cu)		1.1	1.0	
Iron (Fe)		8.0	7.0	
Potassium (K)		1004.5	910.6	
Magnesium (Mg)		112.3	104.5	
Manganese (Mn)		1.4	1.4	
Phosphorus (P)		387.9	346.2	
Zinc (Zn)		3.8	4.0	
Physical characteristic				
100-seed weight, g/100 seeds		3.7	3.8	
Water absorption, g H_2O/g seeds		0.96	0.93	
Dehulling quality				
Dehulling efficiency, %		83.5	84.8	
Powder, %		3.0	2.6	
Broken seeds, %		0.82	0.45	
Undehulled whole seeds, %		2.5	2.2	
Colour of dehulled seeds[2]	**Whole**	**Splits**	**Whole**	**Splits**
Brightness, L*	60.6	62.6	60.5	62.5
Redness, a*	30.2	30.4	30.7	30.5
Yellowness, b*	38.3	40.4	38.4	39.9

[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 Impulse, CDC King Red, CDC Maxim, CDC Proclaim, CDC Redmoon and CDC Rouleau.

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

Table 7 – Seed size distribution for 2019 western Canadian red lentils[1]

Seed size distribution[2]	2019	2018
<3.5 mm, %	0.9	0.4
3.5–4.0 mm, %	6.6	3.2
4.0–4.5 mm, %	21.0	18.5
4.5–5.0 mm, %	39.2	46.2
5.0–5.5 mm, %	24.1	25.9
5.5–6.0 mm, %	7.6	5.1
6.0–6.5 mm, %	0.6	0.7
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 Impulse, CDC King Red, CDC Maxim, CDC Proclaim, CDC Redmoon and CDC Rouleau.
[2]Seed size determined by the image analysis technique.