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# Quality of western Canadian lentils

## 2020

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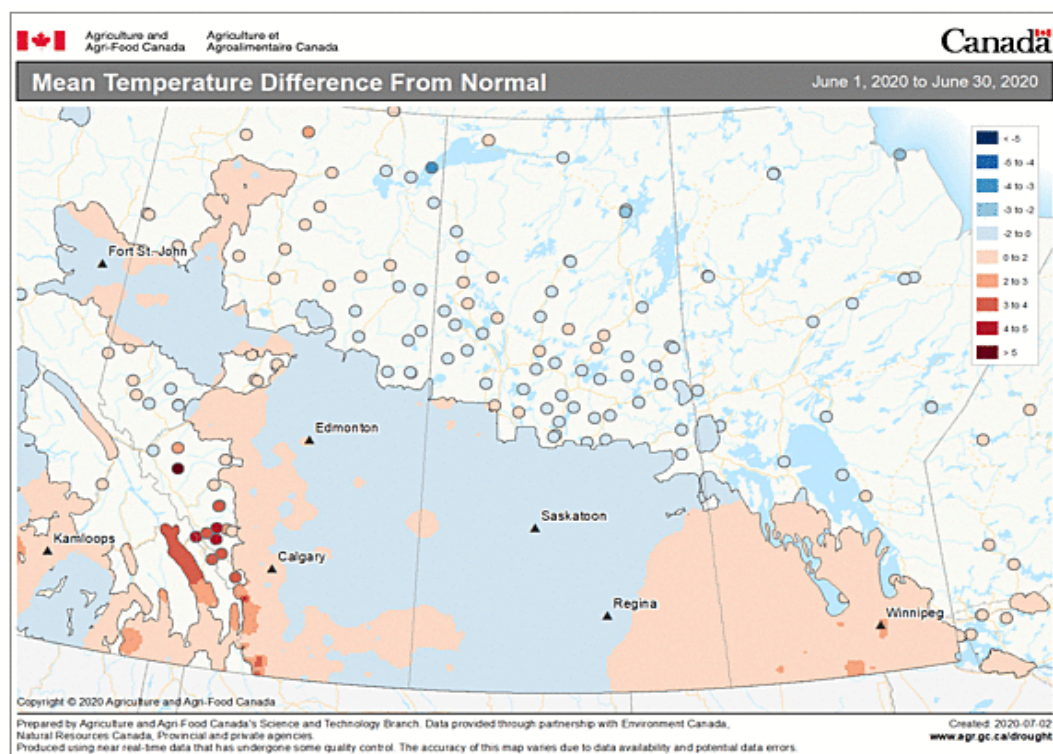
# Introduction

This report presents the quality data for 2020 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.

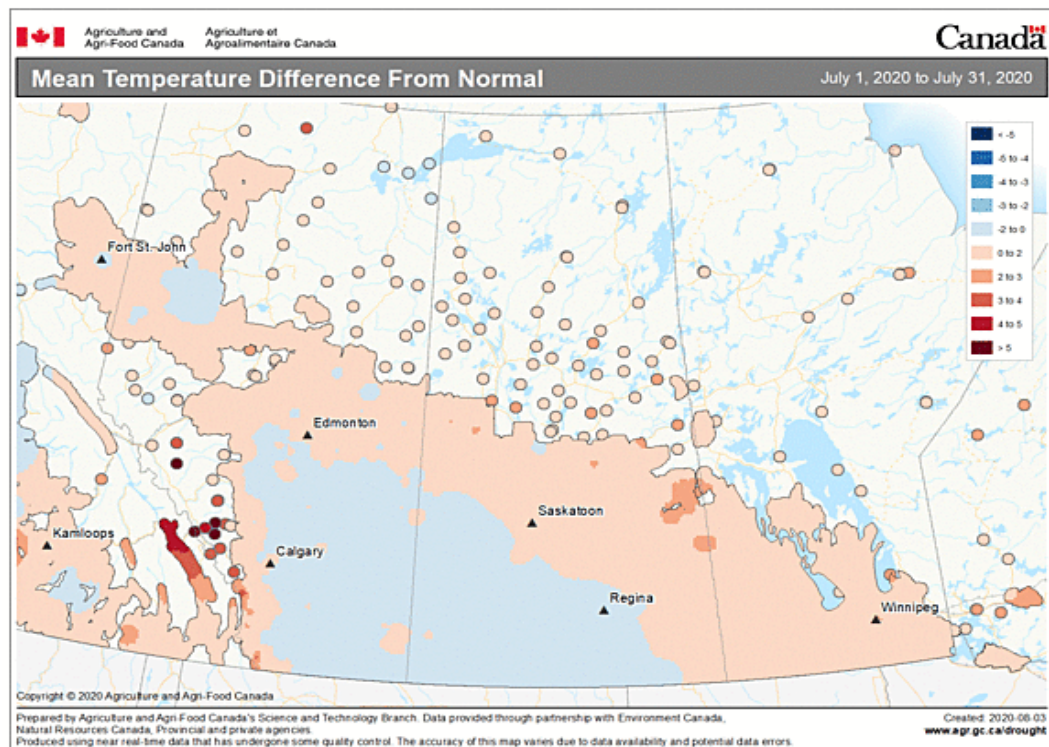
## Growing and harvesting conditions

Figures 1a and 1b show the monthly mean temperature difference from normal (Prairie region) during 2020 growing season (June and July). Figure 2 displays total precipitation (Prairie region) from April 1 to October 31, 2020.

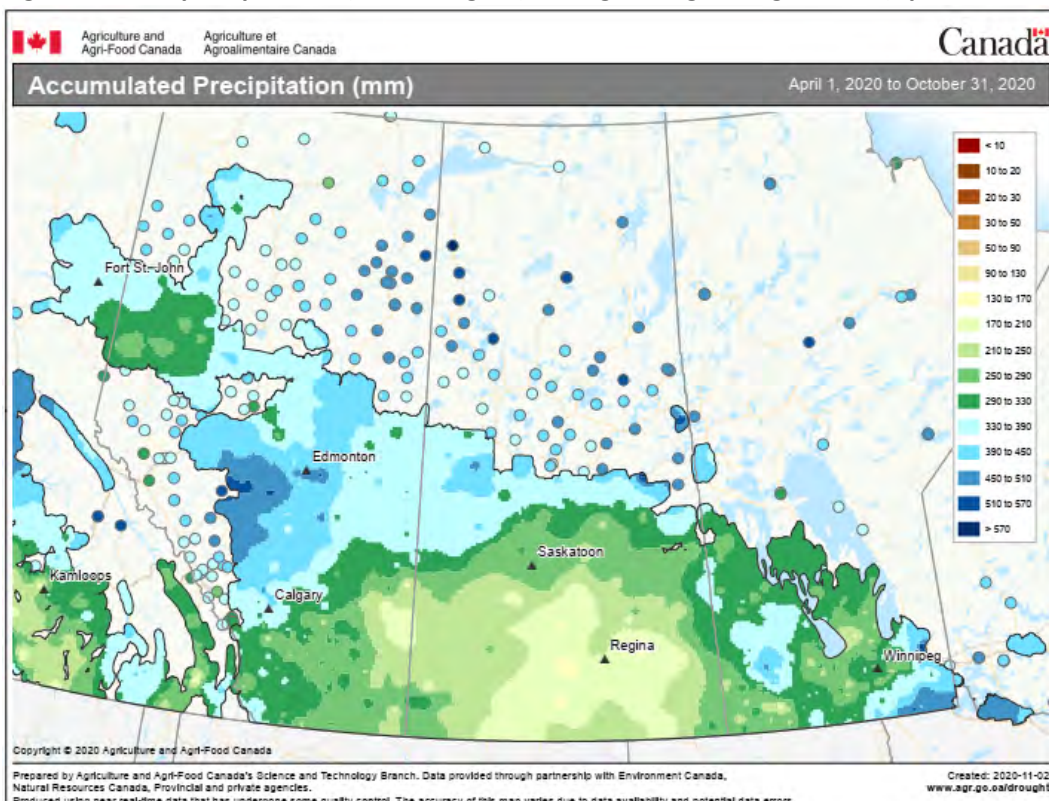
**Figure 1a Monthly mean temperature difference from normal (Prairie region) during growing season (June 2020)**



**Figure 1b Monthly mean temperature difference from normal (Prairie region) during growing season (July 2020)**



**Figure 2 Total precipitation (Prairie region) during 2020 growing season (April 1 to October 31, 2020)**



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Across all Prairie provinces, producers began with the challenge of removing overwintered crops and preparing fields to plant new crops. Seeding began in late April to early May and was completed by early June in Alberta and Saskatchewan and mid-June in Manitoba.

A slow snow melt and a cold and wet spring in Alberta left saturated soils, flooded fields and delayed seeding, especially in parts of northwest, northeast and Peace River regions. Warm and drier conditions in the southern and central region during summer promoted crop growth. But persistent wet weather in some areas of northern Alberta and Peace region deteriorated crop conditions and reduced yield (Figure 2). Harvest was advanced across Alberta with low precipitation and warm conditions in the fall. Lentils were harvested from mid-August to early October with variable yield and quality.

During spring in Saskatchewan, hail damaged some crops in the southwest and northeast regions and heavy rains had drowned out some fields in the northern regions. In summer, warm and dry conditions across the province advanced crop growth. However, yield of some crops in the central region was negatively impacted due to lack of moisture (Figure 2). Favourable weather allowed lentils to be harvested in early August and harvest was completed by mid-September with average yield and good quality.

During this growing season, northwest Manitoba experienced severe winds that blew soil, seed and fertilizer and damaged emerged crops. Severe rainstorms in some areas of southwestern, central and eastern regions also caused flooding and set back crop growth. Overall, warmer temperature in Manitoba had advanced crop development (Figure 1a & b). But 70% to 80% of normal precipitation for the season (Figure 2) and non-timely rainfalls had led to prematurely ripening of some crops in the Interlake region. Harvest progressed with minimal weather delays from early August to mid-September, and crops had variable yield but good quality.

## Production

Lentil production in 2020 was estimated to be 2.9 million tonnes, which was 32.6% higher than in 2019 and 29.0% higher than the 10-year average of 2.2 million tonnes (Table 1). Growth in production was due to a 14.7% and a 15.6% increase in harvested area and yield from 2019, respectively. Saskatchewan continues to dominate lentil production in western Canada, accounting for 87.1% of production, while Alberta accounts for 12.9%.

**Table 1 Production statistics for western Canadian lentils (green and red combined)<sup>1</sup>**

Province	Harvested area		Production		Yield		Mean production
	2020	2019	2020	2019	2020	2019	2010–2019
	thousand hectares		thousand tonnes		kg/ha		Thousand tonnes
<b>Lentils</b>							
Manitoba	-	-	-	-	-	-	-
Saskatchewan	1535	1335	2497	2000	1627	1498	2055
Alberta <sup>2</sup>	170	151	371	163	2185	1074	168
<b>Western Canada</b>	<b>1705</b>	<b>1486</b>	<b>2868</b>	<b>2163</b>	<b>1682</b>	<b>1455</b>	<b>2223</b>

<sup>1</sup>Source: Statistics Canada.

<sup>2</sup>Includes the Peace River area of British Columbia.

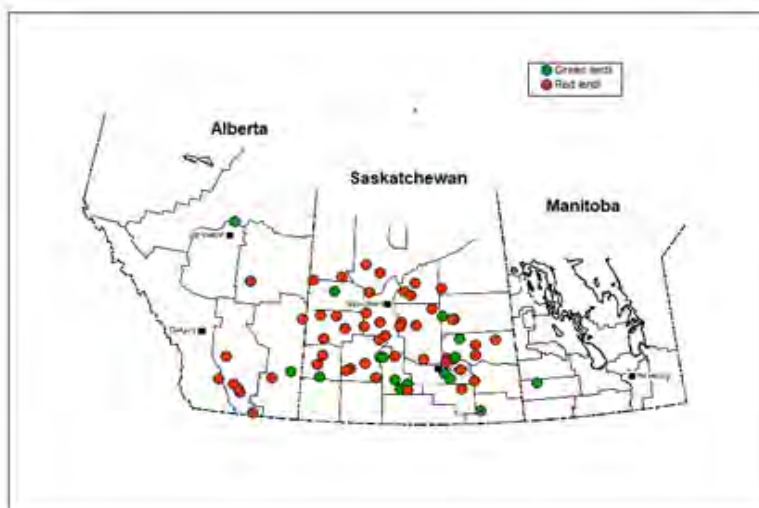
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# Western Canadian lentils 2020

## 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 542 lentil samples including 218 green and 324 red lentil samples 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 the samples reported by grade do not necessarily represent the actual distribution of the grade across western Canada.

**Figure 3 Map of western Canada showing origin of 2020 lentil samples from Canadian Grain Commission's Harvest Sample Program**



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## Quality of 2020 western Canadian lentils

Protein content for green and red lentils in 2020 ranged from 24.5% to 31.6% (Table 2). The mean protein content was 27.7%, which was higher than the mean for 2019 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. Small-sized green lentils were comprised of 3 varieties (CDC Invincible, CDC Kermit and Eston), medium-sized green lentils were of one variety (CDC Richlea) and large-sized green lentils were of 7 varieties (CDC Greenstar, CDC Greenland, CDC Impower, CDC Improve, CDC Lima, CDC Glamis and Laird). Mean protein content was similar between 2020 and 2019 for small (28.3%) and medium-sized (26.2%) green lentils, but it was higher in 2020 for large-sized green lentils (27.5%). Total starch content of 2020 small (44.3%), medium (46.8%) and large (45.7%) green lentils were also higher than those of 2019. Small (12.6%) and medium green lentils (12.2%) had lower total dietary fiber in 2020 than in 2019. Large green lentils had the same total dietary fiber content as 2019 (11.9%). Ash content of small (2.9%) and large-sized (2.8%) green lentils remained similar between the two years, but it was higher for medium-sized (2.9%) in 2020.

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). Medium-sized green lentils had higher levels of K, Mg, P, Ca, Fe and Zn compared to 2019. Other green lentil sizes did not differ much in element content between the two years.

Seed weight of large-sized green lentils (6.1 g/100 seeds) was lower than 2019 (Table 4). Other green lentil sizes had similar 100-seed weight to 2019. Water absorption values per gram of seeds were also similar for the three green lentil sizes in 2019.

Image analysis was used to determine the seed size distribution for green lentils (Table 5). The reported results may differ from those obtained by conventional sieving techniques. Small, medium and large green lentils had 25.6%, 56.8% and 34.8% of seeds that were less than 4.0 mm, 5.5 mm and 6.0 mm in diameter, respectively, as compared to 14.1%, 39.0% and 24.4% in 2019, indicating presence of larger portions of smaller seeds in the 2020 green lentils.

Table 6 shows 2020 quality data for red lentil composites of 12 cultivars including CDC Blaze, CDC Dazi, CDC Imax, CDC Impact, CDC Imperial, CDC Impulse, CDC King Red, CDC Maxim, CDC Proclaim, CDC Redmoon, CDC Simmie and Crimson. Mean protein content (27.3%) was higher, while total starch content (45.0%) was lower than in 2019. Total dietary fiber content (12.4%) and ash content (2.7%) remained similar or same as 2019. Lesser amount of Ca (61 mg/100g sample) was detected from red lentils in 2020 compared to 2019 (Table 6). Seed weight of red lentils (3.4 g/100 seeds) was lower in 2020, while water absorption (0.99% g H<sub>2</sub>O/g seeds) was similar to 2019.

The mean dehulling efficiency for red lentils (85.1%) was higher with less percentage of powders, broken seeds and undeulled whole seeds than in 2019 (Table 6). Colour of dehulled lentils was measured using a Hunterlab LabScan XE spectrophotometer with the CIE L\*, a\* and b\* colour scale. Dehulled splits exhibited more brightness (L\*), redness (a\*) and yellowness (b\*) as compared to dehulled whole seeds (Table 6). Colour of the dehulled whole red lentils and splits remained similar to 2019. A higher portion of smaller sized red lentils was found during 2020, with 78.3% seeds being below 5 mm in diameter compared to 67.7% in 2019 (Table 7).

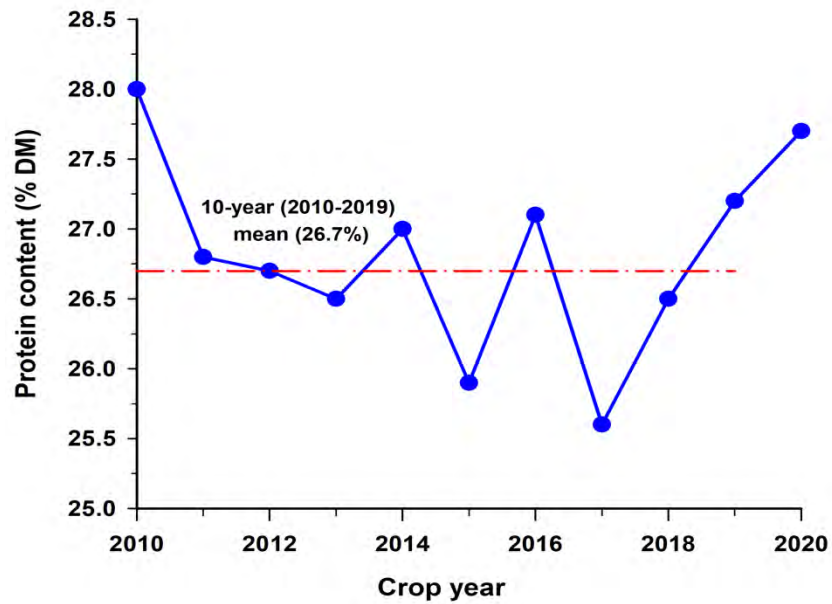
**Table 2 Protein content for 2020 western Canadian lentils (green and red combined) by grade<sup>1</sup>**

Grade	Protein content, % (dry basis)			
	2020			2019
	Mean	Min.	Max.	Mean
<b>Saskatchewan</b>				
Lentils, No.1 Canada	27.7	24.5	31.6	27.2
Lentils, No.2 Canada	27.3	25.0	29.6	27.1
Lentils, Extra No.3 Canada	27.2	25.8	29.5	26.8
Lentils, No.3 Canada	27.3	26.1	30.1	27.0
<b>All grades</b>	<b>27.6</b>	<b>24.5</b>	<b>31.6</b>	<b>27.1</b>
<b>Alberta</b>				
Lentils, No.1 Canada	28.6	26.0	30.0	27.6
Lentils, No.2 Canada	28.1	26.7	29.3	27.3
Lentils, Extra No.3 Canada	29.4	27.9	30.9	28.1
Lentils, No.3 Canada	NS <sup>2</sup>	NS <sup>2</sup>	NS <sup>2</sup>	NS <sup>2</sup>
<b>All grades</b>	<b>28.5</b>	<b>26.0</b>	<b>30.9</b>	<b>27.5</b>
<b>Western Canada</b>				
Lentils, No.1 Canada	27.8	24.5	31.6	27.3
Lentils, No.2 Canada	27.4	25.0	29.6	27.1
Lentils, Extra No.3 Canada	27.7	25.8	30.9	26.9
Lentils, No.3 Canada	27.3	26.1	30.1	27.0
<b>All grades</b>	<b>27.7</b>	<b>24.5</b>	<b>31.6</b>	<b>27.1</b>

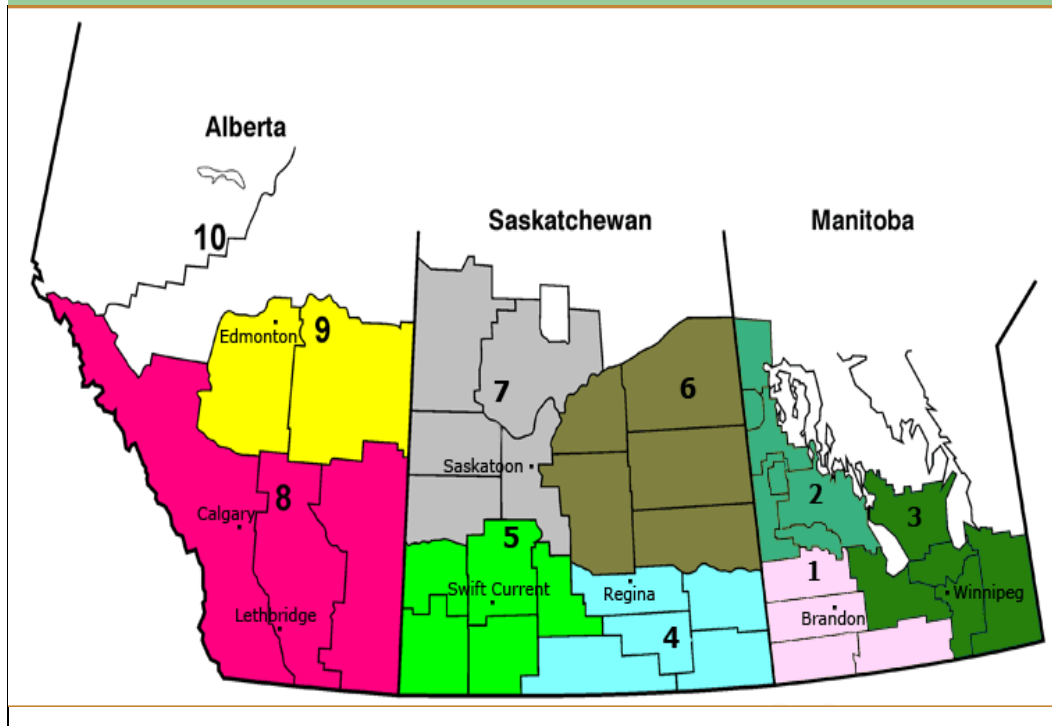
<sup>1</sup>Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

<sup>2</sup>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 2020 western Canadian lentils (green and red combined) by crop region**

Crop region	Protein content, % (dry basis)		Starch content, % (dry basis)	
	2020	2019	2020	2019
4	27.0	27.0	45.6	44.1
5	27.7	27.2	44.9	45.2
6	26.8	26.8	45.4	45.8
7	27.3	26.6	45.8	46.6
8	28.2	27.6	44.9	45.8

**Table 4 Quality data for 2020 western Canadian green lentil composite by seed size<sup>1</sup>**

Quality parameter	2020			2019		
	SL <sup>2</sup>	ML <sup>3</sup>	LL <sup>4</sup>	SL <sup>2</sup>	ML <sup>3</sup>	LL <sup>4</sup>
<b>Chemical composition</b>						
Moisture content, %	9.6	10.1	9.6	10.0	10.0	10.1
Protein content, % (dry basis)	28.3	26.2	27.5	28.2	26.1	26.8
Starch content, % (dry basis)	44.3	46.8	45.7	43.5	45.9	44.5
Total dietary fiber content, % (dry basis)	12.6	12.2	11.9	13.4	12.6	11.9
Ash content, % (dry basis)	2.9	2.9	2.8	2.8	2.6	2.7
<b>Mineral (mg/100 g, dry basis)</b>						
Calcium (Ca)	58.3	78.3	58.0	59.1	66.7	60.2
Copper (Cu)	1.2	1.0	1.0	1.2	1.0	1.1
Iron (Fe)	8.4	7.6	7.7	7.8	6.6	7.3
Potassium (K)	1135.9	1094.7	1077.1	1065.6	994.5	1031.7
Magnesium (Mg)	116.1	127.9	118.7	113.1	117.8	118.0
Manganese (Mn)	1.4	1.6	1.5	1.4	1.6	1.4
Phosphorus (P)	443.7	409.4	412.7	419.2	330.0	395.4
Zinc (Zn)	3.4	4.5	3.9	3.3	3.6	3.8
<b>Physical characteristic</b>						
100-seed weight, g/100 seeds	2.7	4.8	6.1	2.8	4.9	6.4
Water absorption, g H <sub>2</sub> O/g seeds	0.94	1.01	1.05	0.93	1.02	1.03

<sup>1</sup>Lentils, No.1 Canada and Lentils, No.2 Canada combined.

<sup>2</sup>SL=small lentils including CDC Invincible, CDC Kermit and Eston.

<sup>3</sup>ML=medium lentils including CDC Richlea.

<sup>4</sup>LL=large lentils including CDC Greenstar, CDC Greenland, CDC Impower, CDC Improve, CDC Lima, CDC Glamis and Laird.

**Table 5 Seed size distribution for 2020 western Canadian green lentils<sup>1</sup>**

Seed size distribution	2020			2019		
	SL <sup>2</sup>	ML <sup>3</sup>	LL <sup>4</sup>	SL <sup>2</sup>	ML <sup>3</sup>	LL <sup>4</sup>
<3.5 mm, %	3.6	0.8	0.0	1.0	0.0	0.0
3.5–4.0 mm, %	22.0	0.8	0.1	13.1	0.0	0.0
4.0–4.5 mm, %	51.8	4.2	0.3	53.0	0.2	0.0
4.5–5.0 mm, %	21.3	10.7	1.4	31.6	6.4	0.6
5.0–5.5 mm, %	1.2	40.3	7.1	0.9	32.4	3.8
5.5–6.0 mm, %	0.0	39.6	25.9	0.0	52.9	20.0
6.0–6.5 mm, %	0.0	3.5	49.5	0.2	8.2	51.8
6.5–7.0 mm, %	0.0	0.0	15.2	0.1	0.0	22.7
7.0–7.5 mm, %	0.0	0.0	0.4	0.0	0.0	1.0
>7.5 mm, %	0.0	0.0	0.0	0.0	0.0	0.0

<sup>1</sup>Seed size including all grades determined by the image analysis technique.

<sup>2</sup>SL=small lentils including CDC Invincible, CDC Kermit and Eston.

<sup>3</sup>ML=medium lentils including CDC Richlea.

<sup>4</sup>LL=large lentils including CDC Greenstar, CDC Greenland, CDC Impower, CDC Improve, CDC Lima, CDC Glamis and Laird.

**Table 6 Quality data for 2020 western Canadian red lentil composite<sup>1</sup>**

Quality parameter	2020	2019		
Chemical composition				
Moisture content, %	9.6	10.0		
Protein content, % (dry basis)	27.3	27.1		
Starch content, % (dry basis)	45.0	45.6		
Total dietary fiber content, % (dry basis)	12.4	12.5		
Ash content, % (dry basis)	2.7	2.7		
Mineral (mg/100 g, dry basis)				
Calcium (Ca)	61.0	66.0		
Copper (Cu)	1.0	1.1		
Iron (Fe)	7.9	8.0		
Potassium (K)	1032.6	1004.5		
Magnesium (Mg)	112.5	112.3		
Manganese (Mn)	1.4	1.4		
Phosphorus (P)	395.2	387.9		
Zinc (Zn)	3.8	3.8		
Physical characteristic				
100-seed weight, g/100 seeds	3.4	3.7		
Water absorption, g H <sub>2</sub> O/g seeds	0.99	0.96		
Dehulling quality				
Dehulling efficiency, %	85.1	83.5		
Powder, %	2.7	3.0		
Broken seeds, %	0.30	0.82		
Undehulled whole seeds, %	1.9	2.5		
Colour of dehulled seeds <sup>2</sup>	Whole	Splits	Whole	Splits
Brightness, L*	60.7	62.7	60.6	62.6
Redness, a*	30.0	30.5	30.2	30.4

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Yellowness, b*	38.2	40.5	38.3	40.4
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<sup>1</sup>Lentils, No.1 Canada and Lentils, No.2 Canada combined. Red lentils including CDC Blaze, CDC Dazil, CDC Imax, CDC Impact, CDC Imperial, CDC Impulse, CDC King Red, CDC Maxim, CDC Proclaim, CDC Redmoon, CDC Simmie and Crimson.

<sup>2</sup>L\*=darkness (0) to brightness (+); a\*=greenness (-) to redness (+); b\*=blueness (-) to yellowness (+).

**Table 7 Seed size distribution for 2020 western Canadian red lentils<sup>1,2</sup>**

Seed size distribution	2020	2019
<3.5 mm, %	0.9	0.9
3.5–4.0 mm, %	6.8	6.6
4.0–4.5 mm, %	29.8	21.0
4.5–5.0 mm, %	40.8	39.2
5.0–5.5 mm, %	16.8	24.1
5.5–6.0 mm, %	4.6	7.6
6.0–6.5 mm, %	0.3	0.6
6.5–7.0 mm, %	0.0	0.0
>7.0 mm, %	0.0	0.0

<sup>1</sup>Seed size determined by the image analysis technique.

<sup>2</sup>Red lentils including including CDC Blaze, CDC Dazil, CDC Imax, CDC Impact, CDC Imperial, CDC Impulse, CDC King, Red, CDC Maxim, CDC Proclaim, CDC Redmoon, CDC Simmie and Crimson.