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Quality of western Canadian lentils

2018

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Introduction

This report presents the quality data for 2018 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

Figure 1 shows monthly mean temperature difference from normal (Prairie Region) during 2018 growing season (June and July). Figure 2 displays total precipitation (Prairie Region) from April 1 to October 31, 2018.

Figure 1 – Monthly mean temperature difference from normal (Prairie Region) during growing season (June and July 2018).

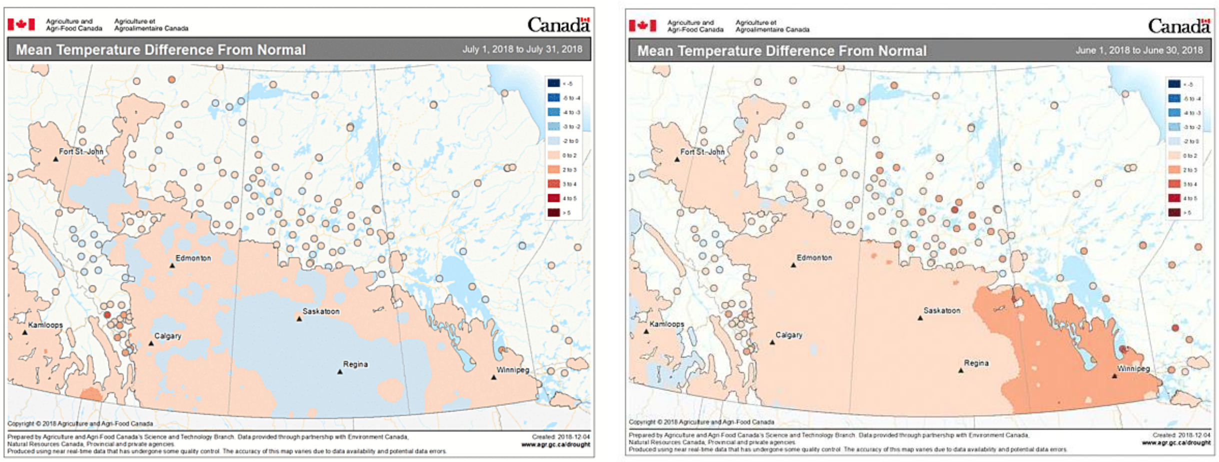
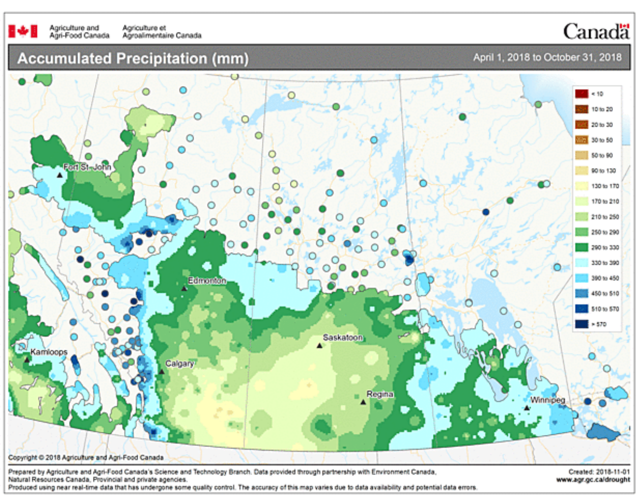


Figure 2 – Total precipitation (Prairie Region) during 2018 growing season (April 1 to October 31, 2018)



Dry field conditions in early May allowed seeding operations to get underway in most areas of Manitoba, and by early June, seeding estimated at 99% completion across Manitoba. Rainfall in late May combined with warm temperatures resulted in rapid germination and crop growth. Warm weather and precipitation were norm in June throughout Manitoba. Hot temperatures during the first two weeks of July helped crop development. Warm and dry conditions in late July and early August caused some stress in many crops, and rainfall was needed to help with grain fill. Crops advanced quickly due to warm temperatures in late July, and harvest was underway in most areas of Manitoba in early August. By the end of August, field pea harvest was complete with reported average yields and good quality. Rainfall and below than normal temperatures in September and early October caused the significant delay in harvest and some damage in some crops, but most of pulse crops were harvested, so damage is minimal.

Seeding was underway in early May across Saskatchewan due to good weather conditions, and by early June seeding operations were nearing completion, although the rain delayed progress in some areas. Rain across most of the province helped to alleviate dry topsoil moisture conditions during the first two weeks of June. The majority of crops were in good condition and at their normal stages of development for this time of year. Crops across the province advanced quickly during the month of July due to good growing conditions. Pulse crops in drier areas were rapidly drying down in the last week of July. Harvest was underway in the province, due to the hot and dry weather in the first two weeks of August. By the end of August, 96% of the lentils and 94% of the field peas were combined. In early September, most areas of the province were reported frost. Wet and cool weather slowed harvest operations in much of the province during the month of September. Warm and sunny weather in mid-to-late October allowed harvest to be complete. Crops harvested prior to the rain and snow in September were graded in the top two grades, while some crops harvested in the month of September and October were downgraded due to weather-related factors such as sprouting, bleaching, staining and frost.

Warm and dry weather throughout Alberta in May provided favorable conditions for seeding operations, and by early June, seeding was 99% completion. In the month of June, most areas of the province received timely rains, and crop growing conditions were good for crop development. Variable weather conditions across the province were reported in July. Most areas in the Peace, North East and North West region and in some parts of the Central region received needed rain, which was adequate for sustainable crop growth. Hot and dry weather in the late July to Mid August added to the stress on crops in dry areas, causing heat stress and pushing maturity quickly, resulting in lower than normal yields. Harvest begun in the middle of August mostly for dry peas in the Southern region. Unsettled weather conditions in Alberta during the harvest season affected harvesting operations. Wet weather in the end of August slowed down harvest in most areas across the province, especially in the North East, North West and Peace regions. Favourable weather conditions at the beginning of the September led to harvest progress, and nearly 80% dry pea were in the bin. However, cold and wet weather in late September in almost all areas of the province halted harvest progress. In addition to the rain/snow mix, frost was reported in some areas of the province. The cool and wet weather affected crop quality. Since mid October, the warmer than average temperatures had allowed harvest operations to progress. At the end of October, nearly 95% crops were in the bin.

Production

Lentil production in 2018 was estimated to be 2.1 million tonnes, which was 18% lower than in 2017, but 5% higher than the 10-year average of 2.0 million tonnes (Table 1). Decrease in production was due to a 16% decrease in harvested area from 2017. Saskatchewan continues to dominate lentil production in western Canada, accounting for about 90% of production, while Alberta accounts for about 10%.

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

	Harvested area		Production		Yield		Mean production
Province	2018	2017	2018	2017	2018	2017	2008–2017
	thousand hectares		thousand tonnes		kg/ha		thousand tonnes
Lentils							
Manitoba	0.8	-	0.7	-	897	-	-
Saskatchewan	1329	1578	1892	2294	1424	1450	1847
Alberta[2]	170	196	200	264	1175	1350	157
Western Canada	**1499**	**1774**	**2093**	**2559**	**1396**	**1440**	**1989**

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

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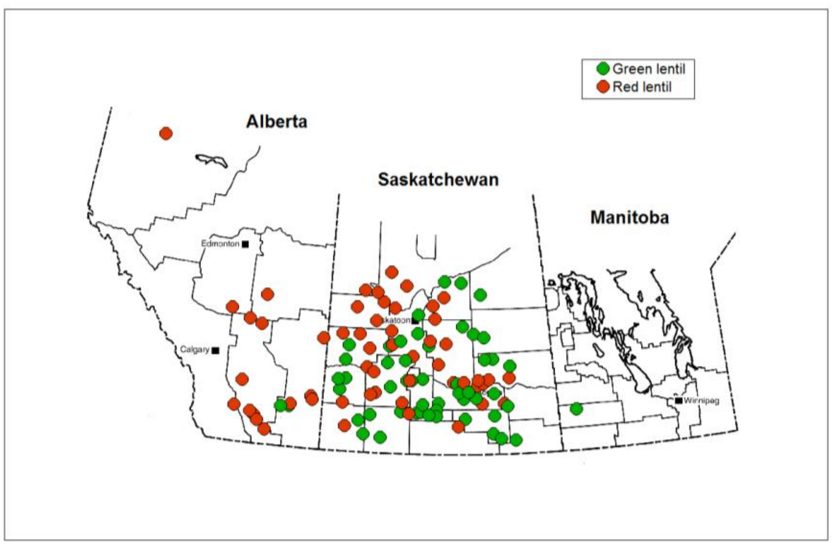
Lentil samples

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 546 lentil samples including 312 green and 234 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 2018 lentil samples from CGC's Harvest Sample Program



Quality of 2018 western Canadian lentils

Protein content for green and red lentils in 2018 ranged from 22.0% to 30.0% (Table 2). The mean protein content was 26.4%, which was higher than the mean for 2017 (25.6%), and lower than the 10-year mean of 26.9% (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 Viceroy, and Eston) was 27.4%, which was higher than the mean for 2017. Mean protein content for medium-size green lentils (CDC Imigreen, CDC Impress and CDC Richlea) was 26.2%, ihigher than the mean for 2017. 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 26.8%, slightly higher than the mean for 2017.

Mean starch content for small-size green lentil was 47.0%, slightly higher than mean for 2017 (Table 4). Mean starch content for medium-size green lentils was 48.4%, higher than that from 2017, while the mean for large-size green lentils was the same as the mean for 2017.

Mean total dietary fiber content for small-size green lentils was 12.9% (Table 4), slightly lower than that for 2017, whereas mean total dietary fiber contents for medium-size and large-size green lentils were higher than the means for 2017. Mean ash content for all 3 green lentil sizes was close to the levels in 2017.

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 3.2 g, 5.2 g and 6.8 g, respectively (Table 4). Mean 100-seed weights for all 3 sizes of lentils were similar to the means for 2017. Mean water absorption values were 0.93 g H_2O per g seeds for small-size lentils, 0.94 g H_2O per g seeds for medium-size lentils and 0.98 g H_2O per g seeds for large-size lentils, which were similar to the means for 2017.

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 47% of the seeds fell within 4.0 to 5.0 mm and 21% fell within 3.5 to 4.0 mm. For medium-size green lentils, 71% fell within 5.0 to 6.0 mm. For large-size green lentils, 91% fell within 5.5 to 7.0 mm.

Table 6 shows 2018 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 26.6%, which was higher than the mean (25.9%) for 2017. Mean starch content (46.7%) was close to the mean for 2017. Mean total dietary fiber content was 14.3%, higher than the mean for 2017. Mean ash content was 2.5%, similar to the mean (2.6%) for 2017. 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 3.8 g per 100 seeds, which was higher than the mean (3.5 g per 100 seeds) for 2017 and the mean water absorption was 0.93 g H_2O per g seeds, similar to that for 2017.

The mean dehulling efficiency for red lentils was 84.8%, which was the same as the mean for 2017 (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 65% of red lentils fell within the 4.0 to 5.0 mm range, which was lower than that (71%) for 2017 (Table 7).

Table 2 – Protein content for 2018 western Canadian lentils (green and red combined) by grade[1]

Grade	Protein content, % dry basis			
	2018			2017
	Mean	Min.	Max.	Mean
Saskatchewan				
Lentils, No. 1 Canada	26.3	22.0	30.0	25.4
Lentils, No. 2 Canada	26.3	23.5	28.5	25.6
Lentils, Extra No. 3 Canada	26.9	24.4	29.9	26.0
Lentils, No. 3 Canada	27.3	26.1	28.0	26.5
All grades	**26.4**	**22.0**	**30.0**	**25.5**
Alberta				
Lentils, No. 1 Canada	26.5	24.0	29.2	26.1
Lentils, No. 2 Canada	27.5	25.5	28.8	26.7
Lentils, Extra No. 3 Canada	28.3	28.1	28.4	26.4
Lentils, No. 3 Canada	NS[2]	NS	NS	NS[2]
All grades	**26.9**	**24.0**	**29.2**	**26.3**
Western Canada				
Lentils, No. 1 Canada	26.3	22.0	30.0	25.5
Lentils, No. 2 Canada	26.3	23.5	28.8	25.7
Lentils, Extra No. 3 Canada	27.0	24.4	29.9	26.1
Lentils, No. 3 Canada	27.3	26.1	28.0	26.6
All grades	**26.4**	**22.0**	**30.0**	**25.6**

[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

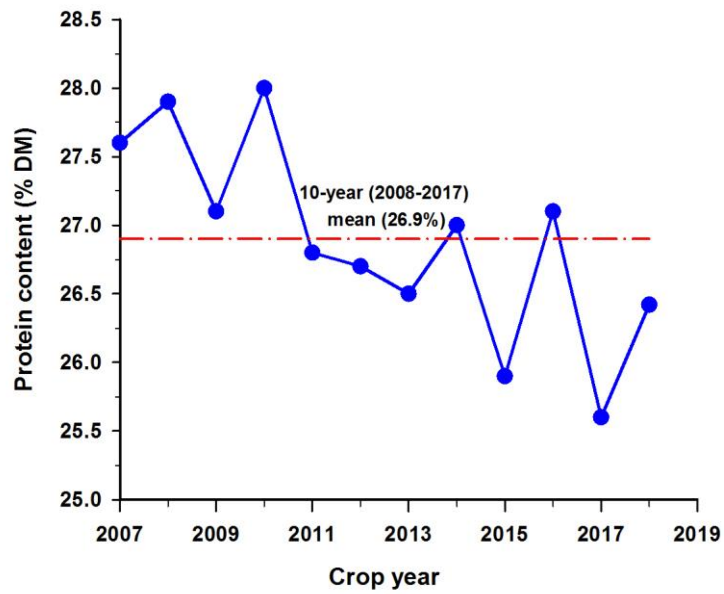


Figure 5 – Crop regions in western Canada

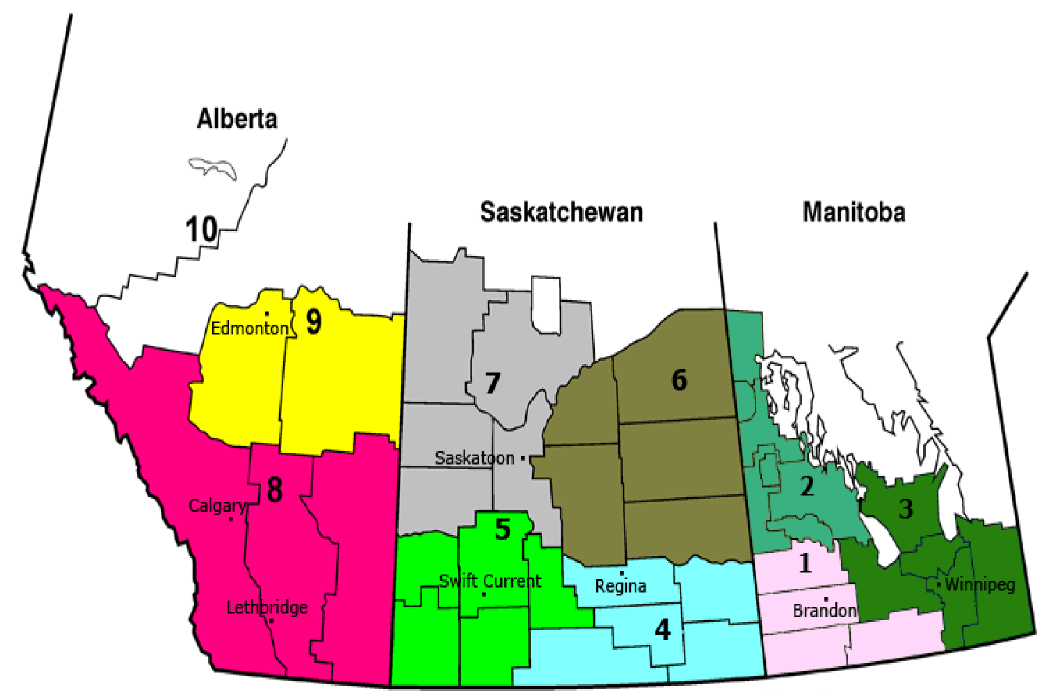


Table 3 – Mean protein and starch content for 2018 western Canadian lentils (green and red combined) by crop region

	Protein content, % dry basis		Starch content, % dry basis	
Crop region[1]	2018	2017	2018	2017
4	26.8	25.9	47.4	46.9
5	26.7	26.0	45.7	46.4
6	26.6	26.1	47.0	46.1
7	26.3	26.4	47.7	45.5
8	27.3	26.8	47.2	45.9

[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 2018 western Canadian green lentil composite by seed size[1]						
	2018			2017		
Quality parameter	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
Chemical composition						
Moisture content, %	9.7	9.7	10.1	10.3	10.2	10.2
Protein content, % dry basis (DM)	27.4	26.2	26.8	26.8	25.5	26.2
Starch content, % DM	47.0	48.4	46.3	46.6	47.2	46.3
Total dietary fiber content, % DM	12.9	14.8	13.8	13.2	11.7	12.4
Ash content, % DM	2.5	2.5	2.6	2.5	2.7	2.6
Mineral (mg/100 g dry basis)						
Calcium (Ca)	64.8	71.8	66.4	69.0	74.6	67.7
Copper (Cu)	1.0	0.9	1.0	1.1	1.0	1.0
Iron (Fe)	7.1	6.1	6.7	7.7	6.8	6.7
Potassium (K)	941.8	998.9	942.2	932.6	968.2	988.3
Magnesium (Mg)	98.8	111.9	108.2	101.5	108.2	112.1
Manganese (Mn)	1.5	1.3	1.4	1.4	1.5	1.3
Phosphorus (P)	367.0	363.2	358.7	344.7	355.1	319.2
Zinc (Zn)	3.6	4.0	4.0	3.9	4.1	3.9
Physical characteristic						
100-seed weight, g/100 seeds	3.2	5.2	6.8	2.9	5.4	6.7
Water absorption, g H_2O/g seeds	0.93	0.94	0.98	0.95	0.93	0.98

[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 2018 western Canadian green lentils[1]

Seed size distribution	2018			2017		
	SL[2]	ML[3]	LL[4]	SL[2]	ML[3]	LL[4]
<3.5 mm, %	15.1	0.4	0.0	1.3	0.2	0.0
3.5–4.0 mm, %	20.6	0.6	0.0	9.6	0.7	0.0
4.0–4.5 mm, %	24.8	2.0	0.1	36.3	2.5	0.1
4.5–5.0 mm, %	21.8	7.9	0.8	46.6	9.5	0.9
5.0–5.5 mm, %	10.6	28.6	4.0	6.1	30.3	3.8
5.5–6.0 mm, %	7.2	42.0	13.9	0.1	41.2	14.7
6.0–6.5 mm, %	0.0	17.8	39.7	0.0	15.4	41.4
6.5–7.0 mm, %	0.0	0.8	37.5	0.0	0.3	35.7
7.0–7.5 mm, %	0.0	0.0	4.0	0.0	0.0	3.3
>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 CDC Viceroy.
[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 6 – Quality data for 2018 western Canadian red lentil composite[1]				
Quality parameter		2018		2017
Chemical composition				
Moisture content, %		9.8		9.8
Protein content, % dry basis (DM)		26.6		25.9
Starch content, % DM		46.7		46.4
Total dietary fiber content, % DM		14.3		13.2
Ash content, % DM		2.5		2.6
Mineral (mg/100 g dry basis)				
Calcium (Ca)		72.3		73.3
Copper (Cu)		1.0		1.1
Iron (Fe)		7.0		7.3
Potassium (K)		910.6		921.7
Magnesium (Mg)		104.5		108.9
Manganese (Mn)		1.4		1.4
Phosphorus (P)		346.2		339.2
Zinc (Zn)		4.0		4.0
Physical characteristic				
100-seed weight, g/100 seeds		3.8		3.5
Water absorption, g H_2O/g seeds		0.93		0.90
Dehulling quality				
Dehulling efficiency, %		84.8		84.8
Powder, %		2.6		2.4
Broken seeds, %		0.45		0.38
Undehulled whole seeds, %		2.2		2.6
Colour of dehulled seeds	**Whole**	**Splits**	**Whole**	**Splits**
Brightness, L*	60.5	62.5	60.6	62.5
Redness, a*	30.7	30.5	30.5	29.7
Yellowness, b*	38.4	39.9	38.7	40.1

[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, 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 2018 western Canadian red lentils[1]		
Seed size distribution[2]	2018	2017
<3.5 mm, %	0.4	0.7
3.5–4.0 mm, %	3.2	5.9
4.0–4.5 mm, %	18.5	25.2
4.5–5.0 mm, %	46.2	45.4
5.0–5.5 mm, %	25.9	19.3
5.5–6.0 mm, %	5.1	2.9
6.0–6.5 mm, %	0.7	0.5
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 Redberry, CDC Redmoon and CDC Rouleau.
[2]Seed size determined by the image analysis technique.