

ISSN 1920-9037

Quality of western Canadian lentils 2024

Dr. Ning Wang
Program Manager, Pulse Research

Tel.: 204-983-2154

Fax: 204-983-0724

Email: ning.wang@grainscanada.gc.ca

Grain Research Laboratory
Canadian Grain Commission
1404-303 Main Street
Winnipeg, MB R3C 3G8
grainscanada.gc.ca



Canadian Grain
Commission

Commission canadienne
des grains

Canada

Table of Contents

Introduction.....	3
Growing and harvesting conditions.....	3
Production	6
Harvest samples	7
Quality of 2024 western Canadian lentils	8
Protein content.....	8
Green lentils	8
Red lentils	8
Acknowledgements	10

Tables

Table 1 Production statistics for 2024 western Canadian lentils	6
Table 2 Protein content (% dry basis) for 2024 western Canadian green lentils by grade	11
Table 3 Protein content (% dry basis) for 2024 western Canadian red lentils by grade	12
Table 4 Mean protein and starch content (% dry basis) for 2024 western Canadian green lentils by crop region	14
Table 5 Mean protein and starch content (% dry basis) for 2024 western Canadian red lentils by crop region..	14
Table 6 Quality data for 2024 western Canadian green lentil composites by size	15
Table 7 Seed size distribution of 2024 western Canadian green lentils	16
Table 8 Quality data for 2024 western Canadian red lentils ²	17
Table 9 Seed size distribution of 2024 western Canadian red lentils ¹	18

Figures

Figure 1 Mean temperature difference from normal in the Prairie region from June 1 to June 30, 2024.....	3
Figure 2 Mean temperature difference from normal in the Prairie region from July 1 to July 31, 2024.....	4
Figure 3 Total precipitation in the Prairie region from April 1 to October 31, 2024.....	4
Figure 4 Origin of 2024 lentil samples received by the Canadian Grain Commission’s Harvest Sample Program ...	7
Figure 5 Mean protein content (% dry basis) of western Canadian lentils from 2013 to 2024	13
Figure 6 Crop regions in western Canada.....	13

Introduction

This report presents harvest quality data for green and red lentils grown in western Canada in 2024. Lentil samples were submitted to the Canadian Grain Commission's Harvest Sample Program by producers and grain companies. Quality data is compiled from the results of [analytical tests](#) performed in the Grain Research Laboratory.

Growing and harvesting conditions

Figure 1 and Figure 2 show the monthly mean temperature differences from normal in the Prairie region during the 2024 growing season (June and July). Figure 3 shows the total precipitation in the Prairie region from April 1 to October 31, 2024.

Figure 1 Mean temperature difference from normal in the Prairie region from June 1 to June 30, 2024

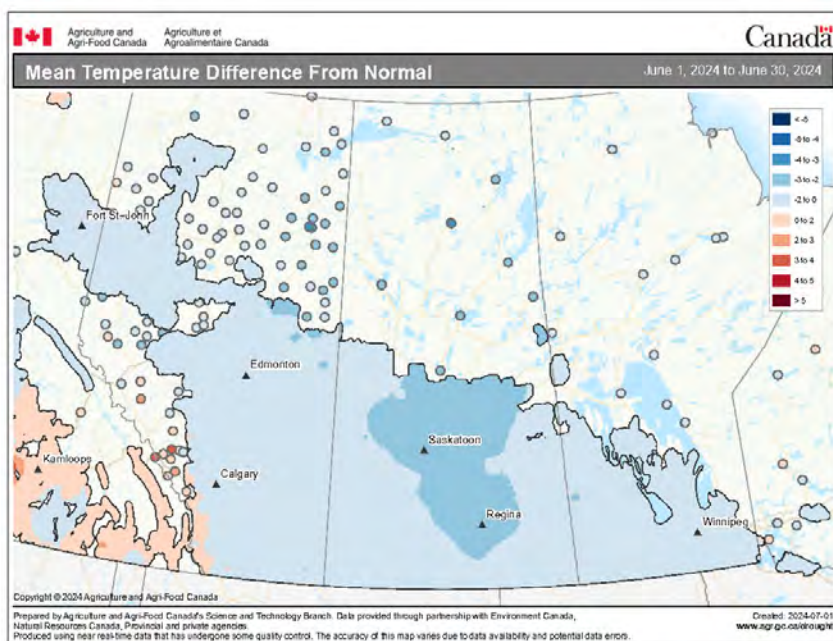


Figure 2 Mean temperature difference from normal in the Prairie region from July 1 to July 31, 2024

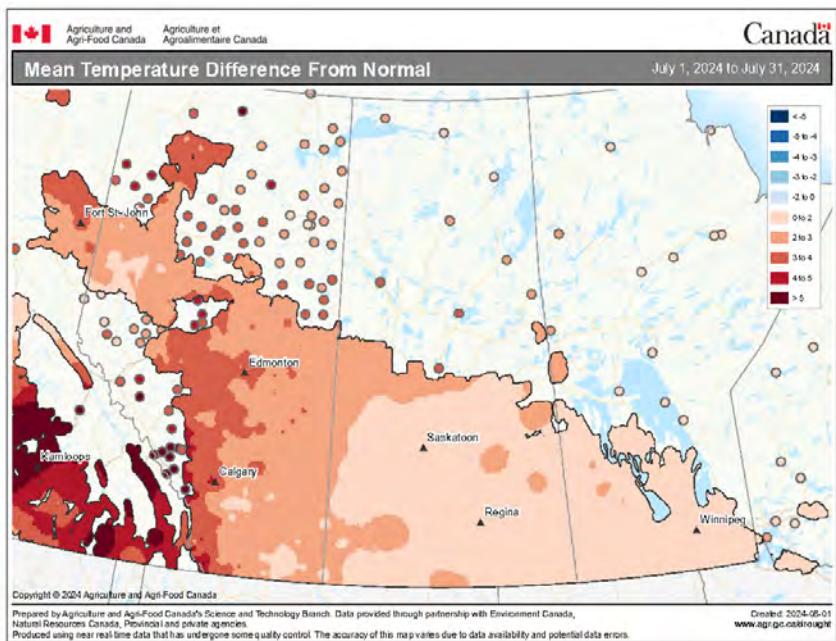
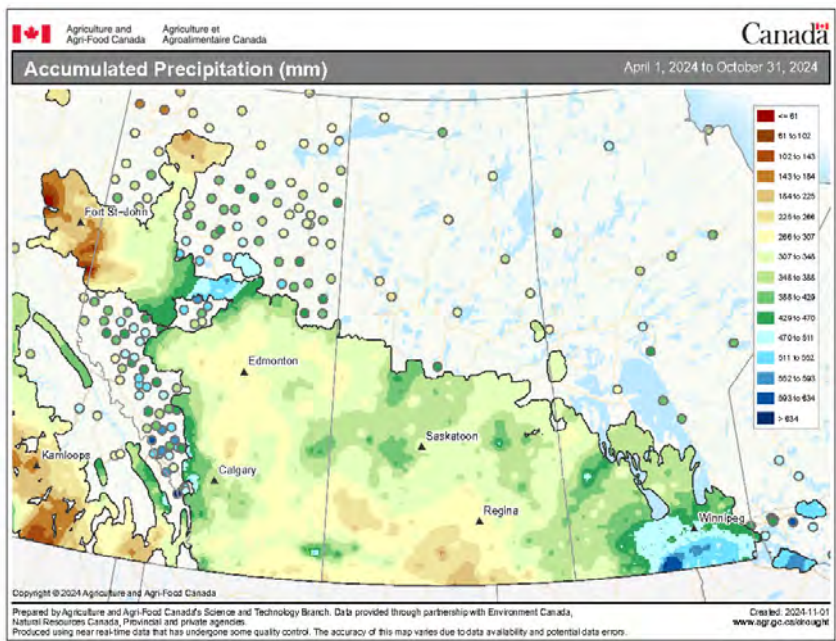


Figure 3 Total precipitation in the Prairie region from April 1 to October 31, 2024



In Saskatchewan, seeding started in early May and was complete by early June. Cooler temperatures and rainfalls during this period (Figure 1 and Figure 3) delayed seeding operations and slowed plant growth. In July and August, crops developed and matured rapidly due to persistently hot and dry conditions (Figure 2 and Figure 3). The lentil harvest began in early August and was complete by early September. Yields were below average in the southeast and southwest regions, but in the rest of the province they were average or above average. The quality of lentils was good and most were in the top two grades.

In Alberta, warm weather allowed seeding to begin in mid-April. Cooler temperatures and rainfalls (Figure 1 and Figure 3) interrupted seeding and slowed plant growth. Seeding was complete by early June and was well ahead of the historical average date in the Peace region. Heat and drought stress in July (Figure 2) caused crops to come out of flowering prematurely. Some storms during August brought moisture that relieved plant stress and helped fill pods. Harvest was completed at a record pace between mid-August and mid-September due to favourable weather. Compared to the 5-year average, more lentils were in the top two grades, and yields were higher than expected in the south, northwest, and Peace regions.

Production

Lentil production in 2024 was estimated to be 2.4 million tonnes, which is 34.9% higher than in 2023 and 3.6% higher than the 10-year average of 2.3 million tonnes (Table 1). The higher production is due to a 16.4% increase in yield and a 15.9% increase in harvested area compared to 2023. Saskatchewan continues to dominate lentil production in western Canada, accounting for 87.0% of production, while Alberta accounts for 13.0%.

Table 1 Production statistics for 2024 western Canadian lentils ¹

Location	Harvested area (thousand hectares)		Production (thousand tonnes)		Yield (kg/ha) ²		Mean production (thousand tonnes)
	2024	2023	2024	2023	2024	2023	2014 to 2023
Manitoba	no data	no data	no data	no data	no data	no data	no data
Saskatchewan	1467	1273	2112	1615	1441	1268	2103
Alberta ³	225	187	316	186	1406	997	240
Western Canada	1692	1460	2429	1801	1436	1234	2344

¹ Source: Statistics Canada.

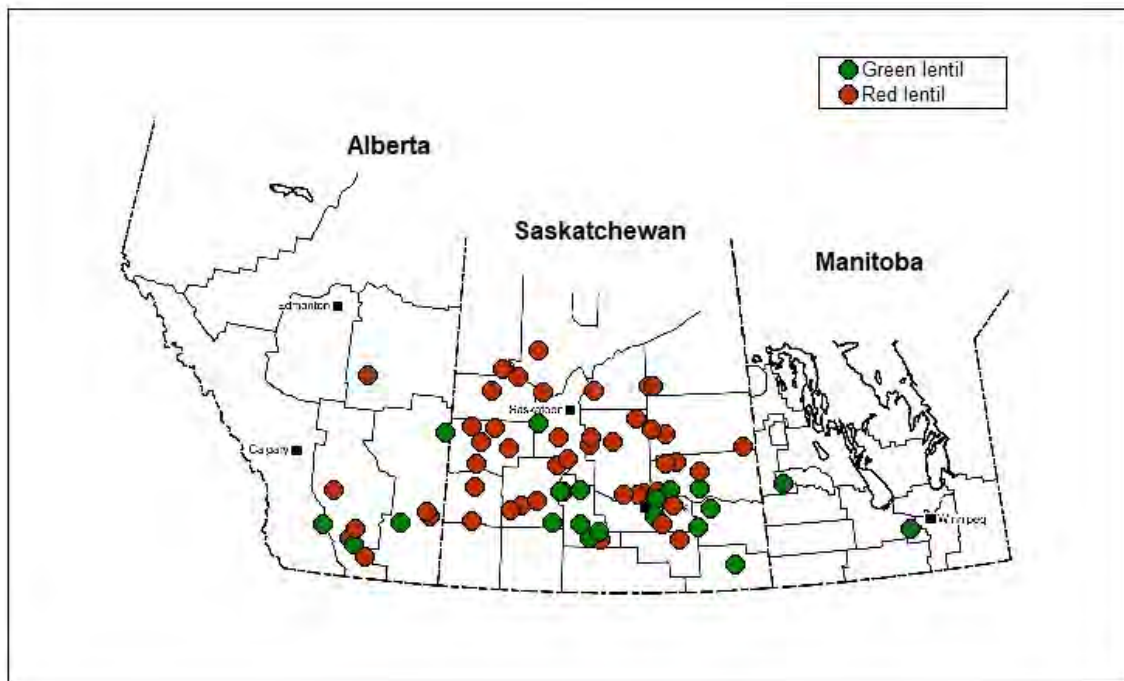
² kg/ha = kilograms per hectare.

³ Includes the Peace River area of British Columbia.

Harvest samples

Samples were submitted to the Canadian Grain Commission's Harvest Sample Program by lentil producers and grain companies across western Canada (Figure 4). The program received 324 lentil samples, consisting of 163 green lentil samples and 161 red lentil samples.

Figure 4 Origin of 2024 lentil samples received by the Canadian Grain Commission's Harvest Sample Program



All samples were graded and analyzed for protein content and seed size distribution. Seed size (small, medium and large) was determined using image analysis. Composites prepared for green lentils (No. 1 and No. 2 Canada combined) were based on seed size and crop region. Composites prepared for red lentils (No. 1 and No. 2 Canada combined) were based on crop region and variety.

The composite samples were tested for:

- moisture content
- protein content
- starch content
- total dietary fiber content
- crude fat content
- ash content
- mineral content
- 100-seed weight
- water absorption

The dehulling quality characteristics of red lentils were also evaluated.

Samples reported by grade do not necessarily represent the actual distribution of grades across western Canada.

Quality of 2024 western Canadian lentils

Protein content

The protein content for green lentils (Table 2) ranged from 24.2% to 32.3% and for red lentils (Table 3) it ranged from 24.5% to 30.8%. The mean protein content was higher for green lentils (27.8%) and red lentils (27.7%) compared to 2023. The mean protein content of green and red lentils combined was higher than the 10-year mean of 27.0% (Figure 5). Table 4 and Table 5 contain the mean protein and starch values for green and red lentils, respectively, according to the applicable crop region (Figure 6).

Green lentils

Table 6 contains the 2024 quality data for green lentil composites according to seed size. Small green lentils were higher in protein (29.0%) and total dietary fiber (15.4%) but lower in starch (43.2%) and crude fat (0.74%) compared to 2023. The ash content (2.9%) of small green lentils and the protein content (27.3%) of large green lentils were similar to 2023. Large green lentils were lower in starch (44.4%) and higher in total dietary fiber (15.0%), crude fat (0.89%) and ash content (2.9%) than in 2023.

Potassium (K) was the most abundant macroelement present in green lentils, followed by phosphorus (P), magnesium (Mg) and calcium (Ca). Among the microelements, iron (Fe) was the most abundant, followed by zinc (Zn), manganese (Mn) and copper (Cu). Ca content was lower and Cu content did not change, compared to 2023. Other elements in small and large green lentils increased, compared to 2023.

The 100-seed weight and water absorption per gram of seeds were lower for small and large green lentils, compared to 2023.

Image analysis was used to determine the seed size distribution of green lentils (Table 7). The reported results may differ from those obtained by conventional sieving techniques. For small green lentils, 75.4% were 4.5 millimetres (mm) or less in diameter, which is higher than in 2023 (59.6%). For large green lentils, 41.2% were 6.0 mm or smaller in diameter, which is higher than 2023 (34.8%).

Red lentils

Table 8 contains the 2024 quality data for red lentils. Red lentils were higher in protein (27.6%), total dietary fiber (14.8%) and ash (2.7%) but lower in starch (44.5%) and crude fat (0.84%) compared to 2023. The Ca content of red lentils was lower than in 2023, while other elements were higher than in 2023. The 100-seed weight (3.4 grams per 100 seeds) was lower than in 2023 and water absorption (0.96 grams water per gram of seeds) was identical to 2023.

Compared to 2023, the dehulling efficiency (78.2%) and the percentage of un-dehulled whole seeds were higher in 2024. The percentages of powdered seeds and broken seeds were lower than in 2023 (Table 8). The colour of dehulled red lentils was measured using a Hunterlab LabScan XE spectrophotometer with the CIE L*, a* and b* colour scale. The brightness (L*) of whole red lentils and splits was lower than in 2023. Dehulled whole red lentils exhibited more redness (a*) and yellowness (b*), and the dehulled splits had less redness (a*) and more yellowness (b*) than in 2023. There was a higher proportion of red lentils (73.3%) that were 5.0 mm or less in diameter, compared to 2023 (60.8%) (Table 9).

Acknowledgements

The Grain Research Laboratory acknowledges the cooperation of western Canadian pulse processors, producers and grain companies in supplying the samples of newly harvested lentils. We also are grateful to the following groups within the Canadian Grain Commission: Industry Services for assistance with grading samples; the Pulse Research Program staff for technical assistance; the staff of the trace elements unit for mineral analysis; and Multimedia services for their assistance in the publication of this document.

Table 2 Protein content (% dry basis) for 2024 western Canadian green lentils by grade ¹

Location	Grade	Number of samples	2024			2023
			Mean	Minimum	Maximum	Mean
Saskatchewan	Lentils, No. 1 Canada	58	28.4	24.5	32.3	27.9
	Lentils, No. 2 Canada	81	27.4	24.2	30.2	27.4
	Lentils, Extra No. 3 Canada	3	28.0	26.9	30.1	27.8
	Lentils, No. 3 Canada	3	28.4	25.6	31.0	26.8
	All grades	145	27.8	24.2	32.3	27.5
Alberta	Lentils, No. 1 Canada	3	27.7	26.3	28.5	no data
	Lentils, No. 2 Canada	12	27.2	24.8	28.6	27.3
	Lentils, Extra No. 3 Canada	no data	no data	no data	no data	27.9
	Lentils, No. 3 Canada	no data	no data	no data	no data	no data
	All grades	15	27.3	24.8	28.6	27.5
Western Canada	Lentils, No. 1 Canada	61	28.4	24.5	32.3	27.9
	Lentils, No. 2 Canada	94	27.3	24.2	30.2	27.4
	Lentils, Extra No. 3 Canada	4	27.5	25.9	30.1	27.9
	Lentils, No. 3 Canada	4	28.1	25.6	31.0	26.8
	All grades	163	27.8	24.2	32.3	27.5

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

Table 3 Protein content (% dry basis) for 2024 western Canadian red lentils by grade ¹

Location	Grade	Number of samples	2024			2023
			Mean	Minimum	Maximum	Mean
Saskatchewan	Lentils, No. 1 Canada	140	27.7	24.5	30.8	27.3
	Lentils, No. 2 Canada	5	27.9	26.8	29.6	27.5
	Lentils, Extra No. 3 Canada	2	27.6	26.4	28.9	27.8
	Lentils, No. 3 Canada	no data	no data	no data	no data	27.1
	All grades	147	27.7	24.5	30.8	27.4
Alberta	Lentils, No. 1 Canada	12	28.0	25.4	29.5	28.2
	Lentils, No. 2 Canada	no data	no data	no data	no data	27.6
	Lentils, Extra No. 3 Canada	no data	no data	no data	no data	no data
	Lentils, No. 3 Canada	no data	no data	no data	no data	no data
	All grades	12	28.0	25.4	29.5	28.1
Western Canada	Lentils, No. 1 Canada	152	27.7	24.5	30.8	27.4
	Lentils, No. 2 Canada	5	27.9	26.8	29.6	27.5
	Lentils, Extra No. 3 Canada	2	27.6	26.4	28.9	27.8
	Lentils, No. 3 Canada	no data	no data	no data	no data	27.1
	All grades	159	27.7	24.5	30.8	27.4

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

Figure 5 Mean protein content (% dry basis) of western Canadian lentils from 2014 to 2024

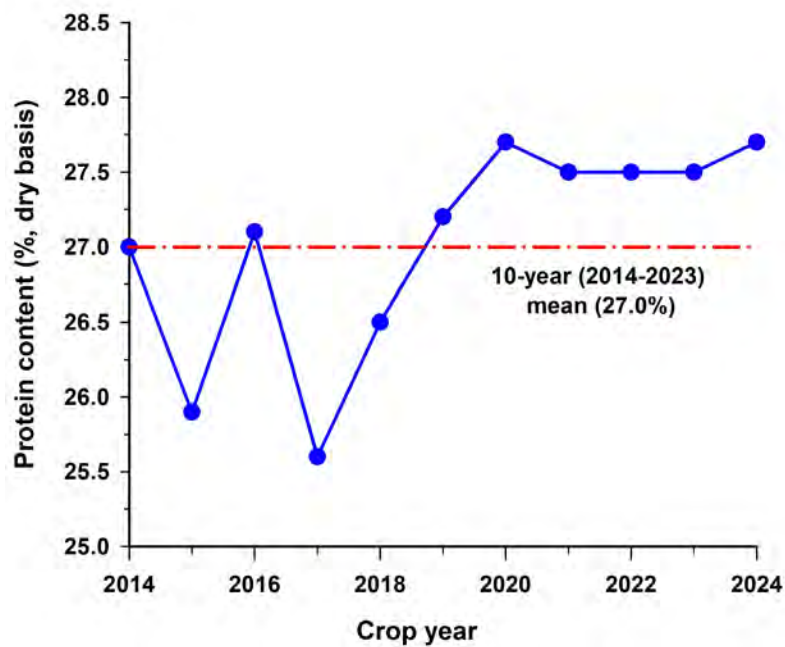


Figure 6 Crop regions in western Canada

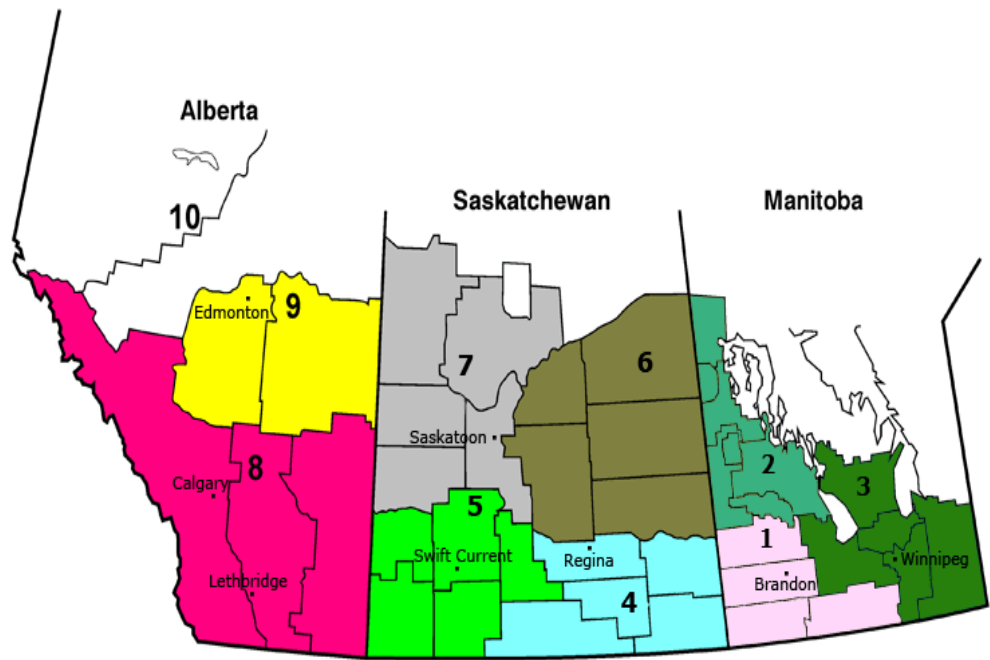


Table 4 Mean protein and starch content (% , dry basis) for 2024 western Canadian green lentils by crop region

Crop region	Protein content		Starch content	
	2024	2023	2024	2023
4	28.2	27.0	43.8	45.9
5	27.6	27.1	44.2	46.2
6	27.2	no data	45.1	no data
7	27.4	no data	43.9	no data
8	27.3	27.6	45.2	46.4

Table 5 Mean protein and starch content (% , dry basis) for 2024 western Canadian red lentils by crop region

Crop region	Protein content		Starch content	
	2024	2023	2024	2023
4	27.9	27.5	44.2	45.5
5	27.4	27.5	44.5	46.1
6	27.8	26.7	43.7	46.2
7	27.2	26.9	45.0	46.1
8	28.1	28.3	44.9	46.0

Table 6 Quality data for 2024 western Canadian green lentil composites by size ¹

Category	Quality parameter	2024			2023		
		SL ²	ML ³	LL ⁴	SL	ML	LL
Chemical composition	Moisture, %	10.1	no data	10.5	10.4	10.8	10.7
	Protein, %, dry basis	29.0	no data	27.3	28.3	25.8	27.3
	Starch, %, dry basis	43.2	no data	44.4	46.6	47.6	46.8
	Total dietary fiber, %, dry basis	15.4	no data	15.0	13.4	14.2	14.1
	Crude fat, %, dry basis	0.74	no data	0.89	0.82	0.87	0.86
	Ash, %, dry basis	2.9	no data	2.9	2.3	2.3	2.5
Mineral content ⁵	Calcium, mg/100 g sample ⁶	59.0	no data	61.1	66.0	69.1	63.5
	Copper, mg/100 g sample	1.0	no data	0.9	1.0	0.8	0.9
	Iron, mg/100 g sample	8.2	no data	14.0	7.5	6.1	7.0
	Potassium, mg/100 g sample	1100.5	no data	1119.6	921.6	951.0	1004.3
	Magnesium, mg/100 g sample	113.9	no data	123.5	107.2	113.8	115.0
	Manganese, mg/100 g sample	1.4	no data	1.6	1.1	1.3	1.2
	Phosphorus, mg/100 g sample	454.3	no data	446.3	317.3	298.9	357.7
	Zinc, mg/100 g sample	4.0	no data	4.2	3.0	3.7	3.5
Physical characteristics	100-seed weight, g/100 seeds ⁷	2.6	no data	5.6	2.9	5.1	6.4
	Water absorption, g H ₂ O/g seeds ⁸	0.92	no data	0.99	0.98	0.99	1.02

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

² SL = small lentils, includes CDC Invincible, CDC Jimini, CDC Kermit and Eston.

³ ML = medium lentils, includes CDC Richlea.

⁴ LL = large lentils, includes CDC Greenstar, CDC Improve, CDC Lima, CDC Grimm and Laird.

⁵ On a dry matter basis.

⁶ mg/g 100 g sample = milligrams per 100 grams of sample.

⁷ g/100 seeds = grams per 100 seeds.

⁸ g H₂O/g seeds = grams of water per gram of seeds.

Table 7 Seed size distribution of 2024 western Canadian green lentils ¹

Seed size distribution	2024		2023	
	SL ²	LL ³	SL	LL
<3.5 mm, %	4.2	0.1	1.9	0.0
3.5 to 4.0 mm, %	22.8	0.2	15.1	0.1
4.0 to 4.5 mm, %	48.4	0.8	42.6	0.0
4.5 to 5.0 mm, %	23.3	3.2	37.8	1.5
5.0 to 5.5 mm, %	1.3	9.9	2.6	7.4
5.5 to 6.0 mm, %	0.0	27.0	0.0	25.8
6.0 to 6.5 mm, %	0.0	43.3	0.0	46.9
6.5 to 7.0 mm, %	0.0	14.8	0.0	17.4
7.0 to 7.5 mm, %	0.0	0.8	0.0	1.0
>7.5 mm, %	0.0	0.0	0.0	0.0

¹ Seed size includes all grades and is determined using image analysis.

² SL = small lentils, includes CDC Invincible, CDC Jimini, CDC Kermit and Eston.

³ LL = large lentils, includes CDC Greenstar, CDC Improve, CDC Lima, CDC Grimm and Laird.

Table 8 Quality data for 2024 western Canadian red lentils ^{1, 2}

Category	Quality parameter	2024	2023		
Chemical composition	Moisture, %	10.3	10.4		
	Protein, %, dry basis	27.6	27.4		
	Starch, %, dry basis	44.5	46.0		
	Total dietary fiber, %,dry basis	14.8	14.2		
	Crude fat, %, dry basis	0.84	0.95		
	Ash, %, dry basis	2.7	2.3		
Mineral content ³	Calcium, mg/100 g sample ⁴	65.3	68.0		
	Copper, mg/100 g sample	1.0	0.9		
	Iron, mg/100 g sample	7.7	6.9		
	Potassium, mg/100 g sample	1066.4	926.4		
	Magnesium, mg/100 g sample	118.9	107.5		
	Manganese, mg/100 g sample	1.4	1.3		
	Phosphorus, mg/100 g sample	429.5	326.0		
	Zinc, mg/100 g sample	4.2	3.6		
Physical characteristics	100-seed weight, g/100 seeds ⁵	3.4	4.1		
	Water absorption, g H ₂ O/g seeds ⁶	0.96	0.96		
Dehulling quality	Dehulling efficiency, %	78.2	77.0		
	Powder, %	3.2	4.7		
	Broken seeds, %	3.2	4.0		
	Un-dehulled whole seeds, %	2.2	1.4		
Colour of dehulled seeds ⁷		Whole	Splits	Whole	Splits
	Brightness, L*	60.6	62.7	61.0	62.9
	Redness, a*	30.3	30.6	29.8	31.2
	Yellowness, b*	40.1	41.3	37.2	39.6

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

² Red lentils include CDC Dazil, CDC Imax, CDC Impact, CDC Impulse, CDC King Red, CDC Maxim, CDC Nimble, CDC Proclaim, CDC Redmoon and CDC Simmie.

³ On a dry matter basis.

⁴ mg/100 g sample= milligrams per 100 grams of sample.

⁵ g/100 seeds = grams per 100 seeds.

⁶ g H₂O/g seeds = grams of water per gram of seeds.

⁷ L* = darkness (0) to brightness (+); a* = greenness (-) to redness (+); b* = blueness (-) to yellowness (+).

Table 9 Seed size distribution of 2024 western Canadian red lentils ^{1,2}

Seed size distribution	2024	2023
<3.5 mm, %	1.0	0.4
3.5 to 4.0 mm, %	6.7	3.2
4.0 to 4.5 mm, %	25.5	16.5
4.5 to 5.0 mm, %	40.1	40.7
5.0 to 5.5 mm, %	20.1	28.2
5.5 to 6.0 mm, %	6.4	10.0
6.0 to 6.5 mm, %	0.3	1.0
6.5 to 7.0 mm, %	0.0	0.2
>7.0 mm, %	0.0	0.0

¹ Seed size includes all grades and is determined using image analysis.

² Red lentils include CDC Dazil, CDC Imax, CDC Impact, CDC Impulse, CDC King Red, CDC Maxim, CDC Nimble, CDC Proclaim, CDC Redmoon and CDC Simmie.