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# Quality of western Canadian lentils

## 2015

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# Introduction

This report presents the quality data for 2015 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 2015 was estimated to be 2.4 million tonnes, which was 19% higher than in 2014, and 67% higher than the 10-year average of 1.4 million tonnes (Table 1). Increase in production was due to a 30% increase in harvested area in 2015 from 2014. Saskatchewan continues to dominate lentil production in western Canada, accounting for about 94% of production, while Alberta accounts for about 6%.

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

| | Harvested area | | Production | | Yield | | Mean production |
|---|---|---|---|---|---|---|---|
| Province | 2015 | 2014 | 2015 | 2014 | 2015 | 2014 | 2005–2014 |
| | thousand hectares | | thousand tonnes | | kg/ha | | thousand tonnes |
| **Lentils** | | | | | | | |
| Manitoba | - | - | - | - | - | - | - |
| Saskatchewan | 1489 | 1174 | 2235 | 1903 | 1500 | 1620 | 1370 |
| Alberta[2] | 100 | 44 | 138 | 84 | 1390 | 1930 | 69 |
| **Western Canada** | **1589** | **1218** | **2373** | **1987** | **1490** | **1630** | **1419** |

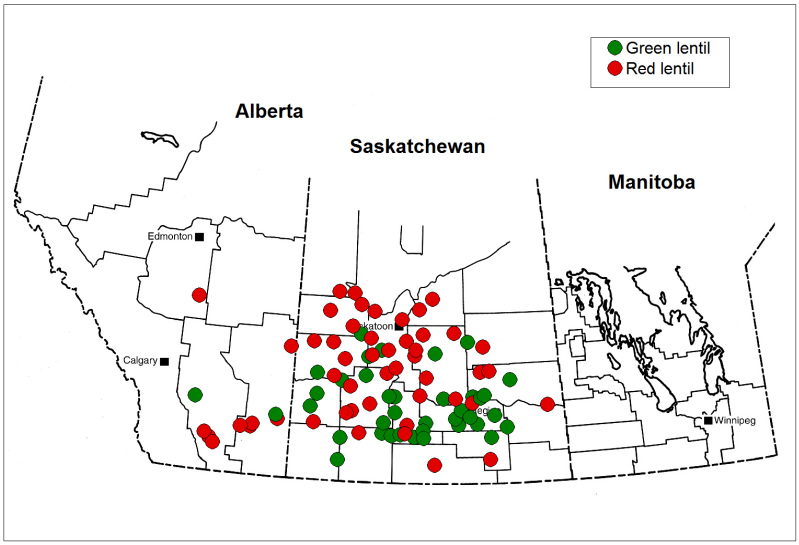
[1]Statistics Canada.
[2]Includes the Peace River area of British Columbia.

# Western Canadian lentils _____2015

## 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 432 lentil samples including 187 green and 245 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 2015 lentil samples from Harvest Sample Program**



## Quality of 2015 western Canadian lentils

Protein content for green and red lentils in 2015 ranged from 21.5% to 28.9% (Table 2). The mean protein content was 25.9%, which was lower than the mean for 2014 (27.0%), and lower than the 10-year mean of 27.2% (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 26.3%, which was lower than the mean for 2014. Mean protein content for medium-size green lentils (CDC Imigreen, CDC Impress, and CDC Richlea) was 24.1%, which was lower than the mean for 2104. Protein content for large-size green lentils (CDC Glamis, CDC Grandora, CDC Greenland, CDC Impower, CDC Improve, CDC Plato, CDC Sovereign, and Laird) was 26.0%, lower than the mean for 2014. Mean starch contents for medium-size and large-size green lentils were similar to the means for 2014, while the mean for small-size green lentils was higher than the mean for 2014. Mean total dietary fiber contents for small-size and large-size green lentils were similar, but were higher than the mean for medium-size green lentils. Mean ash content for all 3 green lentil sizes was similar to levels in 2014. 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 3.0 g, 5.7 g and 6.7 g, respectively (Table 4). Mean 100-seed weights for all 3 sizes of lentils were higher than the means for 2014. Mean water absorption values were 0.91 g $H_2O$ per g seeds for small-size lentils, 0.93 g $H_2O$ per g seeds for medium-size lentils and 0.97 g $H_2O$ per g seeds for large-size lentils, which were similar to the means for 2014.

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 78% of the seeds fell within 4.0 to 5.0 mm. For medium-size green lentils, 67% fell within 5.0 to 6.0 mm. For large-size green lentils, 74% fell within 6.0 to 7.0 mm.

Table 6 shows 2015 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 26.0%, which was lower than the mean (27.1%) for 2014. Mean starch content (46.2%) was similar to the mean for 2014. Mean total dietary fiber content was 13.6%. Mean ash content was 2.7%, similar to the mean (2.8%) for 2014. 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 and the mean water absorption was 0.88 g $H_2O$ per g seeds, which were higher than the means for 2014.

The mean dehulling efficiency for red lentils was 81.0%, which was slightly higher than the mean for 2014 (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 68% of red lentils fell within the 4.0 to 5.0 mm range, which was slightly lower than for 2014 (Table 7).

**Table 2 – Protein content for 2015 western Canadian lentils (green and red combined) by grade[1]**

| Grade | Protein content, % dry basis | | | |
|---|---|---|---|---|
| | 2015 | | | 2014 |
| | Mean | Min. | Max. | Mean |
| **Saskatchewan** | | | | |
| Lentils, No. 1 Canada | 25.8 | 22.6 | 28.6 | 26.8 |
| Lentils, No. 2 Canada | 26.0 | 21.6 | 28.3 | 27.0 |
| Lentils, Extra No. 3 Canada | 26.2 | 21.8 | 28.9 | 27.1 |
| Lentils, No. 3 Canada | 26.3 | 21.5 | 28.0 | 27.1 |
| **All grades** | **25.9** | **21.5** | **28.9** | **27.0** |
| **Alberta** | | | | |
| Lentils, No. 1 Canada | 25.1 | 23.1 | 27.6 | 26.1 |
| Lentils, No. 2 Canada | 25.5 | 23.9 | 26.7 | 26.4 |
| Lentils, Extra No. 3 Canada | NS[2] | NS | NS | 26.9 |
| Lentils, No. 3 Canada | NS | NS | NS | NS |
| **All grades** | **25.3** | **23.1** | **27.6** | **26.5** |
| **Western Canada** | | | | |
| Lentils, No. 1 Canada | 25.7 | 22.6 | 28.6 | 26.8 |
| Lentils, No. 2 Canada | 26.0 | 21.6 | 28.3 | 27.0 |
| Lentils, Extra No. 3 Canada | 26.2 | 21.8 | 28.9 | 27.1 |
| Lentils, No. 3 Canada | 26.3 | 21.5 | 28.0 | 27.1 |
| **All grades** | **25.9** | **21.5** | **28.9** | **27.0** |

[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**

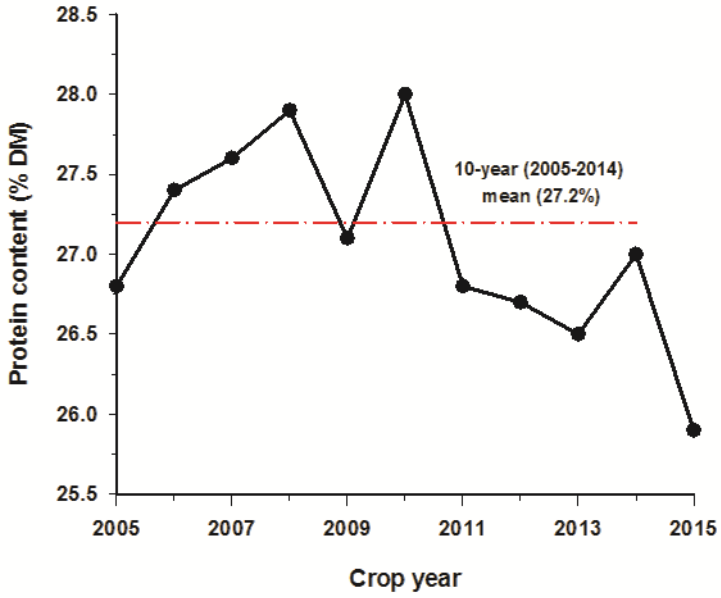


**Figure 3 – Crop regions in western Canada**

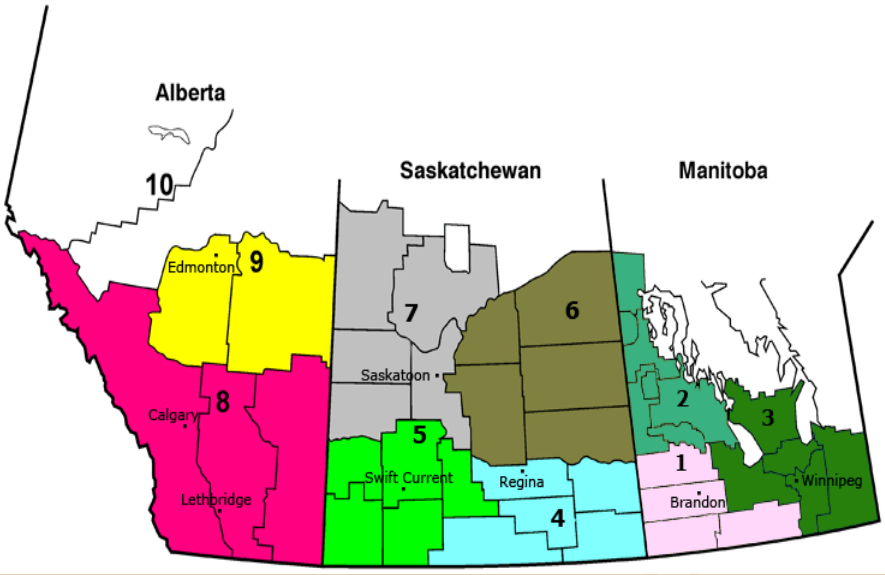


**Table 3 – Mean protein and starch content for 2015 western Canadian lentils (green and red combined) by crop region**

| | Protein content, % dry basis | | Starch content, % dry basis | |
|---|---|---|---|---|
| Crop region[1] | 2015 | 2014 | 2015 | 2014 |
| 4 | 25.8 | 27.3 | 47.0 | 46.6 |
| 5 | 25.6 | 27.1 | 46.7 | 46.3 |
| 6 | 27.1 | 27.2 | 45.1 | 45.4 |
| 7 | 26.4 | 28.0 | 46.1 | 45.9 |
| 8 | 25.0 | 26.4 | 47.4 | 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 2015 western Canadian green lentil composite by seed size[1]**

| | 2015 | | | 2014 | | |
|---|---|---|---|---|---|---|
| Quality parameter | SL[2] | ML[3] | LL[4] | SL[2] | ML[3] | LL[4] |
| **Chemical composition** | | | | | | |
| Moisture content, % | 9.4 | 9.9 | 8.9 | 9.8 | 10.4 | 10.2 |
| Protein content, % dry basis (DM) | 26.3 | 24.1 | 26.0 | 28.6 | 26.1 | 27.2 |
| Starch content, % DM | 47.1 | 48.5 | 46.8 | 45.8 | 48.7 | 46.4 |
| Total dietary fiber content, % DM | 12.3 | 12.0 | 12.4 | NA[5] | NA | NA |
| Ash content, % DM | 2.8 | 2.8 | 2.9 | 2.8 | 2.6 | 3.0 |
| **Mineral (mg/100 g dry basis)** | | | | | | |
| Calcium (Ca) | 75.6 | 85.4 | 79.2 | 61.1 | 74.9 | 72.3 |
| Copper (Cu) | 0.93 | 0.93 | 0.86 | 1.2 | 1.0 | 1.0 |
| Iron (Fe) | 7.8 | 6.7 | 6.8 | 8.9 | 7.2 | 7.3 |
| Potassium (K) | 905.5 | 971.6 | 968.7 | 1047 | 934.9 | 984.9 |
| Magnesium (Mg) | 99.7 | 113.5 | 110.9 | 107.9 | 108.7 | 117.6 |
| Manganese (Mn) | 1.6 | 1.7 | 1.7 | 1.7 | 1.5 | 1.7 |
| Phosphorus (P) | 352.2 | 350.9 | 364.9 | 413.8 | 333.4 | 380.8 |
| Zinc (Zn) | 3.8 | 3.9 | 4.0 | 3.9 | 3.5 | 4.0 |
| **Physical characteristic** | | | | | | |
| 100-seed weight, g/100 seeds | 3.0 | 5.7 | 6.7 | 2.8 | 4.6 | 6.2 |
| Water absorption, g $H_2O$/g seeds | 0.91 | 0.93 | 0.97 | 0.87 | 1.00 | 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 Impower, CDC Improve, CDC Plato, CDC Sovereign, and Laird.
[5]NA=Not available (analysis was not done in 2014).

**Table 5 – Seed size distribution for 2015 western Canadian green lentils[1]**

| Seed size distribution | 2015 | | | 2014 | | |
|---|---|---|---|---|---|---|
| | SL[2] | ML[3] | LL[4] | SL[2] | ML[3] | LL[4] |
| <3.5 mm, % | 1.6 | 0.2 | 0.1 | 2.9 | 0.1 | 0.1 |
| 3.5–4.0 mm, % | 9.0 | 0.3 | 0.2 | 14.8 | 0.4 | 0.3 |
| 4.0–4.5 mm, % | 30.5 | 0.8 | 0.5 | 43.3 | 1.7 | 0.7 |
| 4.5–5.0 mm, % | 47.8 | 4.1 | 1.8 | 34.8 | 8.2 | 2.2 |
| 5.0–5.5 mm, % | 10.9 | 19.3 | 5.0 | 4.2 | 33.5 | 6.5 |
| 5.5–6.0 mm, % | 0.2 | 47.5 | 15.2 | 0.1 | 44.8 | 18.1 |
| 6.0–6.5 mm, % | 0.0 | 26.4 | 39.3 | 0.0 | 11.1 | 40.1 |
| 6.5–7.0 mm, % | 0.0 | 1.4 | 34.8 | 0.0 | 0.4 | 29.4 |
| 7.0–7.5 mm, % | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 2.6 |
| >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 2015 western Canadian red lentil composite[1] | | | | |
|---|---|---|---|---|
| Quality parameter | | 2015 | 2014 | |
| **Chemical composition** | | | | |
| Moisture content, % | | 8.9 | 10.2 | |
| Protein content, % dry basis (DM) | | 26.0 | 27.1 | |
| Starch content, % DM | | 46.2 | 46.3 | |
| Total dietary fiber content, % DM | | 13.6 | NA[3] | |
| Ash content, % DM | | 2.7 | 2.8 | |
| **Mineral (mg/100 g dry basis)** | | | | |
| Calcium (Ca) | | 81.9 | 84.3 | |
| Copper (Cu) | | 0.92 | 0.68 | |
| Iron (Fe) | | 8.1 | 5.1 | |
| Potassium (K) | | 947.1 | 971.9 | |
| Magnesium (Mg) | | 109.4 | 130.4 | |
| Manganese (Mn) | | 1.7 | 1.2 | |
| Phosphorus (P) | | 342.5 | 335.4 | |
| Zinc (Zn) | | 3.8 | 3.8 | |
| **Physical characteristic** | | | | |
| 100-seed weight, g/100 seeds | | 3.8 | 3.3 | |
| Water absorption, g $H_2O$/g seeds | | 0.88 | 0.82 | |
| **Dehulling quality** | | | | |
| Dehulling efficiency, % | | 81.0 | 78.8 | |
| Powder, % | | 2.3 | 2.2 | |
| Broken seeds, % | | 0.79 | 1.6 | |
| Undehulled whole seeds, % | | 5.1 | 5.6 | |
| **Colour of dehulled seeds** | **Whole** | **Splits** | **Whole** | **Splits** |
| Brightness, L* | 60.5 | 62.3 | 61.0 | 63.0 |
| Redness, a* | 29.2 | 29.0 | 29.5 | 30.2 |
| Yellowness, b* | 37.2 | 38.5 | 37.1 | 39.5 |

[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 (+).
[3]NA=Not available (analysis was not done in 2014).

**Table 7 – Seed size distribution for 2015 western Canadian red lentils[1]**

| Seed size distribution[2] | 2015 | 2014 |
|---|---|---|
| <3.5 mm, % | 1.0 | 1.6 |
| 3.5–4.0 mm, % | 6.3 | 8.9 |
| 4.0–4.5 mm, % | 24.7 | 30.7 |
| 4.5–5.0 mm, % | 43.3 | 43.6 |
| 5.0–5.5 mm, % | 21.7 | 14.4 |
| 5.5–6.0 mm, % | 2.9 | 0.9 |
| 6.0–6.5 mm, % | 0.2 | 0.0 |
| 6.50–7.0 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.