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# Quality of Canadian food-type soybeans

## 2012

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## Introduction

This report presents the quality data for the 2012 harvest survey for Canadian food-type soybeans conducted by the Canadian Grain Commission (CGC). Soybean samples for food uses such as, tofu, soymilk, miso and Natto, were submitted by soybean producers and processors across Manitoba (MB), Ontario (ON) and Quebec (QC) to the CGC's Grain Research Laboratory (GRL) for analysis.

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# Canadian food-type soybeans \_\_\_\_\_ 2012

## Harvest survey samples

A total of 188 food-type soybean samples consisting of 183 generic food-type and 5 Natto-type samples were received at the CGC for analysis. All samples were graded by the CGC's Industry Services (IS). Composite samples were prepared based on end uses (generic or Natto), grade (No. 1 Canada or No. 2 Canada) and province (Manitoba, Ontario or Quebec). All samples were tested for protein and oil content. Composite samples were analyzed for 100-seed weight, water absorption capacity, nitrogen solubility index (NSI), protein, oil, sugar and total isoflavones content. It is important to note that samples reported by grade do not necessarily represent the actual distribution of grade.

## Quality of 2012 Canadian food-type soybeans

### Protein and oil content

Protein content for 2012 Canadian food-type soybeans ranged from 35.0 to 51.0 g/100 g DM (Table 1). The average protein content in 2012 was 41.3 g/100 g DM, which was lower than that in 2011 (42.3 g/100 g DM). The average protein content for Manitoba in 2012 was 37.4 g/100 g DM, a decrease of 2.3 g/100 g DM when compared to 2011 (Table 1). The mean protein content for Ontario in 2012 was 41.3 g/100 g DM, which was lower than that in 2011, while the average protein content for Quebec in 2012 was 42.4 g/100 g DM, which was slightly higher than that in 2011. Food-type soybeans from Manitoba displayed lower mean protein content than those from Ontario and Quebec.

Oil content for 2012 Canadian food-type soybeans varied from 17.1 to 24.1 g/100 g DM (Table 2). The average oil content in 2012 was 21.9 g/100 g DM, which was 1.1 g/100 g DM higher than that in 2011. The average oil content for Manitoba in 2012 was 22.5 g/100 g DM, 0.9 g/100 g DM higher as compared to 2011 (Table 2). The mean oil content for Ontario in 2012 was 21.9 g/100 g DM, 1.0 g/100 g DM higher than that in 2011. The average oil content for Quebec in 2012 was 20.8 g/100 g DM, 0.3 g/100 g DM higher than that in 2011. Food-type soybeans from Manitoba exhibited higher average oil content in 2012 than those from Ontario and Quebec.

Variations in protein and oil content for Canadian food-type soybeans can be affected by variety and growing environmental conditions.

### Canadian generic food-type soybeans

Table 3 shows the quality data for 2012 Canadian generic food-type soybeans used for tofu, soymilk or miso. Mean 100-seed weight for 2012 generic food-type soybean was 18.9 g, which was slightly lower than that for 2011 (19.2 g). Water absorption capacity of 2012 generic food-type soybeans was 1.21 g H<sub>2</sub>O/g seeds, which was similar to that for 2011 soybeans. Seed size and water

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uptake capacity are important quality characteristics of food-type soybeans in the production of tofu, soymilk and miso.

Nitrogen solubility index (NSI) indicating percentage of water-soluble protein was 86.6% for 2012 generic food-type soybean (Table 3), which was higher than that for 2011 (85.6%). High NSI is preferred for soymilk and tofu production since soybeans with a high NSI tend to give a high protein recovery into soymilk, which in turn leads to high recovery in the final tofu product.

The average protein content for 2012 Canadian generic food-type soybean was 41.5 g/100 g DM (Table 3), which was slightly lower than that for 2011 (41.8 g/100 g DM). The average oil content for 2012 Canadian generic food-type soybean was 20.3 g/100 g DM, which was slightly lower than that for 2011 (20.6 g/100 g DM).

The mean sucrose content in 2012 generic food-type soybean was 58.4 g/kg DM, which was lower than that (66.2 g/kg DM) in 2011 (Table 3). The average total oligosaccharides content for generic food-type soybean was 42.8 g/kg DM, which was lower than that (46.7 g/kg DM) in 2011.

The average total isoflavones content for 2012 Canadian generic food-type soybean was 2085 mg/kg DM, which was lower than that for 2011 (Table 3).

### **Canadian Natto-type soybeans**

Table 4 displays the quality data for 2012 Canadian Natto-type soybeans. Mean 100-seed weight for 2012 Natto-type soybean was 9.2 g, which was higher than that for 2011. Water absorption value for 2012 Natto-type soybean was 1.28 g H<sub>2</sub>O/g seeds, which was slightly lower than that for 2011. NSI was 85.7% for 2012 Natto-type soybean, which was higher than that for 2011 (84.2%).

The average protein content for 2012 Canadian Natto-type soybean was 43.7 g/100 g DM, which was higher than that for 2011 (41.1 g/100 g DM) (Table 4), while the mean oil content for 2012 Natto-type soybean was 18.7 g/100 g DM, which was lower than that for 2011 (19.8 g/100 g DM).

The average sucrose content for 2012 Canadian Natto-type soybean was 54.3 g/kg DM, which was lower than that for 2011 (61.7 g/kg DM) (Table 4). The mean total oligosaccharides content for 2012 Natto-type soybean was 43.7 g/kg DM. This was lower than that for 2011 (51.9 g/kg DM).

The average total isoflavones content in 2012 Canadian Natto-type soybean was 2242 mg/kg DM, which was lower than that in 2011 (2740 mg/kg DM) (Table 4).

**Table 1 – Mean protein content for 2012 Canadian food-type soybeans by grade and province<sup>1</sup>**

Grade	Protein content, g/100 g DM		
	2012		2011
	Mean	Range	Mean
<b>Manitoba</b>			
Soybean, No. 1 Canada	38.2	37.9–38.5	38.2
Soybean, No. 2 Canada	36.6	35.0–38.1	41.1
<b>All grades</b>	<b>37.4</b>	35.0–38.5	<b>39.7</b>
<b>Ontario</b>			
Soybean, No. 1 Canada	40.8	37.3–44.9	41.9
Soybean, No. 2 Canada	41.7	37.3–49.4	43.5
<b>All grades</b>	<b>41.3</b>	37.3–49.4	<b>42.5</b>
<b>Quebec</b>			
Soybean, No. 1 Canada	42.4	41.4–43.7	43.5
Soybean, No. 2 Canada	42.4	39.1–51.0	42.0
<b>All grades</b>	<b>42.4</b>	39.1–51.0	<b>42.1</b>
<b>Canada</b>			
Soybean, No. 1 Canada	40.8	37.3–44.9	41.8
Soybean, No. 2 Canada	41.6	35.0–51.0	42.7
<b>All grades</b>	<b>41.3</b>	35.0–51.0	<b>42.3</b>

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

**Table 2 – Mean oil content for 2012 Canadian food-type soybeans by grade and province<sup>1</sup>**

Grade	Oil content, g/100 g DM		
	2012		2011
	Mean	Range	Mean
<b>Manitoba</b>			
Soybean, No. 1 Canada	22.2	22.0–22.4	22.5
Soybean, No. 2 Canada	22.8	21.7–23.9	20.7
<b>All grades</b>	<b>22.5</b>	21.7–23.9	<b>21.6</b>
<b>Ontario</b>			
Soybean, No. 1 Canada	22.1	19.2–24.0	21.1
Soybean, No. 2 Canada	21.8	17.7–24.1	20.4
<b>All grades</b>	<b>21.9</b>	17.7–24.1	<b>20.9</b>
<b>Quebec</b>			
Soybean, No. 1 Canada	20.9	19.1–21.8	20.5
Soybean, No. 2 Canada	20.8	17.1–23.5	20.5
<b>All grades</b>	<b>20.8</b>	17.1–23.5	<b>20.5</b>
<b>Canada</b>			
Soybean, No. 1 Canada	22.1	19.1–24.0	21.1
Soybean, No. 2 Canada	21.7	17.1–24.1	20.4
<b>All grades</b>	<b>21.9</b>	17.1–24.1	<b>20.8</b>

<sup>1</sup> Oil content is determined by near infrared measurement calibrated against the ISO 10565:1992(E) reference method.

**Table 3 – Quality data for 2012 Canadian generic food-type soybean composites<sup>1</sup>**

Quality parameter	2012	2011
<b>Physical characteristic</b>		
100-seed weight, g/100 seeds	18.9	19.2
Water absorption, g H <sub>2</sub> O/g seeds	1.21	1.26
Nitrogen solubility index (NSI), %	86.6	85.6
<b>Chemical composition (g/100 g DM)</b>		
Protein content	41.5	41.8
Oil content	20.3	20.6
<b>Sugar content (g/kg DM)</b>		
Sucrose	58.4	66.2
Raffinose	8.4	7.7
Stachyose	34.1	38.0
Verbascose	0.40	0.99
Total oligosaccharides <sup>2</sup>	42.8	46.7
<b>Isoflavones (mg/kg DM)</b>		
Total isoflavones <sup>3</sup>	2085	2555

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

<sup>2</sup> Sum of raffinose, stachyose and verbascose.

<sup>3</sup> Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.



**Table 4 – Quality data for 2012 Canadian Natto-type soybean composites<sup>1</sup>**

Quality parameter	2012	2011
<b>Physical characteristic</b>		
100-seed weight, g/100 seeds	9.2	7.5
Water absorption, g H <sub>2</sub> O/g seeds	1.28	1.33
Nitrogen solubility index (NSI), %	85.7	84.2
<b>Chemical composition (g/100 g DM)</b>		
Protein content	43.7	41.1
Oil content	18.7	19.8
<b>Sugar content (g/kg DM)</b>		
Sucrose	54.3	61.7
Raffinose	6.5	7.1
Stachyose	36.7	43.4
Verbascose	0.52	1.46
Total oligosaccharides <sup>2</sup>	43.7	51.9
<b>Isoflavones (mg/kg DM)</b>		
Total isoflavones <sup>3</sup>	2242	2740

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

<sup>2</sup> Sum of raffinose, stachyose and verbascose.

<sup>3</sup> Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.