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Quality of Canadian food-type soybeans 2013

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Introduction

This report presents the quality data for the 2013 harvest survey of Canadian food-type soybeans conducted by the Canadian Grain Commission. Soybean samples for food uses such as tofu, soymilk, miso and natto were submitted by soybean producers and processors from across Manitoba, Ontario and Quebec to the Canadian Grain Commission's Grain Research Laboratory for analysis.

Canadian food-type soybeans 2013

Harvest survey samples

The Canadian Grain Commission received a total of 212 food-type soybean samples, consisting of 208 generic food-type samples and 4 natto-type samples. The Canadian Grain Commission's Industry Services graded all of the samples. Composite samples were prepared based on end-use (generic or natto) 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), and 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 2013 Canadian food-type soybeans

Protein and oil content

Protein content for 2013 Canadian food-type soybeans ranged from 37.4 g to 52.3 g per 100 g dry matter (Table 1). The mean protein content in 2013 was 41.4 g per 100 g dry matter, which was similar to the mean in 2012 (41.3 g per 100 g dry matter). The mean protein content for Manitoba for 2013 was 41.2 g per 100 g dry matter, which was higher than the mean for 2012. The mean protein content for Ontario for 2013 was 41.3 g per 100 g dry matter, which was the same as that for 2012, while the mean protein content for Quebec for 2013 was 44.8 g per 100 g dry matter, which was higher than the mean for 2012.

Oil content for 2013 Canadian food-type soybeans varied from 16.0 g to 23.7 g per 100 g dry matter (Table 2). The mean oil content in 2013 was 21.1 g per 100 g dry matter, which was lower than the mean for 2012. The mean oil content for Manitoba in 2013 was 20.8 g per 100 g dry matter, which was lower than the mean for2012. The mean oil content for Ontario in 2013 was 21.2 g per 100 g dry matter, which was lower than for 2012. The mean oil content for Quebec in 2013 was 19.0 g per 100 g dry matter, which was lower than the mean for 2012.

Canadian generic food-type soybeans

Table 3 shows the quality data for 2013 Canadian generic food-type soybeans used for tofu, soymilk or miso. Mean 100-seed weight for 2013 generic food-type soybean was 16.4 g, which was lower than the mean for 2012 (18.9 g). Water absorption capacity was 1.08 g H_2O per g seeds, which was lower than that for 2012. Seed size and water uptake capacity are important quality characteristics of food-type soybeans for the production of tofu, soymilk and miso.

The nitrogen solubility index, which indicates the percentage of water-soluble protein, was 83.1% for generic food-type soybeans in 2013 (Table 3), lower than that for 2012 (86.6%). High nitrogen solubility index is preferred for soymilk and tofu production since soybeans with a high nitrogen solubility index tend to give a high protein recovery when processed into soymilk, which in turn leads to high recovery in the final tofu product.

The mean protein content for 2013 Canadian generic food-type soybean was 42.3 g per 100 g dry matter (Table 3), which was higher than the mean for 2012 (41.5 g per 100 g dry matter). The mean oil content for 2013 was 20.6 g per 100 g dry matter, which was slightly higher than the mean for 2012 (20.3 g per 100 g dry matter).

The mean sucrose content in 2013 generic food-type soybean was 62.6 g per kg dry matter, which was higher than the mean for 2012 (58.4 g per kg dry matter) (Table 3). The mean total oligosaccharides content was 43.6 g per kg dry matter, which was higher than the mean for 2012 (42.8 g per kg dry matter).

The mean total isoflavones content for 2013 Canadian generic food-type soybean was 2516 mg per kg dry matter, which was higher than the mean for 2012 (Table 3).

Canadian natto-type soybeans

Table 4 displays the quality data for 2013 Canadian natto-type soybeans. Mean 100-seed weight for 2013 natto-type soybean was 7.6 g, which was lower than the mean for 2012. Water absorption value was 1.12 g H_2O per g seeds, which was slightly lower than the value for 2012. Nitrogen solubility index was 81.8% for, which was lower than that for 2012 (85.7%).

The mean protein content for 2013 Canadian natto-type soybean was 41.7 g per 100 g dry matter, which was lower than the mean for 2012 (43.7 g per 100 g dry matter) (Table 4). The mean oil content was 18.8 g per 100 g dry matter, which was similar to the mean for 2012 (18.7 g per 100 g dry matter).

The mean sucrose content for 2013 Canadian natto-type soybean was 64.4 g per kg dry matter, which was higher than the mean for 2012 (54.3 g per kg dry matter) (Table 4). The mean oligosaccharides content for 2013 was 45.2 g per kg dry matter. This was higher than the mean for 2012 (43.7 g per kg dry matter).

The mean total isoflavones content in 2013 Canadian natto-type soybean was 3084 mg per kg dry matter, which was higher than the mean for 2012 (2242 mg per kg dry matter) (Table 4).

Table 1 – Mean protein content for 2013 Canadian food-type soybeans by grade and province[1]

	Protein content, g/100 g DM (dry matter)		
	2013		2012
Province	Mean	Range	Mean
Manitoba			
Soybean, No. 1 Canada	N/A	N/A	38.2
Soybean, No. 2 Canada	41.2	40.4–41.9	36.6
All grades	**41.2**	40.4–41.9	**37.4**
Ontario			
Soybean, No. 1 Canada	41.4	37.6–46.0	40.8
Soybean, No. 2 Canada	41.2	37.4–48.4	41.7
All grades	**41.3**	37.4–48.4	**41.3**
Quebec			
Soybean, No. 1 Canada	N/A	N/A	42.4
Soybean, No. 2 Canada	44.8	41.1–52.3	42.4
All grades	**44.8**	41.1–52.3	**42.4**
Canada			
Soybean, No. 1 Canada	41.4	37.6–46.0	40.8
Soybean, No. 2 Canada	41.5	37.4–52.3	41.6
All grades	**41.4**	37.4–52.3	**41.3**

[1] 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 2013 Canadian food-type soybeans by grade and province[1]

	Oil content, g/100 g DM (dry matter)		
	2013		2012
Province	Mean	Range	Mean
Manitoba			
Soybean, No. 1 Canada	N/A	22.0–22.4	22.2
Soybean, No. 2 Canada	20.8	20.5–21.1	22.8
All grades	**20.8**	20.5–21.1	**22.5**
Ontario			
Soybean, No. 1 Canada	21.5	18.2–23.7	22.1
Soybean, No. 2 Canada	21.1	17.8–22.8	21.8
All grades	**21.2**	17.7-23.7	**21.9**
Quebec			
Soybean, No. 1 Canada	N/A	N/A	20.9
Soybean, No. 2 Canada	19.0	16.0–21.9	20.8
All grades	**19.0**	16.0–21.9	**20.8**
Canada			
Soybean, No. 1 Canada	21.5	18.2–23.7	22.1
Soybean, No. 2 Canada	20.9	16.0–22.8	21.7
All grades	**21.1**	16.0–23.7	**21.9**

[1] Oil content is determined by near infrared measurement calibrated against the ISO 10565:1992(E) reference method.

Table 3 – Quality data for 2013 Canadian generic food-type soybean composites[1]		
Quality parameter	2013	2012
Physical characteristic		
100-seed weight, g/100 seeds	16.4	18.9
Water absorption, g H_2O/g seeds	1.08	1.21
Nitrogen solubility index (NSI), %	83.1	86.6
Chemical composition (g/100 g DM)		
Protein content	42.3	41.5
Oil content	20.6	20.3
Sugar content (g/kg DM)		
Sucrose	62.6	58.4
Raffinose	8.1	8.4
Stachyose	35.1	34.1
Verbascose	0.40	0.40
Total oligosaccharides[2]	43.6	42.8
Isoflavones (mg/kg DM)		
Total isoflavones[3]	2516	2085

[1] Soybean, No.1 Canada and No. 2 Canada combined.

[2] Sum of raffinose, stachyose and verbascose.

[3] Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

Table 4 – Quality data for 2013 Canadian natto-type soybean composites[1]		
Quality parameter	2013	2012
Physical characteristic		
100-seed weight, g/100 seeds	7.6	9.2
Water absorption, g H_2O/g seeds	1.12	1.28
Nitrogen solubility index (NSI), %	81.8	85.7
Chemical composition (g/100 g DM)		
Protein content	41.7	43.7
Oil content	18.8	18.7
Sugar content (g/kg DM)		
Sucrose	64.4	54.3
Raffinose	6.3	6.5
Stachyose	38.6	36.7
Verbascose	0.30	0.52
Total oligosaccharides[2]	45.2	43.7
Isoflavones (mg/kg DM)		
Total isoflavones[3]	3084	2242

[1] Soybean, No.1 Canada and No. 2 Canada combined.

[2] Sum of raffinose, stachyose and verbascose.

[3] Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.