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Quality of Canadian food-type soybeans 2019

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Introduction

This report presents the quality data for the 2019 harvest survey of Canadian food-type soybeans conducted by the Canadian Grain Commission. Samples collected through the cooperation of soybean processors and producers across the Prairies, Ontario and Quebec were submitted to the Canadian Grain Commission's Grain Research Laboratory for analysis.

Growing and harvesting conditions

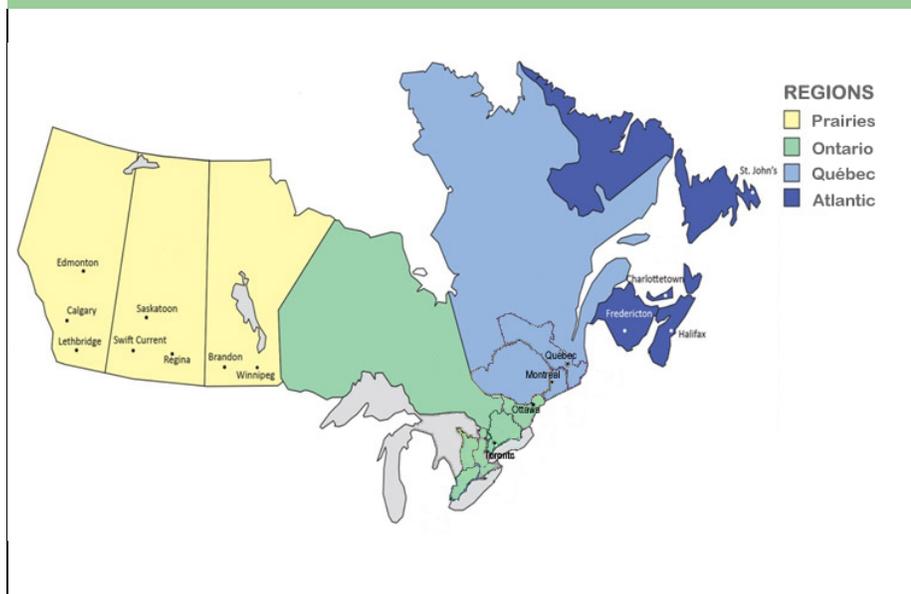
Seeding began in late April in the Prairies and was complete by the first week of June. Dry and cold weather conditions through June and July slowed crop growth. However, warm temperature and timely rainfalls helped crops to advance in late July. In some areas, crops remained at poor conditions and were behind their normal development for this time of the year. In the central and northern regions, below-average temperatures during the growing season delayed crop maturity and caused the delay in the harvest.

In Ontario, the spring of 2019 has been unprecedented with excess rainfall and cool temperatures. This resulted in the significant delay in soybean planting. The majority of soybeans were planted in June. A few areas were forced to push planting right into July. For some areas this was followed by a dry summer, while snow in November and a wet fall hampered harvest for others. Despite these challenges, the overall crop turned out better than expected considering the delayed planting. For those that received good rainfall during the summer the 2019 crop turned out to be above average largely because of adequate moisture during key growth stages.

Harvest survey samples

The Canadian Grain Commission (CGC) received 15 natto-type and 324 generic food-type soybean samples including 12 from Prairies, 217 from Ontario and 110 from Quebec region. All samples were graded by the CGC's Industry Services (IS) and were Canada No.2 or higher. Composite samples were prepared according to region as shown in Fig. 1. All composite samples were analyzed for 100-seed weight, water absorption capacity/water uptake factor, protein, oil, sugar and total isoflavones content. Protein and oil content were determined using a Tecator Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer which was calibrated and verified against the appropriate laboratory reference method. Sugars and isoflavones were analyzed by high performance liquid chromatography (HPLC) methods. It is important to note that samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 1 – Map of Canada showing origin of 2019 food-type soybean samples from CGC's Harvest Sample Program



Quality of 2019 Canadian food-type soybeans

Protein and oil content

Protein content for 2019 Canadian food-type soybeans ranged from 33.1 to 51.0 g per 100 g dry matter (Table 1). The mean protein content in 2019 was 41.2 g per 100 g dry matter, which was lower than the mean in 2018 (41.8 g per 100 g dry matter). The mean protein contents for Prairies, Ontario and Quebec in 2019 were 39.2, 41.4 and 41.0 g per 100 g dry matter, respectively.

Oil content for 2019 Canadian food-type soybeans varied from 16.1 to 24.0 g per 100 g dry matter (Table 2). The mean oil content in 2019 was 20.7 g per 100 g dry matter, which was lower than that for 2018 (21.8 g per 100 g dry matter). The mean oil contents for Prairies, Ontario and Quebec in 2019 were the same (20.7 g per 100 g dry matter), which were lower than their respective means for 2018.

Canadian generic food-type soybeans

Table 3 shows the quality data for 2019 Canadian generic food-type soybeans used for tofu, soymilk or miso. Mean 100-seed weight for 2019 generic food-type soybean was 19.7 g, which was lower than the mean for 2018 (21.7 g). Water absorption capacity was 1.14 g H₂O per g seeds, which was similar to that for 2018. Water uptake factor was 2.14 for 2019. Seed size and water uptake are important quality characteristics of food-type soybeans for the production of tofu, soymilk and miso.

The mean protein content for 2019 Canadian generic food-type soybean was 41.2 g per 100 g dry matter (Table 3), which was slightly lower than the mean for 2018 (41.8 g per 100 g dry matter). The mean oil content for 2019 was 20.8 g per 100 g dry matter, which was lower than the mean for 2018 (21.8 g per 100 g dry matter).

The mean sucrose content in 2019 generic food-type soybean was 76.8 g per kg dry matter, which was higher than the mean for 2018 (59.3 g per kg dry matter) (Table 3). The mean total oligosaccharides content for 2019 was 42.4 g per kg dry matter, which was lower than the mean for 2018 (44.6 g per kg dry matter).

The mean total isoflavones content for 2019 Canadian generic food-type soybean was 3459 mg per kg dry matter, which was higher than the mean for 2018 (Table 3).

Canadian natto-type soybeans

Table 4 displays the quality data for 2019 Canadian natto-type soybeans. Mean 100-seed weight for 2019 natto-type soybean was 9.8 g, similar to that in 2018. Water absorption value was 1.24 g H₂O per g seeds and water uptake factor was 2.24, slightly higher than that for 2018.

The mean protein content for 2019 Canadian natto-type soybean was 39.0 g per 100 g dry matter, which was similar to that in 2018 (Table 4). The mean oil content was 20.3 g per 100 g dry matter, lower than the mean for 2018.

The mean sucrose content for 2019 Canadian natto-type soybean was 76.2 g per kg dry matter, higher than that in 2018 (Table 4). The mean oligosaccharides content was 45.0 g per kg dry matter, lower than that in 2018. The mean total isoflavones content was 3744 mg per kg dry matter, which was higher than the mean for 2018.

Table 1 – Mean protein content for 2019 Canadian food-type soybeans by grade and province¹

Province/Region	Protein content, g/100 g			
	Number of samples	2019		2018
		Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	2	36.9	34.9 – 38.8	NS
Soybean, No. 2 Canada	10	39.6	33.1 – 46.4	38.0
All grades	12	39.2	33.1 – 46.4	38.0
Ontario				
Soybean, No. 1 Canada	92	41.1	35.6 – 51.0	41.6
Soybean, No. 2 Canada	125	41.5	34.9 – 50.9	42.3
All grades	217	41.4	34.9 – 51.0	42.0
Quebec				
Soybean, No. 1 Canada	34	41.0	36.4 – 45.2	40.7
Soybean, No. 2 Canada	76	40.9	33.8 – 46.4	41.6
All grades	110	41.0	33.8 – 46.4	41.3
Canada				
Soybean, No. 1 Canada	132	41.0	34.9 – 51.0	41.4
Soybean, No. 2 Canada	207	41.3	33.1 – 50.9	42.0
All grades	339	41.2	33.1 – 51.0	41.8

¹Protein content (Nx6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method, which is expressed as dry basis.

²NS=insufficient number of samples to generate a representative value.

Table 2 – Mean oil content for 2019 Canadian food-type soybeans by grade and province¹

Province/Region	Oil content, g/100 g			
	Number of samples	2019		2018
		Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	2	21.1	20.8 – 21.3	NS
Soybean, No. 2 Canada	10	20.6	17.7 – 23.3	21.2
All grades	12	20.7	17.7 – 23.3	21.2
Ontario				
Soybean, No. 1 Canada	92	20.9	16.3 – 22.9	22.1
Soybean, No. 2 Canada	125	20.6	16.1 – 24.0	21.5
All grades	217	20.7	16.1 – 24.0	21.8
Quebec				
Soybean, No. 1 Canada	34	20.8	18.1 – 23.2	22.4
Soybean, No. 2 Canada	76	20.6	17.1 – 23.1	21.8
All grades	110	20.7	17.1 – 23.2	22.0
Canada				
Soybean, No. 1 Canada	132	20.9	16.3 – 23.2	22.1
Soybean, No. 2 Canada	207	20.6	16.1 – 24.0	21.6
All grades	339	20.7	16.1 – 24.0	21.8

¹Oil content is determined by near infrared measurement calibrated against the ISO 10565:1992(E) reference method, which is expressed as dry basis.

²NS=insufficient number of samples to generate a representative value.

Table 3 Quality data for 2019 Canadian generic food-type soybean composites¹

Quality parameter	Number of samples	2019	2018
Physical characteristic			
100-seed weight, g/100 seeds	236	19.7	21.7
Water absorption, g H ₂ O/g seeds	236	1.14	1.13
Water uptake factor, g soaked wt/g seeds	236	2.14	2.13
Chemical composition (g/100 g)²			
Protein content	236	41.2	41.8
Oil content	236	20.8	21.8
Sugar content (g/kg DM)			
Sucrose	236	76.8	59.3
Raffinose	236	7.6	8.1
Stachyose	236	33.7	35.1
Verbascose	236	1.2	1.3
Total oligosaccharides ³	236	42.4	44.6
Isoflavones (mg/kg DM)			
Total isoflavones ⁴	236	3459	2349

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

²Results are expressed as dry basis.

³Sum of raffinose, stachyose and verbascose.

⁴Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

Table 4 Quality data for 2019 Canadian natto-type soybean composites¹

Quality parameter	Number of samples	2019	2018
Physical characteristic			
100-seed weight, g/100 seeds	5	9.8	9.9
Water absorption, g H ₂ O/g seeds	5	1.24	1.18
Water uptake factor, g soaked wt/g seeds	5	2.24	2.18
Chemical composition (g/100 g)²			
Protein content	5	39.0	38.9
Oil content	5	20.3	21.7
Sugar content (g/kg DM)			
Sucrose	5	76.2	54.4
Raffinose	5	7.6	7.9
Stachyose	5	35.7	41.4
Verbascose	5	1.7	2.3
Total oligosaccharides ³	5	45.0	51.6
Isoflavones (mg/kg DM)			
Total isoflavones ⁴	5	3744	2493

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

²Results are expressed as dry basis.

³Sum of raffinose, stachyose and verbascose.

⁴Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.