



Quality of Canadian food-type soybeans

2020

Ning Wang

Program Manager, Pulse Research

Contact: Ning Wang

Program Manager, Pulse Research

Telephone: 204 983-2154

Email: ning.wang@grainscanada.gc.ca

Fax: 204-983-0724

Grain Research Laboratory

Canadian Grain Commission

1404-303 Main Street

Winnipeg MB R3C 3G8

www.grainscanada.gc.ca

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Introduction

This report presents information on the quality of food-type soybeans grown in Canada in 2020. The Canadian Grain Commission obtained the data from analyses of samples collected from soybean processors and producers across the Prairies, Ontario, Quebec and Prince Edward Island through the Harvest Sample Program.

Growing and harvesting conditions

Seeding started in the Prairies in late April and ended in mid-June. Early season weather was wet, especially in Alberta. Dry conditions in parts of Saskatchewan and Manitoba affected seed filling and caused yield loss. In addition, frosts occurred in Manitoba in September, causing damage on the later maturing crops. Soybean harvest started from mid-September and was completed by late-October. Overall yield and quality of soybean were better than expected.

In Ontario, seeding of soybeans began in late April and ended in early June. Hot and dry conditions in June and July affected crop growth. Timely rainfalls in August helped to fill pods. Soybean harvest started by mid-September and finished in early November with exceptional yields for most regions.

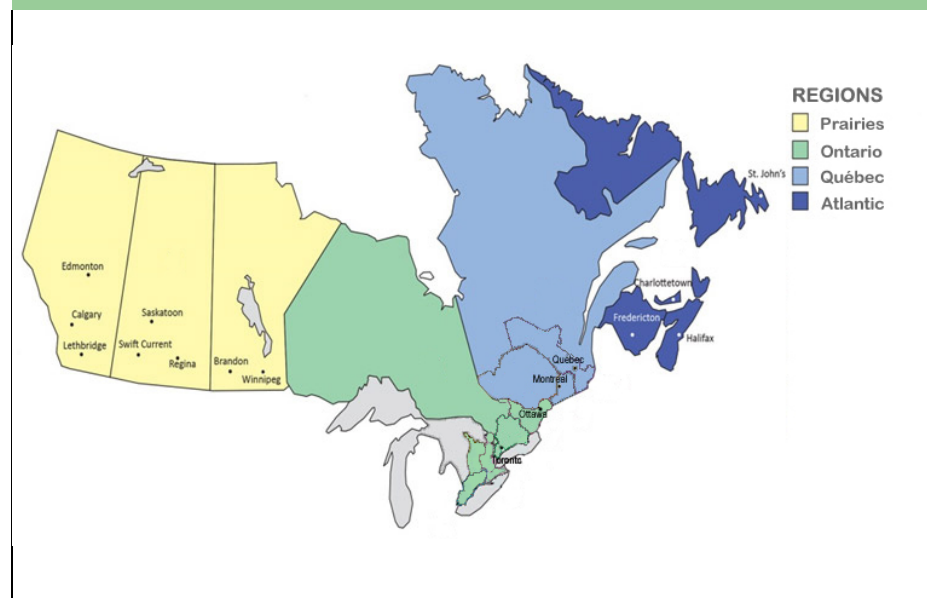
Seeding was delayed in Quebec due to cold spring and was completed by late June. Temperature was warmer than average throughout the growing period. A significant water deficit early in the season affected crop growth. However, July and August brought regular moisture to fill pods. Soybeans were harvested from early October to late November with normal yield and quality for most of the province.

Harvest samples

Through the Harvest Sample Program, the Canadian Grain Commission received 16 natto-type and 285 generic food-type soybean samples including 15 from Prairies, 185 from Ontario, 83 from Quebec and 2 from the Atlantic region. All samples were graded by Canadian Grain Commission inspectors and were Canada No.2 or higher.

Composite samples were prepared according to region as shown in Figure 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 2020 food-type soybean samples from Canadian Grain Commission’s Harvest Sample Program



Quality of 2020 Canadian food-type soybeans

Protein and oil content

Protein content for 2020 Canadian food-type soybeans ranged from 33.6 to 51.8 g per 100 g dry matter (Table 1). The mean protein content in 2020 was 41.7 g per 100 g dry matter, which was higher than the mean in 2019 (41.2 g per 100 g dry matter). The mean protein contents for Prairies, Ontario and Quebec in 2020 were 39.4, 41.6 and 42.5 g per 100 g dry matter.

Oil content for 2020 Canadian food-type soybeans varied from 16.1 to 24.5 g per 100 g dry matter (Table 2). The mean oil content in 2020 was 20.9 g per 100 g dry matter, which was slightly higher than that for 2019 (20.7 g per 100 g dry matter). The mean oil contents for Prairies, Ontario and Quebec in 2020 were 20.7, 21.2, and 20.3 g per 100 g dry matter.

Canadian generic food-type soybeans

Table 3 shows the quality data for 2020 Canadian generic food-type soybeans used for tofu, soymilk and miso. Mean 100-seed weight for 2020 generic food-type soybean was 20.6 g, which was higher than the mean for 2019 (19.7 g). Water absorption capacity was 1.13 g H₂O per g seeds, which was similar to that for 2019. Water uptake factor was 2.13 for 2020. 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 2020 Canadian generic food-type soybean was 41.5 g per 100 g dry matter (Table 3), which was slightly higher than the mean for 2019 (41.2 g per 100 g dry matter). The mean oil content for 2020 was 21.1 g per 100 g dry matter, higher than the mean for 2019 (20.8 g per 100 g dry matter).

The mean sucrose content in 2020 generic food-type soybean was 64.6 g per kg dry matter, which was lower than the mean for 2019 (76.8 g per kg dry matter) (Table 3). The mean total oligosaccharides content for 2020 was 34.5 g per kg dry matter, which was lower than the mean for 2019 (42.4 g per kg dry matter).

The mean total isoflavones content for 2020 Canadian generic food-type soybean was 3316 mg per kg dry matter, which was lower than the mean for 2019 (Table 3).

Canadian natto-type soybeans

Table 4 displays the quality data for 2020 Canadian natto-type soybeans. Mean 100-seed weight for 2020 natto-type soybean was 9.0 g, lower than in 2019 (9.8 g). Water absorption value was 1.21 g H₂O per g seeds and water uptake factor was 2.21, similar to that for 2019.

The mean protein content for 2020 Canadian natto-type soybean was 39.0 g per 100 g dry matter, similar to that in 2019 (Table 4). The mean oil content was 20.7 g per 100 g dry matter, higher than the mean for 2019.

The mean sucrose content for 2020 Canadian natto-type soybean was 54.6 g per kg dry matter, lower than in 2019 (Table 4). The mean oligosaccharides content was 46.3 g per kg dry matter, higher than in 2019. The mean total isoflavones content was 3625 mg per kg dry matter, which was lower than the mean for 2019.

Table 1 – Mean protein content for 2020 Canadian food-type soybeans by grade and province¹

Province/Region	Protein content, g/100 g			
	Number of samples	2020		2019
		Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	1	37.8	37.8 – 37.8	36.9
Soybean, No. 2 Canada	14	39.5	35.9 – 42.7	39.6
All grades	15	39.4	35.9 – 42.7	39.2
Ontario				
Soybean, No. 1 Canada	81	41.4	33.6 – 46.3	41.1
Soybean, No. 2 Canada	113	41.7	35.7 – 51.8	41.5
All grades	194	41.6	33.6 – 51.8	41.4
Quebec				
Soybean, No. 1 Canada	18	42.2	38.6 – 48.4	41.0
Soybean, No. 2 Canada	72	42.6	38.1 – 50.8	40.9
All grades	90	42.5	38.1 – 50.8	41.0
Canada				
Soybean, No. 1 Canada	100	41.5	33.6 – 48.4	41.0
Soybean, No. 2 Canada	199	41.8	35.7 – 51.8	41.3
All grades	299	41.7	33.6 – 51.8	41.2

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

Table 2 – Mean oil content for 2020 Canadian food-type soybeans by grade and province¹

Province/Region	Oil content, g/100 g			
	Number of samples	2020		2019
		Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	1	22.0	22.0 – 22.0	21.1
Soybean, No. 2 Canada	14	20.6	18.9 – 22.6	20.6
All grades	15	20.7	18.9 – 22.6	20.7
Ontario				
Soybean, No. 1 Canada	81	21.3	18.6 – 24.5	20.9
Soybean, No. 2 Canada	113	21.1	16.1 – 23.9	20.6
All grades	194	21.2	16.1 – 24.5	20.7
Quebec				
Soybean, No. 1 Canada	18	20.7	18.4 – 22.7	20.8
Soybean, No. 2 Canada	72	20.2	16.5 – 22.7	20.6
All grades	90	20.3	16.5 – 22.7	20.7
Canada				
Soybean, No. 1 Canada	100	21.2	18.4 – 24.5	20.9
Soybean, No. 2 Canada	199	20.7	16.1 – 23.9	20.6
All grades	299	20.9	16.1 – 24.5	20.7

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

Table 3 Quality data for 2020 Canadian generic food-type soybean composites¹

Quality parameter	Number of samples	2020	2019
Physical characteristic			
100-seed weight, g/100 seeds	222	20.6	19.7
Water absorption, g H ₂ O/g seeds	222	1.13	1.14
Water uptake factor, g soaked wt/g seeds	222	2.13	2.14
Chemical composition (g/100 g)²			
Protein content	222	41.5	41.2
Oil content	222	21.1	20.8
Sugar content (g/kg DM)			
Sucrose	222	64.6	76.8
Raffinose	222	6.4	7.6
Stachyose	222	27.7	33.7
Verbascose	222	0.4	1.2
Total oligosaccharides ³	222	34.5	42.4
Isoflavones (mg/kg DM)			
Total isoflavones ⁴	222	3316	3459

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 2020 Canadian natto-type soybean composites¹

Quality parameter	Number of samples	2020	2019
Physical characteristic			
100-seed weight, g/100 seeds	12	9.0	9.8
Water absorption, g H ₂ O/g seeds	12	1.21	1.24
Water uptake factor, g soaked wt/g seeds	12	2.21	2.24
Chemical composition (g/100 g)²			
Protein content	12	39.0	39.0
Oil content	12	20.7	20.3
Sugar content (g/kg DM)			
Sucrose	12	54.6	76.2
Raffinose	12	5.5	7.6
Stachyose	12	39.5	35.7
Verbascose	12	1.2	1.7
Total oligosaccharides ³	12	46.3	45.0
Isoflavones (mg/kg DM)			
Total isoflavones ⁴	12	3625	3744

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.