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Quality of Canadian food-type soybeans 2023

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Table of Contents

Tables

Figures

Introduction

This report presents information on the quality of food-type soybeans grown in Canada in 2023. The Canadian Grain Commission analyzed soybean samples collected from processors, producers and grain companies across the Prairies, Ontario, Quebec and Prince Edward Island through the Harvest Sample Program.

Growing and harvesting conditions

Across the Prairies, seeding began in early May and was completed by early June. Soybeans matured faster than normal across much of the Prairies due to hot and dry conditions, resulting in lower yields than in 2022. Good conditions led to an early completion of the harvest in most parts of the Prairies.

In western Ontario, the majority of soybean acres were planted during the second week of May. Cold temperatures in May slowed plant growth and soybeans started flowering by the end of June. Excessive rain in July drowned out some areas and increased the presence of root rot. By mid-September, soybeans began to mature. Rain delayed harvest operations in some areas but 60% of the soybean crop was harvested by mid-October. Overall, soybean yields were good.

Seeding started in early May in Quebec and eastern Ontario with good soil conditions. Soybeans planted in mid-May and later, however, were slow to germinate due to dry conditions. Soybeans started flowering in early July. Warm weather and rain between August and mid-September helped fill seed pods but excessive rain caused lodging, diseases, and increased vegetative growth. By mid-October, 65% to 70% of soybean crops were harvested. Overall, yields were satisfactory except for soybeans grown in poorly drained fields.

Harvest samples

Through the Harvest Sample Program, the Canadian Grain Commission received 18 natto-type and 229 generic food-type soybean samples. The geographic distribution of the samples was as follows:

- 183 from Ontario
- 53 from Quebec
- 10 from the Prairie region
- 1 from the Atlantic region

All samples were graded by Canadian Grain Commission inspectors and had a grade of Soybean, No. 2 Canada or higher.

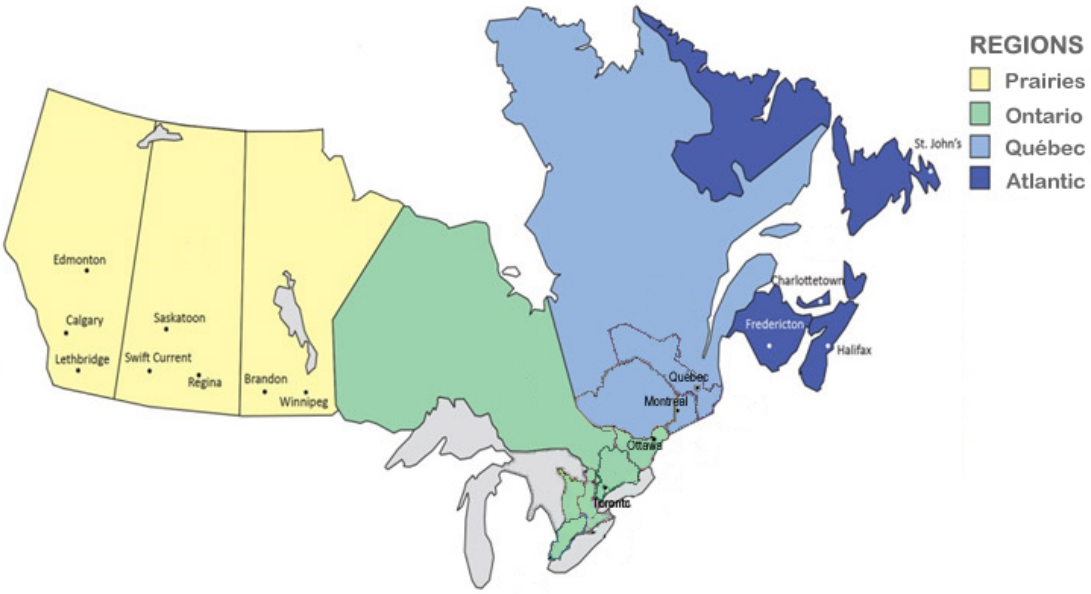
Composite samples were prepared for each of the regions shown in Figure 1. All composite samples were analyzed for:

- 100-seed weight
- water absorption capacity/water uptake factor
- protein content
- oil content
- sugar content (sucrose and total oligosaccharides)
- total isoflavone content

Protein and oil content were determined using an Infratec™ near-infrared spectrometer (NIRS) grain analyzer which was calibrated and verified using the appropriate laboratory reference methods. Sugars and isoflavones were analysed by high performance liquid chromatography (HPLC).

Samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 1 Origin of 2023 food-type soybean samples received by the Canadian Grain Commission's Harvest Sample Program



Quality of 2023 Canadian food-type soybeans

Protein and oil content

Protein content in 2023 Canadian food-type soybeans ranged from 37.3 to 50.3 grams (g) per 100 g dry matter (Table 1). The mean protein content was 43.2 g per 100 g dry matter, which is higher than the mean protein content in 2022 (42.0 g per 100 g dry matter). The mean protein content in food-type soybeans from the Prairies, Ontario and Quebec in 2023 was 40.5 g, 43.3 g and 43.5 g per 100 g dry matter, respectively.

Oil content in 2023 Canadian food-type soybeans ranged from 16.1 to 22.4 g per 100 g of dry matter (Table 2). The mean oil content was 20.5 g per 100 g of dry matter, which is lower than the mean oil content in 2022 (21.8 g per 100 g dry matter). The mean oil content in food-type soybeans from the Prairies, Ontario and Quebec in 2023 was 20.8 g, 20.5 g, and 20.5 g per 100 g of dry matter, respectively.

Canadian generic food-type soybeans

Table 3 contains the quality data for 2023 Canadian generic food-type soybeans used for making tofu, soymilk and miso. Mean 100-seed weight was 21.0 g, which is slightly higher than the mean 100-seed weight in 2022 (20.8 g). Water absorption capacity was 1.19 g of water per g of seeds and water uptake factor was 2.19 g soaked weight per g of seeds, both of which are similar to 2022 values. Seed size and water uptake are important quality characteristics of food-type soybeans used to produce tofu, soymilk and miso.

The mean protein content in 2023 Canadian generic food-type soybeans was 42.5 g per 100 g of dry matter, which is slightly higher than the mean in 2022 (42.2 g per 100 g of dry matter). The mean oil content in 2023 generic food-type soybeans was 20.7 g per 100 g of dry matter, lower than the mean in 2022 (21.7 g per 100 g of dry matter).

The mean sucrose content in 2023 generic food-type soybeans was 60.8 g per kilogram (kg) of dry matter, which is higher than the mean in 2022 (56.2 g per kg of dry matter). The mean total oligosaccharide content in 2023 generic food-type soybeans was 41.3 g per kg of dry matter, which is lower than the mean in 2022 (42.9 g per kg of dry matter).

The mean total isoflavone content in 2023 Canadian generic food-type soybean was 4.3 g per kg of dry matter, which is slightly higher than the mean in 2022.

Canadian natto-type soybeans

Table 4 contains the quality data for 2023 Canadian natto-type soybeans used for making fermented dishes. The mean 100-seed weight of 2023 natto-type soybean was 9.5 g, which is slightly lower than in 2022 (9.8 g). The water absorption value was 1.23 g of water per g of seeds and the water uptake factor was 2.23, both similar to those in 2022.

The mean protein content in 2023 Canadian natto-type soybean was 39.0 g per 100 g of dry matter, slightly higher than in 2022. The mean oil content was 21.2 g per 100 g of dry matter, lower than the mean in 2022.

The mean sucrose content in 2023 Canadian natto-type soybean was 55.5 g per kg of dry matter, higher than in 2022. The mean oligosaccharide content was 47.7 g per kg of dry matter, similar to that in 2022. The mean total isoflavone content was 4.4 g per kg of dry matter, which is slightly lower than that in 2022.

Acknowledgements

The Grain Research Laboratory acknowledges the cooperation of the soybean processors, producers and grain companies from eastern and western Canada for supplying the samples of newly harvested food-type soybeans. We are also grateful to the following groups within the Canadian Grain Commission: Industry Services for grading the samples; Pulse Research Program staff for technical assistance; and Multimedia services for their help in preparing this document.

Table 1 Mean protein content (g/100 g dry matter) for 2023 Canadian food-type soybeans by grade and growing region [1]

		2023			2022
		Number of samples	Mean	Range	Mean
Prairies	Soybean, No. 1 Canada	2	40.0	37.7 to 42.2	36.2
	Soybean, No. 2 Canada	7	40.6	37.3 to 43.8	39.5
	All grades	9	40.5	37.3 to 43.8	39.3
Ontario	Soybean, No. 1 Canada	66	43.2	38.4 to 47.0	41.4
	Soybean, No. 2 Canada	117	43.4	37.6 to 49.8	42.3
	All grades	183	43.3	37.6 to 49.8	42.0
Quebec	Soybean, No. 1 Canada	6	44.6	42.0 to 46.7	42.5
	Soybean, No. 2 Canada	46	43.3	38.2 to 50.3	42.3
	All grades	52	43.5	38.2 to 50.3	42.3
Canada	Soybean, No. 1 Canada	74	43.2	37.7 to 47.0	41.4
	Soybean, No. 2 Canada	170	43.2	37.3 to 50.3	42.2
	All grades	244	43.2	37.3 to 50.3	42.0

Table 2 Mean oil content (g/100 g dry matter) for 2023 Canadian food-type soybeans by grade and growing region [2]

		2023			2022
		Number of samples	Mean	Range	Mean
Prairies	Soybean, No. 1 Canada	2	21.1	20.5 to 21.7	22.7
	Soybean, No. 2 Canada	7	20.7	19.6 to 22.2	21.4
	All grades	9	20.8	19.6 to 22.2	21.3
Ontario	Soybean, No. 1 Canada	66	20.7	18.3 to 22.4	22.1
	Soybean, No. 2 Canada	117	20.4	16.7 to 22.4	21.8
	All grades	183	20.5	16.7 to 22.4	21.9
Quebec	Soybean, No. 1 Canada	6	20.3	19.3 to 21.7	22.0
	Soybean, No. 2 Canada	46	20.6	16.1 to 22.8	21.6
	All grades	52	20.5	16.1 to 22.8	21.7
Canada	Soybean, No. 1 Canada	74	20.6	18.3 to 22.4	22.1
	Soybean, No. 2 Canada	170	20.5	16.1 to 22.8	21.7
	All grades	244	20.5	16.1 to 22.8	21.8

[1] Protein content (Nitrogen x 6.25) is determined by near-infrared measurement calibrated against the Combustion Nitrogen Analysis reference method and is expressed on a dry basis.

[2] Oil content is determined by near-infrared measurement calibrated against the ISO 10565:1992(E) reference method and is expressed on a dry basis.

Table 3 Quality data for 2023 Canadian generic food-type soybean composites [1]

Category	Quality parameter	Number of samples	2023	2022
Physical characteristic	100-seed weight, g/100 seeds	217	21.0	20.8
	Water absorption, g H_2O/g seeds	217	1.19	1.17
	Water uptake factor, g soaked wt/g seeds [2]	217	2.19	2.17
Chemical composition (g/100 g) [3]	Protein content	217	42.5	42.2
	Oil content	217	20.7	21.7
Sugar content (g/kg DM) [4]	Sucrose	217	60.8	56.2
	Raffinose	217	7.9	7.3
	Stachyose	217	32.5	34.7
	Verbascose	217	0.8	0.9
	Total oligosaccharides [5]	217	41.3	42.9
Isoflavone content (g/kg DM) [6]	Total isoflavones [7]	217	4.3	4.0

Table 4 Quality data for 2023 Canadian natto-type soybean composites [1]

Category	Quality parameter	Number of samples	2023	2022
Physical characteristic	100-seed weight, g/100 seeds	18	9.5	9.8
	Water absorption, g H_2O/g seeds	18	1.23	1.21
	Water uptake factor, g soaked wt/g seeds[2]	18	2.23	2.21
Chemical composition (g/100 g)[3]	Protein content	18	39.0	38.7
	Oil content	18	21.2	22.0
Sugar content (g/kg DM) [4]	Sucrose	18	55.5	51.7
	Raffinose	18	7.1	6.2
	Stachyose	18	39.5	40.6
	Verbascose	18	1.0	1.0
	Total oligosaccharides [5]	18	47.7	47.8
Isoflavone content (g/kg DM)	Total isoflavones [6]	18	4.4	4.9

[1] Soybean, No. 1 Canada and No. 2 Canada combined.
[2] g soaked wt/g seeds = grams soaked weight per gram of seeds.
[3] Results are expressed on a dry basis.
[4] g/kg DM = grams per kilogram of dry matter.
[5] Sum of raffinose, stachyose and verbascose.
[6] Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.