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# Quality of Canadian food-type soybeans 2022

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# Introduction

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This report presents information on the quality of food-type soybeans grown in Canada in 2022. The Canadian Grain Commission analysed soybean samples collected from processors and producers across the prairies, Ontario, Quebec and Prince Edward Island through the Harvest Sample Program.

## Growing and harvesting conditions

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In eastern Saskatchewan, seeding was delayed due to wet conditions and was not completed until early June. Warm temperatures and timely rainfalls during the summer resulted in good growth except in the southwest and west-central regions. These areas were hot and dry which led to crops ripening prematurely and having low yields. The harvest of soybean crops in other areas was conducted under mostly dry conditions and was nearly complete (92%) by mid-October. The yields for these crops were above average.

In Manitoba, cool and wet conditions in the spring also delayed seeding in some areas for up to 4 weeks. In June and July, temperatures were below average and moisture levels were slightly above normal. Sufficient heat and moisture from the end of August to the beginning of September, allowed soybean plants to develop well and fill seed pods. By mid-October, 50 to 75% of soybean crops had been harvested. The harvesting conditions were good and the yields were above average.

In Ontario, a wet spring delayed the start of soybean seeding until the second week of May. Heavy rains and strong winds at the end of May extended seeding into June. Warm temperatures allowed soybeans to germinate quickly but extremely dry conditions in July slowed the growth of plants. In some parts of Ontario, there were periods of significant rainfall in August but rain was not always sufficient to fill seed pods. Harvest began in mid-September on fields that were planted early and by mid-October harvest was 70% complete. Overall, yields were variable due to the lack of moisture in some areas.

In Quebec, conditions were good for planting soybeans in May, followed by high amounts of rainfall in June. Temperatures in July were below average but in August average temperatures and high levels of moisture helped fill seed pods. By mid-October, 80 to 90% of soybeans were harvested. The harvesting conditions were good and the overall yield was similar to the 5-year provincial average.

# Harvest samples

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Through the Harvest Sample Program, the Canadian Grain Commission received 21 natto-type and 225 generic food-type soybean samples. The geographic distribution of the samples was as follows:

- 163 from Ontario
- 72 from Quebec
- 8 from the prairie region
- 3 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 analysed for:

- 100-seed weight
- water absorption capacity / water uptake factor
- protein content
- oil content
- sugar content
- total isoflavones content

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

Please note that samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 1 Origin of 2022 food-type soybean samples received by the Canadian Grain Commission's Harvest Sample Program



# Quality of 2022 Canadian food-type soybeans

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## Protein and oil content

Protein content in 2022 Canadian food-type soybeans ranged from 33.7 to 49.0 grams (g) per 100 g dry matter (Table 1). The mean protein content was 42.0 g per 100 g dry matter, which is similar to the mean protein content in 2021 (42.1 g per 100 g dry matter). The mean protein content in food-type soybeans from the prairies, Ontario and Quebec in 2022 was 39.3 g, 42.0 g and 42.3 g per 100 g dry matter, respectively.

Oil content in 2022 Canadian food-type soybeans ranged from 16.8 to 25.1 g per 100 g of dry matter (Table 2). The mean oil content was 21.8 g per 100 g of dry matter, which is similar to the mean oil content in 2021 (21.6 g per 100 g dry matter). The mean oil content in food-type soybeans from the prairies, Ontario and Quebec in 2022 was 21.3 g, 21.9 g, and 21.7 g per 100 g of dry matter, respectively.

## Canadian generic food-type soybeans

Table 3 contains the quality data for 2022 Canadian generic food-type soybeans used for making tofu, soymilk and miso. Mean 100-seed weight was 20.8 g, which is slightly higher than the mean 100-seed weight in 2021 (20.5 g). Water absorption capacity was 1.17 g of water per g of seeds, which is similar to that in 2021. The water uptake factor was 2.17 in 2022. 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 2022 Canadian generic food-type soybeans was 42.2 g per 100 g of dry matter (Table 3), which is slightly lower than the mean in 2021 (42.4 g per 100 g of dry matter). The mean oil content in 2022 generic food-type soybeans was 21.7 g per 100 g of dry matter, slightly higher than the mean in 2021 (21.5 g per 100 g of dry matter).

The mean sucrose content in 2022 generic food-type soybeans was 56.2 g per kilogram (kg) of dry matter, which is higher than the mean in 2021 (51.7 g per kg of dry matter) (Table 3). The mean total oligosaccharides content in 2022 generic food-type soybeans was 42.9 g per kg of dry matter, which is slightly higher than the mean in 2021 (39.7 g per kg of dry matter).

The mean total isoflavones content in 2022 Canadian generic food-type soybean was 3960 milligrams (mg) per kg of dry matter, which is higher than the mean in 2021 (Table 3).

## Canadian natto-type soybeans

Table 4 contains the quality data for 2022 Canadian natto-type soybeans that are used in fermented soy dishes. The mean 100-seed weight of 2022 natto-type soybean was 9.8 g, which is higher than in 2021 (8.8 g). The water absorption value was 1.21 g of water per g of seeds and the water uptake factor was 2.21, both similar to those in 2021.

The mean protein content in 2022 Canadian natto-type soybean was 38.7 g per 100 g of dry matter, higher than in 2021 (Table 4). The mean oil content was 22.0 g per 100 g of dry matter, equal to the mean in 2021.

The mean sucrose content in 2022 Canadian natto-type soybean was 51.7 g per kg of dry matter, higher than in 2021 (Table 4). The mean oligosaccharides content was 47.8 g per kg of dry matter, which is higher than that in 2021. The mean total isoflavones content was 4873 mg per kg of dry matter, which is higher than the mean in 2021.

# Acknowledgements

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The Grain Research Laboratory acknowledges the cooperation of the soybean processors, producers and grain handling facilities 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 2022 Canadian food-type soybeans by grade and growing region <sup>1</sup>

		2022			2021
		Number of samples	Mean	Range	Mean
Prairies	Soybean, No. 1 Canada	2	36.2	33.7 to 38.6	35.6
	Soybean, No. 2 Canada	6	39.5	33.9 to 44.5	39.1
	All grades	8	39.3	33.7 to 44.5	38.7
Ontario	Soybean, No. 1 Canada	51	41.4	35.2 to 45.2	42.4
	Soybean, No. 2 Canada	112	42.3	36.9 to 48.6	42.4
	All grades	163	42.0	35.2 to 48.6	42.4
Quebec	Soybean, No. 1 Canada	14	42.5	38.7 to 46.3	40.8
	Soybean, No. 2 Canada	58	42.3	37.0 to 49.0	42.1
	All grades	72	42.3	37.0 to 49.0	41.8
Canada	Soybean, No. 1 Canada	67	41.4	33.7 to 46.3	41.7
	Soybean, No. 2 Canada	176	42.2	33.9 to 49.0	42.2
	All grades	243	42.0	33.7 to 49.0	42.1

Table 2 Mean oil content (g/100 g dry matter) for 2022 Canadian food-type soybeans by grade and growing region <sup>2</sup>

		2022			2021
		Number of samples	Mean	Range	Mean
Prairies	Soybean, No. 1 Canada	2	22.7	21.4 to 24.0	21.4
	Soybean, No. 2 Canada	6	21.4	19.9 to 22.8	21.1
	All grades	8	21.3	19.7 to 24.0	21.1
Ontario	Soybean, No. 1 Canada	51	22.1	20.0 to 25.1	21.7
	Soybean, No. 2 Canada	112	21.8	18.9 to 24.0	21.6
	All grades	163	21.9	18.9 to 25.1	21.6
Quebec	Soybean, No. 1 Canada	14	22.0	20.3 to 23.2	21.9
	Soybean, No. 2 Canada	58	21.6	16.8 to 24.1	21.6
	All grades	72	21.7	16.8 to 24.1	21.7
Canada	Soybean, No. 1 Canada	67	22.1	20.0 to 25.1	21.8
	Soybean, No. 2 Canada	176	21.7	16.8 to 24.1	21.6
	All grades	243	21.8	16.8 to 25.1	21.6

<sup>1</sup> 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.

<sup>2</sup> 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 2022 Canadian generic food-type soybean composites<sup>1</sup>**

Category	Quality parameter	Number of samples	2022	2021
Physical characteristic	100-seed weight, g/100 seeds	180	20.8	20.5
	Water absorption, g H <sub>2</sub> O/g seeds	180	1.17	1.15
	Water uptake factor, g soaked wt/g seeds <sup>2</sup>	180	2.17	2.15
Chemical composition (g/100 g) <sup>3</sup>	Protein content	180	42.2	42.4
	Oil content	180	21.7	21.5
Sugar content (g/kg DM) <sup>4</sup>	Sucrose	180	56.2	51.7
	Raffinose	180	7.3	7.7
	Stachyose	180	34.7	30.9
	Verbascose	180	0.9	1.1
	Total oligosaccharides <sup>5</sup>	180	42.9	39.7
Isoflavones (mg/kg DM) <sup>6</sup>	Total isoflavones <sup>7</sup>	180	3960	2632

**Table 4 Quality data for 2022 Canadian natto-type soybean composites<sup>1</sup>**

Category	Quality parameter	Number of samples	2022	2021
Physical characteristic	100-seed weight, g/100 seeds	21	9.8	8.8
	Water absorption, g H <sub>2</sub> O/g seeds	21	1.21	1.19
	Water uptake factor, g soaked wt/g seeds <sup>2</sup>	21	2.21	2.19
Chemical composition (g/100 g) <sup>3</sup>	Protein content	21	38.7	38.3
	Oil content	21	22.0	22.0
Sugar content (g/kg DM) <sup>4</sup>	Sucrose	21	51.7	50.9
	Raffinose	21	6.2	7.5
	Stachyose	21	40.6	35.5
	Verbascose	21	1.0	1.3
	Total oligosaccharides <sup>5</sup>	21	47.8	44.3
Isoflavones (mg/kg DM) <sup>6</sup>	Total isoflavones <sup>7</sup>	21	4873	3419

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

<sup>2</sup> g soaked wt/g seeds = grams soaked weight per gram of seeds

<sup>3</sup> Results are expressed on a dry basis

<sup>4</sup> g/kg DM = grams per kilogram of dry matter

<sup>5</sup> Sum of raffinose, stachyose and verbascose

<sup>6</sup> mg/kg DM = milligrams per kilogram of dry matter

<sup>7</sup> Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides