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Quality of Canadian oilseed-type soybeans 2022

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Summary

Data on the quality of oilseed type soybeans from 2022 was collected on composite samples of Soybean, No. 1 Canada and Soybean, No. 2 Canada. The mean oil content (dry basis) for the Canadian No. 1 and No. 2 soybean composite was 22.0% (Tables 1 and 3). This is similar to the 2021 mean of 22.3% (Table 1) and slightly lower than the 5-year mean (2017 to 2021) of 21.7%. The mean protein content (dry basis) for the Canadian No. 1 and No. 2 soybean composite was 38.9% (Tables 1 and 3), which is similar to the 2021 mean of 38.6% and the 5-year (2017 to 2021) mean of 38.7% (Table 1). The mean oil and protein content for No. 1 and No. 2 soybean composites varied between the western, eastern and Maritime provinces. The western Canada (Manitoba and Saskatchewan) composite had a mean oil content of 21.3% and a mean protein content of 38.9%, whereas the eastern Canada composite (Ontario and Quebec) had a mean oil content of 22.3% and a mean protein content of 40.3% (Table 3). However, the Maritimes (New Brunswick and Prince Edward Island) composite had a mean oil content and protein content of 22.5% and 38.9%, respectively.

Introduction

The two major types of soybeans grown in Canada are:

- those commonly referred to as oilseed-type soybeans (“crush” or non-food grade)
- food-grade soybeans (used for tofu and other soy products)

This report deals with oilseed-type soybeans, which are used in the crushing industry and in animal feed production. Oilseed-type soybeans are grown to produce oil and high-protein meal. Soybean oil is used in oil-based salad dressing, shortening and margarine products. The defatted soybean meal, which is protein rich, is used to supplement livestock rations.

The Canadian soybean production area has expanded in recent years and crops are now grown from the Maritimes through to Saskatchewan (Figure 1).

At the end of the 2022 harvest, 256 samples of oilseed-type soybeans had been received by the Harvest Sample Program, much less than in 2021 (333 samples). The 2022 samples originated from Saskatchewan (7), Manitoba (90), Ontario (131), Quebec (24), and the Maritimes (4). Of the submitted samples, 20% were graded Soybean, No. 1 Canada, whereas 80% were graded Soybean, No. 2 Canada.

Quality data (oil, protein, free fatty acid, chlorophyll content and fatty acid composition) for oilseed type soybeans are based on the means of No. 1 and No. 2 soybean composite samples. This includes all samples received from western Canada (Manitoba and Saskatchewan), eastern Canada (Ontario and Quebec) and the Maritimes (New Brunswick and Prince Edward Island). Table 1 compares 2022 data to 2021 data, as well as to the 5-year mean. Oil and protein content are provided on a dry basis and on a 13% moisture basis. Quality data according to province for No. 1 and No. 2 soybean composites are presented in Tables 3 and 4.

Table 1 Quality data for 2022 and 2021 Canadian oilseed-type soybeans plus the 5-year means according to grade

Grade	Quality parameter	2022	2021	2017 to 2021 mean
Soybeans, No. 1 Canada and Soybeans, No. 2 Canada	Oil content (% dry basis)	22.0	22.3	21.7
	Oil content (% 13% moisture)	19.1	19.4	18.9
	Protein content ¹ (% dry basis)	38.9	38.6	38.7
	Protein content (% 13% moisture)	33.8	33.6	33.7
	Defatted meal protein of the meal (% 13% moisture)	43.4	43.3	42.8
	Chlorophyll content (mg/kg ² in seed)	0.5	0.4	0.4
	Free fatty acids ³ (%)	.13	0.07	0.13
	Oleic acid (% in oil)	20.3	21.8	20.6
	Linoleic acid (% in oil)	54.5	53.8	54.4
	α-Linolenic acid (% in oil)	8.7	8.2	9.0
	Total saturated fatty acids ⁴ (% in oil)	15.5	15.4	15.3
	Iodine value (units)	135.0	133.6	135.7

¹ protein content calculated from nitrogen (N) content using N x 6.25

² mg/kg = milligrams per kilogram

³ calculated as % of oleic acid

⁴ sum of all saturated fatty acid from C12:0 to C24:0

Figure 1 Soybean production areas in Canada



Source: [Growing Areas : SOY Canada](#)

Weather and production review

Weather

In eastern Canada, soybean seeding began in May, with some areas in Ontario experiencing rain delays. Quebec experienced ideal planting conditions in the spring and 70% of the crop had been planted by mid-May. Increased precipitation at the end of May pushed seeding into June. Most of the soybean crop in eastern Canada had been planted by mid-June.

In Ontario precipitation during the growing season was highly variable. Western and southern areas of the province received below average precipitation which resulted in crop stress while above average precipitation in eastern Ontario resulted in good growing conditions. Most of Quebec experienced cooler temperatures and lack of moisture throughout the growing season. Favorable harvesting conditions in the fall, led to a relatively quick harvest with most of the soybean crop harvested by mid-October.

In western Canada, an extremely wet spring with heavy rain delayed soybean seeding in Manitoba and only 40% of the crop had been planted by May 31. Most of the crop had been planted by mid-June. The soybeans thrived under hot humid conditions and frequent rainfalls. The harvest period was extended due to late seeding and rain delays in the fall. By late October, most of the soybean crop had been harvested.

In Saskatchewan, a late snow melt and cool temperatures delayed much of the seeding. Seeding was 52% complete by mid-May and not finished until early June. Significant widespread moisture helped crops progress. Dry weather in September and October allowed the producers to harvest with few delays. By mid-October, 92% of the crop had been harvested.

Sources:

[Manitoba crop reports](#)

[Saskatchewan crop reports](#)

[Field Crop News](#)

Production and grade

Seeded area and production data for 2022 and 2021 are presented in Table 2. In 2022, seeded soybean areas decreased to 2,111,000 hectares (ha) from 2,130,000 ha in 2021.

Canada's overall soybean production increased steadily from 2000 to 2022 due to increased production in Ontario. Production in the west has decreased in recent years, however, due mainly to poor weather conditions and uncertainty in the market.

In 2022, soybean production in Canada increased approximately 4% compared to 2021 (Table 2). Approximately 60.5% of Canadian soybeans were produced in eastern Canada, 37.9% in western Canada and 1.6% in the Maritimes.

Table 2 Seeded area and production for Canadian soybeans in 2022 and 2021¹

Province	Seeded area (thousand hectares)		Production (thousand tonnes)		5-year mean production (thousand tonnes)
	2022	2021	2022	2021	2017 to 2021
Manitoba	459,200	532,900	1,318,459	963,764	1,389,463
Saskatchewan	18,400	34,400	36,883	50,935	215,626
Western Canada	477,600	567,300	1,355,342	1,014,699	1,605,089
Ontario	1,246,600	1,188,200	3,996,015	4,082,331	3,874,474
Quebec	386,800	374,500	1,126,353	1,101,708	1,154,984
Eastern Canada	1,633,400	1,562,700	5,122,368	5,184,039	5,029,458
Total Canada	2,111,000	2,130,000	6,477,710	6,198,738	6,634,546

¹ Statistics Canada Table 001-0010 - [Estimated areas, yield, production and average farm price of principal field crops, in metric units.](#)

Harvest samples

In 2022, the Canadian Grain Commission's Harvest Sample Program received 256 soybean samples, 77 less than in 2021 (Table 3). The distribution of samples was:

- 4 from the Maritimes (7 in 2021)
- 155 from eastern Canada (195 in 2021)
- 97 from western Canada (131 in 2021)

Canadian Grain Commission inspectors graded the samples according to [the Official Grain Grading Guide](#). In 2022, almost all of the submitted soybean samples were graded No. 1 or No. 2. The grade distribution was relatively similar between eastern and western Canada, with 99.4% of the samples from the east (Maritimes, Ontario, and Quebec) being graded Soybeans, No. 1 Canada and Soybeans, No. 2 Canada compared to 100 % from the west (Manitoba and Saskatchewan).

Key quality factors for oilseed-type soybeans are the content of oil, protein, free fatty acid (FFA) and chlorophyll and the composition of fatty acids. Oil and protein content give quantitative estimates of soybean oil and of the defatted meal used for protein in animal feed. Fatty acid composition provides information about the nutritional, physical and chemical characteristics of the oil extracted from the beans.

Individual samples were analyzed for oil and protein content using a FOSS DS2500 near-infrared (NIR) spectrometer, calibrated and verified against the appropriate samples analysed by reference methods. Grade composite samples were analysed by reference methods for oil, protein, FFA, chlorophyll and fatty acid composition. [Oilseed method and test procedures](#) are available on our website.

Oil and protein content

In 2022, the mean oil content was 22.0% on a dry basis (19.1% at 13% moisture) for the No. 1 and No. 2 soybean composite. These values are similar to the 2021 means (22.3% on a dry basis, 19.4% at 13% moisture) and the 5-year means (21.7% on a dry basis, 18.9% at 13% moisture) (Table 1). The oil content of individual samples ranged from 19.5% to 24.8% on a dry basis and 17.0% to 21.6% at 13% moisture. Figure 4 shows the oil content trends for eastern Canada, western Canada and all of Canada since 2006.

The mean protein content for the No. 1 and No. 2 soybean composite was 38.9% on a dry basis and 33.8% at 13% moisture (Table 1). These values are slightly higher than the results in 2021 (38.6% on a dry basis and 33.6% at 13% moisture) but similar to the 5-year mean (38.7% on a dry basis and 33.7% at 13% moisture). The protein content of samples from eastern Canada had a similar protein content (38.9%) when compared to western Canada (38.9%) and higher than the Maritimes (37.7%) (Table 3). For the top two grades combined, the protein content of individual samples ranged from 33.8% (29.7% at 13% moisture) to 43.3% (37.7% at 13% moisture). Figure 2 shows the protein content trends from eastern and western Canada since 2006. Mean protein content in western Canadian samples has been consistently lower and has slightly more yearly variability than mean protein content in samples from eastern Canada.

Figure 3 presents the protein content of fully defatted soybean meal. The protein content of the defatted soybean meal from western Canada is slightly lower (49.4%) than that in samples from eastern Canada (50.2%).

Environmental growing conditions are usually responsible for year-to-year variations, whereas genetics, or varietal differences, are usually responsible for trends over several years. A combination of genetics and environmental growing conditions is responsible for differences between eastern and western soybeans. Currently, breeding focuses primarily on yield and other agronomic factors. Quality factors, such as oil or protein content, are not considered when registering new soybean varieties in Canada.

Fatty acid composition

Table 4 shows the fatty acid composition of the soybean No. 1 and No. 2 composites according to province in 2022. Linoleic acid (C18:2), the main fatty acid found in soybean oil, had a mean value of 54.5%, whereas the 2021 mean was 53.8%. Oleic acid (C18:1), the second most important fatty acid in soybeans, had a mean value of 20.3% in 2022, which is much lower than the 2021 mean of 21.9%. The other important unsaturated fatty acid, α -linolenic acid (C18:3), had a mean value of 8.7% (8.2% in 2021). Total saturates had a mean value of 15.5% in soybeans from all of Canada.

Iodine value estimates the level of fatty acid unsaturation in oil. The higher the number of double bonds in the oil, the higher the iodine value and level of unsaturation. For 2022, both the mean α -linolenic acid and the mean linoleic acid values were higher than in 2021 and accordingly, the iodine value in 2022 (135.0 units) is higher than in 2021 (133.6 units). Figure 5 presents the iodine value trends since 2006 for eastern Canada, western Canada and all of Canada. The yearly variations reflect the environmental differences, including geographic factors and climatic factors such as temperature and precipitation.

There is no requirement to control the fatty acid composition of Canadian oilseed-type soybeans. Varieties can, therefore, show a large variation in fatty acid composition. Weather also plays a role in year-to-year fatty acid composition variability. In hot and dry conditions, seeds tend to produce an oil with more saturation. For example, seeds will produce less polyunsaturated fatty acids, such as α -linolenic and linoleic acids, and more total saturates and oleic acids. The opposite is observed if seeds are grown in cool conditions.

Free fatty acid content

Composites of No. 1 and No. 2 soybeans had a mean FFA value of 0.13% in 2022 (Table 1 and 3), which is higher than results in 2021 (0.07%). High FFA values are mainly due to seed damage caused by wet harvest conditions and improper storage.

Chlorophyll content

Chlorophyll content is an indicator of maturity in soybeans: the lower the chlorophyll the more mature the seed. Chlorophyll content for the top grades of soybeans was similar in the western provinces at 0.5 milligrams per kilograms (mg/kg) compared to the eastern and Maritime provinces at 0.5mg/kg and 0.4 mg/kg, respectively (Table 3).

Figure 2 Seed protein content (% dry basis) of Canadian oilseed-type soybeans from 2006 to 2022

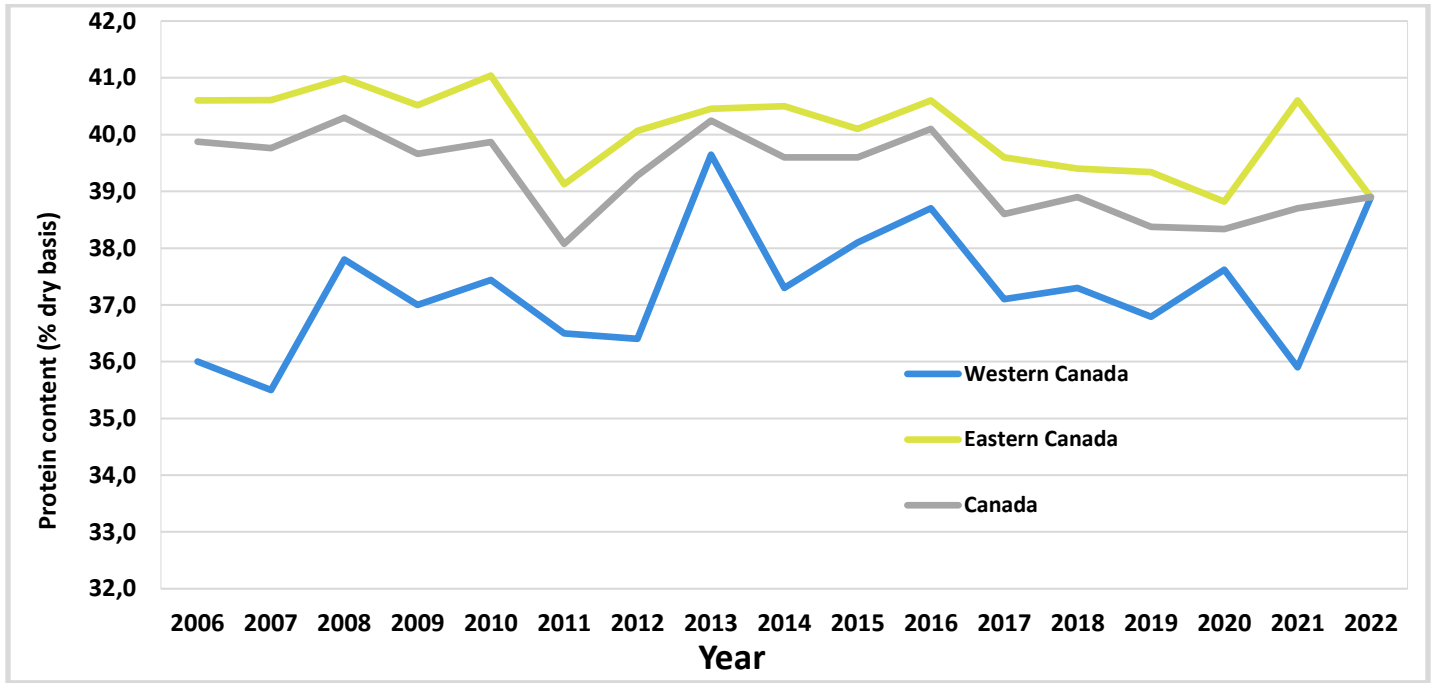


Figure 3 Defatted meal protein content (% dry basis) of Canadian oilseed-type soybeans from 2006 to 2022

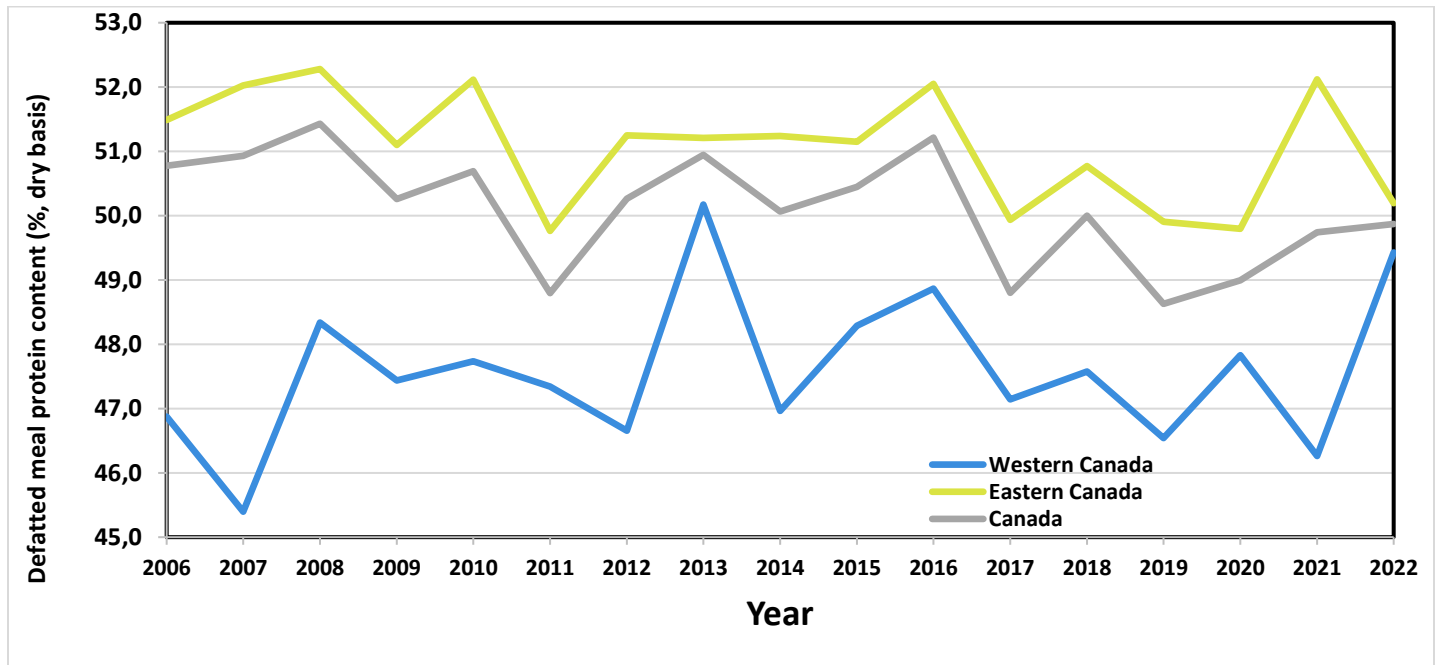


Figure 4 Seed oil content (% dry basis) of Canadian oilseed-type soybeans from 2006 to 2022

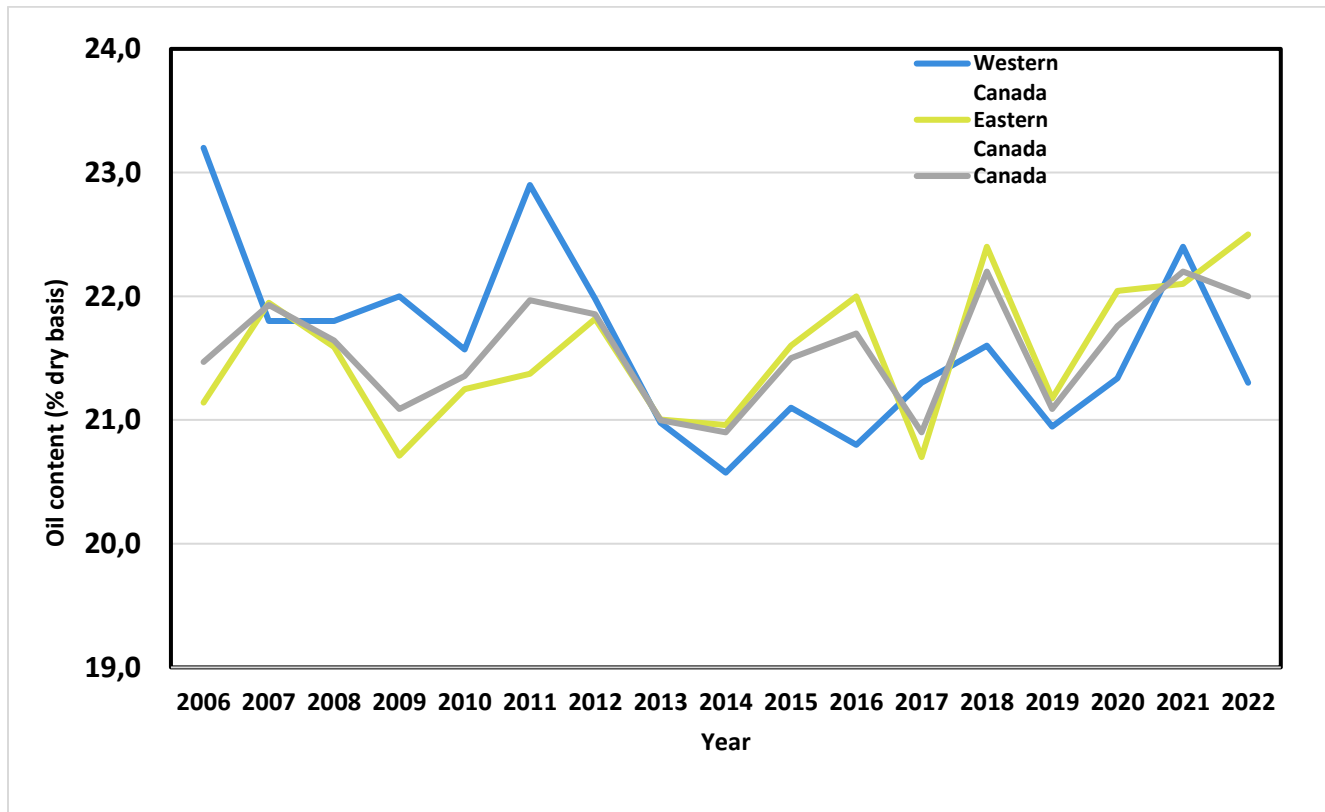


Figure 5 Oil iodine values (units) of Canadian oilseed-type soybeans from 2006 to 2022

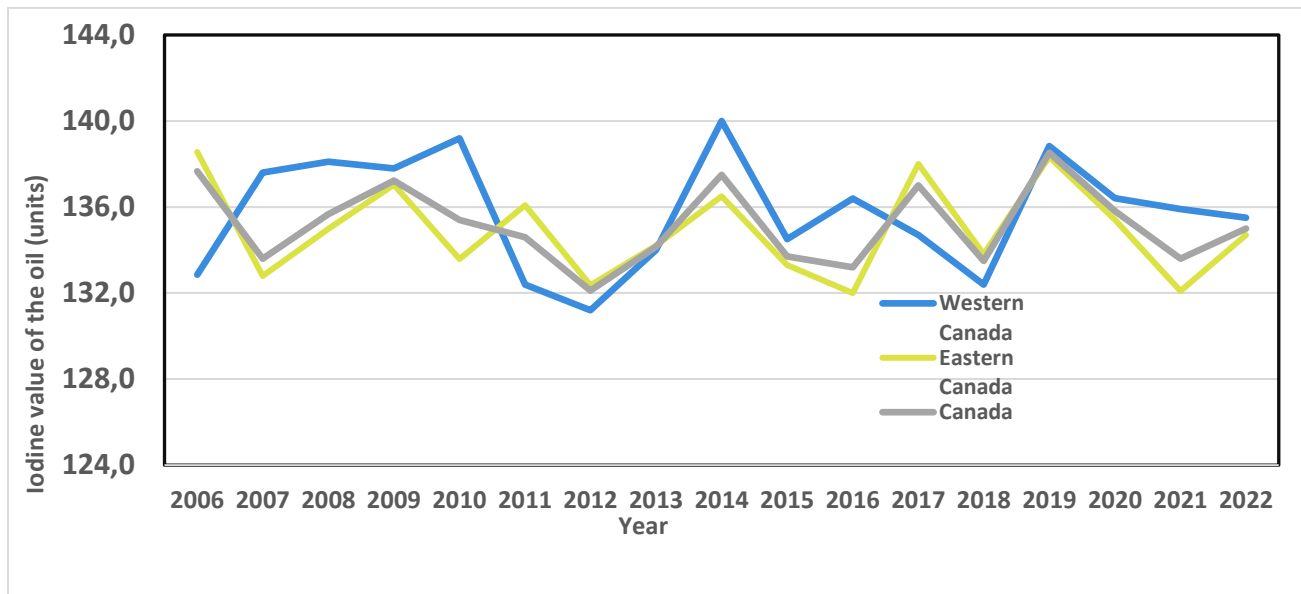


Table 3 Oil, protein, chlorophyll and free fatty acid content of 2022 Soybeans, No. 1 Canada and Soybeans No. 2, Canada composite samples according to province

Grade	Province	Number of samples	Oil (% , dry basis)			Protein ¹ (%, dry basis)			Chlorophyll (mg/kg ⁴)	Free fatty acids ⁵ (%)
			Mean	Min ²	Max ³	Mean	Min	Max		
Soybeans, No. 1 Canada and Soybeans, No. 2 Canada	Manitoba	90	21.3	19.5	23.3	38.9	34.5	43.3	0.50	0.15
	Saskatchewan	7	21.1	20.6	22.4	38.5	36	40.5	1.10	0.02
	Western Canada	97	21.3	19.5	23.3	38.9	34.5	43.3	0.50	0.15
	Ontario	131	22.5	21.0	24.8	38.8	33.8	41.8	0.50	0.12
	Quebec	24	22.5	21.1	23.7	39.6	37.6	42.0	0.50	0.12
	Eastern Canada	155	22.3	19.1	24.9	40.3	33.1	45.0	0.21	0.10
	Maritimes	4	22.5	21.0	24.8	38.9	33.8	42.0	0.5	0.05
	Canada	256	22.0	19.5	24.8	38.6	33.8	43.3	0.50	0.13

¹ protein content calculated from nitrogen (N) content using N x 6.25

² Min = minimum

³ Max = maximum

⁴ mg/kg = milligrams per kilogram

⁵ calculated as % of oleic acid

Table 4 Main fatty acid content and iodine value of oil in 2022 Soybeans, No. 1 Canada and Soybeans, No. 2 Canada composite samples according to province

Grade	Province	Number of samples	Fatty acid composition (% in oil)					SFA ¹	Iodine value (units) ²
			Palmitic C16:0	Stearic C18:0	Oleic C18:1	Linoleic C18:2	α-Linolenic C18:3		
Soybeans, No. 1 Canada and Soybeans, No. 2 Canada	Manitoba	90	10.5	4.2	21.1	54.4	9.1	15.5	135.5
	Saskatchewan	7	10.7	4.5	20.2	53.6	9.2	16.2	134.4
	Western Canada	97	10.5	4.2	21.0	54.3	9.1	15.6	135.5
	Ontario	131	10.0	4.3	20.6	54.5	8.5	15.5	134.6
	Quebec	24	10.7	4.7	20.1	55.2	8.1	15.6	134.5
	Eastern Canada	155	10.1	4.4	20.5	54.6	8.4	15.5	134.6
	Maritimes	4	10.4	3.7	18.7	56.3	9.2	14.9	138.0
	Canada	256	10.5	4.2	20.3	54.5	8.7	15.5	135.0

¹ SFA = saturated fatty acids, sum of all saturated fatty acids from C12:0 to C24:0

² calculated from the fatty acid composition

Acknowledgments

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