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Quality of western Canadian flaxseed 2021

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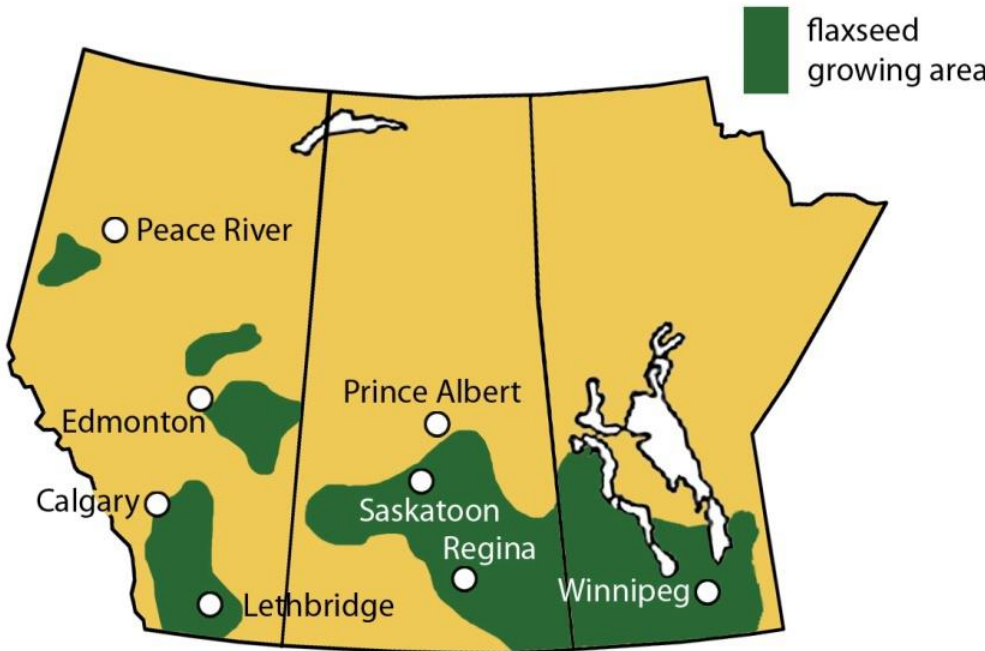
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Introduction

This report presents data and information on the quality of flaxseed grown in western Canada in 2021. Samples of flaxseed submitted to the Harvest Sample Program by producers and grain companies were analysed by the Oilseeds Program for quality parameters, including oil, protein, free fatty acids, fatty acid composition and iodine values. Figure 1 illustrates the traditional growing areas of flaxseed in the Prairie provinces of western Canada.

Figure 1 Traditional flaxseed growing areas in the Prairie provinces of Canada



Summary

The 2021 western Canadian flaxseed samples received by the Harvest Sample Program contained lower oil content, higher protein content and lower iodine values than the 2020 harvest samples.

Tables 1 and 2 present the data for 2021 brown flaxseed graded Flaxseed, No. 1 Canada Western. Mean oil content was 44.3%, which is lower than the 2020 mean (45.6%) and lower than the 10-year mean (45.8%). Mean protein content was 26.4%, which is higher than both the 2020 mean (23.0%) and the 10-year mean (22.3%). Iodine value was 186.3 units, which is lower than both the 2020 mean value (189.0 units) and 10-year mean (191.6 units). Oil and protein values are reported on a dry matter basis.

Table 1 Quality data for brown flaxseed (Flaxseed, No. 1 Canada Western) from 2021 harvest samples

Quality parameter	2021	2020	2011 to 2020 mean
Oil content ¹ , %	44.3	45.6	45.8
Protein content ² , %	26.4	23.0	22.3
Free fatty acids, %	0.24	0.16	0.18
Iodine value, units	186.3	189.0	191.6

¹ calculated on a dry matter basis

² protein content calculated from nitrogen content using N x 6.25 on a dry matter basis

Table 2 Main fatty acid composition of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2021 harvest samples

Fatty acid, % in oil	2021	2020	2011 to 2020 mean
Palmitic acid (C16:0)	5.2	5.3	5.1
Stearic acid (C18:0)	3.6	3.7	3.4
Oleic acid (C18:1)	20.3	18.7	18.3
Linoleic acid (C18:2)	15.6	15.5	15.3
α-Linolenic acid (C18:3)	54.1	58.8	57.1

Tables 3 and 4 present the data for 2021 yellow flaxseed graded Flaxseed, No. 1 Canada Western. Mean oil content was 44.9%, which is lower than the 2020 mean (46.4%). Mean protein content was 27.4%, which is higher than the 2020 mean (23.8%). Iodine value was 199.6 units, which is slightly higher than the 2020 value (198.5 units). Oil and protein values are reported on a dry matter basis.

Table 3 Quality data for yellow flaxseed (Flaxseed, No. 1 Canada Western) from 2021 harvest samples

Quality parameter	2021	2020
Oil content ¹ , %	44.9	46.4
Protein content ² , %	27.4	23.8
Free fatty acids, %	0.30	0.21
Iodine value, units	199.6	198.5

¹ calculated on a dry matter basis

² protein content calculated from nitrogen content using N x 6.25 on a dry matter basis

Table 4 Main fatty acid composition of yellow flaxseed (Flaxseed, No. 1 Canada Western) from 2021 harvest samples

Fatty acid, % in oil	2021	2020
Palmitic acid (C16:0)	5.0	5.0
Stearic acid (C18:0)	3.1	3.2
Oleic acid (C18:1)	15.1	15.2
Linoleic acid (C18:2)	13.4	14.3
α-Linolenic acid (C18:3)	62.4	61.4

Weather and production review

Seeding and growing conditions

The Prairie provinces saw extreme drought during the 2021 growing season. Seeding started earlier than usual in Manitoba due to a lack of snow and dry soils. Most seeding began in early to mid April. Some of the emerging crop received frost damage in late May. For most of June and July, crops experienced drought conditions as there was little to no precipitation. Most of the harvest was completed by mid October.

In Saskatchewan, most of the seeding was completed by the last week of May. Lack of topsoil moisture and strong winds were the main causes for concern. Prolonged heat and limited precipitation for most of June and July impacted the quality and yields of most crops. Harvest started early in 2021 with most of the crops in bins by early October.

Like Manitoba and Saskatchewan, areas in Alberta also experienced a lack of spring precipitation. Although it was a concern, it allowed seeding to occur early and be mostly completed by the first week of June. Record breaking temperatures in July, combined with a lack of precipitation, caused growing conditions to deteriorate and reduced yields. In August, low to moderate precipitation was received throughout the province but it came too late to benefit most of the flaxseed crops. Favorable weather in September allowed for an early harvest that was mostly completed by the first week of October.

Sources:

[Manitoba seasonal crop reports](#)

[Saskatchewan crop reports](#)

[Alberta crop reports](#)

Production and grade information

Western Canadian farmers seeded 415,100 hectares (ha) of flaxseed in 2021 (Table 5), which is higher than the seeded area in 2020 (376,000 ha). The 2021 yield was estimated to be 860 kilograms per hectare (kg/ha). Flaxseed production for the 2021 harvest was 346,100 metric tonnes, which is a decrease from 2020 (577,600 metric tonnes). Due to the extreme weather in 2021, there was a decrease in the metric tonnes of flaxseed produced in Manitoba, Saskatchewan and Alberta: 39,500 (46,000 in 2020), 246,000 (453,100 in 2020) and 59,600 (78,600 in 2020), respectively.

Flaxseed samples were graded by Canadian Grain Commission grain inspectors according to [the Official Grain Grading Guide](#). In 2021, 97.2% of the submitted flaxseed samples were graded Flaxseed, No. 1 Canada Western, while the remaining 2.8% were graded Flaxseed, No. 2 Canada Western or lower.

Table 5 Seeded area and production of western Canadian flaxseed¹

Province	Seeded area (thousand hectares)		Production (thousand tonnes)		Average production (thousand tonnes)
	2021	2020	2021	2020	2011 to 2020
Manitoba	27.8	26.5	39.5	46.0	56.0
Saskatchewan	320.0	310.3	246.0	453.1	488.6
Alberta	57.3	39.3	59.6	78.6	69.8
Western Canada	415.1	376.1	345.1	577.7	614.4

¹ Source: Statistics Canada. [Table 32-10-0359-01](#) Estimated areas, yield, production, average farm price and total farm value of principal field crops, in metric and imperial units

Harvest samples

Flaxseed samples received by the Harvest Sample Program were cleaned to remove dockage prior to testing. Individual samples were analysed for oil content, protein content and iodine values using a Foss NIR Systems 6500 scanning near-infrared spectrometer, calibrated to and verified against the appropriate reference methods. Composite samples were used for analyses that are more precise and detailed, including free fatty acid (FFA) content and fatty acid composition. Composites of brown flaxseed graded Flaxseed, No. 1 Canada Western were prepared by combining brown flaxseed samples for each province. Composites of flaxseed graded Flaxseed, No. 2 Canada Western, Flaxseed, No. 3 Canada Western and Flaxseed, Sample Canada Western combine all samples from western Canada rather than from each province.

The 2021 harvest report includes 235 brown flaxseed samples compared to 276 in 2020. Manitoba contributed 38 samples, Saskatchewan 168 samples and Alberta 29 samples of Flaxseed No. 1 Canada Western samples. Three samples were graded Flaxseed, No. 2 Canada Western, 2 as Flaxseed, No. 3 Canada Western and 1 as Flaxseed, Sample Canada Western.

In 2021, the Harvest Sample Program received 11 samples of yellow flaxseed, compared to 14 samples in 2020. Of the 11 samples, 10 samples were graded as Flaxseed, No. 1, Canada Western and 1 was graded as Flaxseed, Sample Canada Western.

Quality of western Canadian flaxseed

Tables 6 and 7 contain detailed information on the quality of brown flaxseed harvested in western Canada while Tables 8 and 9 contain quality data for yellow flaxseed. The number of harvest samples collected from each province may not represent the actual production or grade distribution. There were, however, sufficient samples to provide good quality information for each province. The samples received followed the historical trends in provincial production.

Flaxseeds are used as a source of oil and protein meal. Alpha-linolenic acid is an omega-3 fatty acid and can play an important role in maintaining good health in humans and animals. This is the main factor for the increased use of whole and ground flaxseed in cereals and baked goods. Flaxseed is also used in animal feed. For example, flax incorporated into chicken feed can result in hen's producing eggs that are high in omega-3 fatty acids.

Iodine value is a measure of the overall unsaturation of oil and is calculated from the fatty acid composition. Oils with higher iodine values (with more unsaturation), polymerize more rapidly in the presence of air. In flaxseed, iodine value is directly related to the amount of α -linolenic acid present in the oil. Alpha-linolenic acid is one of the most important quality factors for the industrial use of flaxseed oil as it is responsible for most of its drying properties.

Table 6 Quality data for 2021 western Canadian brown flaxseed according to grade and province

Grade	Province	Number of samples	Oil content ¹ , %			Protein content ² , %			Iodine value, units		
			Mean	Min ³	Max ⁴	Mean	Min ⁸	Max ⁴	Mean	Min ⁸	Max ⁴
Flaxseed, No. 1 Canada Western	Western Canada	229	44.3	40.6	46.9	26.4	20.1	30.3	186.3	169.5	196.7
	Manitoba	34	44.7	41.1	46.3	25.4	20.1	29.4	188.9	179.7	196.1
	Saskatchewan	166	44.3	40.6	46.9	25.8	21.2	30.3	186.3	169.5	196.7
	Alberta	29	3	41.4	46.4	26.2	23.1	28.4	186.6	177.5	196.3
Flaxseed, No. 2 Canada Western	Western Canada	3	41.7	39.7	45.5	26.8	25.2	28.6	187.8	179.8	196.3
Flaxseed, No. 3 Canada Western	Western Canada	2	45.8	45.4	46.2	26.6	25.7	27.5	187.8	181.8	193.8
Flaxseed, Sample Canada Western	Western Canada	1	45.7	-	-	22.1	-	-	182.6	-	-

¹ calculated on a dry matter basis

² protein content calculated from nitrogen content using N x 6.25 on a dry matter basis

³ Min = minimum

⁴ Max = maximum

Table 7 Fatty acid composition and free fatty acid content of brown flaxseed (Flaxseed, No.1 Canada Western) from 2021 harvest samples

Grade	Province	Number of samples	Fatty acid composition, %					Free fatty acids, %
			Palmitic C16:0	Stearic C18:0	Oleic C18:1	Linoleic C18:2	Alpha-linolenic C18:3	
Flaxseed, No. 1 Canada Western	Western Canada	229	5.2	3.6	20.3	15.6	54.1	0.24
	Manitoba	34	5.1	3.5	19.6	15.3	55.4	0.34
	Saskatchewan	166	5.2	3.7	20.5	15.7	53.9	0.22
	Alberta	29	5.0	3.7	20.4	15.8	54.1	0.26

Table 8 Quality data for 2021 western Canadian yellow flaxseed according to grade and province

Grade	Province	Number of samples	Oil content ¹ , %			Protein content ² , %			Iodine value, units		
			Mean	Min ³	Max ⁴	Mean	Min ⁸	Max ⁴	Mean	Min ⁸	Max ⁴
Flaxseed, No. 1 Canada Western	Western Canada	10	44.9	42.8	47.3	27.4	23.2	30.0	199.6	175.5	212.6
	Manitoba	2	46.4	45.5	47.3	24.8	23.2	26.3	207.8	207.4	208.2
	Saskatchewan	6	44.4	42.8	46.1	26.8	24.5	29.2	192.8	175.5	206.5
	Alberta	2	44.4	43.9	44.8	29.0	28.0	30.0	206.7	200.8	212.6
Flaxseed, No. 2 Canada Western	Western Canada	1	43.8	-	-	26.1	-	-	182.8	-	-

¹ calculated on a dry matter basis

² protein content calculated from nitrogen content using N x 6.25 on a dry matter moisture basis

³ Min = minimum

⁴ Max = maximum

Table 9 Fatty acid composition and free fatty acid content of yellow flaxseed (Flaxseed, No. 1 Canada Western) from 2021 harvest samples

Grade	Provinces	Number of samples	Fatty acid composition ³ , %					Free fatty acids, %
			Palmitic C16:0	Stearic C18:0	Oleic C18:1	Linoleic C18:2	Alpha-linolenic C18:3	
Flaxseed, No. 1 Canada Western	Western Canada	10	5.0	3.1	15.1	13.4	62.4	0.30

Oil content

In 2021, the mean oil content of brown flaxseed graded Flaxseed, No. 1 Canada Western was 44.3%. This is lower than the 2020 mean (45.6%) and lower than the 10-year mean (45.8%) (Figure 2). The mean oil content of flaxseed samples from Manitoba (44.4%) is similar to that of Saskatchewan (44.2%) and Alberta (44.1%) (Table 6). In samples from across western Canada, the oil content of brown flaxseed graded Flaxseed, No. 1 Canada Western ranged from 40.6% to 46.9% (Table 6).

In 2021, the mean oil content of yellow flaxseed graded Flaxseed, No. 1 Canada Western was 44.9%. This is lower than the 2020 mean of 46.4%. The mean oil content of samples from Manitoba (46.4%) is higher than that of Saskatchewan (44.4%) and Alberta (44.4%) (Table 8). In samples from across western Canada, the oil content of yellow flaxseed graded Flaxseed, No. 1 Canada Western ranged from 42.8% to 47.3% (Table 8).

Protein content

In 2021, the mean protein content of brown flaxseed graded Flaxseed, No.1 Canada Western was 26.4%. This is higher than the 2020 mean (23.0%), and higher than the 10-year mean (22.3%) (Figure 3). The mean protein content of samples from Manitoba (25.4%) is similar to that of Saskatchewan (25.8%) and slightly lower than Alberta (26.2%). In samples from across western Canada, the protein content of brown flaxseed graded Flaxseed, No. 1 Canada Western ranged from 20.1% to 30.3% (Table 6).

The mean protein content of yellow flaxseed graded Flaxseed, No.1 Canada Western was 27.4%. This is higher than the 2020 mean of 23.8%. The mean protein content of samples from Manitoba (24.8%) is lower than that of Saskatchewan (26.8%) and Alberta (29.0%). In samples from across western Canada, the protein content of yellow flaxseed graded Flaxseed, No. 1 Canada Western ranged from 23.2% to 30.0% (Table 8).

Free fatty acid content

In 2021, the mean free fatty acid (FFA) content of brown flaxseed graded Flaxseed, No. 1 Canada Western was 0.24%. This is higher than the mean in 2020 (0.16%) and the 10-year mean of 0.17% (Figure 4). The mean FFA content of samples from Manitoba (0.34%) and Alberta (0.26%) is higher than the mean found in samples from Saskatchewan (0.22%) (Table 7).

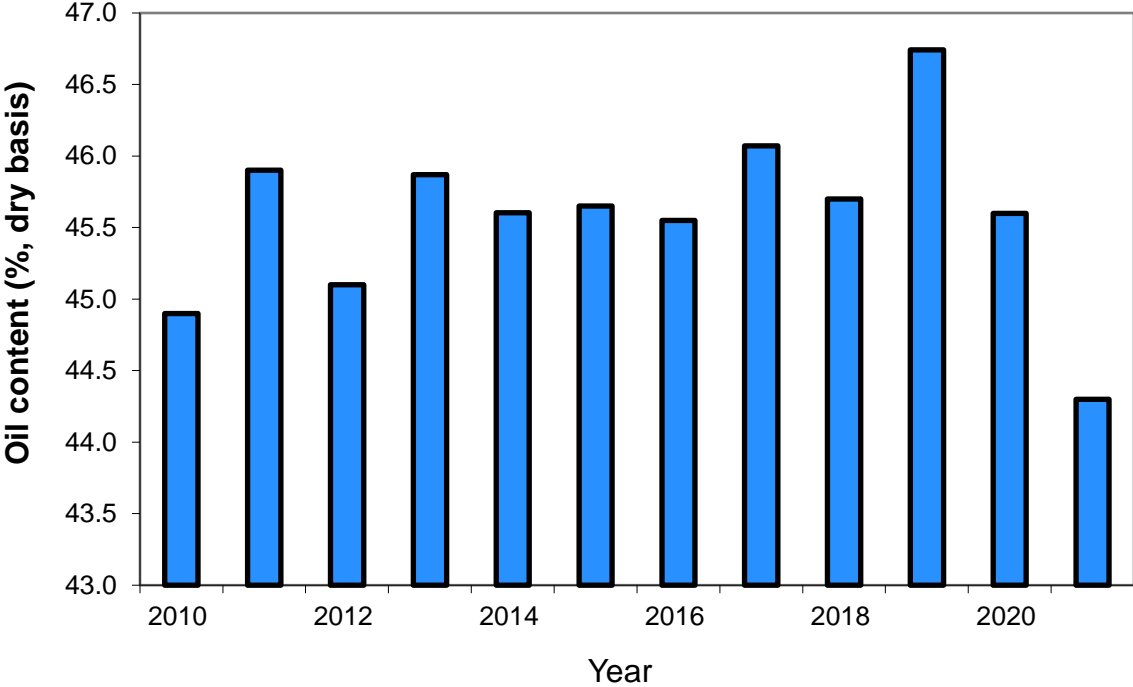
The mean FFA content of yellow flaxseed graded Flaxseed, No. 1 Canada Western was 0.30%, which is higher than the 2020 mean of 0.21%.

Fatty acid composition

In 2021, the mean α -linolenic acid (C18:3) content of brown flaxseed graded Flaxseed, No. 1 Canada Western was 54.1%. This is similar to the 2020 mean (54.8%) and the 10-year mean of 57.1% (Figure 5). Mean α -linolenic acid (C18:3) content of yellow flaxseed graded Flaxseed, No. 1 Canada Western was 62.4%.

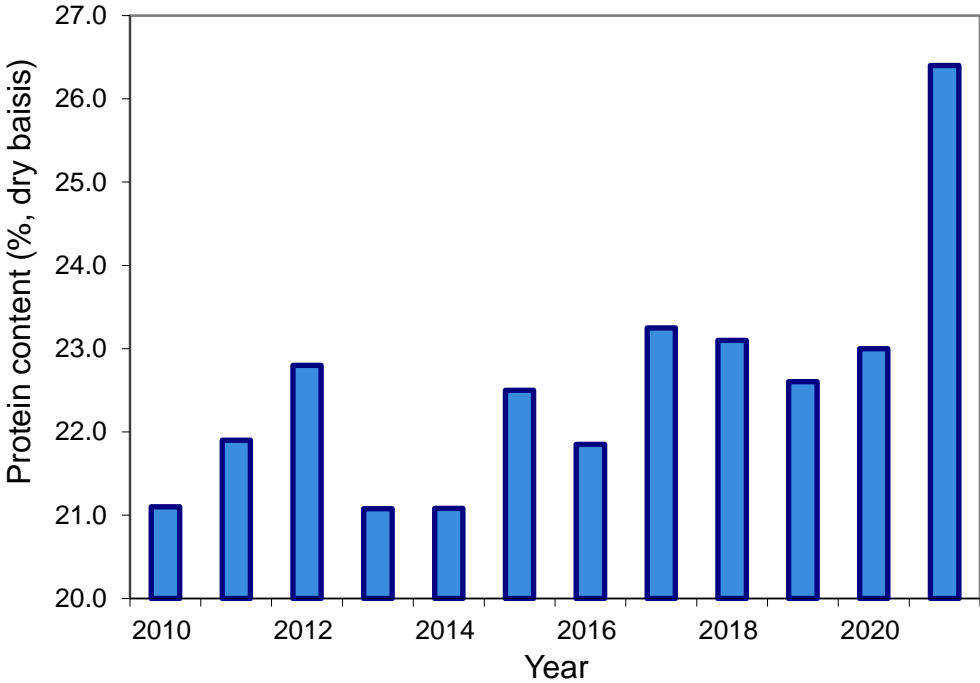
In 2021, the mean iodine value of brown flaxseed graded Flaxseed, No. 1 Canada Western was 186.3 units. This is lower than the 2020 mean (189.0 units) and the 10-year mean of 191.6 units (Figure 6). The mean iodine value of yellow flaxseed graded Flaxseed, No. 1 Canada Western was 199.6 units.

Figure 2 Mean oil content (% dry basis) of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2010 to 2021 harvest samples



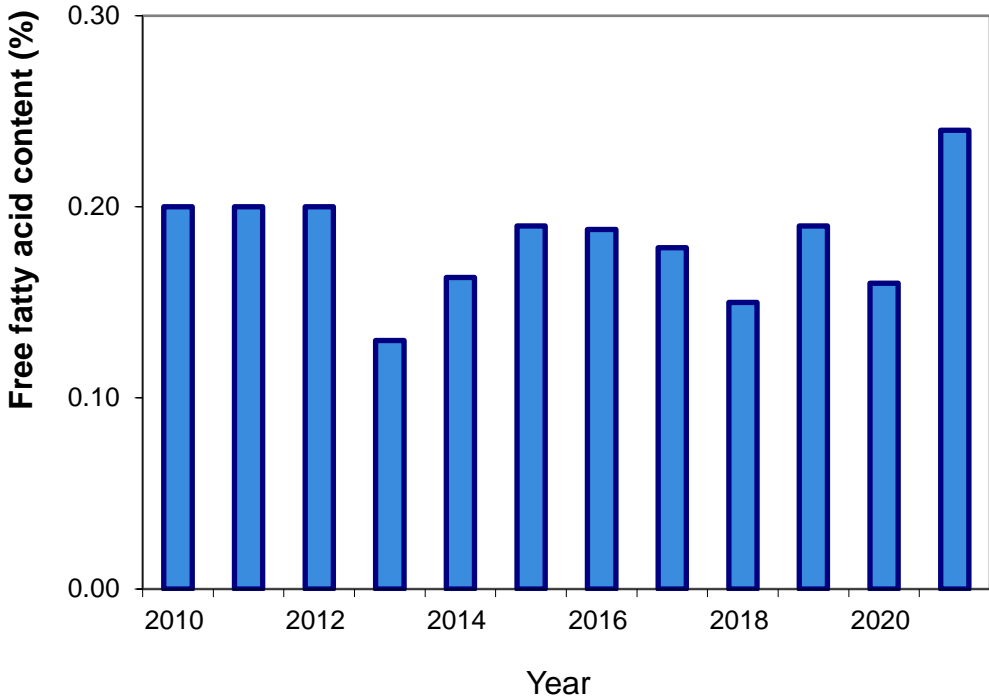
2021 mean 44.3%
 2020 mean 45.6%
 2011 to 2020 mean 45.8%

Figure 3 Mean protein content (% dry basis) of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2010 to 2021 harvest samples



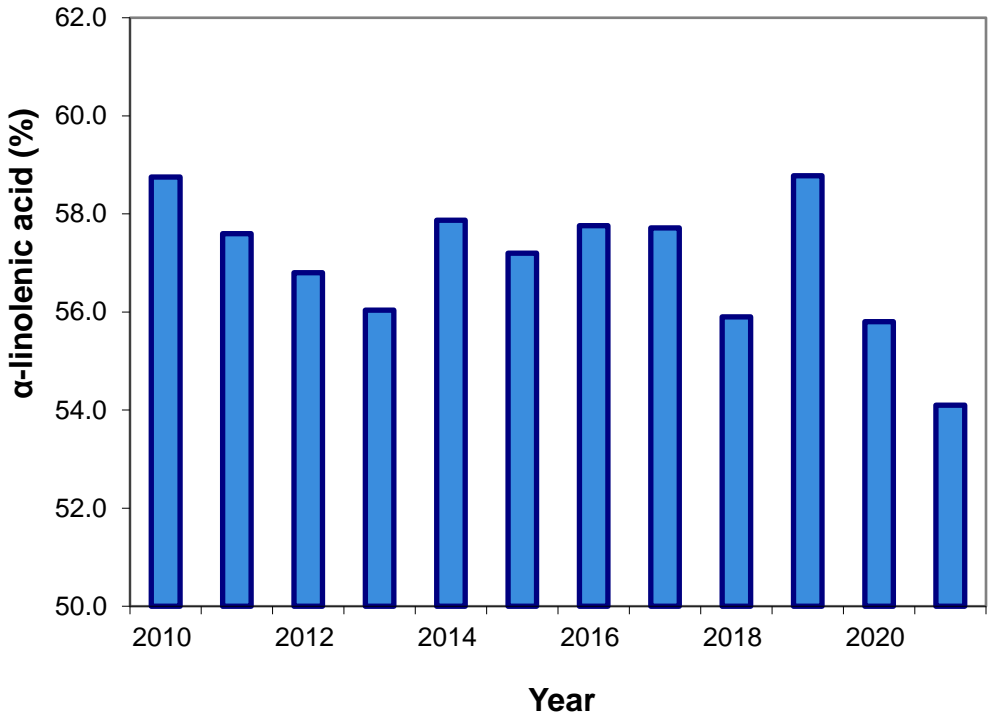
2021 mean 26.4%
 2020 mean 23.0%
 2011 to 2020 mean22.3%

Figure 4 Mean free fatty acid content (%) of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2010 to 2021 harvest samples



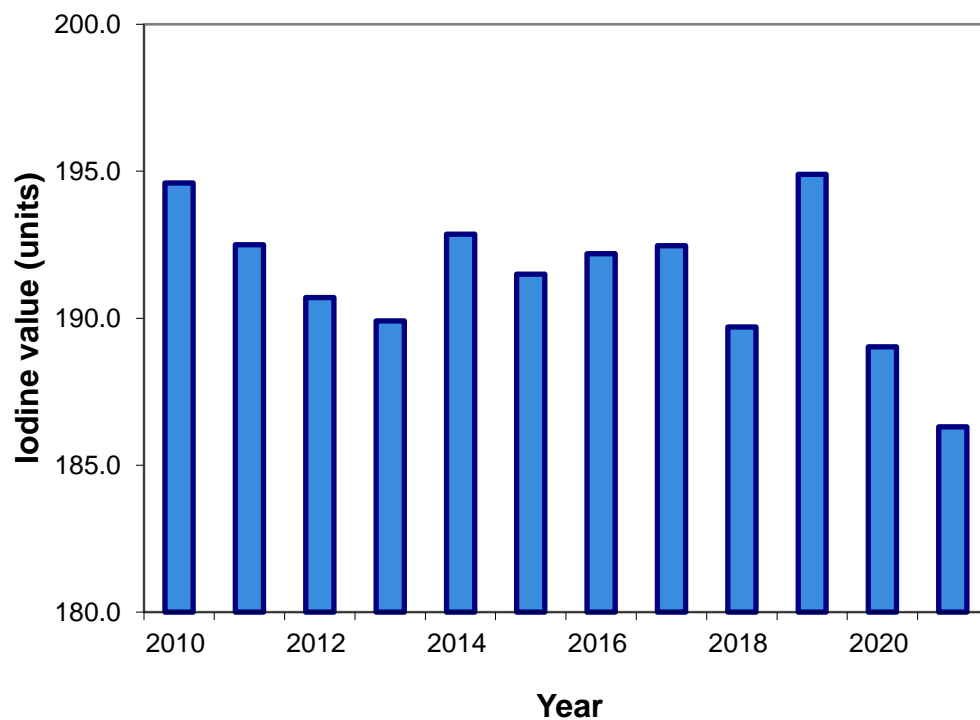
2021 mean 0.24%
 2020 mean 0.16%
 2011 to 2020 mean0.17%

Figure 5 Mean α -linolenic acid content (% in oil) of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2010 to 2021 harvest samples



2021 mean54.1%
 2020 mean55.8%
 2011 to 2020 mean57.1%

Figure 6 Mean iodine values (units) of brown flaxseed (Flaxseed, No. 1 Canada Western) from 2010 to 2021 harvest samples



2021 mean 186.3
 2020 mean 189.0
 2011 to 2020 mean191.6