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Quality of western Canadian flaxseed

2019

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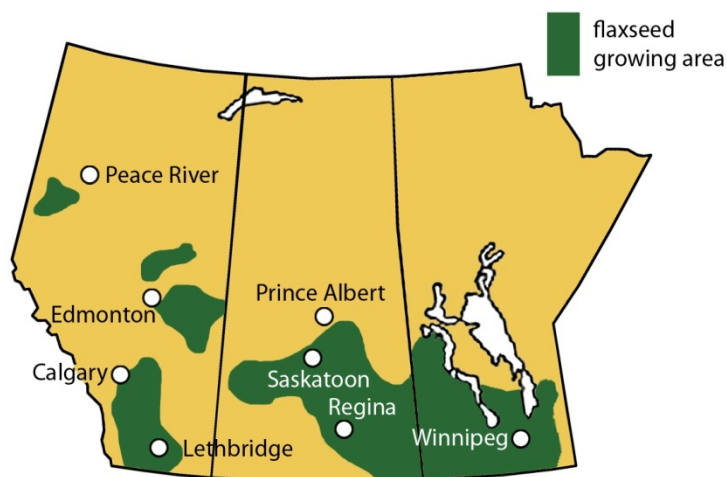
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Introduction

This report presents quality data and information based on samples of western Canadian flaxseed from the Canadian Grain Commission's 2019 Harvest Sample Program. The quality data includes oil, protein, free fatty acids, fatty acid composition and iodine values of harvest samples submitted to the Grain Research Laboratory. Producers and grain companies submitted the samples throughout the harvest period. The Prairie provinces map shows traditional growing areas for flaxseed in western Canada.

Figure 1 – Map of Prairie provinces showing traditional growing areas for flaxseed



Source: Flax Council of Canada

Summary

The Canadian Grain Commission's Harvest Sample Program of western Canadian flaxseed shows that the 2019 crop contains higher oil content, lower protein content and higher iodine values when compared to the 2018 harvest.

Table 1 shows data for Flaxseed, No. 1 Canada Western. Oil content is 46.7%, which is higher than the 2018 mean (45.7%) and higher than the 10-year mean (45.6%). Protein content is 22.6%, which is lower than the 2018 mean (23.1%) but higher to the 10-year mean (22.1%). Iodine value is 194.9 units, which is higher than the 2018 value of 189.7 units. Oil and protein values are reported on a dry matter basis.

Table 1 - Flaxseed, No. 1 Canada Western Quality data for 2019 harvest

Quality parameter	2019	2018	2009-18 Mean
Oil content ¹ , %	46.7	45.7	45.6
Protein content ² , %	22.6	23.1	22.1
Free fatty acids, %	0.19	0.15	0.17
Iodine value	194.9	189.7	192.0

¹ Dry matter basis

² N x 6.25; Dry matter moisture basis

Table 2 - Flaxseed, No. 1 Canada Western Fatty acid composition for 2019 harvest

Fatty acid ¹ , % in oil	2019	2018	2009-18 Mean
Palmitic acid (C16:0)	5.0	5.1	5.0
Stearic acid (C18:0)	3.3	3.6	3.4
Oleic acid (C18:1)	16.5	18.7	18.2
Linoleic acid (C18:2)	15.5	15.8	15.3
α -Linolenic acid(C18:3)	58.8	55.9	57.4

¹ Percentage of total fatty acids in the oil including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Weather and production review

Weather review, seeding and growing conditions

Relatively good weather over the month of May allowed nearly all the flax to be seeded by the end of May. Top soil moisture levels were a concern going into June and crop development was delayed. Towards the end of June, however, moisture conditions improved considerably along with the crop conditions.

The flax crop continued to develop well into July and August with most of the reports claiming the crop was in fair to good condition and most regions receiving adequate moisture.

Harvest started by the second week in September, but progress was slow and delayed by rain, snow and cool weather. After many starts and stops the harvest ended by the middle of November, with only 80% completed in Saskatchewan, 85% in Manitoba and 90% in Alberta.

For a more detailed look at the 2019 growing season, please refer to the following:

<https://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html>

<https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/market-and-trade-statistics/crops-statistics/crop-report>

<https://www.alberta.ca/alberta-crop-reports.aspx>

Production and grade information

Western Canadian farmers seeded 376,000 hectares of flaxseed in 2019 (Table 3), which is a slight increase compared to 2018 (344,200 hectares). The 2019 yield was estimated to be 1,433 kilograms per hectare (kg/ha). Flaxseed production decreased slightly by 6,600 metric tonnes from last year's 489,800 metric tonnes. Manitoba and Alberta saw an increase in production while it decreased in Saskatchewan. Saskatchewan accounted for 74.3% of flaxseed production while Manitoba and Alberta had 8.8% and 16.9%, respectively.

Over 83% of the samples received for the Canadian Grain Commission's 2019 Harvest Sample Program graded as Flaxseed, No. 1 Canada Western at the time of our quality analysis. Lower grades were primarily due to weather damage to the flaxseed contributing to low test weights.

Table 3 - Seeded area and production for western Canadian flaxseed¹

	Seeded area		Production		Average production
	2019	2018	2019	2018	2009-18
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	35.2	15.2	42.3	24.7	61.0
Saskatchewan	294.4	291.9	359.2	404.2	487.2
Alberta and B.C.	46.4	37.1	81.7	60.5	63.1
Western Canada	376.0	344.2	483.2	489.8	611.3

¹ **Source:** Statistics Canada. *Table 001-0010 - Estimated areas, yield and production of principal field crops in metric* (<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210035901>)

Harvest samples

Flaxseed samples for the Canadian Grain Commission's Harvest Sample Program are collected and cleaned to remove dockage prior to testing. Individual samples are analyzed for oil, protein and iodine value using a Foss NIR Systems 6500 scanning near-infrared spectrometer, calibrated to and verified against the appropriate reference methods. Composite samples are used for more precise and detailed analyses that includes free fatty acids and fatty acid composition analyses. Composites are prepared by combining brown-seeded flax samples by province for Flaxseed, No.1 Canada Western. Composites of Flaxseed, No. 2 Canada Western, Flaxseed, No. 3 Canada Western and Sample Grade combine all samples from western Canada by grade.

This year's harvest report includes 237 brown flax samples compared to 232 in 2018. Manitoba contributed 31 samples of Flaxseed, No. 1 Canada Western, Saskatchewan 177 samples, and Alberta 29 samples. There were 23 samples graded as Flaxseed, No. 2 Canada Western, 15 as No. 3 Canada Western and one as Sample Grade. We received seven yellow flax samples but there were not enough samples from any province or grade to make a composite.

Quality data by province and western Canada

Tables 4 and 5 show detailed information on the quality of top grade western Canadian (CW) flaxseed harvested in 2019. The number of harvest samples collected from each province may not represent the actual production or grade distribution. However, there were sufficient samples to provide good quality information for each province and the samples received followed the provincial trends in production.

Oil and protein content give quantitative estimates of the value of the seed as a source of oil and of the resulting meal as a source of protein for animal feed. Alpha-linolenic acid is an omega-3 fatty acid which literature has shown can play an important role in maintaining good health in humans and animals (www.flaxcouncil.ca). It is the main factor in the increased use of whole and ground flaxseed in cereals and baked goods. Flaxseed is also used in animal feeds, for example in chicken to produce omega-3 eggs.

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

Table 4 - Quality data for 2019 western Canadian flaxseed

Province/Grade	Number of samples	Oil content ¹ , %			Protein content ² , %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
No. 1 CW	198	46.7	41.5	51.1	22.6	18.3	28.9	194.9	178.3	206.2
Manitoba	24	46.3	43.7	49.4	22.7	18.3	24.2	193.1	188.3	199.8
Saskatchewan	145	47.0	41.5	51.1	22.4	17.7	26.5	195.4	178.3	206.2
Alberta	29	46.0	43.5	50.8	23.7	18.4	26.8	193.9	179.9	205.1
No. 2 CW	23	46.4	43.3	48.2	23.1	17.6	25.2	190.4	182.8	199.0
No. 3 CW	15	45.6	39.4	48.4	23.5	19.6	25.5	190.8	184.9	204.6
Sample	1	43.2	-	-	23.9	-	-	188.6	-	-

¹ Dry matter basis

² N x 6.25; dry matter basis.

Table 5 – Fatty acid composition and free fatty acids content of 2019 Canadian flaxseed

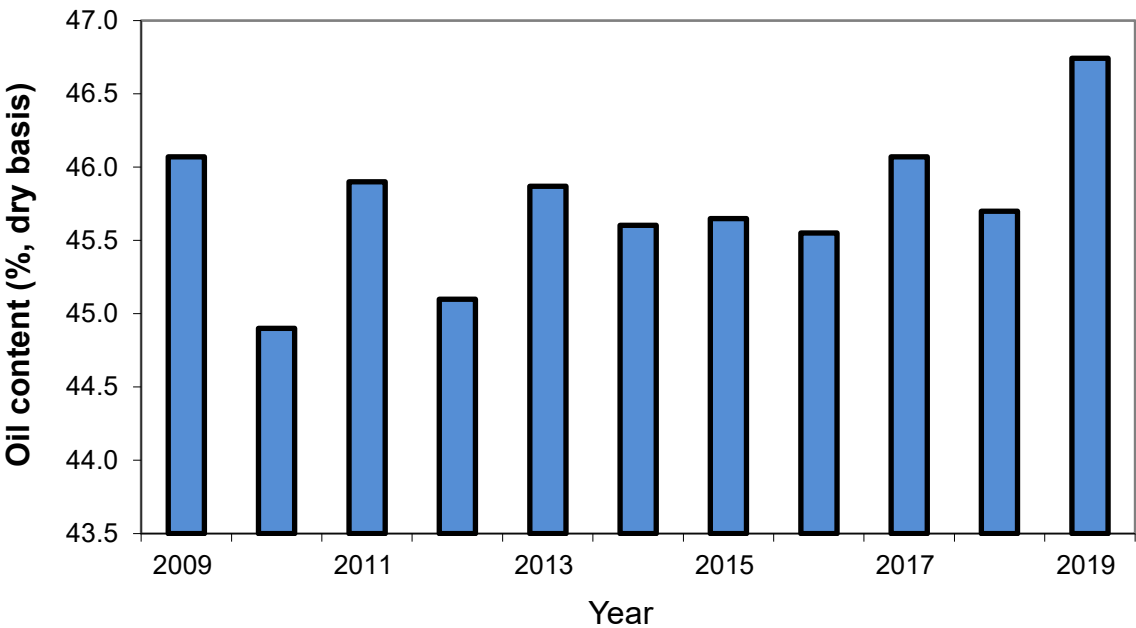
Province/Grade	Number of samples	Fatty acid composition, % ¹					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
No. 1 CW	198	5.0	3.3	16.5	15.5	58.8	0.19
Manitoba	24	5.1	3.6	17.0	14.8	58.3	0.27
Saskatchewan	145	4.9	3.3	16.4	15.4	59.0	0.17
Alberta	29	5.0	3.4	16.5	16.3	57.8	0.20
No. 2 CW	23	5.1	3.7	17.9	15.9	56.3	0.23
No. 3 CW	15	4.9	3.7	18.3	15.2	56.7	0.42
Sample	1	5.5	3.7	17.4	17.6	54.7	0.39

¹ Percentage of total fatty acids in the oil including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Oil content

Average oil content (46.7%) in Flaxseed, No. 1 Canada Western is higher than the 2018 average (45.7%) and the 10-year mean (45.6%) (Figure 2). Average oil content for Manitoba (46.3%) and Saskatchewan (47.0%) were higher than the average for Alberta (46.0%) (Table 4). Oil content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 41.5 to 51.1% (Table 4). Oil content usually increases with cooler temperatures and with adequate soil moisture.

**Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest samples, 2009-19**

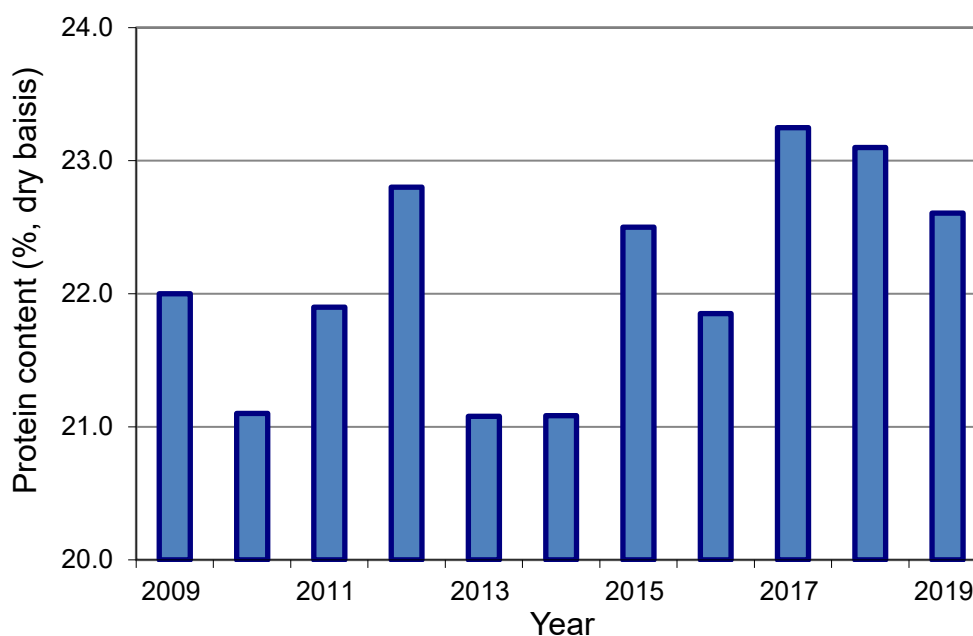


2019 average	46.7%
2018 average	45.7%
2009–18 mean	45.6%

Protein content

Average protein content (22.6%) for Flaxseed, No.1 Canada Western is lower than the 2018 harvest average (23.1%) but slightly higher than the 10-year mean (22.1%) (Figure 3). The average in Manitoba (22.7%) is higher than the average in Saskatchewan (22.4%) but lower than the average in Alberta (23.7%). Protein content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 18.3 to 28.9% (Table 4).

**Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest samples, 2009-19**



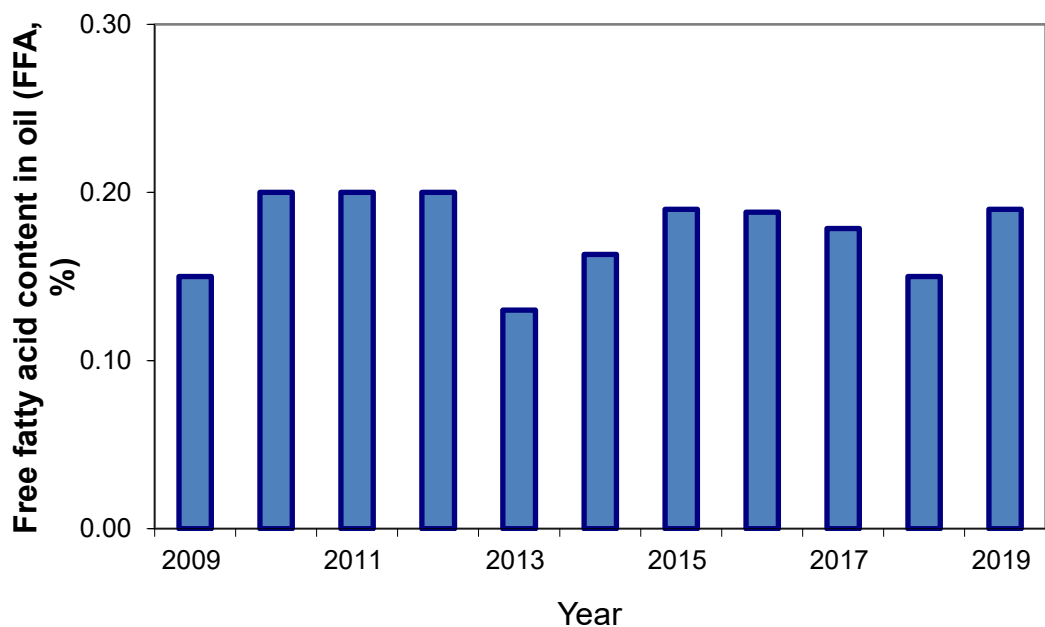
2019 average	22.6%
2018 average	23.1%
2009–18 mean	22.1%

Free fatty acids content

Average free fatty acids content (0.19%) in Flaxseed, No. 1 Canada Western is higher than the average in 2018 (0.15%) and to the 10-year mean (0.17%) (Figure 4). The average in Manitoba (0.27%) is higher than the average in Saskatchewan (0.17%) and **Alberta** (0.20%) (Table 5).

Samples that graded No. 2 and No. 3 Canada Western had an average free fatty acids content of 0.31%.

**Figure 4 – Flaxseed, No. 1 Canada Western
Free fatty acid content of harvest samples, 2009-19**



2019 average	0.19%
2018 average	0.15%
2009–18 mean	0.17%

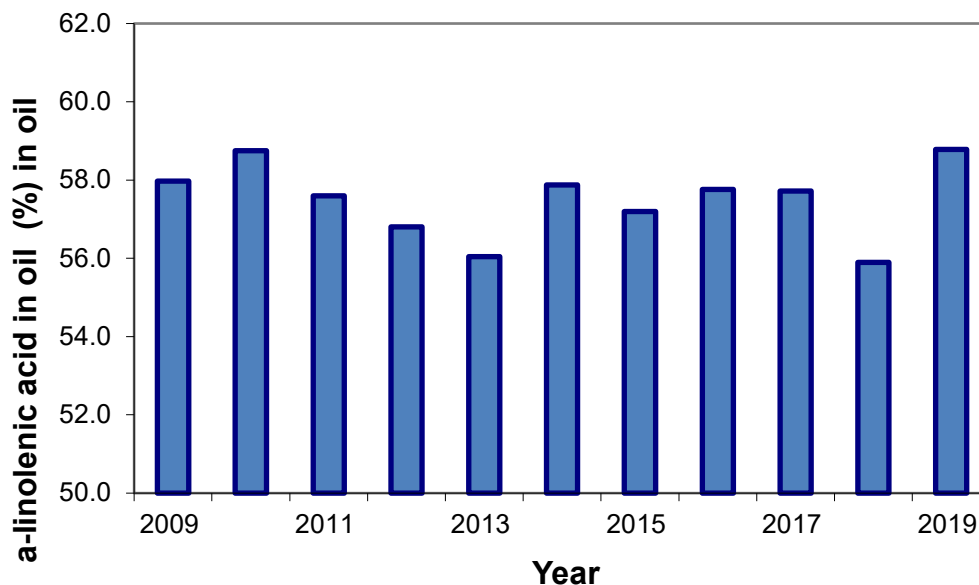
Fatty acid composition

Average α -linolenic acid (C18:3) content (58.8%) in Flaxseed, No. 1 Canada Western is higher than the 2018 average (55.9 %) and the 10-year mean (57.4%) (Figure 5).

The average iodine value of the oil from Flaxseed, No. 1 Canada Western samples is 194.9 units. Iodine value is a measure of the total degree of unsaturation of the oil and, in flaxseed, is heavily influenced by the α -linolenic acid content of the oil. The 2019 iodine value is higher than in 2018 and the 10-year mean (192.0 units) (Figure 6). Iodine values for Flaxseed, No. 1 Canada Western samples from producers across western Canada varied from 178.3 to 206.2 units.

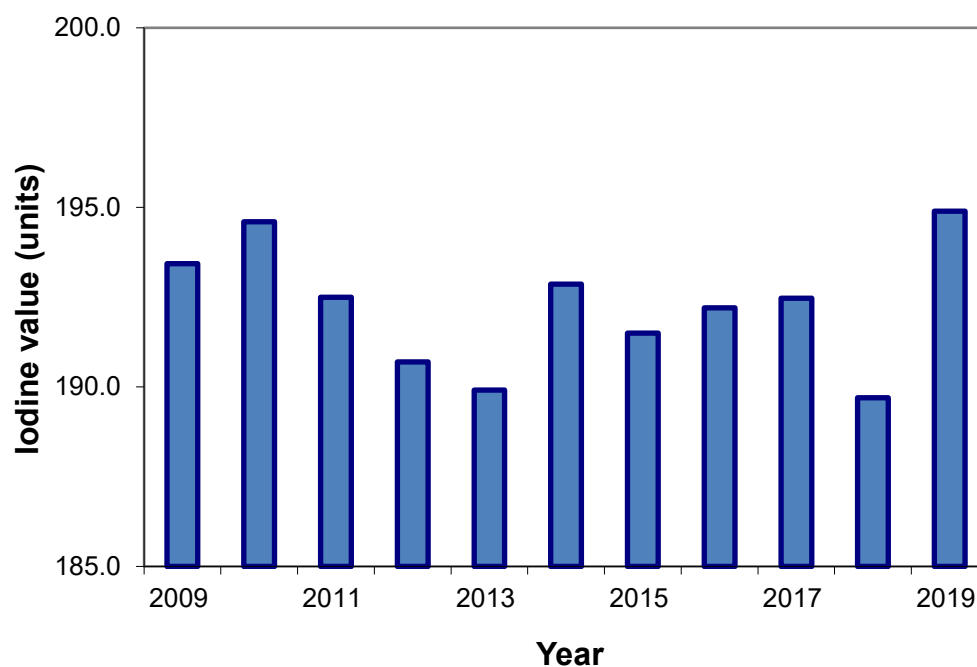
Similar to the relationship of oil content and environmental conditions, α -linolenic acid and iodine values tend to increase as temperatures decrease and when soil moisture conditions are adequate.

**Figure 5 – Flaxseed, No. 1 Canada Western
Percent α -Linolenic acid content of harvest samples, 2009-19**



2019 average.....	58.8%
2018 average.....	55.9%
2009–18 mean.....	57.4%

**Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest samples, 2009-19**



2019 average	194.9
2018 average	189.7
2009–18 mean	192.0
