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Quality of western Canadian flaxseed 2014

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Quality Innovation Service

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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 2014 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 map shows the Prairie provinces, the traditional growing areas for flaxseed in western Canada.

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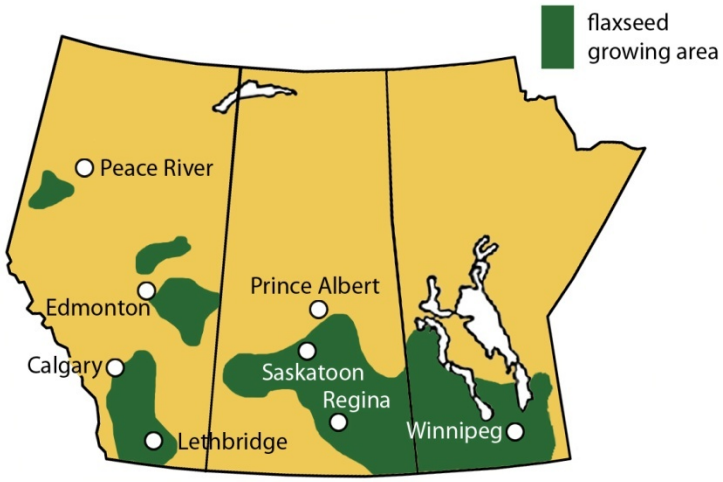
Figure 1 – Map of Prairie provinces showing traditional growing areas for flaxseed



Source: Flax Council of Canada

Summary

The Canadian Grain Commission's Harvest Sample Program of western Canadian flaxseed shows that the 2014 crop contains lower oil content, similar protein content and higher iodine values when compared to the 2013 harvest.

Table 1 shows data for Flaxseed, No. 1 Canada Western. Oil content is 45.6%, 0.3% lower than the 2013 mean (45.9%) and similar to the 10-year mean (45.6%). Protein content is 21.1% and is slightly lower than the 2013 mean (21.2%) and 1.3% lower than the 10-year mean (22.4%). Iodine value is 192.9 units, which is 3.2 units higher than the 2013 value of 189.7 units.

Environmental factors can play an important role in oil and protein content trends, as well as fatty acid composition. The Grain Research Laboratory's long-term harvest sample results have shown cool, wet growing conditions tend to produce a flaxseed crop with higher oil content and iodine values and lower protein content.

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Table 1 - Flaxseed, No. 1 Canada Western
Quality data for 2014 harvest

Quality parameter	2014	2013	2004-2013 Mean
Oil content[1], %	45.6	45.9	45.6
Protein content[2], %	21.1	21.2	22.4
Free fatty acids, %	0.2	0.1	0.2
Iodine value	192.9	189.7	191.5

[1] Dry matter basis
[2] N x 6.25; Dry matter moisture basis

Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2014 harvest

Fatty acid[1], % in oil	2014	2013	2004-2013 Mean
Palmitic acid (C16:0)	5.1	5.2	5.0
Stearic acid (C18:0)	3.2	3.3	3.3
Oleic acid (C18:1)	18.2	19.5	18.1
Linoleic acid (C18:2)	14.8	15.1	15.7
α-Linolenic acid(C18:3)	57.9	56.0	57.0

[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

The climate across the Prairies was quite varied throughout the 2014 growing season. April temperatures were 4 to 5 degrees lower than average, which delayed seeding for about 2 to 3 weeks. The majority of seeding was complete by early June.

Precipitation also drastically increased in June, and there was localized flooding in some of the important flax growing regions such as southwestern Manitoba and southeastern Saskatchewan. While Manitoba and Saskatchewan received a lot of precipitation, some areas in Alberta had drought-like conditions. Harvest was also delayed due to excess moisture. The majority of the harvest was completed by the 3rd week of October.

Source: http://www.agr.gc.ca

Production and grade information

Western Canadian farmers seeded 628,000 hectares of flaxseed in 2014 (Table 3), which is an increase compared to 2013 (418,000 hectares). The 2014 yield estimate of 1,400 kilograms per hectare was lower than the yield reported in 2013 (1,700 kilograms per hectare) and higher than the 10-year mean of 1,323 kilograms per hectare. Western Canada flaxseed production increased by134,000 metric tonnes from last year's 712,000 thousand metric tonnes. In Manitoba, production decreased to 53,000 metric tonnes, but increased in Saskatchewan to 706,000 metric tonnes and in Alberta to 87,000 metric tonnes when compared to 2013 production values. (Statistics Canada) Saskatchewan accounted for 84% of flaxseed production while Manitoba and Alberta had 6% and 10%, respectively.

Over 98% of the samples received for the Canadian Grain Commission's 2014 Harvest Sample Program were graded as Flaxseed, No.1 Canada Western.

Table 3 - Seeded area and production for western Canadian flaxseed[1]

	Seeded area		Production		Average production
	2014	2013	2014	2013	2004-2013
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	36	34	53	54	118
Saskatchewan	546	348	706	584	510
Alberta	46	36	87	74	40
Western Canada	**628**	**418**	**846**	**712**	**668**

[1] **Source:** Statistics Canada. *Table 001-0010 - Estimated areas, yield, production and average farm price of principal field crops, in metric units, annual,* CANSIM (database). http://www5.statcan.gc.ca010010&

Harvest samples

Flaxseed samples for the Canadian Grain Commission's Harvest Sample Program are collected and cleaned to remove dockage prior to testing. The samples are analyzed for oil, protein and iodine value using a Foss NIRSystems 6500 scanning near-infrared spectrometer, calibrated to and verified against the appropriate reference method. Composite samples are used for free fatty acids and fatty acid composition analyses. Composites are prepared by combining 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 259 samples compared to 176 in 2013. Manitoba contributed 39 samples of Flaxseed, No. 1 Canada Western, Saskatchewan 180 samples, and Alberta 40 samples during the harvest period from September 1st to December 1st, 2014. Weighting factors are used to calculate provincial and western Canadian means.

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 2014. Of the flaxseed samples submitted to the Grain Research Laboratory, 98% were graded as No. 1 Canada Western with the remaining 2% consisting of No. 2 Canada Western, No. 3 Canada Western and Sample grade. 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. To calculate western Canadian averages, provincial averages are weighted by the Statistics Canada production estimate and an estimate of grade distribution.

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, and flaxseed oil in salads. 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 can be 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. Alph-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 - Flaxseed, No. 1 Canada Western
Quality data for 2014 harvest

Province	Number of samples tested	Oil content[1], %			Protein content[2], %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Manitoba	39	46.3	43.5	48.4	21.3	17.8	24.5	193.9	185.7	208.3
Saskatchewan	180	45.4	40.8	49.5	20.5	17.5	24.5	193.0	180.2	205.8
Alberta	40	45.7	41.7	50.1	23.5	19.1	26.4	191.0	182.5	201.7
Western Canada[3]	259	45.6	40.8	50.1	21.1	17.5	26.4	192.9	180.2	208.3

[1] Dry matter basis
[2] N x 6,25; dry matter basis
[3] Mean values are weighted averages based on estimated production by province (Statistics Canada).

Table 5 – Flaxseed, No. 1 Canada Western
Fatty acid composition and free fatty acids content of 2014 harvest

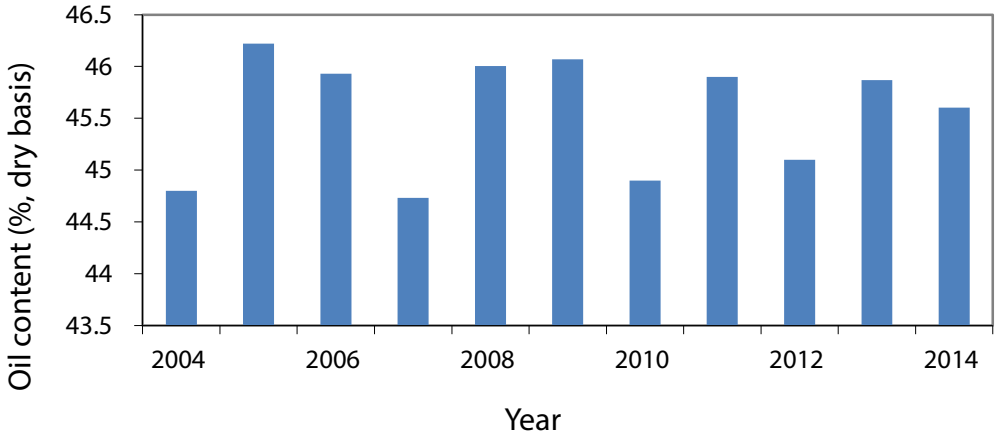
Province	Number of samples	Fatty acid composition, %[1]					
		C16:0	C18:0	C18:1	C18:2	C18:3	Free fatty acids
Manitoba	39	4.9	3.3	17.3	15.4	58.2	0.2
Saskatchewan	180	5.1	3.1	18.2	14.6	58.0	0.1
Alberta	40	5.1	3.4	18.9	14.9	56.8	0.2
Western Canada[2]	259	5.1	3.2	18.2	14.8	57.9	0.2

[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)
[2] Mean values are weighted averages based on estimated production by province (Statistics Canada).

Oil content

Average oil content (45.6%) in Flaxseed. No. 1 Canada Western is similar to the 2013 average (45.9%) and is identical to the 10-year mean (45.6%) (Figure 2). Average oil content for Manitoba (46.3%) is higher than the average in Saskatchewan (45.4%) and Alberta (45.7%) (Table 4). Oil content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 40.8 to 50.1% (Table 4).

Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest samples, 2004-2014

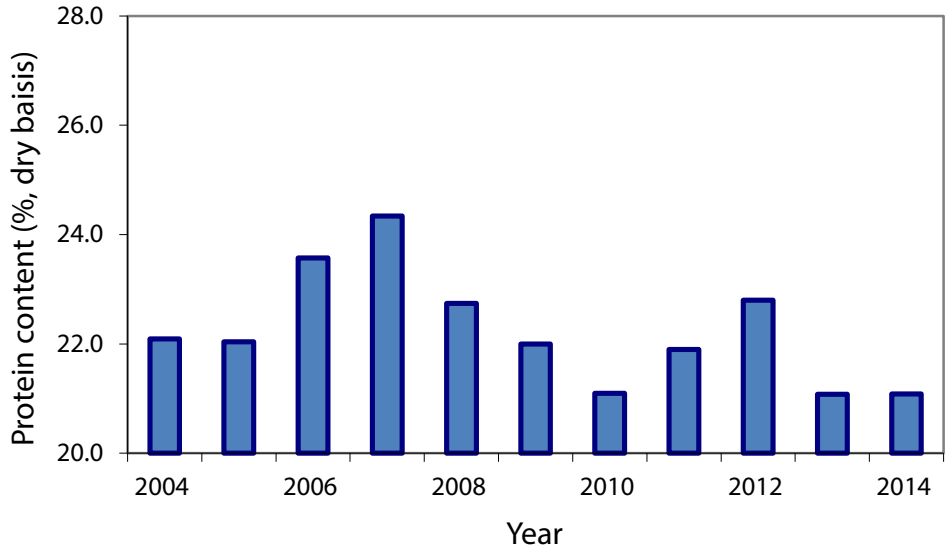


2014 average	45.6%
2013 average	45.9%
2004–2013 mean	45.6%

Protein content

Average protein content (21.1%) for Flaxseed, No.1 Canada Western is similar to the 2013 harvest average (21.2%) and lower than the 10-year mean (22.4%) (Figure 3). The average in Manitoba (21.3%) is higher than the average in Saskatchewan (20.5%) and lower than the average in Alberta (23.5%). Protein content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 17.5 to 26.4% (Table 4).

Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest samples, 2004–2014



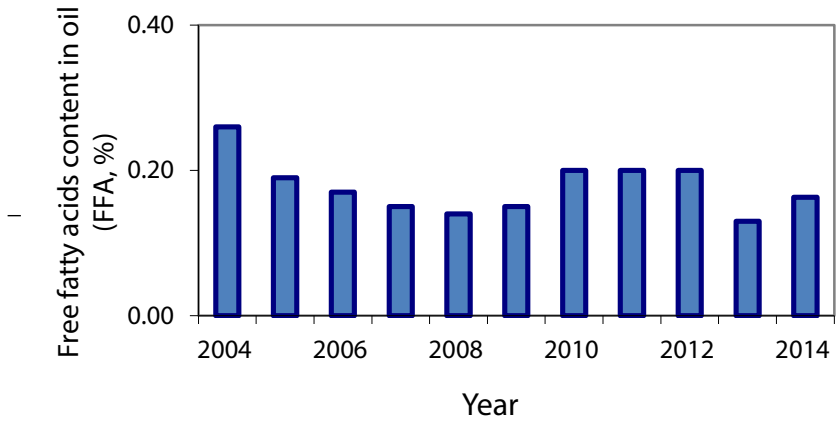
2014 average	21.1%
2013 average	21.2%
2004–2013 mean	22.4%

Free fatty acids content

Average free fatty acids content (0.20%) in Flaxseed, No. 1 Canada Western is higher than the average in 2013 (0.13%) and the same as the 10-year mean (0.20) (Figure 4). The average in Manitoba (0.20%) is higher than the average in Saskatchewan (0.10%) and similar to the Alberta average (0.20%) (Table 5). Higher values are mainly due to seed damage.

Samples that graded No. 2 Canada Western, No. 3 Canada Western and Sample grade all have an average free fatty acids content of 1.05%.

Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest samples, 2004–2014



2014 average	0.20%
2013 average	0.13%
2004–2013 mean	0.20%

Fatty acid composition

Average alpha-linolenic acid (C18:3) content (57.9%) in Flaxseed, No. 1 Canada Western is higher than the average in 2013 (56.0%) and the 10-year mean (57.0%) (Figure 5).

Values in samples of Flaxseed, No. 1 Canada Western from producers across western Canada ranged from 49.6% to 65.6%.

The average iodine value of the oil from Flaxseed, No.1 Canada Western samples is 192.9 units. Iodine value is a measure of the total degree of unsaturation of the oil and, in flaxseed, is heavily influenced by the linolenic acid content of the oil. The 2014 iodine value is 3.2 units higher than in 2013 and 1.4 units higher than the 10-year mean of 191.5 units (Figure 6). Iodine values for Flaxseed, No.1 Canada Western samples from producers across western Canada varied from 180 to 208 units.

Usually oils with iodine values greater than 188 units are desired by the coatings industry for products such as paints, varnishes and inks, while oils with iodine values around 183 units are preferred by the linoleum industry. Iodine value, like oil content, is influenced by growing temperatures and length of photoperiod.

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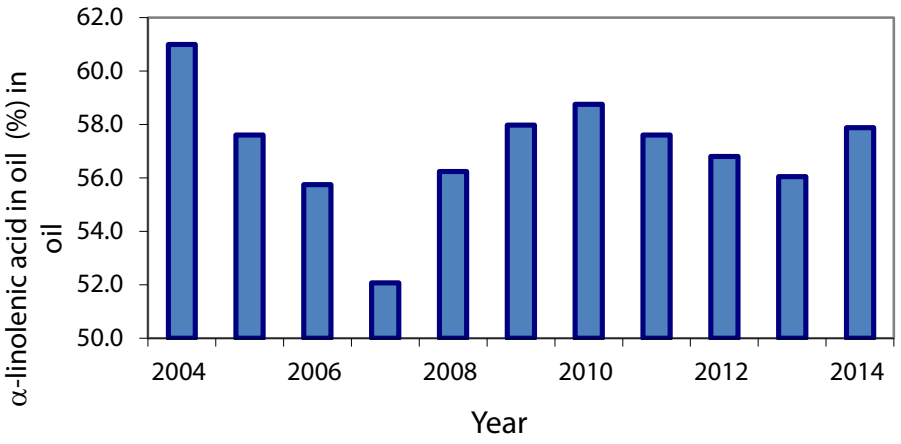
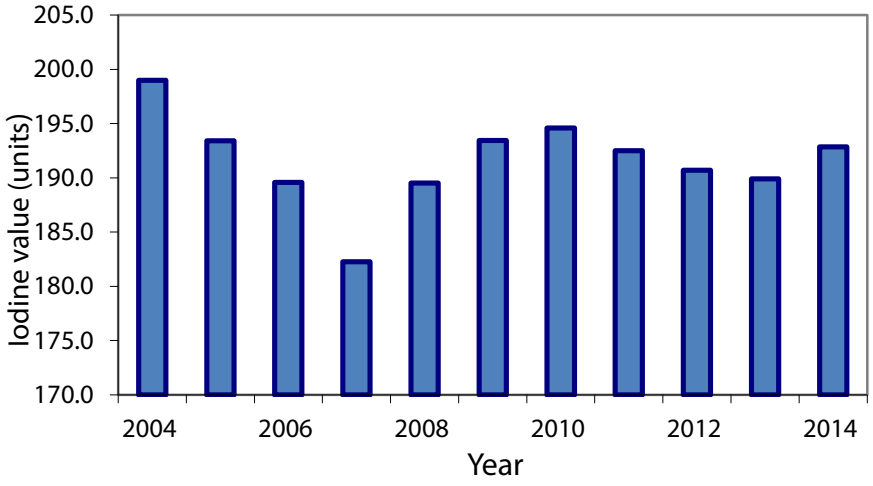
Figure 5 – Flaxseed, No. 1 Canada Western

Percent α–Linolenic acid content of harvest samples, 2004–2014



2014 average.....57.9%
2013 average.....56.0%
2004–2013mean 57.0%

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest samples, 2004–2014



2014 average..... 192.9
2013 average..... 189.7
2004–2013 mean..... 191.5