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Quality of western Canadian flaxseed 2013

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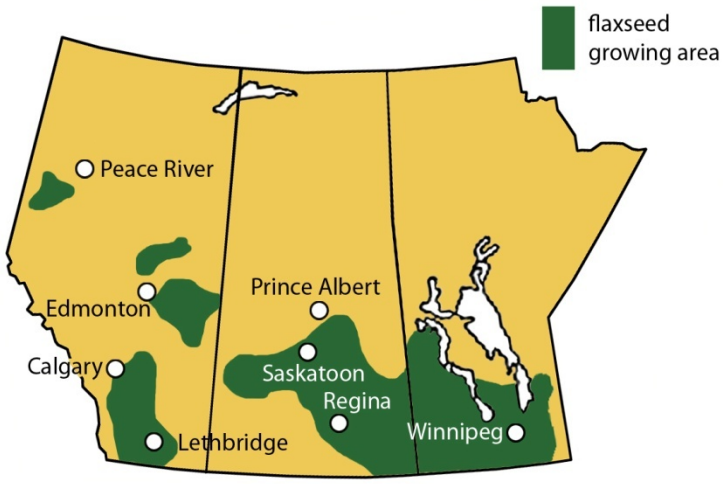
Introduction

This report presents quality data and information based on the Canadian Grain Commission's 2013 harvest survey of western Canadian flaxseed. The quality data includes oil, protein, free fatty acids, fatty acid composition and iodine values of harvest survey samples submitted to the Grain Research Laboratory. Producers and grain companies submitted the samples throughout the harvest period. The map shows the 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 survey of western Canadian flaxseed shows that the 2013 crop contains higher than average oil content, lower iodine values and below average protein content when compared to the 2012 harvest and the 10-year means.

Table 1 shows data for Flaxseed, No. 1 Canada Western. Oil content is 45.9%, 0.8% higher than the 2012 mean (45.1%) and 0.5% higher than the 10-year mean (45.4%). Protein content is 21.1%, 1.7% lower than the 2012 mean (22.8%) and the 10-year mean (22.8%). The iodine value was at 189.7 units, which is slightly lower than the 2012 value at 190.7 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 survey results have shown that cool, wet growing conditions tend to produce a flaxseed crop with higher oil content and iodine value, but lower protein content, which was illustrated with the 2013 harvest.

Table 1 - Flaxseed, No. 1 Canada Western
Quality data for 2013 harvest survey

Quality parameter	2013	2012	2003-2012 Mean
Oil content[1], %	45.9	45.1	45.4
Protein content[2], %	21.2	22.8	22.8
Free fatty acids, %	0.13	0.17	0.18
Iodine value	189.7	190.7	191.2

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

Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2013 harvest survey

Fatty acid[1], % in oil	2013	2012	2003-2012 Mean
Palmitic acid (C16:0)	5.2	5.0	5.0
Stearic acid (C18:0)	3.3	3.4	3.4
Oleic acid (C18:1)	19.5	19.2	18.4
Linoleic acid (C18:2)	15.1	14.7	15.7
α-Linolenic acid(C18:3)	56.0	56.8	56.7

[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 weather played an important role in providing a good quality crop. April temperatures were 4 to 5 degrees lower than average, which delayed seeding for about 2 to 3 weeks when compared to last year. The majority of seeding was completed by late May early June.

Cooler temperatures in midsummer helped to increase oil content in the developing seed. A warm September and the absence of frost allowed crops to fully mature.

About 90% of the harvest was completed by mid-October.

A cool growing season in the summer with average precipitation and a warm fall provided ideal conditions for a good quality harvest.

Production and grade information

Western Canadian farmers seeded 418,000 hectares of flaxseed in 2013 (Table 3), which is an increase compared to 2012 (397,000 hectares). The 2013 yield estimate of 1,700 kilograms per hectare was higher than the yield reported in 2012 (1,300 kilograms per hectare) and higher than the 10-year mean of 1,260 kilograms per hectare.

Western Canada flaxseed production (712,000 metric tonnes) increased by 223,000 metric tonnes from 489,000 metric tonnes in 2012 (Table 3). Flaxseed production decreased in Manitoba to 54,000 metric tonnes, but increased in Saskatchewan to 584,000 metric tonnes and in Alberta to 74,000 metric tonnes when compared to 2012 production values (Statistics Canada). Saskatchewan accounted for 82% of flaxseed production while Manitoba and Alberta had 8% and 10%, respectively.

Over 97% of the samples received for the 2013 CGC Harvest Survey were graded as Flaxseed, No.1 Canada Western.

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

	Seeded area		Production		Average production
	2013	2012	2013	2012	2003-2012
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	34	63	54	66	133
Saskatchewan	348	314	584	381	540
Alberta	36	20	74	42	35
Western Canada	418	397	712	489	708

[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.ca/cansim/a26?lang=eng&retrLang=eng&id=0010010&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid

Harvest survey samples

Flaxseed samples for the Canadian Grain Commission's harvest survey are collected and cleaned to remove dockage prior to testing. The samples are analyzed for oil, protein and iodine value using a 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 No. 1 flaxseed samples by province. Composites of Flaxseed No.2 Canada Western, No.3 Canada Western and Sample Grade combine all samples from western Canada by grade.

This year's harvest survey report includes 176 samples compared to 239 in 2012. Manitoba contributed 34 samples of No. 1 flaxseed, Saskatchewan contributed 123 samples, and Alberta 13 samples during the harvest period from September 1 to December 1st, 2013. 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 flaxseed harvested in 2013. Of the flax samples submitted to the Grain Research Laboratory, 97% were graded as No. 1 Canada Western and 3% consisted of No. 2 Canada Western, No. 3 Canada Western and Sample grade. The number of harvest survey 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. It is the main factor for the increasing 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 oils 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 flax, 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 - Flaxseed, No. 1 Canada Western
Quality data for 2013 harvest survey

Province	Number of samples tested	Oil content[1], %			Protein content[2], %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Manitoba	34	45.6	42.6	48.0	22.4	18.9	27.1	190.6	179.0	200.0
Saskatchewan	123	46.0	41.3	48.4	20.7	16.4	25.2	189.2	180.0	201.0
Alberta	13	45.6	41.5	49.2	22.8	20.2	25.8	191.9	182.0	199.0
Western Canada[3]	170	45.9	41.3	49.2	21.2	16.4	27.1	189.7	179.0	201.0

[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 2013 harvest survey

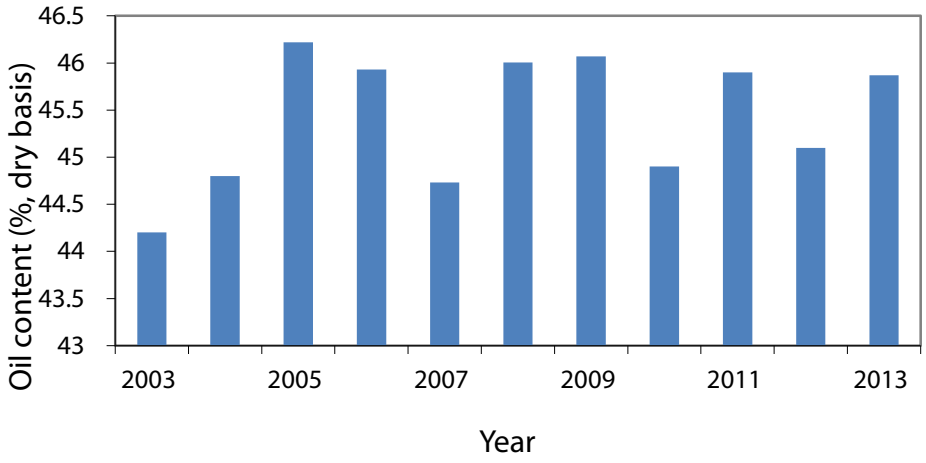
Province	Number of samples	Fatty acid composition, %[1]					
		C16:0	C18:0	C18:1	C18:2	C18:3	Free fatty acids
Manitoba	34	5.0	3.4	19.1	15.2	56.5	0.17
Saskatchewan	123	5.2	3.3	19.7	15.1	55.8	0.12
Alberta	13	5.0	3.7	18.2	14.5	57.7	0.15
Western Canada[2]	170	5.2	3.3	19.5	15.1	56.0	0.13

[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 (45.9%) in Flaxseed, No.1 Canada Western is higher compared to the 2012 average (45.1%) (Figure 2). Average oil content for Manitoba and Alberta (both 45.6%) is lower than the average in Saskatchewan (46.0%) (Table 4). However, the averages for each province are higher than the 2012 averages: Manitoba (43.9%), Saskatchewan (45.5%) and Alberta (45.1%). (http://www.grainscanada.gc.ca/flax-lin/harvest-recolte/2012/hqf12-qrl12-eng.htm). The oil content of Flaxseed, No.1 Canada Western samples from producers across western Canada ranged from 41.3 to 49.2% (Table 4).

Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest survey samples, 2003-2013

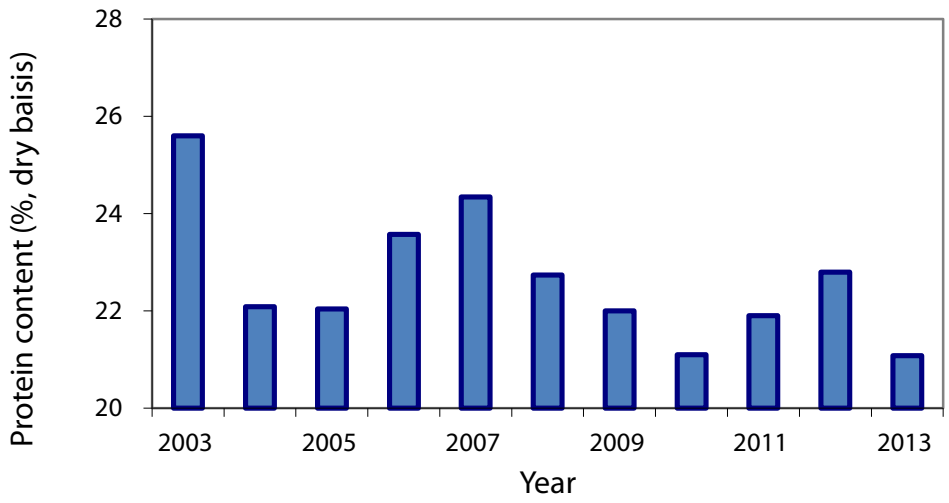


2013 average	45.9%
2012 average	45.1%
2003–2012 mean	45.4%

Protein content

Average protein content (21.2%) in Flaxseed, No. 1 Canada Western is lower than both the average in 2012 (22.8%) and the 10-year mean (22.8%) (Figure 3). The average in Manitoba (22.4%) is lower than the average in Alberta (22.8%) and higher than the average in Saskatchewan (20.7%) (Table 4). Compared to 2012, the average protein content for Manitoba, Saskatchewan and Alberta is lower (a difference of 2.7%, 1.3% and 1.1% respectively). The protein content of Flaxseed, No.1 Canada Western samples from producers across western Canada ranged from 16.4 to 27.1% (Table 4).

Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest survey samples, 2003–2013



2013 average	21.2%
2012 average	22.8%
2003–2012 mean	22.8%

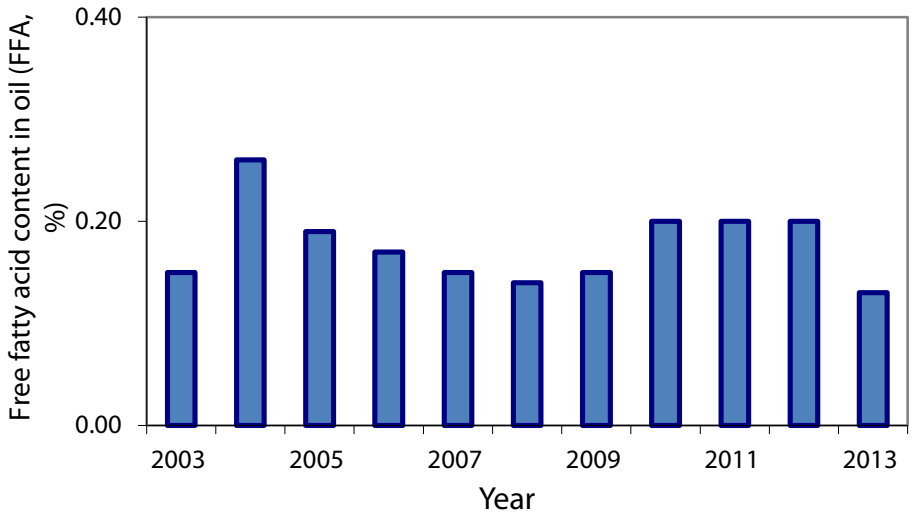
Free fatty acids content

Average free fatty acids content (0.13%) in Flaxseed, No. 1 Canada Western is lower the average in 2012 (0.17%), as well as the 10-year mean (0.18%) (Figure 4).

The average in Manitoba (0.17%) is higher than the averages in Saskatchewan (0.12%) and Alberta (0.15%) (Table 5) . Higher values are mainly due to seed damage.

Samples that graded No.2 Canada Western, No.3 Canada Western and Sample Grade have an average free fatty acids content of 0.78%.

Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest survey samples, 2003–2013



2013 average	0.13%
2012 average	0.17%
2003–2012 mean	0.18%

Fatty acid composition

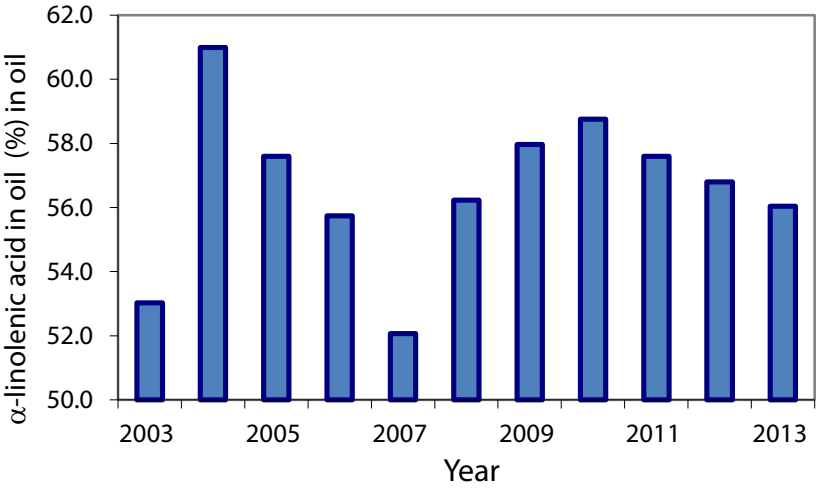
Average alpha-linolenic acid content (56.0%) in Flaxseed, No. 1 Canada Western is lower the average in 2012 (56.8%) and slightly lower than the 10-year mean (56.7%) (Figure 5).

Compared to 2012, the average alpha-linolenic acid content for Manitoba is higher (a difference of 1.1%); lower for Saskatchewan (a difference of 1.3%); and higher for Alberta (a difference of 1.1%) (Table 5). Values in samples of Flaxseed, No. 1 Canada Western from producers across western Canada ranged from 48.8% to 63.0%.

The average iodine value of the oil from samples of Flaxseed, No.1 Canada Western is 189.7 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. Iodine value is 1 unit lower than the 2012 average and the 10-year mean of 190.9 units (Figure 6). Average iodine value increased in Manitoba and Alberta by 1.4 units, whereas in Saskatchewan it decreased by 2 units. Values in samples of Flaxseed, No.1 Canada Western from producers across western Canada varied in iodine value from 179 to 201units.

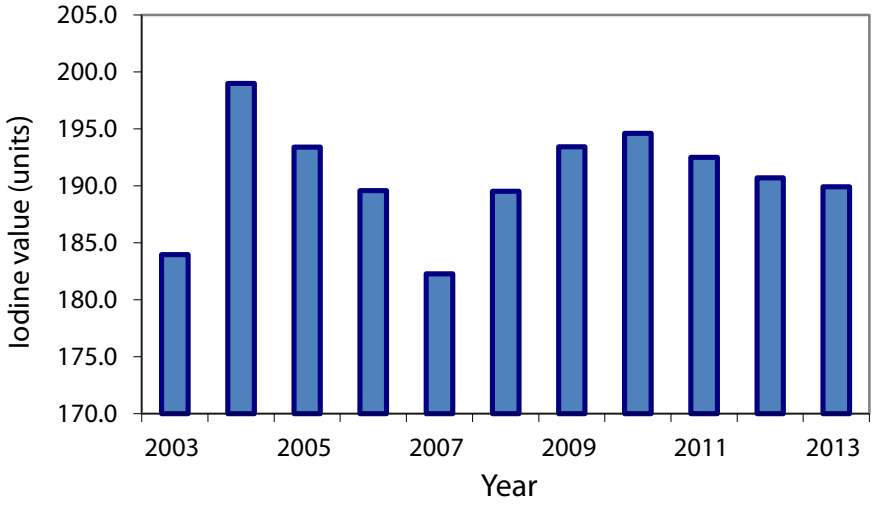
Usually oils with iodine values greater than 188 units are desired by the coatings industry for products such as paints, varnishes and inks, while oils with iodine values around 183 units are preferred by the linoleum industry. Iodine value, like oil content, is influenced by temperatures during the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

Figure 5 – Flaxseed, No. 1 Canada Western
Percent α–Linolenic acid content of harvest survey samples, 2003–2013



2013 average	56.0%
2012 average	56.8%
2003–2012 mean	56.7%

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest survey samples, 2003–2013



2013 average	189.7
2011 average	190.7
2003–2012 mean	190.9