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Quality of western Canadian flaxseed 2012

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Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2012 harvest survey of western Canadian flaxseed. The quality data includes oil, protein, free fatty acids, fatty acid composition and iodine values (IV) of harvest survey samples submitted to the Grain Research Laboratory (GRL). Producers and grain companies submitted the samples throughout the harvest period. The map shows the traditional growing areas for flaxseed in western Canada.

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Figure 1 – Map of western Canada showing traditional growing areas for flaxseed

Source: Flax Council of Canada

Summary

The CGC Harvest Survey of Western Canadian Flaxseed shows the 2012 crop to contain lower than average oil content and IV values and above average protein content when compared to the 2011 harvest and the 10 year means.

When comparing to the 2011 harvest, the oil content is 0.8% lower at 45.1% and 0.3% lower than the 10 year mean. Protein content is 0.9% higher than 2011 at 22.8% and similar to the 10 year average of 22.9%. Iodine values for 2012 were at 190.7units, which is 1.8 units lower than the 2011 harvest and 0.61 units lower than the 10 year average.

Environmental factors can play an important role in oil and protein content trends as well as fatty acid composition. The GRL's long-term harvest survey results have shown warm dry growing conditions tend to produce a flaxseed crop with lower oil contents and IV, but higher protein contents, which was illustrated with this year's 2012 harvest.

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Table 1 - Flaxseed, No. 1 Canada Western
Quality data for 2012 harvest survey

Quality parameter	2012	2011	2002-2011 Mean
Oil content[1], %	45.1	45.9	45.4
Protein content[2], %	22.8	21.9	22.9
Free fatty acids, %	0.2	0.20	0.19
Iodine value	190.7	192.5	191.3

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

Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2012 harvest survey

Fatty acid[1], % in oil	2012	2011	2002-2011 Mean
Palmitic acid (C16:0)	5.0	5.1	5.0
Stearic acid (C18:0)	3.4	3.4	3.4
Oleic acid (C18:1)	19.2	17.9	18.2
Linoleic acid (C18:2)	14.7	15.1	15.8
α-Linolenic acid (C18:3)	56.8	57.6	56.9

[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

This year's growing season was characterized by extremes in weather conditions across the Western Prairies, which included excess moisture, heat stress and extreme winds.

Seeding occurred earlier than normal in most of the flax growing regions (Southern Manitoba and South Eastern Saskatchewan) due to warmer and dryer conditions in April and May. Extreme winds in early May caused wind damage to newly emerged seedlings in parts of the Prairie Provinces.

Hot dry conditions persisted though out most of the growing season with daily maximum temperatures ranging from +25 degrees Celsius to +34 degrees Celsius in July and August and less than 10 mm of precipitation when compared to average monthly precipitation in July and August.

The warm and dry conditions continued through out August allowing for harvest to commence earlier than normal. Well over 50% of the flax crop was harvested by mid September.

Weather maps for the whole growing season can be found at:
http://www4.agr.gc.ca/DW-GS/historical-historiques.jspx?lang=eng&jsEnabled=true

Production and grade information

Western Canadian farmers seeded 397 thousand hectares of flaxseed in 2012 (Table 3), which is an increase when compared to 2011 (300 thousand hectares). The 2012 yield estimate of 1,300 kg/ha was lower than the yield reported in 2011 (1,400 kg/ha) and higher than the 10-year mean of 1,238 kg/ha. Western Canada flaxseed production had an overall increase of 100 thousand metric tonnes when compared to last year's 389, thousand metric tonnes. Flaxseed production increased in Manitoba to 66 thousand metric tonnes, Saskatchewan to 381 thousand metric tonnes but in Alberta production decreased to 42 thousand metric tonnes when compared to 2011 production values as shown in Statistics Canada Table 001-0010- Estimated areas, yield, production. Saskatchewan accounted for 78% of flaxseed production while Manitoba and Alberta had 14% and 9%, respectively.

Over 97% of the samples received for the 2012 CGC Harvest Survey were graded as Flaxseed, No.1 CW.

Table 3 - Seeded area and production for western Canadian flaxseed

	Seeded area		Production[1]		Average production[2]
	2012	2011	2012	2011	2002-2011
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	63	55	66	55	148
Saskatchewan	314	217	381	279	546
Alberta	20	28	42	55	42
Western Canada	397	300	489	389	727

Source: Statistics Canada. *Table 001-0010 - Estimated areas, yield, production and average farm price of principal field crops, in metric units, annual,* CANSIM (database).

Harvest survey samples

Flaxseed samples for the CGC 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 Flaxseed samples by province for Flaxseed, No.1 CW and Flaxseed No.2 CW, No.3 CW Canada and Sample Grade by western Canada.

This year's harvest survey report includes 239 samples compared to 176 in 2011. Manitoba contributed 54 samples, Saskatchewan 165 samples and Alberta 12 samples during the harvest period from September 1 to December 1st, 2012 of Flaxseed, No. 1 CW. Weighting factors are used to calculate provincial and western Canadian means.

Quality of western Canadian flaxseed – 2012

Tables 4 and 5 show detailed information on the quality of top grade western Canadian (CW) flaxseed harvested in 2012. Of the flax samples submitted to the GRL 97 % were graded as No. 1 Canada Western with the reminder 3% consisting of No. 2 CW No. 3 CW 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. αLinolenic acid is an omega-3 (ω-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 increase use of whole and ground flaxseed in cereals and baked goods, and flaxseed oil in salads. Flax seeds are also used in animal feeds, for example in chicken to produce ω-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 α-linolenic acid present in the oil. α-linolenic acid is one of the most important quality factor for industrial use as it is this fatty acid, which is responsible for most of flaxseed oil's drying properties.

Table 4 - Flaxseed, No. 1 Canada Western
Quality data for 2012 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	54	43.9	40.5	47.4	25.1	20.1	30.1	189.2	179.6	205.2
Saskatchewan	165	45.5	40.9	48.4	22.0	17.5	26.0	191.2	181.6	199.4
Alberta	12	45.1	41.2	47.0	23.9	20.4	26.6	190.5	185.4	197.5
Western Canada[3]	231	45.1	40.5	48.4	22.8	17.5	30.1	190.7	179.6	205.2

[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 2012 harvest survey

Province	Number of samples	Fatty acid composition, %[1]					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
Manitoba	54	4.9	3.5	20.1	14.5	56.1	0.20
Saskatchewan	165	5.1	3.4	18.9	14.8	57.1	0.17
Alberta	12	4.9	3.7	18.7	15.2	56.6	0.13
Western Canada[2]	231	5.0	3.4	19.2	14.7	56.8	0.20

[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).

Table 6 compares the quality of 2011-2012 flaxseed exports with this year's harvest survey data. The harvest survey data are from producer samples that have been cleaned to remove dockage, while recent exports of flaxseed from Thunder Bay and Vancouver contained from 1.1% to 7.6% dockage. Dockage will affect quality factors such as oil content, iodine value and free fatty acids. Flaxseed exports containing over 2.5% dockage are considered not commercially clean.

Table 6 – Flaxseed, No. 1 Canada Western
Comparison of 2012 harvest survey quality data with 2011-2012 export shipments

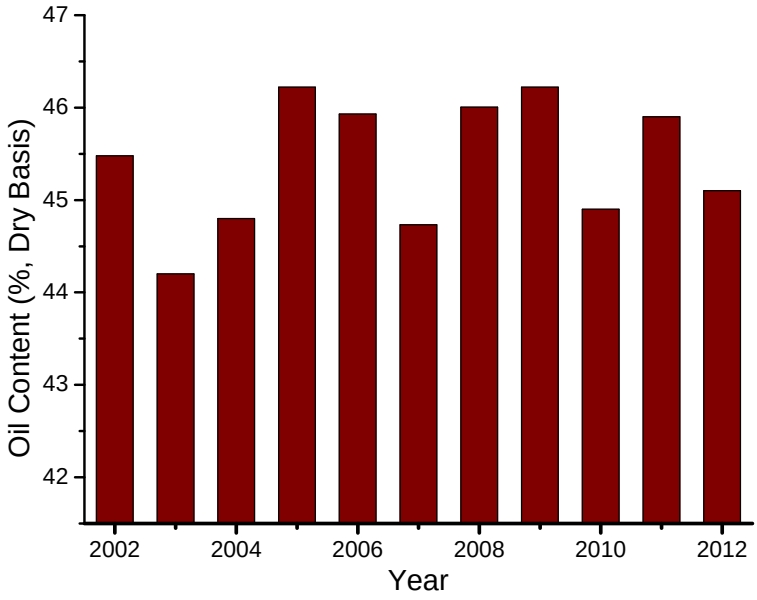
Quality parameter	2012 survey	2011-2012 exports
Oil content[1]%	45.1	44.0
Protein content[2]%	22.8	21.0
Free fatty acids, %	0.2	0.4
Iodine value (units)	190.7	192.8
Palmitic acid, % in oil	5.0	5.1
Stearic acid, % in oil	3.4	3.3
Oleic acid, % in oil	19.2	17.7
Linoleic acid, % in oil	14.7	15.5
α-Linolenic acid, % in oil	56.7	57.6
Number of samples	231	22

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

Oil content

The average oil content of 45.1 % for Flaxseed, No.1 CW from the 2012 harvest survey is lower when compared to the 2011 oil content of 45.9% (Figure 2). The oil content for Manitoba, 43.9% is lower than in Saskatchewan and Alberta, which had oil content of 45.5% and 45.1% respectively. When comparing to 2011 the average oil contents in 2012 are 1.5% lower for Manitoba 0.6% lower Saskatchewan and 1.1% lower for Alberta samples. The oil content of Flaxseed, No.1 CW samples from producers across western Canada ranged from 40.5% to 48.4%.

Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest survey samples, 2002-2012



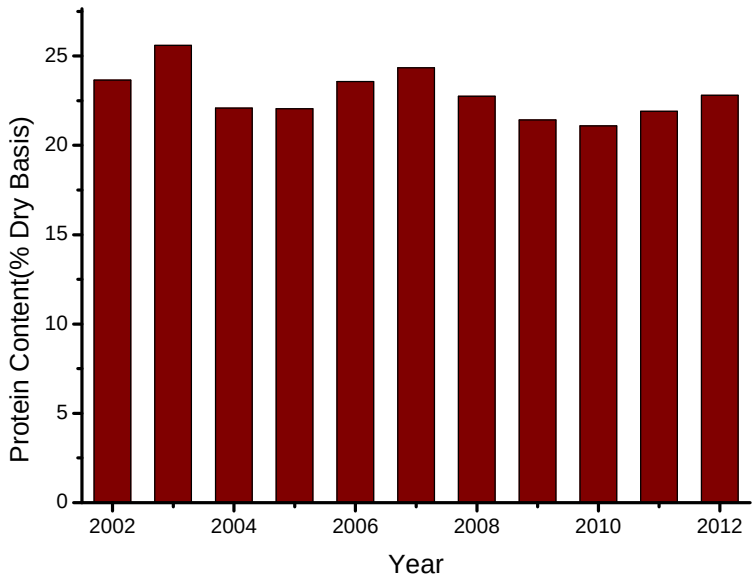
2012 average 45.1%
2011 average 45.9%
2002–2011 mean 45.4%

Protein content

The average protein content of 22.8% for Flaxseed, No.1 CW from the 2012 harvest survey is 0.9% higher than in 2011and similar to the 10-year mean of 22.9% (Figure 3). The Manitoba average protein content of 25.1% was higher than the 23.9% in Alberta and the 22.0% in Saskatchewan. Compared to 2011, the average protein contents for Manitoba and Saskatchewan and Alberta increased at 2.5%, 0.4% and 1.8% respectively. The protein content of Flaxseed, No.1 CW samples from producers across western Canada ranged from 17.5% to 29.6%.

As Table 6 shows, the protein content of Flaxseed, No.1 CW exports averaged 21.0% for the 2011–2012 shipping season. The protein content of flaxseed exports in 2012–2013 should be similar to the export shipments of the previous season.

Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest survey samples, 2002–2012



2012 average.....22.8%
2011 average.....21.9%
2002–2011 mean.....22.9%

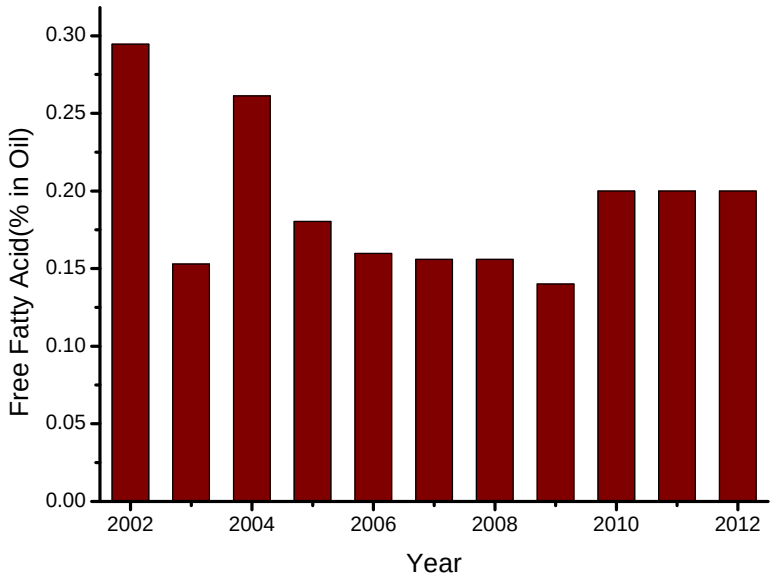
Free fatty acids content

The average free fatty acids (FFA) content of 0.17 % in top grade 2012 survey samples is similar to the 2011 average and the 10-year mean of 0.19% (Figure 4). The average FFA content of Manitoba samples, 0.20% is higher than Saskatchewan's and Alberta's FFA value of 0.17% and 0.13%, respectively. Higher FFA values are mainly due to seed damage.

The lower grade samples (No.2 CW, No.3 CW Canada and Sample Grade) had a mean FFA content of 0.24%.

The FFA content of Flaxseed, No.1 CW exports for 2011-2012 exports was 0.52%.

Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest survey samples, 2002–2012



2012 average	**0.17%**
2011 average	**0.18%**
2002–2011 mean	**0.19%**

Fatty acid composition

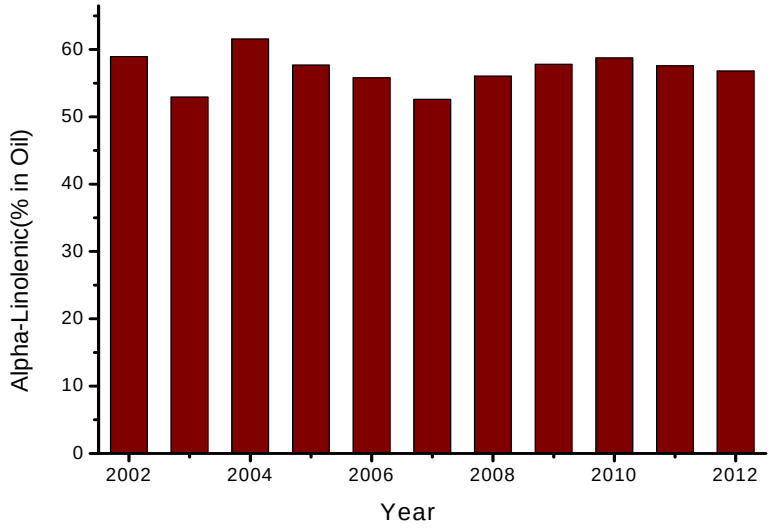
The average α-linolenic acid content of 2012 harvest survey Flaxseed, No.1 CW samples is 56.8%, lower than 2011 at 57.6% and similar to the 10-year mean (Figure 5). Compared to 2011, the average α-linolenic acid content decreased by 1.4%, 0.5 and 1.8 %for Manitoba, Saskatchewan and Alberta respectively. Flaxseed, No. 1 CW samples from producers across western Canada had a range of linolenic acid content from 50.0% to 65.8%.

The average iodine value of the oil from Flaxseed, No.1 CW samples is 190.7 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. The 2012 iodine value is 1.8 units lower than in 2011 and .60 units lower than the 10-year mean of 191.3 units (Figure 6). The average iodine value decreased by 3 units, 1 unit, and 3.3 units for Manitoba Saskatchewan and Alberta samples, when compared to 2011. Flaxseed, No.1 CW samples from producers across western Canada varied in iodine value from 179.6 to 205.2 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.

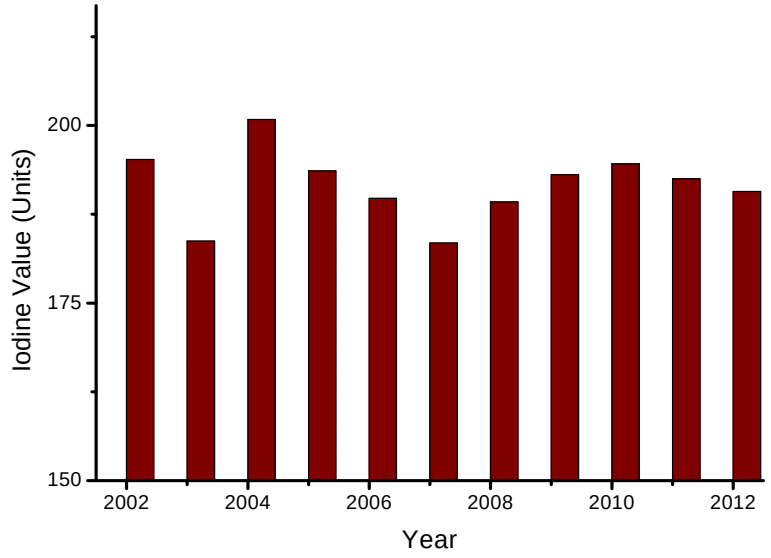
The 2011–2012 mean export values in Table 6 shows the α-linolenic acid content at 57.6% and the iodine value at 192.8 units. Flaxseed, No.1 CW exports will likely produce oils with iodine values around 190 units. Flaxseed exports that are not commercially clean may have lower iodine values than those exports that are cleaned to contain less than 2.5% dockage.

Figure 5 – Flaxseed, No. 1 Canada Western
Percent α–Linolenic acid content of harvest survey samples, 2002–2012



2012 average.....56.8%
2011 average.....57.6%
2002–2011 mean.....56.9%

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest survey samples, 2002–2012



2012 average 190.7
2011 average 192.5
2002–2011 mean 191.3