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Quality of western Canadian flaxseed 2010

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Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2010 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 (GRL). Producers, grain companies and oilseed crushing plants submitted the samples throughout the harvest period. The map shows the traditional growing areas for flaxseed in western Canada.

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



Summary

The Canadian Grain Commission's 2010 Harvest Survey of Western Canadian Flaxseed shows a decrease in oil and protein content, and an increase in iodine value when compared to the 2009 Harvest survey. Oil content for 2010 was 44.9%, a 1.2% decrease from 2009. The protein content for 2010 was 21.1%, a 0.9% decrease from 2009. Iodine value for 2010 was 194.6 units, an increase of 1.2 units when compared to the 2009 harvest survey.

Later seeding and reseeded due to the abundant precipitation experienced in the spring may have been a contributing factor in the reduction of oil and protein content, especially in Manitoba and Saskatchewan. In Saskatchewan where 68% of our samples arrived from, seeding progress was at 70% in the first week of June, compared to 2009 where seeding progress was at 99% and 96% for the 5-year average for seeding for the first week of June (Saskatchewan crop report 10, June 10 2010).

**Table 1 - Flaxseed, No. 1 Canada Western
Quality data for 2010 Harvest survey**

Quality parameter	2010	2009	2000-2009 Mean
Oil content ¹ , %	44.9	46.1	45.2
Protein content ² , %	21.1	22.0	23.3
Free fatty acids, %	0.20	0.15	0.27
Iodine value	194.6	193.4	191.0

¹ Dry matter basis

² N x 6.25; 8.5% moisture basis

**Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2010 harvest survey**

Fatty acid ¹ , % in oil	2010	2009	2000-2009 Mean
Palmitic acid	5.2	4.8	5.1
Stearic acid	3.2	3.1	3.4
Oleic acid	16.8	16.9	18.4
Linoleic acid	15.2	15.7	15.3
α -Linolenic acid	58.8	58.0	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

The 2010 flax growing season was characterized by excessive moisture throughout the prairies, and cooler temperatures. Seeding started early in most of the regions, but severe rain storms halted seeding progress and resulted in flooding in already seeded areas.

Heavy rainfall continued throughout most of the growing season except for the Peace River region, which experienced drought like conditions. Crop development was delayed 3-4 weeks due to the excessive moisture and cool temperatures.

Heavy rains in late August and early September delayed the onset of harvest. In mid-September the first fall frost was experienced throughout most of the prairies which resulted in damage to later maturing crops. The onset of warmer and drier weather conditions in late September and early October, aided in the completion of harvest.

Details on the 2010 growing season can be found at <http://www4.agr.gc.ca/DW-GS/historical-historiques.aspx?lang=eng&jsEnabled=true>. Weather and Crop Surveillance department of the Canadian Wheat Board and AAFC provided the majority of the detailed weather review for the 2010 crop year.

Production and grade information

Western Canadian farmers seeded 374.3 thousand hectares of flaxseed in 2010 (Table 3), which is a significant decrease when compared to 2009 (631.3 thousand hectares). The 2010 yield estimate of 1,200 kg/ha was lower than the yield reported in 2009 (1,500 kg/ha) but similar to the 10-year mean of 1,206 kg/ha. Western Canada flaxseed production had an overall decrease with 423.0 thousand metric tonnes when compared to last year's 930.1, thousand metric tonnes. Flaxseed production decreased in the prairie provinces with Manitoba at 81.3 thousand metric tonnes, Saskatchewan at 311.2 thousand metric tonnes and Alberta with a slight increase of 30.5 thousand metric tonnes when compared to 2009 production values as shown in *Field Crop Reporting Series No. 8*, November estimates. Saskatchewan accounted for 73.5% of flaxseed production while Manitoba and Alberta had 19.2% and 7.2% respectively.

Over 98% of the samples received for the 2010 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
	2010	2009	2010	2009	2000-2009
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	70.8	121.4	81.3	193.0	174.8
Saskatchewan	287.3	550.4	311.2	708.7	582.6
Alberta	16.2	20.2	30.5	28.4	27.9
Western Canada	374.3	692.0	423.0	930.1	785.3

¹ Source—Source: *Field Crop Reporting Series, No. 8*, December 2010; Statistics Canada

² Source—Source: *Field Crop Reporting Series*, revised final estimates for 2000-2009.

Harvest survey samples

Flaxseed samples for the CGC harvest survey are collected from producers, grain handling offices and oilseed crushing plants across western Canada. The samples are 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 crop districts for each grade.

This year's harvest survey report included 240 samples compared to 333 in 2009. Manitoba contributed 64 samples, Saskatchewan 164 samples and Alberta 12 samples during the harvest period from September 1 to December 1st, 2010. Weighting factors are used to calculate provincial and western Canadian means.

Quality of western Canadian flaxseed – 2010

Tables 4 and 5 show detailed information on the quality of top grade western Canadian flaxseed harvested in 2010. 97.5 % of the flax samples submitted to the GRL were graded as No. 1 Canada Western with the remainder 2.5% consisting of No. 2 Canada Western and No. 3 Canada Western. 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. Iodine value is a measure of the overall unsaturation of the oils 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. For flaxseed, the high level of α -linolenic acid is an important quality factor as it is this fatty acid, which is responsible for most of flaxseed oil's drying properties. α -Linolenic acid is also the omega-3 (ω -3) fatty acid considered to contribute to good health in humans and is responsible for the increasing use of whole and ground flaxseed in cereals and baked goods, and flaxseed oil in salads.

**Table 4 - Flaxseed, No. 1 Canada Western
Quality data for 2010 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	64	44.4	43.5	45.3	21.9	20.5	24.4	191.4	187.7	201.4
Saskatchewan	164	45.1	44.3	47.2	20.7	18.6	21.7	195.6	190.2	201.5
Alberta	12	45.9	45.0	46.4	22.2	20.7	22.9	198.3	196.6	202.1
Western Canada³	240	44.9	42.8	47.2	21.1	18.6	24.4	194.6	187.7	202.1

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 2010 harvest survey**

Province	Number of samples	Free fatty acid composition, % ¹					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
Manitoba	64	5.3	3.3	18.5	15.0	57.1	0.30
Saskatchewan	164	5.2	3.2	16.2	15.3	59.3	0.20
Alberta	12	5.1	3.6	16.1	17.3	63.4	0.45
Western Canada²	240	5.2	3.2	16.8	15.2	58.8	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 recent 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 0.8% to 7.7% 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 2010 harvest survey quality data with recent export³ shipments**

Quality parameter	2010 survey	December 2010 exports	2009-2010 exports
Oil content ¹ %	44.9	44.6	45.1
Protein content ² %	21.1	21.6	20.9
Free fatty acids, %	0.20	0.5	0.3
Iodine value	194.6	193.8	193.9
Palmitic acid, % in oil	5.2	4.9	4.7
Stearic acid, % in oil	3.2	3.1	3.0
Oleic acid, % in oil	16.8	17.6	17.6
Linoleic acid, % in oil	15.2	15.7	15.8
α -Linolenic acid, % in oil	58.8	57.8	57.7
Number of samples	240	16	83

¹ Dry matter basis

² N x 6.25; dry matter basis

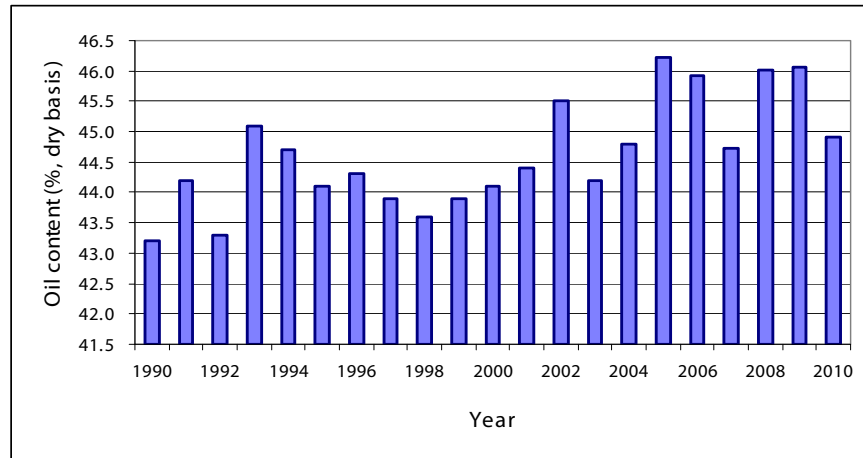
³ Commercially clean exports containing less than 2.5% dockage

Oil content

The average oil content of 44.9 % for Flaxseed, No.1 CW from the 2010 harvest survey is lower when compared to the 2009 oil content of 46.1%. The oil content for Manitoba, 44.4% is lower than in Saskatchewan and Alberta, which had oil content of 45.1% and 45.9% respectively. When comparing to 2009 the average oil contents in 2010 are 1.3% lower for both Manitoba and Saskatchewan samples and 0.3% higher for Alberta samples. The oil content of Flaxseed, No.1 CW samples from producers across western Canada varied from 42.8% to 47.2%

Quality information on the varieties from the 2010 survey will be available upon request. The oil content of December 2010 Flaxseed, No.1 CW exports averaged 44.7%, slightly lower than the 2009–2010 export mean of 45.1%. Flaxseed exports that are not commercially clean will have lower oil contents than exports that are cleaned to contain less than 2.5% dockage.

**Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest survey samples, 1990-2010**



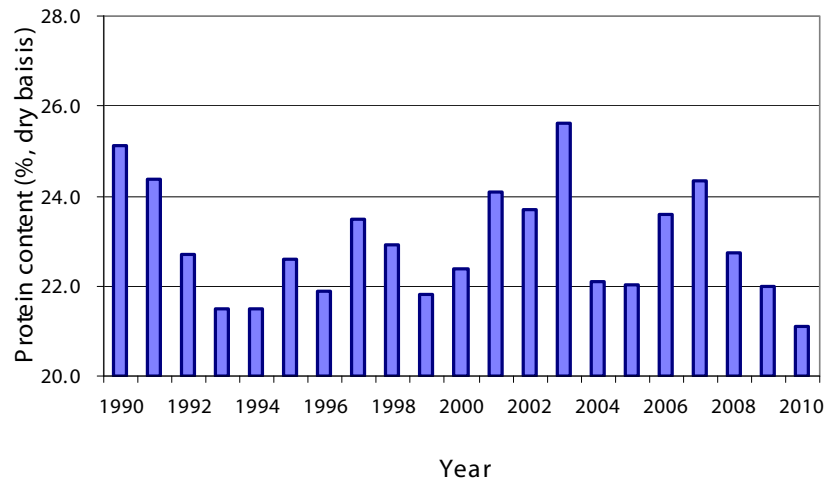
2010 average44.9%
 2009 average46.1%
 2000–2009 mean.....45.2%

Protein content

The average protein content of 21.1% for Flaxseed, No.1 CW from the 2010 harvest survey is 0.9% lower than in 2009 and 2.1% lower than the 10-year mean of 23.2%. The Manitoba average protein content of 21.9% was significantly lower than the 22.2% in Alberta and higher than the 20.7% in Saskatchewan. Compared to 2009, the average protein contents for Manitoba and Saskatchewan were similar with 0.2% increase for Manitoba and a 0.2% decrease for Saskatchewan, and Alberta showed the most change with a decrease of 1.2% when compared to the protein content in the 2009 harvest survey. The protein content of Flaxseed, No.1 CW samples from producers across western Canada varied from 18.6% to 24.4%.

As Table 6 shows, the protein content of 21.6% for December 2010 flaxseed exports is 0.7% higher than the 20.9% for the 2009–2010 shipping season. The protein content of flaxseed exports in 2010–2011 should be slightly higher than the export shipments of the previous season.

**Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest survey samples, 1990–2010**



2010 average.....	21.1%
2009 average.....	22.0%
2000–2009 mean	23.2%

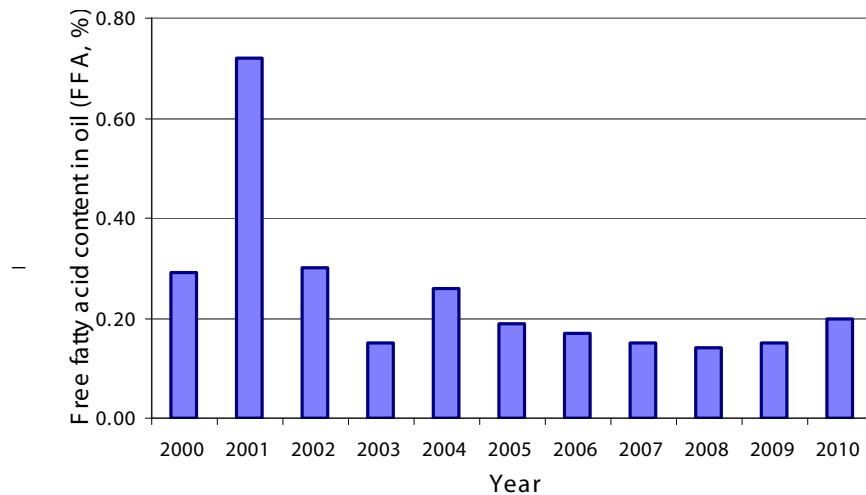
Free fatty acids content

The average free fatty acids (FFA) content of 0.20 % in top grade 2010 survey samples is similar to the 2009 average of 0.15% and below the 10-year mean of 0.28%. The average FFA content of Manitoba samples, 0.30% is higher than Saskatchewan’s FFA value of 0.20% and lower than Alberta’s FFA value of 0.45%. Higher FFA values are mainly due to seed damage resulting in exposure to moisture and oxygen, wet harvesting conditions and improper storage.

The lower grade samples (No.2 CW to Canada Sample Grade) had a mean FFA content of 0.29%.

The FFA content of Flaxseed, No.1 CW exports in December 2010 averaged 0.52%, higher than 2009-2010 exports of 0.31%.

**Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest survey samples, 2000–2010**



2010 average.....	0.20%
2009 average.....	0.15%
2000–2009 mean	0.28%

Fatty acid composition

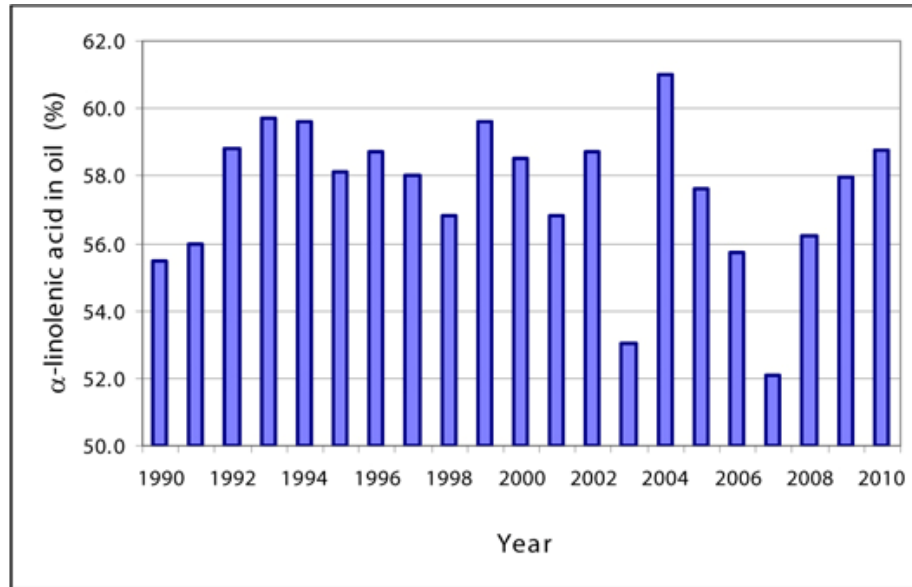
The average α -linolenic acid content of 2010 harvest survey Flaxseed, No.1 CW samples is 58.8%, higher than 2009 at 58.0% and higher than the 10-year mean of 56.9%. Compared to 2009, the average α -linolenic acid content decreased by 0.5%, for Manitoba and increased by 1.5% and 4.1 % for Saskatchewan and Alberta. Flaxseed, No. 1 CW samples from producers across western Canada had a range of linolenic acid content from 52.0% to 62.7%.

The average iodine value of the oil from Flaxseed, No.1 CW samples is 194.6 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 2010 iodine value is 1.2 units higher than in 2009 and 3.3 units higher than the 10-year mean of 191.3 units. The average iodine value decreased by 1.3, for Manitoba and increased by 2.5 and 3.1 units respectively for Saskatchewan and Alberta samples. Flaxseed, No.1 CW samples from producers across western Canada varied in iodine value from 187.7 to 202.1 units.

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. Generally, cooler growing conditions and longer photoperiods will result in both higher iodine value and oil content.

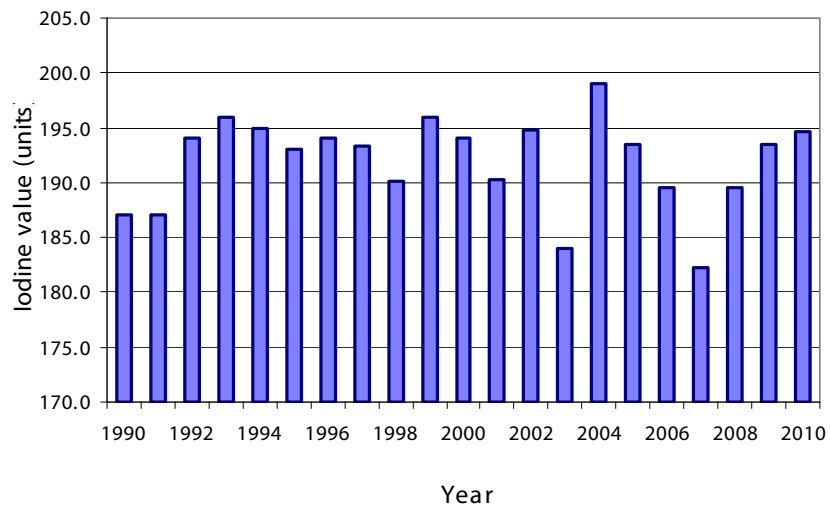
The December 2010 export data in Table 6 shows the α -linolenic acid content at 57.8% and the iodine value at 193.8 units, similar to the 2009–2010 mean export values. Flaxseed, No.1 CW exports will likely produce oils with iodine values of 190 units and higher. Flaxseed exports that are not commercially 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
Linolenic acid content of harvest survey samples, 1990–2010**



2010 average..... 58.8%
 2009 average..... 58.0%
 2000–2009 mean 56.9%

**Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest survey samples, 1990–2010**



2010 average 194.6
 2009 average 193.4
 2000–2009 mean..... 191.3