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Quality of western Canadian flaxseed 2006

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Quality Innovation Service

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Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2006 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 Canada showing traditional growing areas for flaxseed



Source: Flax Council of Canada

Summary

The Canadian Grain Commission (CGC) harvest survey of western Canadian flaxseed shows the 2006 crop to contain above average oil and protein contents but a below average iodine value. The iodine value is 3 units lower while the oil content is 1.4% higher and the protein content is 0.6% higher than the 10-year means.

Compared to 2005, the oil content, 45.9%, is 0.3% lower while the protein content, 23.6%, is 1.6% higher. The linolenic acid content, 55.8%, is 1.9% lower than in 2005, resulting in an iodine value of 190, four units lower than in 2005.

The GRL's long-term harvest survey results show warm, dry growing conditions tend to produce a flaxseed crop with lower oil contents and iodine values, but higher protein contents.

**Table 1 – Flaxseed, No. 1 Canada Western
Quality data for 2006 harvest survey**

Quality parameter	2006	2005	1996–2005 mean
Oil content ¹ , %	45.9	46.2	44.5
Protein content ² , %	23.6	22.0	23.0
Free fatty acids, %	0.16	0.18	0.23
Iodine value	190	194	193
Linolenic acid, % in oil	55.8	57.7	57.9

¹ Dry matter basis

² N x 6.25; dry matter basis

**Table 2 – Flaxseed, No. 1 Canada Western
Fatty acid composition for 2006 harvest survey**

Fatty acid ¹ , % in oil	2006	2005	1996–2005 mean
Palmitic	5.0	5.0	5.2
Stearic	3.6	3.3	3.4
Oleic	19.5	16.8	18.1
Linoleic	15.6	16.3	15.0
Linolenic	55.8	57.7	57.9

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

Temperature and precipitation patterns for the 2006 western Canadian growing season can be found on the PFRA web site ([http://www.agr.gc.ca/pfra/drought/drmaps_e.htm](http://www.agr.gc.ca/pfra/drought/drmmaps_e.htm)). The prairie provinces experienced adequate to excessive moisture to start the 2006 growing year. A drier and warmer than normal growing period eventually stressed many crops, but also allowed for quicker crop maturity and an earlier than normal harvest. The Weather and Crop Surveillance department of the Canadian Wheat Board provided the majority of the detailed weather review for the 2006 crop year.

Seeding

The soil moisture supply in western Canada was good to excellent in most regions for seeding of the 2006 crop, although excess moisture caused delays in northern Saskatchewan. The source of the excess moisture was precipitation received during the 2005 harvest season, as the winter precipitation was generally below normal. Seeding began in the southern areas of the Prairies at the end of April, with slow progress reported until the second week of May. Progress rapidly accelerated during the middle of May and reached 75% completion by May 22. Planting progress slowed during the next few weeks as heavy rains fell in the northern growing areas of Saskatchewan. Seeding continued in northern Saskatchewan into the third week of June. Approximately 800 000 hectares were left fallow due to the wet conditions in northeastern Saskatchewan. Temperatures were mostly above normal during seeding, which resulted in rapid germination and emergence of the crop. Crops in the southern and central Prairies were about one week ahead of normal development by the end of June.

Growing conditions

The above-normal temperatures experienced during the spring continued through the months of July and August. Average monthly temperatures were generally one to four degrees above normal across the Prairies, with the largest deviations seen in the eastern growing areas. Maximum temperature deviations were even higher, but relatively cool evening temperatures helped crops survive the hot weather. Precipitation amounts were well below normal in all areas of the Prairies during July and August. Southern and central areas received between 25 and 50% of normal precipitation, while northern growing areas received between 50 and 75%. The combination of hot temperatures and a lack of moisture stressed crops and lowered yield potential. The dry conditions minimized disease pressure in the crop and advanced crop development such that it was two to three weeks ahead of normal in most growing areas. The northeastern areas of Saskatchewan were an exception to this trend, as crop development was close to normal due to the late planting during the spring.

Harvest conditions

The early start to the harvest was a sharp contrast to the delayed harvests of the previous two growing seasons. The hot, mostly dry conditions experienced during August resulted in rapid crop ripening. The dry, warm conditions continued into September, which allowed 60% of the flaxseed crop to be harvested by the mid-month. Cooler, wet conditions prevailed in the last half of September, which slowed the harvest and prevented completion of the harvest until October. As of mid-October the flaxseed harvest was over 99% completed in Manitoba, 90% completed in Saskatchewan and about 95% completed in Alberta.

Production and grade information

Western Canadian farmers planted 842 thousand hectares of flaxseed in 2006 (Table 3), similar to last year's area. The 2006 yield estimate of 1300 kg/ha was similar to that reported in 2005 and above the 10-year mean of 1199 kg/ha. Western Canada flaxseed production declined 3.8% to 1.0 million tonnes, the result of a decrease in Saskatchewan production. According to the Statistics Canada estimates in Field Crop Reporting Series No. 8, Saskatchewan accounted for 77 percent of flaxseed production while Manitoba and Alberta had 19 percent and four percent respectively.

For the 2006 Saskatchewan flaxseed crop, Saskatchewan Agriculture, Food and Rural Revitalization Report Number 28 estimated the portion of Flaxseed, No.1 CW to be 89% compared to 83% in 2005 and 80% for the ten-year mean. However, poor weather in September and October resulted in some regional downgrading in northern areas of Saskatchewan and Alberta.

Table 3 – Seeded area and production for western Canadian flaxseed

	Seeded area ¹		Production ¹		Average production ²
	2006	2005	2006	2005	1996–2005
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	154	154	193	147	243
Saskatchewan	660	656	805	881	555
Alberta	28	32	43	53	30
Western Canada	842	842	1,041	1,082	828

¹ Source—*Field Crop Reporting Series, No. 8*, December 7, 2006; Statistics Canada

² Source—*Field Crop Reporting Series*, revised final estimates for 1996–2005

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, No.1 Canada Western (CW) samples by province.

This year's harvest survey report included 600 samples compared to 640 in 2005. Manitoba contributed 181 samples, Saskatchewan 399 samples and Alberta 20 samples during the harvest period from September 1 to November 15, 2006. Weighting factors used to calculate provincial and western Canadian means are derived from the previous five-year average production for each crop district and this year's provincial production estimates in Statistics Canada's Field Crop Reporting Series No. 8, December 7, 2006.

Quality of western Canadian flaxseed 2006

Tables 4 and 5 show detailed information on the quality of top grade western Canadian flaxseed harvested in 2006. A complete summary of the survey by province and lower grades can be found at: <http://grainscanada.gc.ca/Quality/grlreports/Flax/flaxmenu-e.htm>. 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.

Table 6 compares the quality of recent flaxseed exports with this year's harvest survey data. The harvest survey data is from producer samples that have been cleaned to remove dockage, while recent exports of flaxseed from Thunder Bay and Vancouver contained 6.2% and 2.0% dockage respectively. 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.

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 linolenic acid is an important quality factor as it is this fatty acid, which is responsible for most of flaxseed oil's drying properties. Linolenic acid is also the omega-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 2006 harvest survey**

Province	Number of samples	Oil content ¹			Protein content ²			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
			%				%			
Manitoba	181	45.3	38.9	50.6	24.3	18.5	30.2	190	179	210
Saskatchewan	399	46.1	39.7	51.6	23.4	19.2	31.5	190	174	204
Alberta	20	46.4	42.6	50.8	23.5	17.9	27.6	194	180	204
Western Canada³	600	45.9	38.9	51.6	23.6	17.9	31.5	190	174	210

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 for 2006 harvest survey**

Province	Number of samples	Fatty acid composition, % ¹					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
Manitoba	181	5.0	3.5	19.6	15.5	55.8	0.23
Saskatchewan	399	5.0	3.6	19.6	15.6	55.7	0.14
Alberta	20	4.9	3.4	17.0	16.1	58.1	0.11
Western Canada²	600	5.0	3.6	19.5	15.6	55.8	0.16

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 – Flaxseed, No. 1 Canada Western
Comparison of 2006 harvest survey quality data
with recent export³ shipments**

Quality parameter	2006 survey	October 2006 exports	2005-2006 exports
Oil content ¹ , %	45.9	45.9	46.0
Protein content ² , %	23.6	22.5	22.0
Free fatty acids, %	0.16	0.41	0.35
Iodine value	190	192	194
Palmitic acid, % in oil	5.0	4.9	4.9
Stearic acid, % in oil	3.6	3.5	3.4
Oleic acid, % in oil	19.5	18.4	17.2
Linoleic acid, % in oil	15.6	16.4	16.6
Linolenic acid, % in oil	55.8	56.5	57.5
Number of samples	600	3	23

¹ Dry matter basis

² N x 6.25; dry matter basis

³ Commercially clean exports containing less than 2.5% dockage

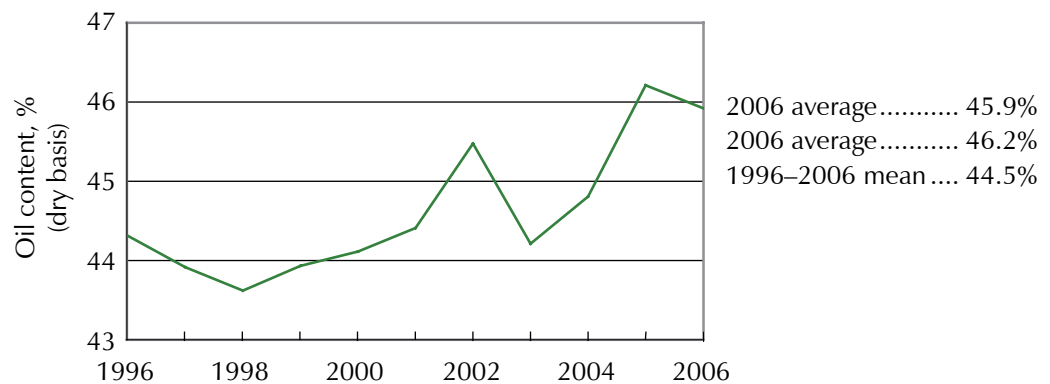
Oil content

The average oil content of 45.9% for Flaxseed, No.1 CW from the 2006 survey is only 0.3% below the record high 46.2% of 2005. The oil content of 45.3% for Manitoba is significantly lower than the 46.1% and 46.4% in Saskatchewan and Alberta samples. Compared to 2005, average oil contents are 0.6%, 0.2% and 0.1% lower respectively for Manitoba, Alberta and Saskatchewan samples. The oil content of Flaxseed, No.1 CW samples from producers across western Canada varied from 38.9% to 51.6%.

The decreased oil contents seen in the 2006 survey are a result of the drier and warmer than normal growing conditions in southern portions of the flaxseed growing area. The GRL's long-term harvest survey results have shown that hot, dry growing conditions tend to produce a flaxseed crop with lower oil contents and iodine values, but higher protein contents (<http://grainscanada.gc.ca/Quality/Flax/flaxmenu-e.htm>). While average monthly temperatures were generally one to four degrees above normal across the Prairies, relatively cool evening temperatures helped crops survive the hot weather and maintain relatively high oil contents. Another, contributing reason for the improvement in the western Canada mean oil content in the past few years is the continuing trend of planting more of the newer high quality Canadian flaxseed cultivars. Quality information on the varieties from the 2006 survey will be available at a later date on the above noted CCC website.

The oil content of October 2006 Flaxseed, No.1 CW exports averaged 45.9%, similar to the 2005–2006 export mean of 46.0%. This suggests the oil content of the 2006–2007 flaxseed exports will be similar to the previous year. 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, 1996–2006**

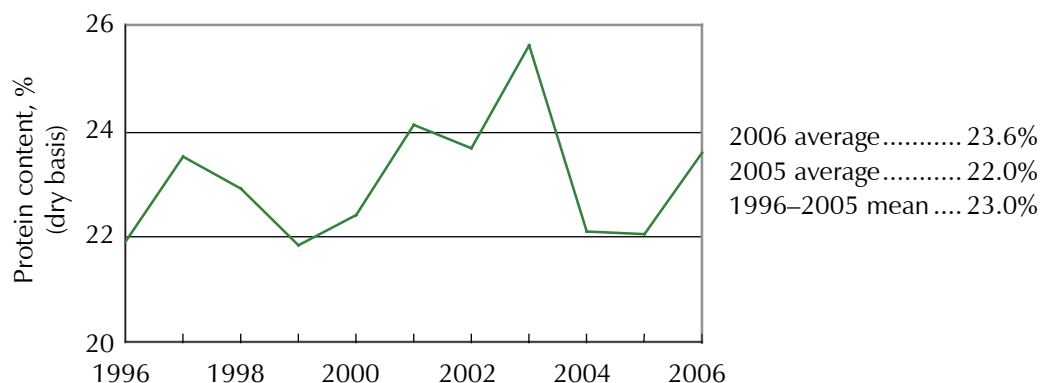


Protein content

The average protein content of 23.6% for Flaxseed, No.1 CW from the 2006 harvest survey is 1.6% higher than in 2005 and 0.6% higher than the 10-year mean of 23.0%. The Manitoba average protein content of 24.3% was significantly higher than the 23.5% in Alberta and the 23.4% in Saskatchewan. Compared to 2005, the average protein contents increased by 2.4%, 1.4% and 0.8% respectively for Manitoba, Saskatchewan, and Alberta samples. The protein content of Flaxseed, No.1 CW samples from producers across western Canada varied from 17.9% to 31.5%.

As Table 6 shows, the protein content of 22.5% for October 2006 flaxseed exports is 0.5% higher than the 22.0% for the 2005–2006 shipping season. The protein content of flaxseed exports in 2006–2007 should be higher than the export shipments of the previous season.

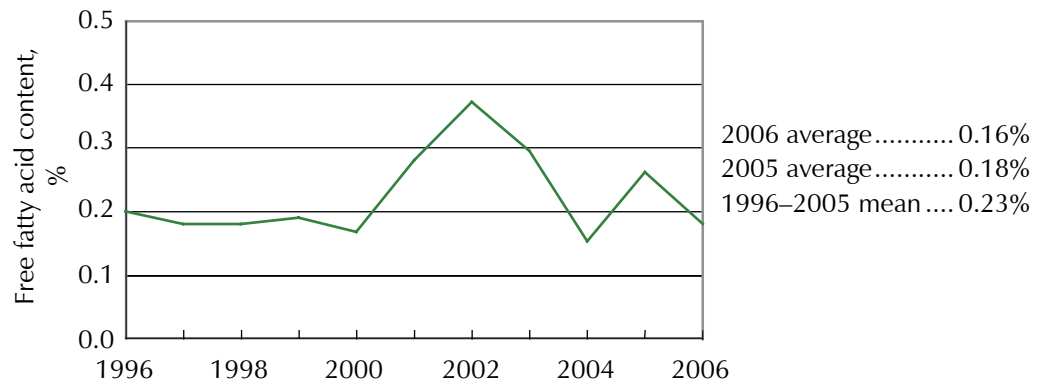
**Figure 3 - Flaxseed, No. 1 Canada Western
Protein content of harvest survey samples, 1996–2006**



Free fatty acids content

The average free fatty acids (FFA) content of 0.16 % in top grade 2006 survey samples is similar to the 2005 average of 0.18% and below the 10-year mean of 0.23%. The average FFA content of Manitoba samples (0.23%) is notably higher than those from Alberta (0.11%) and Saskatchewan (0.14%). Flaxseed from regions where the crop was heat stressed or delayed due to wet harvest conditions will have FFA levels above the provincial means. The Flaxseed, Canada Sample Grade composite had FFA levels of 0.48%. The FFA content of Flaxseed, No.1 CW exports in October 2006 averaged 0.41%; suggesting the levels in 2006–2007 will be similar to the 2005–2006 values (Table 6).

**Figure 4 - Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest survey samples, 1996–2006**



Fatty acid composition

The average linolenic acid content of 2006 harvest survey Flaxseed, No.1 CW samples is 55.8%, significantly lower than both the 57.7% in 2005 and the 10-year mean of 57.9%. Compared to 2005, the average linolenic acid content decreased by 3.1%, 2.5% and 1.6% respectively in Alberta, Manitoba, and Saskatchewan. Flaxseed, No. 1 CW samples from producers across western Canada had a range of linolenic acid content from 46.3% to 69.2%.

The average iodine value of the oil from Flaxseed, No.1 CW samples is 190 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 2006 iodine value is 4 units lower than in 2005 and 3 units below the 10-year mean of 193 units. The average iodine value decreased by 6, 5 and 4 units respectively for Alberta, Manitoba, and Saskatchewan samples. Flaxseed, No.1 CW samples from producers across western Canada varied in iodine value from 174 to 210 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 warmer growing season temperatures in 2006 contributed to the decrease in the mean iodine value.

The October 2006 export data in Table 6 shows the linolenic acid content at 56.5% and the iodine value at 192 units, lower than the 2005–2006 mean export values. Flaxseed, No.1 CW exports will likely produce oils with iodine values between 190 and 192 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
Linolenic acid content of harvest survey samples, 1996–2006**



**Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest survey samples, 1996-2006**

