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Quality of western Canadian flaxseed 2008

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Table of contents

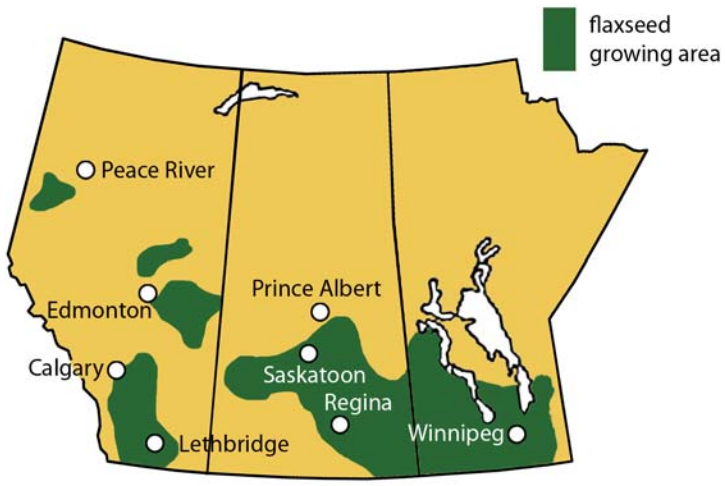
Tables

Figures

Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2008 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



Source: Flax Council of Canada

Summary

The Canadian Grain Commission (CGC) harvest survey of western Canadian flaxseed shows the 2008 crop to have a near record oil content but with lower than average protein content. For 2008 the mean oil content is 1.3% higher while the mean protein content is 0.6% below the 10-year mean. While the iodine value is below the 10-year mean it is significantly higher than the near record low of last year.

Compared to 2007, the oil content, 46.0%, is 1.3% higher while the protein content, 22.7%, is 1.6% lower. The linolenic acid content, 56.0%, is 3.5% higher than in 2007, resulting in an iodine value of 189, six units higher than in 2007. The 2008 flaxseed crop shows less regional differences in oil, protein and fatty acid composition than most years.

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

Table 1 - Flaxseed, No. 1 Canada Western
Quality data for 2008 harvest survey

Quality parameter	2008	2007	1998-2007 Mean
Oil content[1], %	46.0	44.7	44.7
Protein content[2], %	22.7	24.3	23.3
Free fatty acids, %	0.14	0.16	0.22
Iodine value	189.2	183.5	191.7
Linolenic acid, % in oil	56.0	52.6	57.1

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

Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2008 harvest survey

Fatty acid[1], % in oil	2008	2007	1998-2007 Mean
Palmitic	4.8	5.0	5.2
Stearic	3.5	3.6	3.4
Oleic	18.9	20.6	18.5
Linoleic	15.2	16.2	15.2
Linolenic	56.0	52.6	57.1

[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 2008 western Canadian growing season can be found on the PFRA web site (http://www.agr.gc.ca/pfra/drought/mapscc_e.htm). The prairie provinces experienced cool spring weather to start the 2008 growing year. A cooler and wetter than normal growing period characterized much of the south, while some northern regions experienced near drought like conditions. The Weather and Crop Surveillance department of the Canadian Wheat Board provided the majority of the detailed weather review for the 2008 crop year.

Seeding

The early spring season was characterized by very cool temperatures which delayed planting in the south and slowed the snowmelt in the northern growing areas. Cool soil temperatures delayed crop germination and early seeded regions reported poor crop emergence. Moderate to heavy precipitation fell in the southern growing regions during the late-April to mid-May period, which provided much needed moisture for the seeding and germination of the crop. Northern areas of the Prairies were mostly dry, which allowed regions that had received heavy snowfall to plant most of the crop by the end of May. The dry trend in the northern growing areas persisted through the first half of growing season

Growing conditions

Precipitation during June was close to normal or above normal in most of the Prairie region, which helped boost crop prospects. Temperatures during the month of May and June were significantly below normal, which delayed crop development. By the end of June, growth was 10 days to two weeks behind normal, but the crop condition was rated as mostly good to excellent. In July, moderate temperatures were reported, with many stations in the western Prairies reporting monthly averages that were 2 to 5 degrees Celsius below those received in July 2007. The cooler temperatures allowed crops to move through the reproductive stage without significant stress. Dry conditions persisted in the northern growing areas during July and caused some crop deterioration. The Peace River region of Alberta and British Columbia was dry throughout the month, with above normal temperatures that caused significant crop stress and significantly reduced yield expectations. In northern areas of Alberta and Saskatchewan, the cooler than normal temperatures in July helped maintain crop conditions until rains arrived in late July and early August.

Harvest conditions

Above normal temperatures were reported in August across the Prairies, which helped boost crop development. However, frost and crop damage were reported during the month in parts of Alberta and western Saskatchewan. Warmer temperatures allowed the harvest of flaxseed crop to begin by the first week of September. Persistent rains in the last week of August and the first ten days of September slowed the harvest. Temperatures remained mild during September, with many areas reporting their first fall frost one to two weeks later than normal. This allowed late developing crops to mature without significant quality damage. Drier and warmer conditions returned to the entire Prairie region during the mid-September to mid-October period, which allowed for a rapid completion of the harvest. Approximately 80% of the Saskatchewan flax crop was harvested by the middle of October.

Production and grade information

Western Canadian farmers planted 631 thousand hectares of flaxseed in 2008 (Table 3), a 20% increase from last year's area. The 2008 yield estimate of 1400 kg/ha was higher than the 1200 kg/ha reported in 2007 and well above the 10-year mean of 1180 kg/ha. Western Canada flaxseed production increased 36% to 861,100 tonnes, the result of significant increases in both seeded area and yields. 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 4 percent respectively.

For the 2008 Saskatchewan flaxseed crop, *Saskatchewan Agriculture, Food and Rural Revitalization Report Number 28* estimated the portion of Flaxseed, No. 1 CW to be 88% compared to 89% in 2007 and 79% for the ten-year mean.

Table 3 - Seeded area and production for western Canadian flaxseed

	Seeded area		Production[1]		Average production
	2008	2007	2008	2007	1998-2007
	thousand hectares		thousand tones		thousand tonnes
Manitoba	107	81	161	105	203
Saskatchewan	506	435	667	512	584
Alberta	18	12	33	16	30
Western Canada	**631**	**528**	**861**	**633**	**817**

[1] Source—Source: *Field Crop Reporting Series, No. 8,* December 2008; Statistics Canada
[2] Source—Source: *Field Crop Reporting Series*, revised final estimates for 1998-2007.

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 Industry Services Division of the Canadian Grain Commission assigned grades to all the survey samples. 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 345 samples compared to 359 in 2007. Manitoba contributed 108 samples, Saskatchewan 223 samples and Alberta 14 samples during the harvest period from September 1 to November 30, 2008. 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, 2008.

Quality of western Canadian flaxseed – 2008

Tables 4 and 5 show detailed information on the quality of top grade western Canadian flaxseed harvested in 2008. A complete summary of the survey by province including a few lower grade samples can be found at: http://grainscanada.gc.ca/flax-lin/hqfm-mqrl-eng.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 6.7% 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 2008 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	104	45.5	40.9	48.5	22.8	19.0	26.4	190	184	202
Saskatchewan	212	46.1	41.4	50.0	22.7	17.1	28.4	188	176	196
Alberta	14	46.2	43.5	49.0	23.3	20.3	25.4	189	180	198
Western Canada[3]	**330**	**46.0**	**40.9**	**50.0**	**22.7**	**17.1**	**28.4**	**189**	**176**	**202**

[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 2008 harvest survey

Province	Number of samples	Fatty acid composition, %[1]					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
Manitoba	104	4.9	3.3	18.2	15.0	57.1	0.15
Saskatchewan	212	4.9	3.6	19.1	15.2	55.7	0.14
Alberta	14	4.6	3.8	18.3	15.4	56.4	0.15
Western Canada[2]	**330**	**4.8**	**3.5**	**18.9**	**15.2**	**56.0**	**0.14**

[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 2008 harvest survey quality data with recent export[3] shipments

Quality parameter	2008 survey	November 2008 exports	2007-2008 exports
Oil content[1]%	46.0	45.5	45.4
Protein content[2]%	22.7	22.3	23.4
Free fatty acids, %	0.14	0.21	0.43
Iodine value	189	189	189
Palmitic acid, % in oil	4.8	4.8	4.9
Stearic acid, % in oil	3.5	3.6	3.5
Oleic acid, % in oil	18.9	19.3	18.7
Linoleic acid, % in oil	15.2	15.3	15.7
Linolenic acid, % in oil	56.0	55.7	55.6
Number of samples / shipments	**330**	**1**	**25**

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Commercially clean exports contain less than 2.5% dockage while survey samples are dockage free

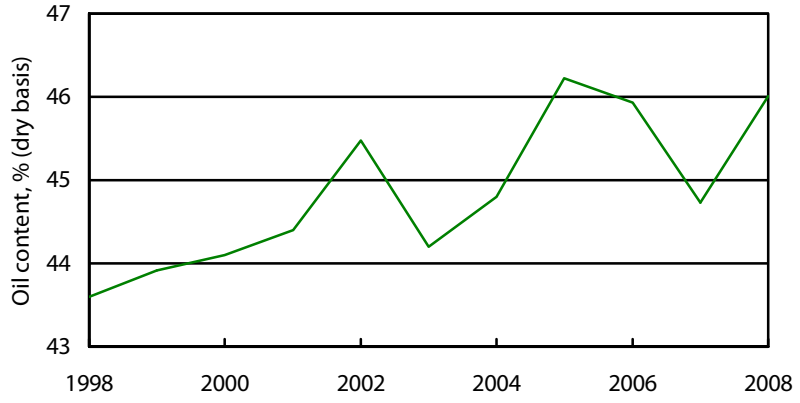
Oil content

The average oil content of 46.0% for Flaxseed, No. 1 CW from the 2008 survey is 1.3% above both the 44.7% of 2007 and the ten–year (1998-2007) mean of 44.7%. The mean oil content of 45.5% for Manitoba samples is lower than the 46.1% and 46.2% for Saskatchewan and Alberta samples. Compared to 2007, average oil contents changed by +1.4%, +1.3% and +0.8% respectively for Manitoba, Saskatchewan, and Alberta samples. The oil content of Flaxseed, No. 1 CW samples from producers across western Canada varied from 40.9% to 50.0%.

The increased oil contents seen in the 2008 survey are a result of the generally cooler growing conditions experienced during July over much of the western Canadian flaxseed growing area. In general, cool growing conditions tend to produce flaxseed with higher oil contents but lower protein content. In addition, there has been overall improvement in the western Canada mean oil content in the past decade due to the continuing trend of planting more of the newer Canadian flaxseed cultivars. Quality information on the varieties from the 2008 survey will be available at a later date on the CGC website.

The oil content of November 2008 Flaxseed, No. 1 CW exports averaged 45.5%, slightly higher than the 2007–2008 export mean of 45.4% (Table 6). This suggests the oil content of the 2008–2009 flaxseed exports will be higher than 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, 1998-2008



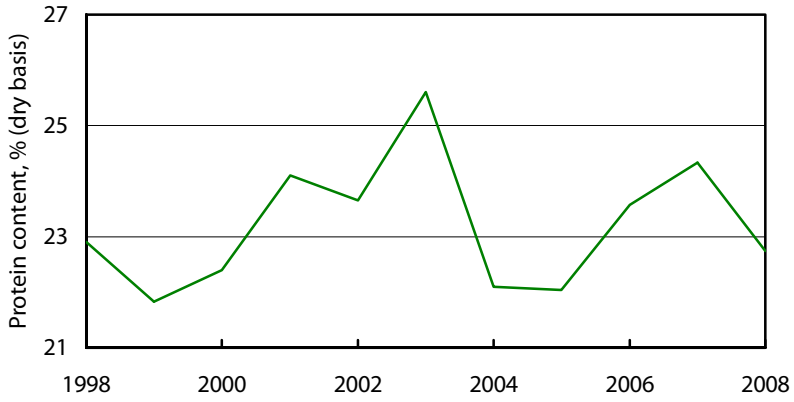
2008 average	46.0%
2007 average	44.7%
1998–2007 mean	44.7%

Protein content

The average crude protein content of 22.7% for Flaxseed, No. 1 CW from the 2008 harvest survey is 1.6% lower than in 2007 and 0.6% lower than the 10-year mean of 23.3%. The Alberta average protein content of 23.3% was higher than the 22.8% in Manitoba and the 22.7% in Saskatchewan. Compared to 2007, the average protein contents changed by -1.7%, -1.2% and -1.2% respectively for Saskatchewan, Manitoba and Alberta samples. The protein content of Flaxseed, No.1 CW samples from producers across western Canada varied from 17.1% to 28.4%.

As Table 6 shows, the protein content of 22.3% for November 2008 flaxseed exports is 1.1% lower than the 23.4% for the 2007–2008 shipping season. The protein content of flaxseed exports in 2008–2009 should be notably lower than the export shipments of the previous season.

Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest survey samples, 1998–2008



2008 average 22.7%
2007 average 24.3%
1998–2007 mean.....23.3%

Free fatty acids content

The average free fatty acids (FFA) content of 0.14 % in top grade 2008 survey samples is slightly lower than the 2007 average of 0.16% and significantly below the 10-year mean of 0.22%. Flaxseed from regions where the crop was heat stressed or delayed due to wet harvest conditions will have FFA levels above the provincial means. For initial 2008-2009 exports, FFA levels for Flaxseed, No. 1 CW are expected to be around 0.2% (Table 6). The FFA levels towards the end of the shipping season will likely be higher than the values in November shipments because FFA levels tend to increase over time.

Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest survey samples, 1998–2008

2008 average 0.14%
2007 average 0.16%
1998–2007 mean.....0.22%

Fatty acid composition

Beginning with the 2007/2008 crop year there was a change to the manner in which the fatty acid profiles for flaxseed samples are calculated and reported. Prior to 2007/2008 fatty acid profiles for flaxseed samples were considered to include only the following five major fatty acids found in flaxseed oil: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3). Fatty acid profiles and Calculated Iodine Values were based on just those 5 major fatty acids, normalized to 100%.

Flaxseed samples contain as much as 0.5% of other minor fatty acids such as arachidic (C20:0), eicosenoic (C20:1), behenic (C22:0), and lignoceric (C24:0). In addition, export composite loading samples, often contain trace amounts of other oilseed crops which can contribute 1% to 1.5% of additional minor fatty acids to the complete profile. As a result, a flaxseed export shipment fatty acid profile can contain any or all of the following fatty acids: myristic (C14:0), palmitic (C16:0), palmitoleic (C16:1), stearic (C18:0), oleic (C18:1), linoleic (C18:2), linolenic (C18:3), arachidic (C20:0), eicosenoic (C20:1), eicosadienoic (C20:2), behenic (C22:0), erucic (C22:1), docosadienoic (C22:2), lignoceric (C24:0), and nervonic (C24:1). Beginning in 2007-2008 crop year they are all included in the fatty acid profile and calculated Iodine Value. Compared to previous calculations, Iodine Values for flaxseed samples are approximately 2 to 3 IV units lower than were previously reported (pre-2007) for an identical sample.

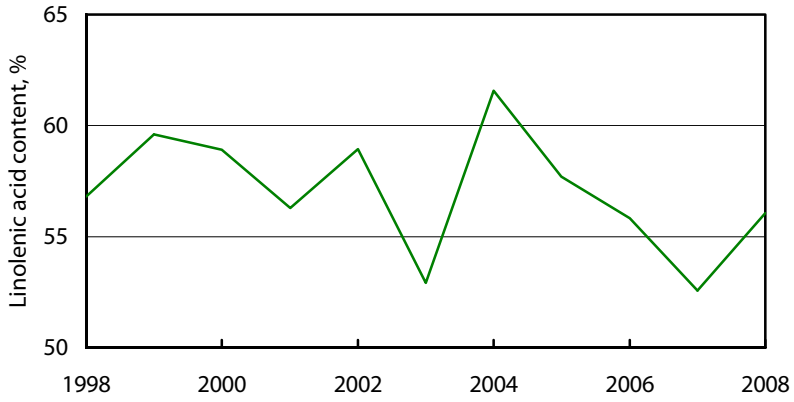
The average linolenic acid content of 2008 harvest survey Flaxseed, No. 1 CW samples is 56.0%, significantly higher than the 52.6% in 2007and similar to the 10-year mean of 57.1%. Compared to 2007, the average linolenic acid content increased by 4.2%, 3.3% and 1.2% respectively in Manitoba, Saskatchewan, and Alberta. Flaxseed, No. 1 CW samples from producers across western Canada had a range of linolenic acid content from 49.4% to 61.8%.

The average iodine value of the oil from Flaxseed, No. 1 CW samples is 189 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 2008 iodine value is 6 units higher than in 2007 and 3 units below the 10-year mean of 192 units. The average iodine value increased by 7, 6 and 2 units respectively for Manitoba, Saskatchewan, and Alberta samples. Flaxseed, No. 1 CW samples from producers across western Canada varied in iodine value from 176 to 202 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 2007 contributed to the decrease in the mean iodine value.

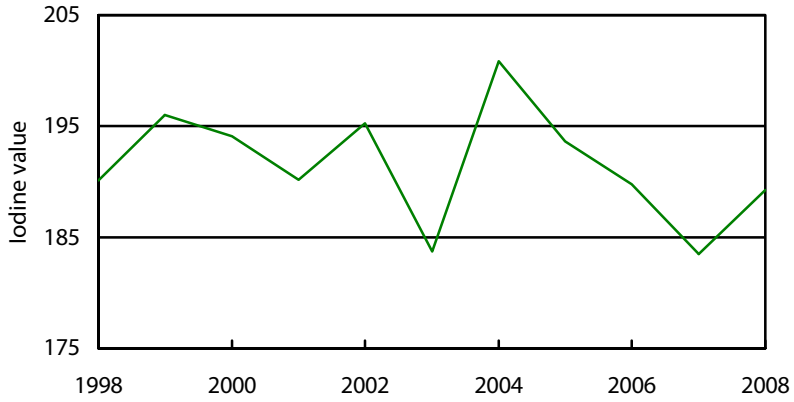
The November 2008 export data in Table 6 shows the linolenic acid content at 55.7% and the iodine value at 189 units, similar to the 2007–2008 mean export values. Flaxseed, No. 1 CW exports will likely produce oils with iodine values between 188 and 190 units. Flaxseed exports that are not commercially 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
Linolenic acid content of harvest survey samples, 1998–2008



2008 average 56.0%
2007 average 52.6%
1998–2007 mean.....57.1%

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest survey samples, 1998–2008



2008 average 189
2007 average 183
1998–2007 mean.....192