Quality of western Canadian flaxseed

1999

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Summary

The harvest survey for 1999 western Canadian flaxseed shows above average oil content and iodine value.

Compared to 1998, the oil content, 43.9%, and iodine value, 196 units, are higher, while the protein content, 21.8%, is lower. The iodine value is five units higher, the oil content 0.1% higher and the protein content 1.6% lower than the 10-year means. The linolenic acid content, 59.6%, is significantly higher than in 1998.

The cool, wet growing conditions resulted in certain regions having higher oil contents and iodine values than the reported provincial means.

Table 1 • Quality data for harvest survey No. 1 Canada Western flaxseed

Quality parameter	1999	1998	1989–98 Mean
Oil content[1], %	43.9	43.6	43.8
Protein content[2], %	21.8	22.9	23.4
Free fatty acids, %	0.2	0.2	0.2
Iodine value	196	190	191
Linolenic acid content, % in oil	59.6	56.8	57.4

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

Table 2 • Fatty acid composition[1] of harvest survey No. 1 Canada Western flaxseed

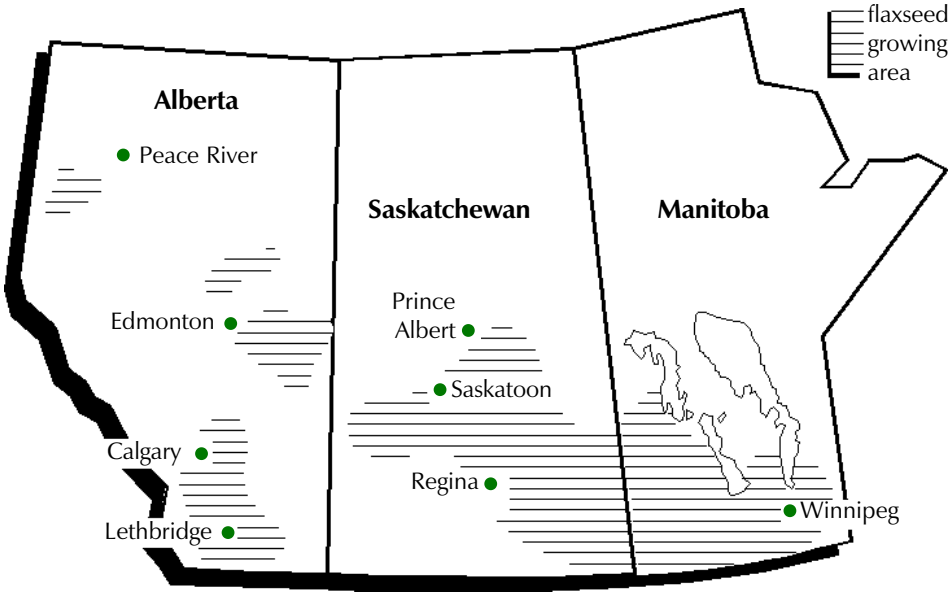
Fatty acid, % in oil	1999	1998	1989–98 Mean
	%	%	%
Palmitic	5.4	5.5	5.2
Stearic	3.1	3.6	3.2
Oleic	17.1	19.4	18.6
Linoleic	14.7	14.3	14.7
Linolenic	59.6	56.8	57.4

[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)

Introduction

This report presents information on the major quality parameters for the 1999 harvest survey of western Canadian flaxseed. Included is information on the oil, protein, free fatty acid content and the fatty acid composition, including iodine value, of harvest survey samples. Quality data presented were obtained from analyses of flaxseed samples submitted to the Grain Research Laboratory throughout the harvest period by producers, grain companies and oilseed crushing plants. The map shows the traditional growing areas for flaxseed in western Canada.

Figure 1 • Map of western Canada showing traditional growing area for flaxseed



Source: Flax Council of Canada

Weather and production review

Weather review

The weather review for the 1999 flaxseed harvest survey was provided by the Weather and Crop Surveillance department of the Canadian Wheat Board. A wet and cool spring over much of the prairie region resulted in late seeding and contributed to an extended harvest period.

Seeding

The planting of flaxseed in 1999 started earlier than normal in those parts of the Prairies which had above normal temperatures in the second half of April. The warm, dry conditions continued into the first week of May and permitted some regions, especially southern Alberta and southeastern Manitoba, to seed a great portion of the flaxseed crop at this time. For the rest of the prairie region, especially eastern Saskatchewan and western Manitoba, seeding was delayed by heavier than normal snow cover and excessive soil moisture levels. Over most of the southern and central Prairies, May precipitation was significantly above normal, while in northern regions precipitation was closer to normal.

Temperatures in May also turned cooler with most prairie locations reporting deviations of one to two degrees below normal. These conditions slowed seeding progress and resulted in serious planting delays. The wet conditions continued through the first half of June, which resulted in continued planting delays in the eastern half of the Prairies. The waterlogged soil conditions in the eastern Prairies resulted in seeding more than half of the flaxseed crop after June 1. As a result of the prolonged seeding period, flaxseed crop development varied greatly throughout the prairie region.

Growing conditions

Wet conditions persisted through June across most of the Prairies. In areas where crops had emerged, the moisture resulted in above average stands with excellent yield potential. The frequent rainfall continued through July which helped maintain crop conditions. Temperatures remained cooler than normal through June and July, with stations reporting monthly averages ranging from 0.5°C to 3.0°C below normal. The coolest temperatures were in the western regions of the Prairies during June and July.

The cooler weather during late July and early August provided ideal conditions for flaxseed flowering and the yield potential in many regions was above normal. August brought a change in the weather as rains generally tapered off and temperatures climbed to normal or above normal across the Prairies. The warm temperatures helped encourage crop development, although most regions were still 10 to 15 days behind normal development at the end of the month.

The only exception to the wetter than normal conditions in June and July was the Peace River region of Alberta. This region received below normal precipitation during June, which caused stress to flaxseed crops. Dry conditions persisted in this region through July and August reducing yields significantly.

Harvest conditions

The lateness of the flaxseed crop across the prairie region raised concerns about the potential for frost damage. The first sub-zero temperatures were reported in the foothills of southern and central Alberta and east-central Alberta during the first week of September. During the same week parts of northern and west-central Saskatchewan reported light frosts. The remainder of the Prairies did not report freezing temperatures until the second half of September. In most regions, the first frost in 1999 was very close to or after the average frost date for the region.

Harvest began in southeastern Manitoba and southern Alberta by the middle of August, but these regions were the exception. The majority of the western Canadian flaxseed harvest started in September and finished in late October. Precipitation during September and October was below normal, especially in the western half of the Prairies. The eastern half of the Prairies received normal to above normal precipitation during September and October, which resulted in lower bushel weights and poor appearance of the seed harvested under wet conditions.

Production and grade information

Table 3 shows western Canadian farmers planted 809,400 hectares of flaxseed in 1999, which was an eight percent decrease from last year's area. The final 1999 yield estimate of 1300 kg/ha was similar to both the 1300 kg/ha reported in 1998 and the ten-year mean of 1255 kg/ha. With slightly above average yields, total flaxseed production in western Canada was a 1.05 million tonnes according to estimates by Statistics Canada reported in *Field Crop Reporting Series No. 8*, December 3, 1999. Saskatchewan accounted for 70 percent of production in 1999, Manitoba for 26 percent and Alberta for 4 percent.

Compared to 1998, the flaxseed samples contain a higher percentage of damaged seeds including shriveled, frosted and blackened, and white, severely discoloured seeds. There are also producer reports of "sticky" flaxseed caused by wetting of the seed coat and mucilage layer on the outer surface of flaxseed. This occurs when water penetrates the boll during wet harvest conditions. Mucilage content of the seed may decrease, but no quality losses are attributed to this type of weathering damage as shown in studies by the Canadian Grain Commission. Weathered seeds of this kind are not considered damaged and not considered as a grading factor.

Table 3 • Seeded area and production for the 1999 and 1998 crops of western Canadian flaxseed and average annual flaxseed production for the 10-year period 1989 to 1998

	Seeded area[1] thousand hectares		Production[1] thousand tonnes		Average production[2] thousand tonnes
	1999	1998	1999	1998	1989–98
Manitoba	210	283	272	361	323
Saskatchewan	567	567	734	681	423
Alberta	32	28	43	39	40
Western Canada	**809**	**878**	**1049**	**1081**	**786**

[1] Source—*Field Crop Reporting Series*, *No. 8*, December 3, 1999, Statistics Canada

[2] Source—*Field Crop Reporting Series*, revised final estimates for 1989–98

Harvest survey samples

Samples for the Canadian Grain Commission flaxseed 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 an 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 CW samples by province.

This year's harvest survey included 257 samples from across western Canada. Manitoba contributed 93 samples, Saskatchewan 154 samples and Alberta 10 samples during the harvest period from September 1,1999 to December 15,1999. Weighting factors used to calculate provincial and western Canadian means are derived from the previous five-year average production for each crop district and the 1999 provincial production estimates in Statistics Canada's *Field Crop Reporting Series No. 8*, December 3,1999.

Acknowledgments

The Grain Research Laboratory acknowledges the cooperation of flaxseed producers, grain handling offices, and oilseed crushing plants in western Canada for supplying the samples of flaxseed harvested in 1999, the assistance of the Industry Services grain inspectors for grading the producer survey samples, the Weather and Crop Surveillance department of the Canadian Wheat Board for providing the review of the 1999 growing season, and the GRL staff, in particular Ken Howard, Michelle Kisilowsky, Barry Misener, and Bert Siemens for their technical assistance and for conducting the analyses.

Quality of 1999 flaxseed

Tables 4 and 5 show detailed information on the quality of western Canadian flaxseed harvested in 1999. Table 6 compares the quality of recent flaxseed exports. The number of samples in 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 the 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, that is, 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 flaxseed's increasing use as a component in some cereals and baked goods.

Table 4 • Quality data for 1999 harvest survey of No. 1 Canada Western flaxseed by province

	Number of samples tested	Oil content[1] %			Protein content[2] %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Manitoba	93	43.7	40.2	48.2	22.4	19.1	25.2	197	184	204
Saskatchewan	154	43.9	38.8	48.1	21.5	17.8	25.3	196	186	202
Alberta	10	44.9	41.0	48.4	23.2	17.7	27.7	196	185	201
Western Canada[3]	**257**	**43.9**	**38.8**	**48.4**	**21.8**	**17.7**	**27.7**	**196**	**184**	**204**

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Values are weighted averages based on estimated production by province (Statistics Canada).

Table 5 • Fatty acid composition and free fatty acid content for the 1999 harvest survey of No. 1 Canada Western flaxseed by province

Province	Number of samples tested	Fatty acid composition[1] C16:0	C18:0	C18:1	C18:2	C18:3	Free fatty acids
		%	%	%	%	%	%
Manitoba	93	5.3	3.1	16.8	14.3	60.4	0.20
Saskatchewan	154	5.5	3.1	17.2	14.8	59.4	0.15
Alberta	10	4.9	3.5	16.9	15.6	59.0	0.28
Western Canada[2]	**257**	**5.4**	**3.1**	**17.1**	**14.7**	**59.6**	**0.17**

[1] Percentage of total fatty acids including: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), linolenic (C18:3)
[2] Values are weighted averages based on estimated production by province (Statistics Canada).

Table 6 • Comparison of No.1 Canada Western flaxseed from the 1999 harvest survey with export shipments of No. 1 Canada Western flaxseed

Quality parameter	1999 survey	November exports	1998-1999 exports
Oil content[1], %	43.9	44.8	43.2
Protein content[2], %	21.8	21.7	22.6
Free fatty acids,%	0.2	0.4	0.4
Iodine value	196	194	190
Palmitic acid, % in oil	5.4	5.4	5.5
Stearic acid, % in oil	3.1	3.3	3.6
Oleic acid, % in oil	17.1	17.8	19.3
Linoleic acid, % in oil	14.7	14.7	14.6
Linolenic acid, % in oil	59.6	58.5	56.5

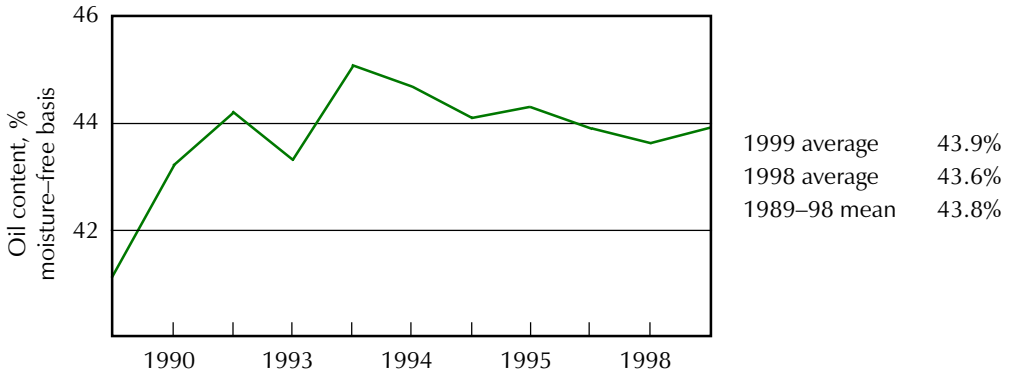
[1] Dry matter basis
[2] N x 6.25; dry matter basis

Oil content

The oil content of 43.9% for No. 1 CW flaxseed from the 1999 survey is higher than 43.6% in 1998 and similar to the 10-year mean of 43.8%. The cool, moist growing conditions over much of the Prairies contributed to the higher average oil content for 1999. Compared to 1998, mean oil contents have increased by 0.4% and 0.2% for Manitoba and Saskatchewan respectively. The small number of samples received from Alberta make comparisons less reliable. The oil content of No. 1 CW flaxseed samples from producers across western Canada varied from 38.8% to 48.4%.

As Table 6 shows, the oil content of the November 1999 flaxseed exports averaged 44.8%, an increase from the 1998–99 export mean of 43.2%. This suggests that the oil content of 1999–2000 flaxseed exports will be significantly higher than in the previous year.

Oil content of 1989–99 harvest survey samples of No. 1 Canada Western flaxseed

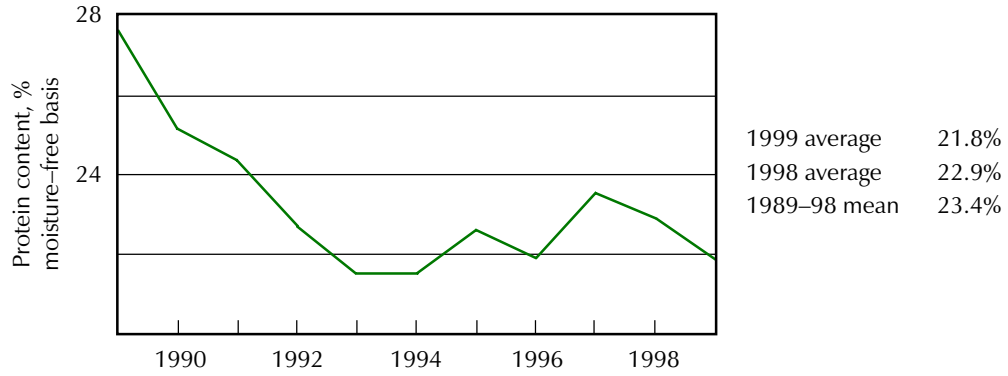


Protein content

At 21.8%, the seed protein content of No. 1 CW flaxseed from the 1999 survey was 1.1% lower than in 1998 and 1.6 % lower than the 10-year mean of 23.4%. Saskatchewan had the lowest average protein content in 1999 (Table 4). Compared to 1998 the Manitoba average protein content of 22.4% is 0.7% lower while the Saskatchewan average protein content of 21.5% is 1.3% lower. The protein content of No. 1 CW flaxseed samples from producers across western Canada varied from 17.7% to 27.7%.

As Table 6 shows, the protein content of flaxseed exports, which averaged 22.6% during the 1998-9 shipping season, decreased to 21.7% by November 1999. The protein content of 1999–2000 flaxseed exports may be significantly lower than in 1998–99.

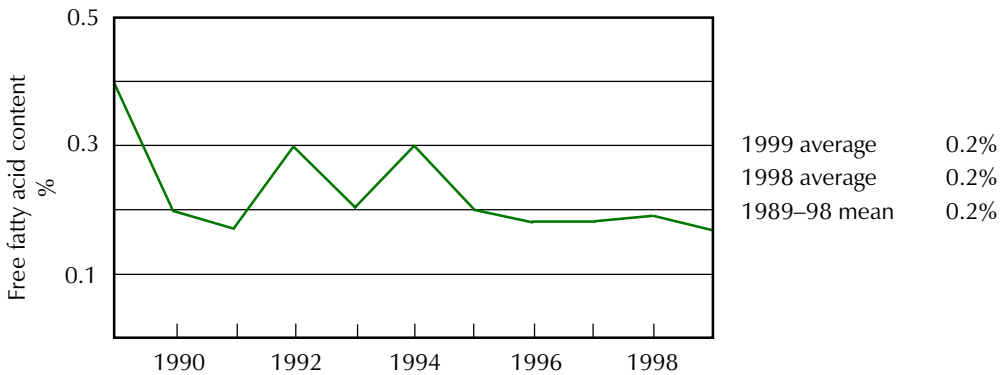
Protein content of 1989–99 harvest survey samples of No. 1 Canada Western flaxseed



Free fatty acid content

The free fatty acid (FFA) content of the 1999 flaxseed survey samples, 0.2 %, was similar to the 1998 and 10-year means. Flaxseed from regions where the harvest was delayed may have higher FFA levels. Because FFA data was not collected on harvest survey samples until 1993, FFA data for earlier years were obtained from inspection composite samples to produce the 1989–98 mean of 0.2%. As of November 1999, the FFA content of No.1 CW Flaxseed exports averaged 0.4%, similar to the 1998–99 value of 0.4% shown in Table 6.

Free fatty acid content of 1989–98 harvest survey samples of No. 1 Canada Western flaxseed



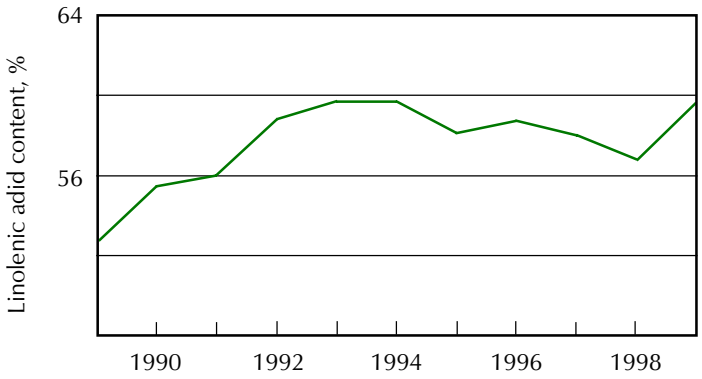
Fatty acid composition

The average iodine value of the oil from the 1999 harvest survey samples was 196 units. This is six units higher than in 1998 and five units above the 10-year mean of 191 units. The linolenic acid content was 59.6% in 1999, significantly higher than in 1998 at 56.8% and below the 10-year mean of 57.4%. Compared to 1998, the average linolenic acid content increased by 3.2% in Manitoba and 2.8% in Saskatchewan. The average iodine value increased by six and seven units for Manitoba and Saskatchewan respectively. The iodine value of No. 1 CW flaxseed samples from producers across western Canada varied from 184 to 204 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.

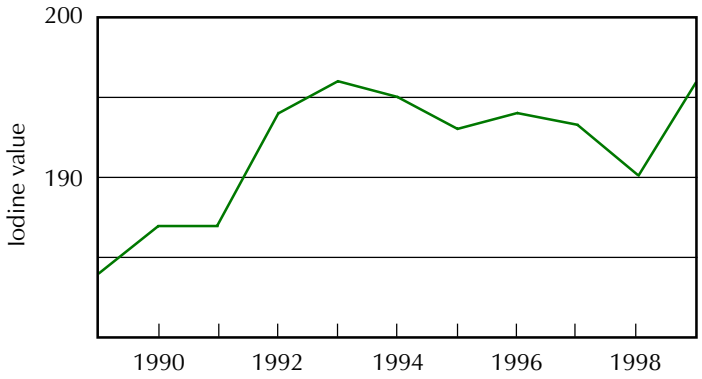
The November 1999 export data in Table 6 shows that the linolenic acid at 58.5% and the iodine value at 194 units, were higher than the 1998–99 mean export values. The No. 1 CW flaxseed exports will likely produce oils with iodine values around 194 units.

Linolenic acid content of 1989–99 harvest survey samples of No. 1 Canada Western flaxseed



1999 average	59.6%
1998 average	56.8%
1989–98 mean	57.4%

Iodine value of 1989–99 harvest survey samples of No. 1 Canada Western flaxseed



1999 average	196
1998 average	190
1989–98 mean	191