Canadian Grain Commission
Commission canadienne des grains

Quality of western Canadian flaxseed 2002

Douglas R. DeClercq
Oilseeds Chemist

James. K. Daun
Program Manager
Oilseeds and Pulses

Contact: Doug DeClercq
Tel: 204 983-3354
Email: ddeclercq@grainscanada.gc.ca
Fax: 204 983-0724

Grain Research Laboratory
Canadian Grain Commission
1404–303 Main Street
Winnipeg MB R3C 3G8
www.grainscanada.gc.ca

Canada

Quality of western Canadian flaxseed 2002

Table of contents

Tables

Figures

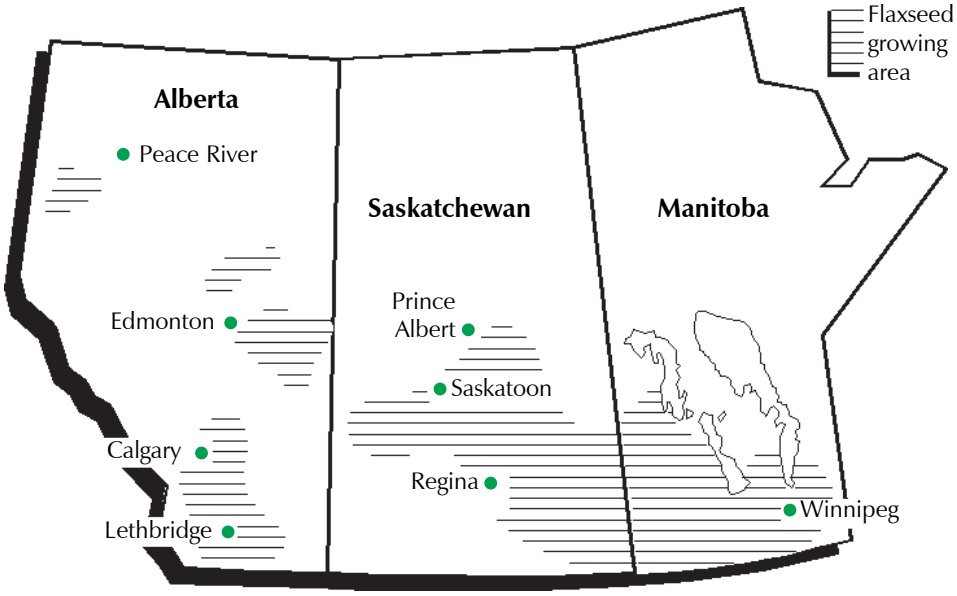
Figures (continued)

Quality of western Canadian flaxseed 2002

Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2002 harvest survey of western Canadian flaxseed. Quality data presented includes oil, protein and free fatty acids content, the fatty acid composition, and the iodine value of harvest survey samples. Quality data are based on analyses of flaxseed samples submitted to the Grain Research Laboratory (GRL) 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

Summary

The Canadian Grain Commission (CGC) harvest survey of western Canadian flaxseed shows the 2002 crop to be well above average in oil and protein content with a slightly higher than average iodine value. The iodine value is one unit higher while the oil content and protein contents are 1.4% and 1.2% higher than the 10-year means.

Compared to 2001, the oil content, 45.5%, is 1.1% higher while the protein content, 23.7%, is 0.4% lower. The linolenic acid content, 58.9%, is significantly higher than in 2001, resulting in an iodine value of 195, which is five units higher than in 2001.

Table 1 • No. 1 Canada western flaxseed
Quality data for 2002 harvest survey

Quality parameter	2002	2001	1992-2001 Mean
Oil content[1], %	45.5	44.4	44.1
Protein content[2], %	23.7	24.1	22.5
Free fatty acids, %	0.29	0.37	0.24
Iodine value	195	190	194
Linolenic acid content, % in oil	58.9	56.3	58.5

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

Table 2 • No. 1 Canada western flaxseed
Fatty acid composition for 2002 harvest survey

Fatty acid, % in oil[1]	2002	2001	1992-2001 Mean
Palmitic	4.9	5.2	5.3
Stearic	3.1	3.7	3.3
Oleic	17.3	19.5	17.8
Linoleic	15.1	15.1	14.6
Linolenic	58.9	56.3	58.5

[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

The Weather and Crop Surveillance department of the Canadian Wheat Board provided the weather review for the 2002 harvest survey (http://www.cwb.ca/en/growing/weather/crop_issues.jsp.)

Seeding

The extremely dry conditions, combined with cooler than normal weather in April and May, delayed seeding of cereal and oilseed crops. Planting in Western Canada was only 75 per cent complete by the end of May. Heavy rains fell in the southern areas of Saskatchewan and Alberta during the first week of June, further delaying planting in those regions. Seeding continued into the third week of June in those areas that received heavy rains. Northern and central growing areas of Saskatchewan and Alberta remained dry and crops were planted into dust. Germination was quite uneven in these regions, with some crops not emerging until rains fell in July. Seeding progressed rapidly in eastern Saskatchewan and Manitoba, with planting in these areas finishing during the first week of June.

Growing conditions

Cool weather during May and early June slowed crop growth and development across the Prairies. Heavy rains in the southern Prairies did improve soil moisture conditions, especially in Alberta and Saskatchewan. The heavy rains caused some flooding in all three provinces resulting in some reseeding, especially in southern Alberta. Warmer than normal temperatures during the second half of June increased crop stress, especially in the parched regions of northern Alberta and Saskatchewan. The dry conditions caused uneven emergence in oilseed crops, with many fields having three to four stages of development.

The warmer than normal weather continued through July, which caused severe stress to all crops. Yield potential for flaxseed crops declined rapidly under the stressful conditions. The rainfall pattern of the spring continued into July, with the heaviest rainfall reported in the southern Prairies. Northern regions reported minimal amounts during the month, with only isolated areas reporting enough rainfall to improve crop prospects. Even in the regions that had received adequate moisture during the spring, severe heat stress began to take a toll on production prospects.

The warm temperatures did accelerate crop development, especially in eastern areas of the Prairies. A cool, wet weather pattern settled over the Prairies during the first week in August, bringing significantly above normal rainfall to the dry areas in Saskatchewan. A significant frost during the first week of August caused damage to crop quality in northern and central areas of Saskatchewan and Alberta. The rains brought a flush of secondary growth in the drought regions and delayed maturity in southern areas.

Harvest conditions

The harvest started in southern Manitoba and southeastern Saskatchewan in the third week of August. Frequent rains during the last week of August and first two weeks of September resulted in a reduction in grade pattern of the mature crops in the eastern Prairies. Severe frost was reported by the middle of the month in Saskatchewan and Alberta, which brought an end to the growing season in most areas. Harvest during the last half of September continued to be plagued by frequent light to heavy showers. In eastern growing areas, significant harvest progress was made during the last two weeks of September, while

western areas continued to struggle with poor drying conditions. The uneven growth of crops in Alberta and Saskatchewan continued to slow harvest activity into October. Frequent rainfall combined with cooler than normal temperatures delayed further progress. Snow during the last two weeks of October has essentially brought an end to harvest activity. The Manitoba flaxseed harvest was essentially completed by the end of October while the Saskatchewan flaxseed crop was estimated to be only 55% harvested as of October 20th. As with most crops grown in western Canada, a portion of the 2002 flaxseed crop may not be harvested until the spring of 2003.

Production and grade information

Table 3 shows western Canadian farmers planted 692 thousand hectares of flaxseed in 2002, which was a three percent increase from last year's area. The 2002 yield estimate of 1100 kg/ha was similar to the 1100 kg/ha reported in 2001 but below the 10-year mean of 1277 kg/ha. Total flaxseed production in western Canada is down five percent to 679 thousand tonnes according to estimates by Statistics Canada reported in *Field Crop Reporting Series No. 8,* December 5, 2002. In 2002, Saskatchewan accounted for 65 percent of flaxseed production while Manitoba and Alberta had 32 percent and three percent respectively. The below average production in western Canada is a result of below average harvested area and below average yields, largely due to the drought conditions in Saskatchewan and Alberta.

The grade pattern of all 2002 crops was negatively affected by the cool, wet conditions experienced since August. A major concern for flaxseed has been general weathering of the crop with shriveled, underdeveloped and severely discoloured damage being noted. Frost damage, heating and immature kernels were also evident in areas in northern Alberta and Saskatchewan. In some areas, as a result of inadequate weed control, flaxseed samples were downgraded due to the presence of high levels of admixture. While production and quality expectations for the majority of western Canadian crops are the poorest in close to 30 years, the flaxseed crop appears to have done better than many of the other crops.

Table 3 •Seeded area and production for western Canadian flaxseed

Province	Seeded area[1] thousand hectares		Production[1] thousand tonnes		Average production[2] thousand tonnes
	2002	2001	2002	2001	1992-2001
Manitoba	174	182	215	199	297
Saskatchewan	498	474	444	495	498
Alberta	20	16	20	20	32
Western Canada	**692**	**672**	**679**	**715**	**827**

[1] Source-*Field Crop Reporting Series*, *No.8*, December 5, 2002; Statistics Canada
[2] Source-*Field Crop Reporting Series*, revised final estimates for 1992-2001

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

This year's harvest survey included 355 samples compared to 408 in 2001. Manitoba contributed 175 samples, Saskatchewan 177 samples and Alberta 3 samples during the harvest period from September 1 to December 15, 2002. The majority, 334, of the flaxseed samples received in the CGC survey were graded as No.1 CW. 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 5, 2002.

Quality of 2002 western Canadian flaxseed

Tables 4 and 5 show detailed information on the quality of top grade western Canadian flaxseed harvested in 2002. 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 the 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 1.7% 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 • No. 1 Canada Western flaxseed
Quality data for 2002 harvest survey

Province	Number of samples	Oil content[1]			Protein content[2]			Iodine value[3]		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
		%			%					
Manitoba	164	45.7	41.1	50.0	23.7	19.9	27.4	193	184	201
Saskatchewan	168	45.4	42.4	49.8	23.6	18.9	27.7	196	182	203
Alberta	2	44.6	44.0	46.0	23.9	23.8	24.1	195	194	200
Western Canada[3]	334	45.5	41.1	50.0	23.7	18.9	27.7	195	182	203

[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 • No. 1 Canada Western flaxseed
Fatty acid composition and free fatty acid content for 2002 harvest survey

Province	Number of samples	Fatty acid composition, %[1]					Free fatty acids, %
		C16:0	C18:0	C18:1	C18:2	C18:3	
Manitoba	164	4.9	3.2	18.3	14.9	58.1	0.35
Saskatchewan	168	4.9	3.1	16.7	15.2	59.4	0.27
Alberta	2	4.6	3.4	16.8	14.6	59.9	0.20
Western Canada[2]	**334**	**4.9**	**3.1**	**17.3**	**15.1**	**58.9**	**0.29**

[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 • No. 1 Canada Western flaxseed
Comparison of 2002 harvest survey quality data with recent export shipments[1]

Quality parameter	2002 survey	November 2002 exports	2001-2002 exports
Oil content[2], %	45.5	45.2	44.1
Protein content[3], %	23.7	23.3	23.3
Free fatty acids, %	0.29	0.31	0.66
Iodine value	195	196	192
Palmitic acid, % in oil	4.9	5.0	5.3
Stearic acid, % in oil	3.1	3.4	3.5
Oleic acid, % in oil	17.3	17.5	18.7
Linoleic acid, % in oil	15.1	15.4	15.0
Linolenic acid, % in oil	58.9	58.8	57.2
Number of samples	334	2	37

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Commercially clean exports containing less than 2.5% dockage

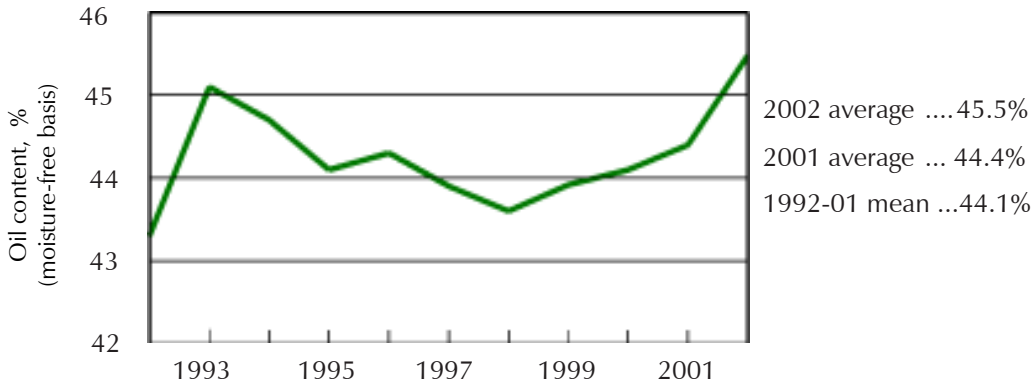
Oil content

The average oil content of 45.5% for No. 1 CW flaxseed from the 2002 survey is higher than both the 44.4% in 2001 and the 10-year mean of 44.1%. The oil content of 45.7% for Manitoba is slightly higher than the 45.4% in Saskatchewan samples. The two samples from Alberta had an average oil content of 44.6%. Compared to 2001, mean oil contents are 1.4%, 0.9%, and 0.2% higher for Manitoba, Saskatchewan, and Alberta respectively. The hot, dry growing conditions in some regions resulted in those samples having significantly lower oil contents than the reported provincial means. The oil content of No. 1 CW flaxseed samples from producers across western Canada varied from 41.1% to 50.0%.

Part of the increased oil contents seen in the 2002 survey may be due to the continuing trend to planting more of the newer high quality Canadian flaxseed cultivars. The 2001 varietal data from the GRL survey indicated certain varieties had significantly higher mean oil contents than other varieties. Of note, is that the two varieties that ranked highest in oil content for Saskatchewan in 2001 accounts for over 50% percent of survey samples received from Saskatchewan in 2002. Quality information on the varieties from the 2002 survey will be available at a later date on the CGC website (http://www.grainscanada.ca/Cdngrain/flax/flaxq-e.htm#key).

The oil content of November 2002 No. 1 CW flaxseed exports averaged 45.2%, higher than the 2001–2002 export mean of 44.1%. This suggests the oil content of the 2002–2003 flaxseed exports should be higher than the previous year. Flaxseed exports that are not commercially clean will have significantly lower oil contents than exports that are cleaned to contain less than 2.5% dockage.

Figure 2 • No. 1 Canada western flaxseed
Oil content of harvest survey samples, 1992-2002

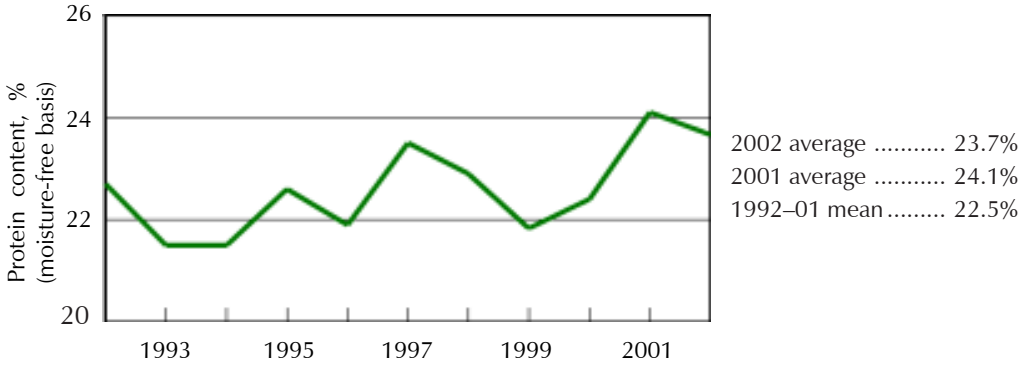


Protein content

The average protein content of 23.7% for No. 1 CW flaxseed from the 2002 harvest survey is 0.4% lower than in 2001 but 1.2 % higher than the 10-year mean of 22.5%. As Table 4 shows, all three provinces had very similar protein contents in 2002. Compared to 2001, the protein content for Alberta's two samples decreased by 1.1% while the mean protein contents increased by 0.3%, and 0.2% respectively for the Manitoba and Saskatchewan samples. The protein content of No. 1 CW flaxseed samples from producers across western Canada varied from 18.9% to 27.7%.

As Table 6 shows, the protein content of 23.0% for November flaxseed exports is similar to the protein content of 23.3% for the 2001-2002 shipping season. The protein content of flaxseed exports in 2002–2003zz should be similar to the export shipments of the previous season.

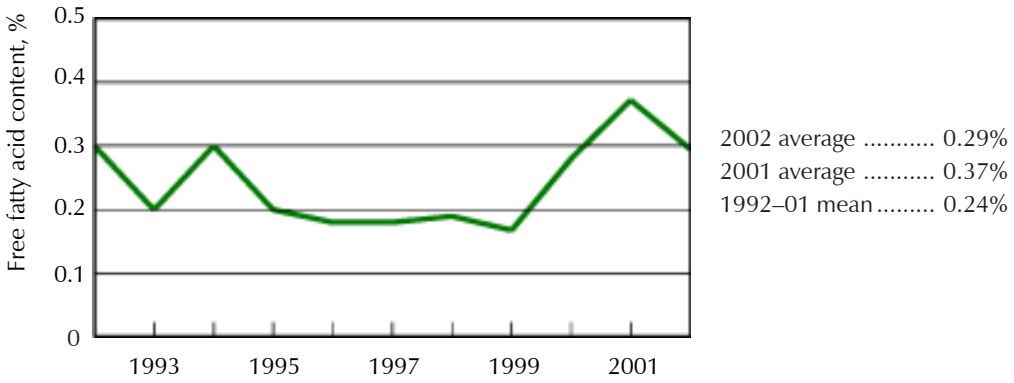
Figure 3 • No. 1 Canada western flaxseed
Protein content of harvest survey samples, 1992-2002



Free fatty acid content

The average free fatty acids (FFA) content of 0.29 % in top grade 2002 survey samples is lower than the 2001 average of 0.34% and similar to the 10-year mean of 0.24%. The FFA content of 0.35% for Manitoba samples is slightly higher than the 0.27% in Saskatchewan samples and the 0.20% in Alberta samples. Flaxseed from regions where the harvest was delayed by wet weather may have higher FFA levels. The No. 2 CW, No. 3 CW, and SAMPLE grade composites had FFA levels of 0.93%, 0.64% and 1.27% respectively. The FFA content of No.1 CW flaxseed exports in November 2002 averaged 0.3%; suggesting the levels in 2002-2003 may be lower than the 2001–2002 mean value of 0.7% (Table 6).

Figure 4 • No. 1 Canada western flaxseed
Free fatty acid content of harvest samples, 1992-2002



Fatty acid composition

The average linolenic acid content in 2002 harvest survey No.1 CW samples is 58.9%, significantly higher than the 56.3% in 2001 and similar to the 10-year mean of 58.5%. Compared to 2001, the average linolenic acid content increased by 3.9%, 3.1% and 1.7% respectively in Alberta, Saskatchewan and Manitoba samples. No. 1 CW flaxseed samples from producers across western Canada had a range of linolenic acid content from 52.3% to 63.3%.

The average iodine value of the oil is 195 units. This is five units higher than in 2001 and one unit above the 10-year mean of 194 units. The average iodine value increased by seven, six and four units respectively for Alberta, Saskatchewan and Manitoba samples. No. 1 CW flaxseed samples from producers across western Canada varied in iodine value from 182 to 203 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 2002 export data in Table 6 shows the linolenic acid content at 58.8% and the iodine value at 196 units, notably higher than the 2001–2002 mean export values. The No. 1 CW flaxseed exports will likely produce oils with iodine values around 193 to 196 units. Flaxseed exports that are not commercially clean may have significantly lower iodine values than those exports that are cleaned to contain less than 2.5% dockage.

Figure 5 • No. 1 Canada western flaxseed
Linolenic acid content of harvest survey samples, 1992-2002

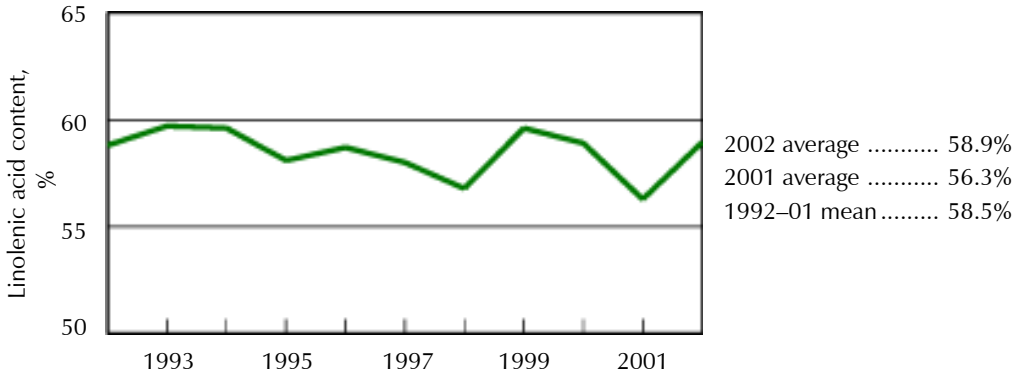


Figure 6 • No. 1 Canada western flaxseed
Iodine value of harvest survey samples, 1992-2002