Canadian Grain Commission
Commission canadienne des grains

Quality of western Canadian flaxseed 2000

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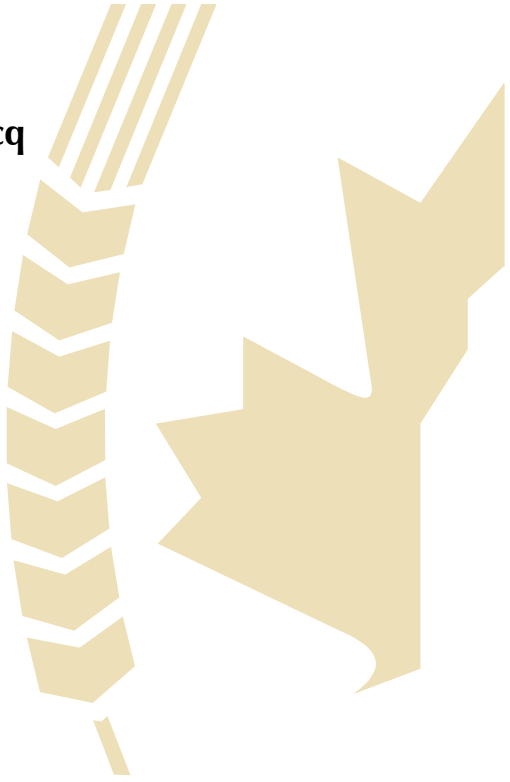


Canada

Table of contents

Tables

Figures

Summary

The Canadian Grain Commission (CGC) harvest survey of western Canadian flaxseed shows average oil content and iodine value for 2000. The iodine value is one unit higher and the oil content is 0.1% higher than the 10-year means. Protein content, however, is 0.4% lower than average.

Compared to 1999, the oil content, 44.1%, is slightly higher and the protein content, 22.4%, is significantly higher. Although oil content is similar to last year, the linolenic acid content, 58.9%, is lower in 2000, resulting in an iodine value of 194–two units lower than in 1999.

Table 1 • No. 1 Canada Western flaxseed
Quality data for 2000 harvest survey

Quality parameter	2000	1999	1990–99 Mean
Oil content[1], %	44.1	43.9	44.0
Protein content[2], %	22.4	21.8	22.8
Free fatty acids, %	0.3	0.2	0.2
Iodine value	194	196	193
Linolenic acid content, % in oil	58.9	59.6	58.1

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

Table 2 • No. 1 Canada Western flaxseed
Fatty acid composition for 2000 harvest survey

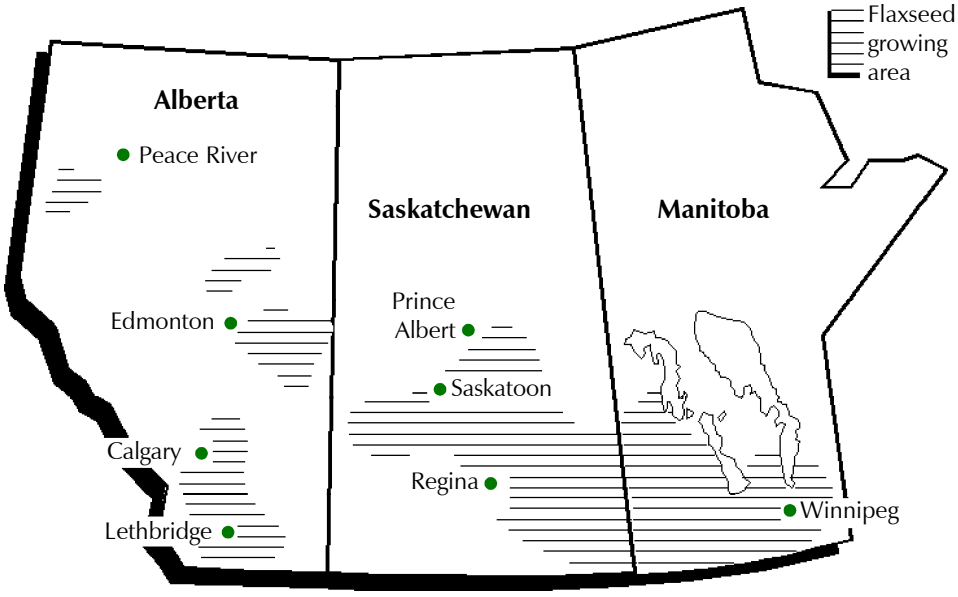
Fatty acid, % in oil	2000	1999	1990–99 Mean
	%	%	%
Palmitic	5.4	5.4	5.3
Stearic	3.2	3.1	3.2
Oleic	17.9	17.1	18.0
Linoleic	14.2	14.7	14.6
Linolenic	58.9	59.6	58.1

[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)

Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2000 harvest survey of western Canadian flaxseed. Quality data presented includes oil, protein and free fatty acid 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

Weather and production review

Weather review

The Weather and Crop Surveillance department of the Canadian Wheat Board provided the weather review for the 2000 harvest survey.

Seeding

Seeding on the Prairies in 2000 was completed in early June, and the average seeding date was approximately two weeks earlier than normal.

Early seeding was a welcome contrast to the delays experienced during seeding in 1999. Because of warmer than normal temperatures and dry conditions during April and the first half of May, seeding began early and was completed quickly, especially in Manitoba and Alberta. Close to half of the crop in Alberta and over three-quarters of the crop in Manitoba was in the ground by the second week of May. While seeding was slightly slower in Saskatchewan, it was nevertheless earlier than normal.

Soil moisture was significantly below normal in southern and eastern Alberta and western Saskatchewan due to a lack of precipitation during the fall and winter. Although parts of this area received precipitation in the second half of May, drought conditions persisted in southern Alberta and parts of western Saskatchewan throughout the growing season.

Growing conditions

Cooler temperatures during the second half of May and most of June slowed early crop development. Some of the benefits of early seeding were lost to slow growth during this period. Temperatures were 1–5ºC below normal across the Prairies during the month of June. Cooler temperatures helped minimize crop stress in southern Alberta and western Saskatchewan.

Precipitation during June ranged from significantly above normal in the eastern Prairies to well below normal in southern Alberta. Dry regions of western Saskatchewan received rainfall during the month of June, considerably reducing the size of the area affected by drought. Remaining dry areas were concentrated in the west-central region of the province, where soil moisture levels only partially recovered.

Temperatures during July increased to near normal levels improving crop development. Frequent, heavy rainfall covered a good portion of the Prairies during July, with exceptional amounts reported in various locations in the eastern Prairies. While the cloudy weather that accompanied the rainfall slowed crop development slightly, crops were on average one week ahead of schedule by the end of the month. Rains during July caused concerns about disease development in crops, especially in the eastern growing areas. Southern Alberta, however, received only 3–7 mm of moisture during July. The dry weather combined with the warm temperatures caused significant stress to crops, eventually resulting in significantly lower than normal yields in the region. Scattered frosts during the middle of July in northeastern and east central Saskatchewan caused some damage to flowering oilseed and cereal crops.

Harvest conditions

The harvest began during the first two weeks in August in Manitoba and Alberta where crops were seeded early and matured quickly. Elsewhere in Alberta and southern Saskatchewan, most of the crops were not ready to harvest until the third week in September. Weather during September was poor for harvesting. Below normal temperatures, i.e., 1–2ºC, and moderate to heavy rainfall persisted throughout the month. Particularly damaging was a heavy and widespread rainfall across the Prairies during the first weekend in September. Combined with damp conditions during the following weeks, it caused some cereal and oilseed crops to sprout. Severe frost during the third week in September caused some damage to crops in the Peace River region.

Production and grade information

Table 3 shows western Canadian farmers planted 595 000 hectares of flaxseed in 2000, which was a 26% decrease from last year's area. The 2000 yield estimate of 1200 kg/ha was lower than both the 1300 kg/ha reported in 1999 and the 10-year mean of 1302 kg/ha. With less planted area and a drop in yield, total flaxseed production in western Canada is down 32% to 694 000 tonnes according to estimates by Statistics Canada reported in *Field Crop Reporting Series No. 8*, December 5, 2000. Saskatchewan accounted for 68% of production in 2000 and Manitoba for 30%. Alberta produced only 2%, down from nearly 4% in 1999.

Table 3 • Seeded area and production for western Canadian flaxseed

	Seeded area[1] thousand hectares		Production[1] thousand tonnes		Average production[2] thousand tonnes
	2000	1999	2000	1999	1990–99
Manitoba	176	210	206	272	328
Saskatchewan	405	567	470	711	471
Alberta	14	32	18	39	40
Western Canada	**595**	**809**	**694**	**1022**	**838**

[1] Source—*Field Crop Reporting Series*, *No. 8*, December 5, 2000, Statistics Canada
[2] Source—*Field Crop Reporting Series*, revised final estimates for 1990–99

Harvest survey samples

Flaxseed samples for the Canadian Grain Commission 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 306 samples, of which 283 were graded No.1 CW flaxseed. Manitoba contributed 96 samples and Saskatchewan 197 samples during the harvest period from September 1 to December 15, 2000. Only five samples were received from Alberta reflecting the more than 50% drop in seeded area in Alberta compared to the 26% decrease in flax acreage across the Prairies. 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, 2000.

Acknowledgments

The CGC acknowledges the cooperation of flaxseed producers, grain handling offices, and oilseed crushing plants in western Canada for supplying the samples of flaxseed harvested in 2000, and the Weather and Crop Surveillance department of the Canadian Wheat Board for providing the review of the 2000 growing season. The CGC recognizes Industry Services grain inspectors for grading the damaged harvest survey samples and GRL staff for conducting the analyses and preparing the report.

Quality of 2000 flaxseed

Tables 4 and 5 show detailed information on the quality of western Canadian flaxseed harvested in 2000. 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.

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 2000 harvest survey of by province

Province	Number of samples	Oil content[1] %			Protein content[2] %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Manitoba	81	43.7	38.0	47.3	22.4	18.2	27.9	192	178	202
Saskatchewan	197	44.2	39.9	48.9	22.3	18.3	27.3	195	185	200
Alberta	5	44.8	43.0	47.3	23.3	21.5	25.4	196	190	199
Western Canada[3]	**283**	**44.1**	**38.0**	**48.9**	**22.4**	**18.2**	**27.9**	**194**	**178**	**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 • No. 1 Canada Western flaxseed
Fatty acid composition and free fatty acid content for the 2000 harvest survey of by province

Province	Number of samples	Fatty acid composition[1]					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
		%	%	%	%	%	%
Manitoba	81	5.4	3.4	19.0	14.3	57.5	0.34
Saskatchewan	197	5.4	3.2	17.5	14.2	59.5	0.25
Alberta	5	5.0	3.2	17.4	14.4	59.6	0.24
Western Canada[2]	**283**	**5.4**	**3.2**	**17.9**	**14.2**	**58.9**	**0.28**

[1] Percentage of total fatty acids including: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), 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 2000 harvest survey data with recent export shipments

Quality parameter	2000 survey	November exports	1999-2000 exports
Oil content[1], %	44.1	43.9	44.0
Protein content[2],%	22.4	22.3	22.2
Free fatty acids, %	0.28	0.45	0.40
Iodine value	194	194	193
Palmitic acid, % in oil	5.4	5.4	5.4
Stearic acid, % in oil	3.2	3.3	3.3
Oleic acid, % in oil	17.9	17.4	18.1
Linoleic acid, % in oil	14.2	14.9	14.9
Linolenic acid, % in oil	58.9	58.7	58.0

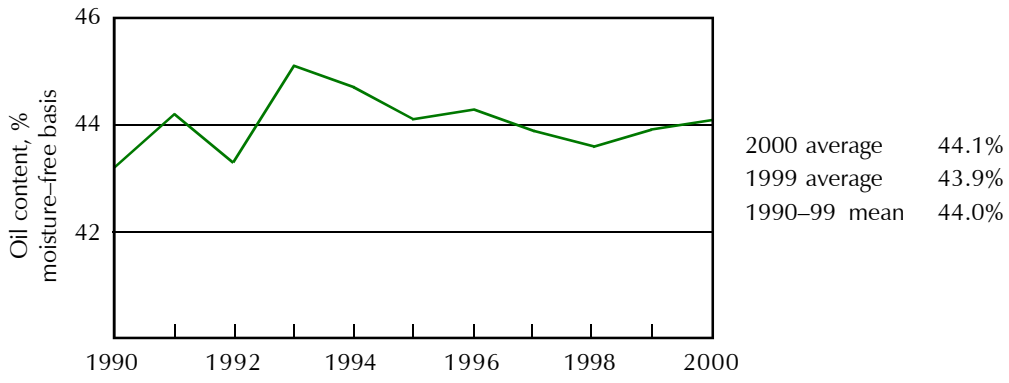
[1] Dry matter basis
[2] N x 6.25; dry matter basis

Oil content

The oil content of 44.1% for No. 1 CW flaxseed from the 2000 survey is slightly higher than the 43.9% in 1999 and similar to the 10-year mean of 44.0%. The oil content of 43.7% for Manitoba samples is significantly lower than 44.2% in Saskatchewan samples and 44.8% in Alberta samples. Compared to 1999, mean oil contents are the same for Manitoba and Alberta, but higher by 0.3% for Saskatchewan. The warm, dry growing conditions in southern regions resulted in those regions having lower oil contents than the reported provincial means. The oil content of No. 1 CW flaxseed samples from producers across western Canada varied from 38.0% to 48.9%.

Table 6 compares the quality of recent flaxseed exports with this year's harvest survey data. As Table 6 shows, the oil content of the November 2000 flaxseed exports averaged 43.9%, similar to the 1999–2000 export mean of 44.0%. This suggests that the oil contents of 2000–2001 flaxseed exports will remain similar to the previous year.

No. 1 Canada Western flaxseed
Oil content of harvest survey samples,1990–2000

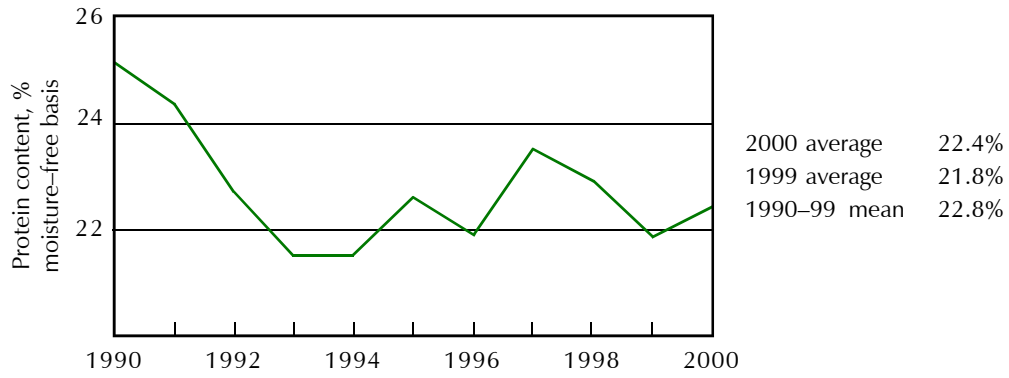


Protein content

The protein content of 22.4% for No. 1 CW flaxseed from the 2000 harvest survey is 0.6% higher than in 1999 but 0.4 % lower than the 10-year mean of 22.8%. As Table 4 shows, Manitoba and Saskatchewan had similar protein contents in 2000. Compared to 1999, the Manitoba and Alberta average protein contents were unchanged, while the Saskatchewan protein is 0.8% higher. The protein content of No. 1 CW flaxseed samples from producers across western Canada varied from 18.2% to 27.9%.

As Table 6 shows, the protein content of 22.3% for November flaxseed exports is similar to the protein content of 22.2% for the 1999–2000 shipping season. The protein content of 2000–2001 flaxseed exports should remain similar to export shipments during the previous season.

No. 1 Canada Western flaxseed
Protein content of harvest survey samples, 1990–2000

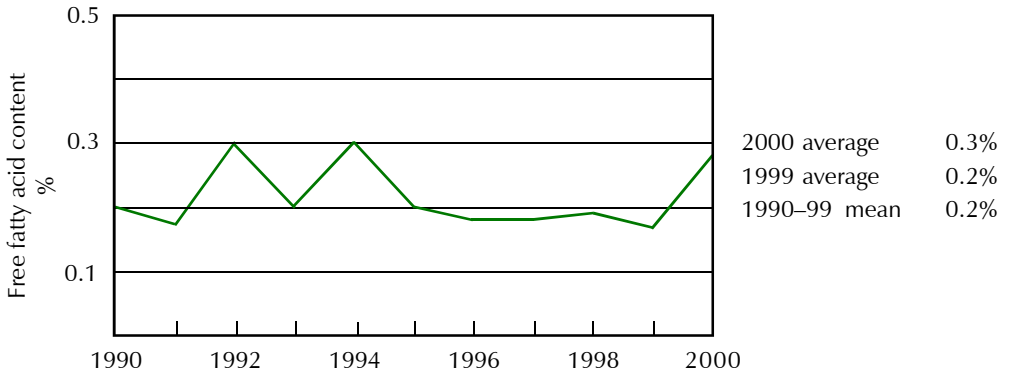


Free fatty acid content

The free fatty acid (FFA) content of 0.3 % in 2000 survey samples is slightly higher than the 1999 and 10-year means. Flaxseed from regions where the harvest was delayed may have higher FFA levels and may account for the overall higher FFA. 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 1990–99 mean of 0.2%.

As Table 6 shows, as of November 2000 the FFA content of No.1 CW flaxseed exports averaged 0.5%, slightly higher than the 1999–2000 value of 0.4%.

No. 1 Canada Western flaxseed
Free fatty acid content of harvest survey samples, 1990–2000



Fatty acid composition

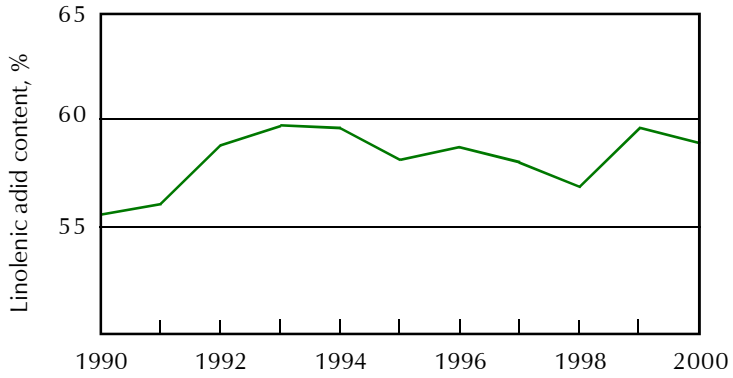
The linolenic acid content in 2000 harvest survey samples is 58.9%, significantly lower than in 1999 at 59.6% but above the 10-year mean of 58.1%. Compared to 1999, the average linolenic acid content decreased by 2.9% in Manitoba samples and increased by 0.1% in those from Saskatchewan.

The average iodine value of the oil is 194 units. This is two units lower than in 1999 but one unit above the 10-year mean of 193 units. The average iodine value decreased by five units in Manitoba and by one unit in Saskatchewan samples. No. 1 CW flaxseed samples from producers across western Canada varied in iodine value from 178 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.

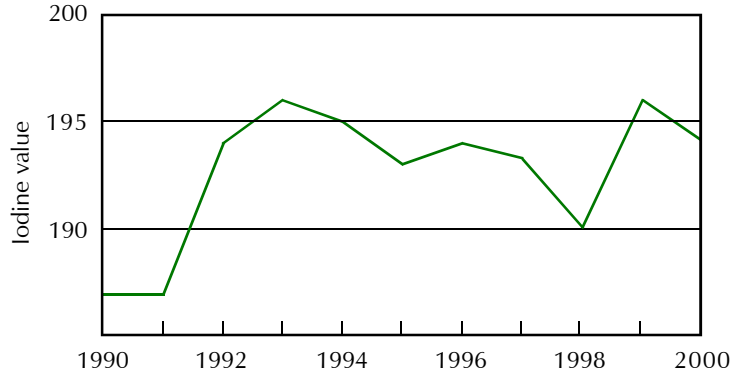
The November 2000 export data in Table 6 shows the linolenic acid content at 58.7% and the iodine value at 194 units, similar to the 1999–2000 mean export values. The No. 1 CW flaxseed exports will likely produce oils with iodine values around 194 units.

No. 1 Canada Western flaxseed
Linolenic acid content of harvest survey samples, 1990–2000



2000 average	58.9%
1999 average	59.6%
1990–99 mean	58.1%

No. 1 Canada Western flaxseed
Iodine value of harvest survey samples, 1990–2000



2000 average	194
1999 average	196
1990–99 mean	193

Methods • Oilseeds

Chlorophyll content

Chlorophyll content is determined by International Organization for Standardization method reference number ISO 10519:1992(E), Rapeseed—Determination of chlorophyll content—Spectrometric method. Results are expressed as milligrams per kilogram (mg/kg), seed basis.

Fatty acid composition

Fatty acid composition is determined by the International Organization for Standardization method reference number ISO 5508:1990 (E), Animal and vegetable fats and oils—Analysis by gas chromatography of methyl esters of fatty acids. A 15m by 0.32mm column with a 0.25mm Supelcowax 10 coating is used. Major and important fatty acids are reported although samples may also contain as much as 1% of other minor fatty acids which are included in the calculations.

Free fatty acid content

Free fatty acid content is determined by a method adapted from the procedure of Ke et al, *Analytica Chemica Acta* 99:387–391 (1978), and is expressed as a percentage by weight of fatty acid of a specified molecular weight in the oil. Oleic acid with a molecular weight of 282 is used.

Glucosinolate content

Glucosinolate content is determined by International Organization for Standardization method reference number ISO 9167–1:1992(E), Rapeseed—Determination of glucosinolate content—Part 1: Method using high performance liquid chromatography. Results are total seed glucosinolates expressed as micromoles per gram (μmol/g), calculated to an 8.5% moisture basis for canola or on a dry matter basis for all mustard seeds.

Iodine value

Iodine value is a measure of unsaturation calculated from the fatty acid composition according to AOCS Recommended Practice Cd 1c-85 as re-approved 1993 and updated 1995, Calculated Iodine Value.

Oil content

Oil content is determined by nuclear magnetic resonance (NMR) according to the International Organization for Standardization, reference number ISO 10565:1992(E) Oilseeds—Simultaneous determination of oil and moisture contents—Method using pulsed nuclear magnetic resonance spectroscopy. A Bruker NMS 110 Minispec NMR Analyzer calibrated with appropriate oilseed samples extracted with petroleum ether is used. Results are reported as a percentage, calculated to a specified moisture basis. Canola is calculated to an 8.5% moisture basis, and flaxseed, solin, soybean and all mustard seeds are calculated on a dry matter basis.

Protein content

Protein content is determined by the AOCS Official Method Ba 4e-93, revised 1995, Combustion method for determination of crude protein, using a LECO FP-428 Nitrogen and Food Protein Determinator. Results are reported as a percentage, N x 6.25, calculated to specified moisture basis. Canola is calculated to an 8.5% moisture basis, and flaxseed, solin, soybean and all mustard seeds are calculated on a dry matter basis.