Canadian Grain Commission | Commission canadienne des grains

Quality of western Canadian solin 2000

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Summary

The 2000 Canadian Grain Commission (CGC) harvest survey of western Canadian solin shows increased oil and protein contents, attributable to the introduction of a new variety and favourable growing conditions. The 2000 oil content, 44.6%, is 1.1% higher while the protein content, 22.5%, is 0.8% higher than in 1999. The linoleic acid content, 72.0%, is only slightly lower than the 72.2% in 1999.

Introduction

This report presents quality data and information based on the CGC 2000 harvest survey of western Canadian solin. Quality data presented includes oil content, protein content, and fatty acid composition of solin harvest survey samples. Quality data are based on analyses of solin samples forwarded to the CGC Grain Research Laboratory (GRL).

Solin is the name adopted by the Flax Council of Canada to distinguish yellow seeded, low linolenic acid flaxseed from conventional brown flaxseed**.**
See (http://www.flaxcouncil.ca/38.htm).

Weather and production review

Weather review

The weather and growing conditions for the 2000 solin harvest survey were similar to those for the CGC's flaxseed survey. 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 1–5°C 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., 1–2°C, 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

Although Statistics Canada does not publish official production statistics for solin, the industry consensus is that less solin acres were planted in 2000 compared to 1999. As in 1999, a small percentage of the solin survey samples contained damaged seeds such as green and discoloured seeds. Some 2000 harvest survey samples showed the effects of damage by heavy and widespread rains that fell across the Prairies during the first weekend in September. Continuing damp conditions during the following weeks caused sprouting or spoilage in some of the 2000 solin crop.

Harvest survey samples

The 2000 harvest survey data are based on 49 samples of solin provided by United Grain Growers Limited, including 25 samples originating from Saskatchewan, 16 from Manitoba, and 8 from Alberta. The CGC's Industry Services Division graded 47 samples as No. 1 Canada Western solin, and two as No. 2 CW. Two varieties are represented in the 2000 harvest survey, 25 samples identified as variety 989 and 24 samples identified as 1084. For comparison, 40 of the 45 samples in the 1999 survey were identified as variety 989.

The GRL received the solin samples representing the 2000 crop during the period September to December 2000.

For the harvest survey, individual samples are cleaned to remove dockage and graded by CGC Industry Services prior to testing. Solin samples are analyzed for oil content, protein content, linolenic acid, linoleic acid, 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 measuring complete fatty acid profiles and are prepared by combining No. 1 CW samples by province and variety.

Acknowledgements

The CGC acknowledges the cooperation of solin producers and United Grain Growers Limited for supplying the samples of solin 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 solin survey samples and the GRL staff for conducting the analyses and writing the report.

Quality of 2000 solin

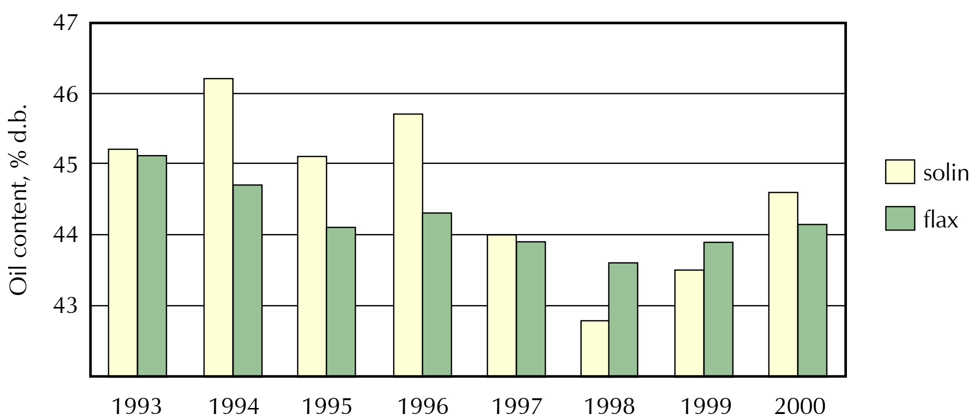
Quality data for No. 1 CW solin 2000 harvest survey samples are shown in Table 1, including oil content, protein content, fatty acid composition and iodine value. Data for No. 1 CW solin are also summarized by province in Table 2 and by variety in Table 3. The quality of solin and conventional flaxseed from 2000 and 1999 is compared in Table 4. Trends in the solin and flaxseed quality data since the start of the solin survey in 1993 are shown in graphical form in Figures 1 to 4. The means and standard deviations of the 2000 NIR survey data can be found at http://www.cgc.ca/Quality/qualmenu-e.htm#Solin.

Oil content

Oil content of No. 1 CW solin 2000 survey samples is 44.6%, an increase of 0.9% compared to 1999. Good growing conditions in the solin growing regions of the prairies contributed to overall higher oil contents in 2000. However, the introduction of variety 1084 in 2000 was most likely the stronger influence. Samples of the variety 1084 tested 3.1 % higher in oil content than the variety 989, and comprised about one-half of the solin survey samples. For 2000, the variety 989 had an oil content of 43.1%, similar to the 43.4% in 1999. There were no samples of variety 1084 in the 1999 solin harvest survey.

The oil content of No. 1 CW solin samples from producers across western Canada varied from 41.0% to 47.9%. While Figure 1 shows both solin and conventional flaxseed had increased oil contents for the 2000 surveys, the increase in solin oil content was larger.

Figure 1 • No. 1 Canada Western solin and flaxseed
Oil content of harvest survey samples, 1993–2000



Protein content

The protein content of No. 1 CW solin for the 2000 survey was 22.5%, an increase of 0.8% over 1999. The protein content of No. 1 CW solin samples from producers across western Canada varied from 18.4% to 26.5%. Both solin and conventional flaxseed had increased protein contents in 2000 as illustrated in Figure 2.

Samples of the new variety 1084 had a protein content of 21.5% compared to 23.5% in samples of the variety 989. However, the protein content of variety 989 samples were 1.8% higher than in 1999. With 989 still comprising about one-half of the solin survey samples, the overall protein content was higher as well as oil content for the 2000 harvest survey.

Figure 2 • No. 1 Canada Western solin and flaxseed
Protein content of harvest survey samples, 1993–2000

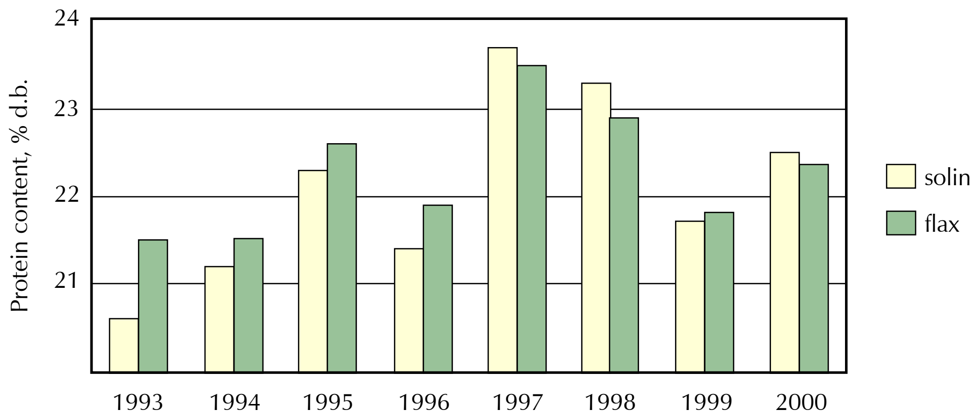
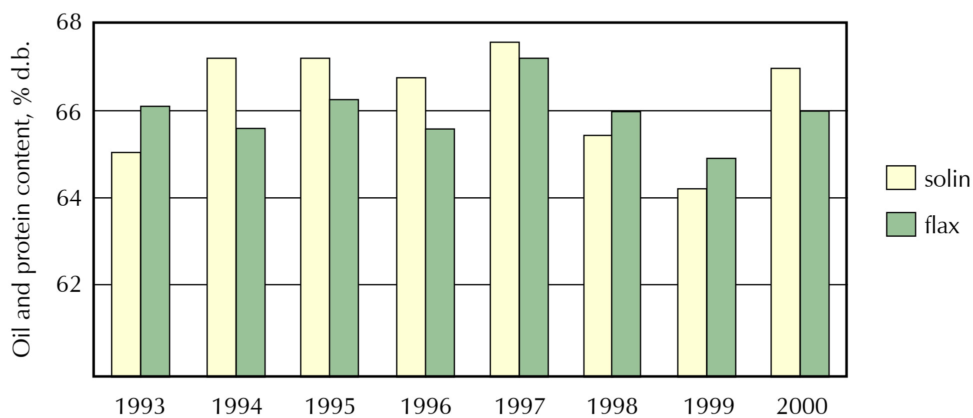


Figure 3 • No. 1 Canada Western solin and flaxseed
Sum of oil and protein contents of harvest survey samples, 1993–2000



Fatty acid composition

The mean linolenic acid (C18:3) content of the 2000 solin samples was 2.1.%, slightly lower than the 2.2% in 1999. This is well below the maximum 5% linolenic acid specified for solin. Figure 4 illustrates how the lower levels of linolenic acid in solin oil results in a lower iodine value compared to conventional flaxseed oil.

The mean linoleic acid (C18:2) content of the 2000 solin survey samples decreased to 72.0% from 72.2% in 1999. On average, the variety 1084 samples contained about 0.1% more linoleic acid than the variety 989 samples. The linoleic acid of No. 1 CW solin samples from producers across western Canada varied from 68.0% to 75.2%. The overall cool temperatures in the major solin growing areas plus the fact that both varieties 1084 and 989 have relatively high linoleic acid contents contributed to the continued high linoleic acid values in 2000.

Figure 4 • No. 1 Canada Western solin and flaxseed Iodine value of harvest survey samples, 1993–2000

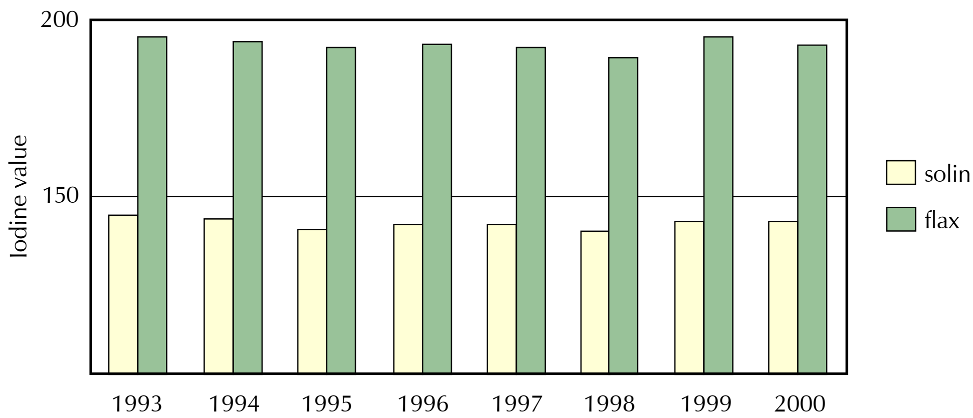


Table 1 • No. 1 Canada Western solin
Quality data for 2000 harvest survey

Quality parameter	Mean	Standard deviation	Minimum	Maximum	Range
Oil content[1], %	44.6	2.0	41.0	47.9	6.9
Protein content[2], %	22.5	1.9	18.4	26.5	8.1
Palmitic acid[3], %	5.7	0.5	5.2	6.6	1.4
Stearic acid[3], %	3.6	0.4	3.0	4.7	1.7
Oleic acid[3], %	15.4	1.9	13.2	18.0	4.8
Linoleic acid[3], %	72.0	1.8	68.0	75.2	7.2
Linolenic acid[3], %	2.1	0.2	1.6	2.3	0.7
Iodine value	143.0	2.4	138.0	147.0	9.0

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Percentage of total fatty acids including: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Table 2 • No. 1 Canada Western solin
Quality data for 2000 harvest survey by province

Province	Number of samples	Oil content[1]	Protein content[2]	Linoleic content[3]	Linolenic content[3]	Iodine value
		%	%	%	%	
Manitoba	15	44.1	23.2	71.0	2.0	142.0
Saskatchewan	24	45.0	21.7	71.6	2.0	142.8
Alberta	8	44.7	23.5	72.1	2.0	143.5
Western Canada	**47**	**44.6**	**22.5**	**71.5**	**2.0**	**142.7**

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Percentage of total fatty acids in oil for linolenic (C18:3) and linoleic (C18:2) acid

Table 3 • No. 1 Canada Western solin
Quality data for 2000 harvest survey by variety

Variety	989	1084	All samples
Number of samples	24	23	47
Oil[1],%	43.1	46.2	44.6
Protein[2],%	23.5	21.5	22.5
Palmitic acid[3], %	6.0	5.4	5.7
Stearic acid[3],%	3.6	3.6	3.6
Oleic acid[3],%	14.9	15.8	15.4
Linoleic acid[3],%	72.0	72.1	72.0
Linolenic acid[3],%	2.2	1.9	2.1
Iodine value	143	144	143

[1] Dry matter basis
[2] N x 6.25; dry matter basis
[3] Percentage of total fatty acids including: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Table 4 • No. 1 Canada Western solin and flaxseed
Quality data for 2000 and 1999 harvest surveys

Quality factor	Solin 2000	Flaxseed 2000	Solin 1999	Flaxseed 1999
Oil[1],%	44.6	44.1	43.5	43.9
Protein[2],%	22.5	22.4	21.7	21.8
Palmitic acid[3], %	5.7	5.4	6.1	5.4
Stearic acid[3],%	3.6	3.2	3.5	3.1
Oleic acid[3],%	15.4	17.9	14.6	17.1
Linoleic acid[3],%	72.0	14.2	72.2	14.7
Linolenic acid[3],%	2.1	58.9	2.2	59.6
Iodine value	143	194	143	196

[1] Dry matter basis
[2] N x 6.25;dry matter basis
[3] Percentage of total fatty acids including: palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Methods

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.