Quality of western Canadian solin

1999

Douglas R. DeClercq

Oilseeds Chemist

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

Table of contents

List of tables

Figures

Summary

The 1999 solin harvest survey shows increased oil content and higher linoleic acid level, but lower protein content. These differences, compared to 1998, are likely the result of cool, moist growing conditions in Saskatchewan where most of the samples originate.

Introduction

This report presents information on the oil content, protein content and fatty acid composition of solin grown in western Canada in 1999. Solin is the name adopted by the Flax Council of Canada to distinguish yellow seeded, low linolenic acid flaxseed from conventional brown flaxseed. Quality data are obtained from analyses of solin samples collected by the Canadian Grain Commission's (CGC) Grain Research Laboratory (GRL). http://www.flaxcouncil.ca/38.htm

Weather and production review

Weather review

The weather and growing conditions for solin grown in 1999 were similar to those for western Canadian flaxseed. The weather review for 1999 flaxseed may be found at http://www.cgc.ca/Pubs/Quality/Oilseeds/Flax/flax99-e.pdf.

A wet and cool spring over much of the prairie region resulted in late seeding and contributed to an extended harvest period. More detailed regional and weekly information on the 1999 growing season can be found in the Agriculture and Agri-Food Canada Crop Conditions Reports at http://www.agr.ca/policy/crop/home_e.html

Production and grade

Although Statistics Canada does not publish official production statistics for solin, the industry consensus is that that solin seeded acres were less than in 1998. Compared to 1999, the solin harvest survey samples contained slightly higher percentages of damaged seeds such as green and discoloured seeds.

Harvest survey samples

The 1999 harvest survey was based on 45 samples of solin provided by United Grain Growers Limited. There were 36 survey samples from Saskatchewan, seven from Manitoba and two from Alberta. The CGC's Industry Services Division graded 37 samples as No. 1 Canada Western (CW), seven as No. 2 CW, and one as No. 3 CW. The majority of the samples—40—were identified as the variety 989. The remaining five samples were not identified by a variety name.

Samples of solin grown in 1999 were submitted to the GRL during the period September to December 1999. The individual samples were cleaned to remove dockage and graded prior to testing by CGC Industry Services Division.

For the harvest survey, samples are analyzed for oil content, protein content, linolenic acid, linoleic acid and iodine value using an NIRSystems 6500 scanning near infra-red (NIR) spectrometer calibrated to and verified against the appropriate reference method. Composite samples are used for fatty acid composition. Composite samples are prepared by combining samples grading No. 1 CW by province and by variety.

Acknowledgements

The GRL acknowledges the cooperation of United Grain Growers Limited for supplying the samples of solin harvested in 1999, the assistance of the Industry Services grain inspectors for grading the 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 harvest survey solin

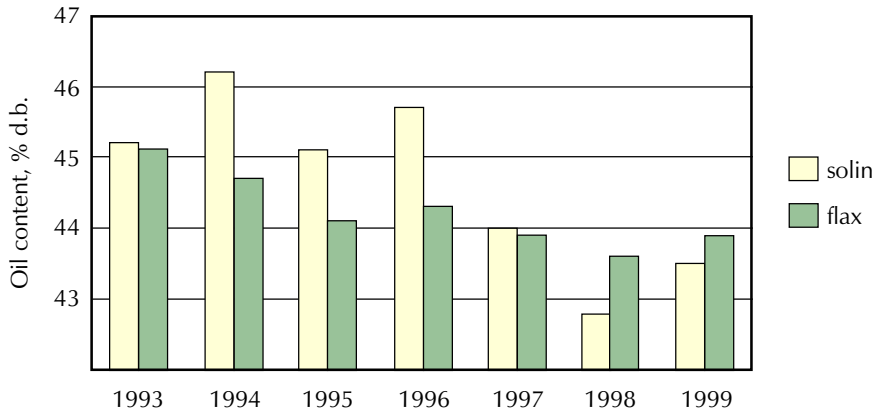
Quality factors measured for the 1999 solin survey include oil content, protein content, fatty acid composition and iodine value. Quality data for the No. 1 CW solin are shown in Table 1. Data for 1999 No. 1 CW solin are also summarized by province in Table 2 and by variety in Table 3. The quality of solin and conventional flaxseed from 1999 and 1998 is compared in Table 4. Trends in the solin and flaxseed quality data since 1993 are shown in graphical form in Figures 1 to 4. The means and standard deviations of the 1999 NIR survey data can be found at http://www.cgc.ca/Quality/qualmenu-e.htm#Solin.

Oil content

Oil content of 1999 No. 1 CW solin increased 0.7% to 43.5%. Cool, wet growing conditions in the solin growing regions of the prairies contributed to overall higher oil contents in 1999. Oil contents of No. 1 CW solin samples from producers across western Canada varied from 40.8% to 45.9%. Both solin and conventional flaxseed had increased oil contents in 1999 as illustrated in Figure 1.

The increase in oil content for 1999 occurred even though the lower oil content variety 989 replaced 947 as the dominant solin variety. Composite samples from 1998 survey samples had shown the variety 989 was 1.2 % lower in oil content than the variety 947. For 1999, the variety 989 had an oil content of 43.4% compared to 42.7% in 1998. There were no samples identified as variety 947 in the 1999 solin harvest survey.

Figure 1 • Solin and flaxseed oil contents from GRL harvest surveys



Protein content

Protein content of 1999 No. 1 CW harvest survey solin decreased 1.6% to 21.7%. The decreased protein content is a reflection of the same growing conditions which favoured higher oil contents in 1999. The protein content of No. 1 CW solin samples from producers across western Canada varied from 18.8% to 24.6%. Both solin and conventional flaxseed had decreased protein contents in 1999 as illustrated in Figure 2.

In 1999 the composite sample for variety 989 had a protein content of 21.7% compared to 23.1% in 1998. Although 989 is an inherently higher protein/lower oil content variety than 947, the cool, moist growing conditions likely promoted lower protein contents in 1999 compared to 1998.

Figure 2 • Solin and flaxseed protein contents from GRL harvest surveys

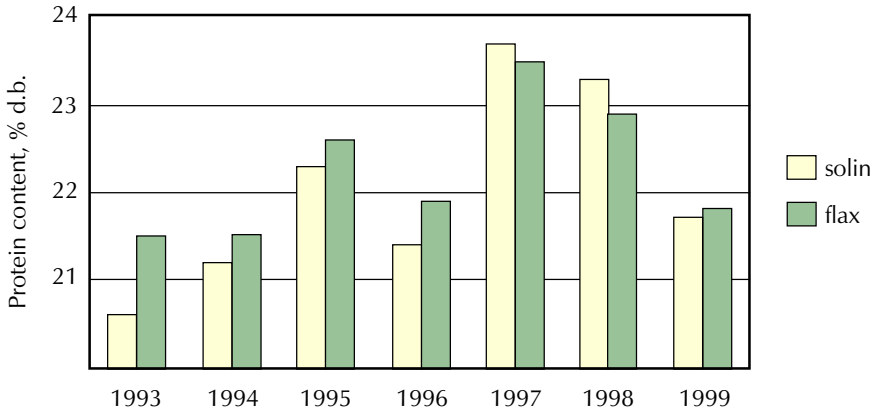
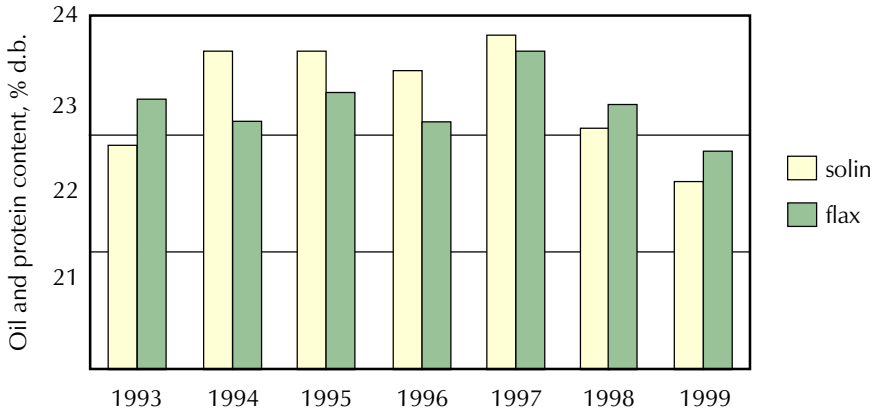


Figure 3 • Solin and flaxseed sum of oil and protein contents from GRL harvest surveys



Fatty acid composition

The mean linolenic acid (C18:3) content of 1999 solin samples was 2.2%, slightly higher than the 1.9% in 1998. This is well below the maximum 5% linolenic acid specified for solin. Mean linoleic acid (C18:2) content for 1999 increased to 72.2%, up from 70.0% for 1998. Linoleic acid values of No. 1 CW individual samples from producers across western Canada varied from 68.7% to 74.2%.

The cool growing conditions plus the fact that 989 is a slightly higher linoleic acid content variety contributed to the increased linoleic acid values seen in 1999. On average, the variety 989 contained about 0.5% more linoleic acid than 947 in 1998 comparisons. Figure 4 illustrates how the lower levels of linolenic acid in solin oil results in a lower iodine value compared to conventional flaxseed oil.

Figure 4 • Solin and flaxseed iodine values from GRL harvest surveys

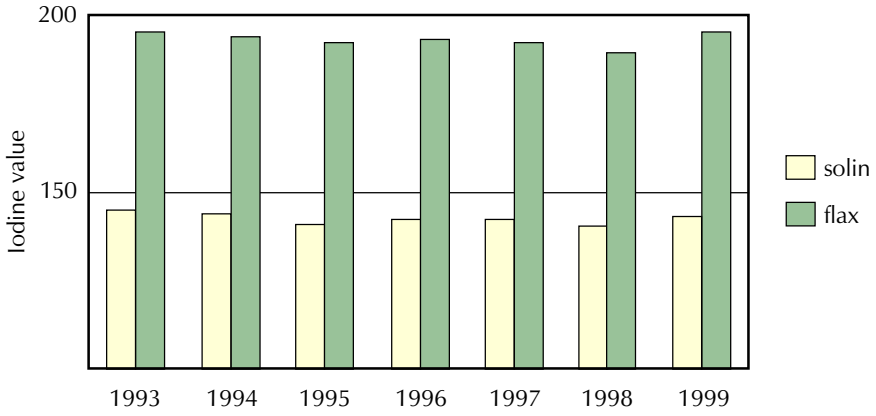


Table 1 • Quality data for harvest survey No. 1 Canada Western solin

Quality parameter	Mean	Standard deviation	Minimum	Maximum	Range
Oil content[1], %	43.5	1.2	40.8	45.9	
Protein content[2], %	21.7	1.6	18.8	24.6	5.8
Palmitic acid[3], %	6.1	0.2	5.7	6.5	0.8
Stearic acid[3], %	3.5	0.3	3.3	4.3	1.0
Oleic acid[3], %	14.6	0.9	13.2	16.7	3.5
Linoleic acid[3], %	72.2	1.1	68.7	74.2	5.5
Linolenic acid[3], %	2.2	0.3	1.9	3.1	1.2
Iodine value	143.4	1.6	139.4	146.1	6.7

[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 • Quality data for harvest survey No. 1 Canada Western solin by province

Province	Number of samples	Oil content[1]	Protein content[2]	Linoleic content[3]	Linolenic content[3]	Iodine value
		%	%	%	%	
Manitoba	5	43.3	22.0	72.31	2.24	143.6
Saskatchewan	31	43.5	21.6	72.15	2.21	143.4
Alberta	1	43.6	23.8	71.96	2.17	143.4
Western Canada	**37**	**43.5**	**21.7**	**72.20**	**2.20**	**143.4**

[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 • Quality data for harvest survey No. 1 Canada Western solin by variety

Variety	989	Unidentified	All samples
Number of samples	33	4	37
Oil[1],%	43.4	44.1	43.5
Protein[2],%	21.7	21.4	21.7
Palmitic acid[3], %	6.1	n/a	6.1
Stearic acid[3],%	3.5	n/a	3.5
Oleic acid[3],%	14.6	n/a	14.6
Linoleic acid[3],%	72.2	n/a	72.2
Linolenic acid[3],%	2.2	n/a	2.2
Iodine value	143	n/a	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 • Quality of 1999 and 1998
No. 1 Canada Western solin and conventional flaxseed

Quality factor	Solin 1999	Flaxseed 1999	Solin 1998	Flaxseed 1998
Oil[1],%	43.5	43.9	42.8	43.9
Protein[2],%	21.7	21.8	23.3	22.9
Palmitic acid[3], %	6.1	5.4	6.4	5.5
Stearic acid[3],%	3.5	3.1	4.1	3.6
Oleic acid[3],%	14.6	17.1	16.2	19.4
Linoleic acid[3],%	72.2	14.7	70.0	14.3
Linolenic acid[3],%	2.2	59.6	1.9	56.8
Iodine value	143	196	140	190

[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 0.25µm 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 9167-391(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 and 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 10565:1998(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 the appropriate oilseed samples extracted with petroleum ether is used. Results are reported as 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 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.