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Quality of western Canadian solin 2003

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Summary

The 2003 Canadian Grain Commission (CGC) harvest survey of western Canadian solin shows a slight increase in oil content and a significant increase in protein content. The 2003 oil content, 46.4%, is 0.2% higher while the protein content, 26.0%, is 3.3% higher than in 2002. The linoleic acid content of the oil, 68.3%, is significantly lower than the 72.6% in 2002.

Introduction

This report presents quality data and information based on the CGC 2003 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

Temperature and precipitation patterns for the 2003 western Canadian growing season can be found on the PFRA web site
(http://www.agr.gc.ca/pfra/drought/maps/td03_08e.pdf).
Of particular note this growing season was that both day and night temperatures were extremely high for long periods of time. The Weather and Crop Surveillance department of the Canadian Wheat Board provided the detailed weather review for the 2003 crop year (http://www.cwb.ca/en/growing/weather/crop_issues.jsp).

Seeding

A combination of rains during the 2002 harvest and normal to above normal winter precipitation greatly improved the soil moisture situation in western Canada for the spring seeding season. The wetter than normal precipitation pattern continued through the month of April and into early May in Saskatchewan and Alberta. Amounts received during that period were 125 to 175 per cent of normal, which delayed seeding progress.
The spring precipitation was accompanied by cooler than normal temperatures, which slowed planting progress as well. Temperatures recovered by May 15 and seeding advanced rapidly in the western Prairies. Manitoba and parts of eastern Saskatchewan did not experience planting delays, due to drier and warmer weather in the first half of May. This allowed farmers to plant most oilseed crops before May 15 in the eastern growing region. Overall planting progress was 10 days to two weeks behind normal for the Prairies. Planting of all grains and oilseeds in western Canada advanced rapidly during the second half of May and was complete by the first week in June. Germination and emergence of crops were very good, but some patches of severe frost in northern Saskatchewan and Alberta meant that some crops needed reseeding.

Growing conditions

Moisture conditions began to deteriorate in the second half of June in the northern and central areas of Saskatchewan. The dryness, combined with above normal temperatures, resulted in stress to crops. The rest of the region received timely rainfall throughout June, but total amounts for the month were below normal over most of the Prairie region. Although the crop was rated in mostly good to excellent condition in mid-June, the lack of sub-soil moisture was a major concern. These concerns were well founded, as hot and dry conditions dominated the weather on the Prairies from mid-June to late August. The southern Prairies received less than 50 per cent of normal precipitation in July and August, while the northern areas received less than 75 per cent of normal precipitation. The rains were very timely in northern Alberta and northwestern Saskatchewan over the summer months, which helped maintain crop potential. Temperatures were warmer than normal during the months of July and August, which increased stress to all crops. August temperatures were 2 to 5 degrees Celsius above normal across western Canada. The warmer than normal temperatures caused yield reductions in all crops, dropping above average production potential back to average to slightly-below-average in most regions. Timely rains limited yield losses in northern growing areas of Alberta. The warm, dry weather during the summer months was ideal for grasshoppers, which resulted in significant damage to crops throughout the Prairie region. The environmental conditions did keep plant diseases in check, with leaf and head diseases reported at the lowest levels in a decade. Crop development was boosted by the warmer than normal temperatures, with most crops reaching maturity by the end of July in the eastern Prairies. Crops in western areas were not mature until the middle of August, while northern Alberta and the Peace River region were delayed until the end of the month.

Harvest conditions

The harvest began the first week of August on the eastern Prairies and was underway in all areas except northern Alberta by the middle of the month. Rainfall during August and September was well below normal, which resulted in a rapid harvest pace. The majority of the crop was harvested by the first week of September, with most of the unfinished harvest located in northern Alberta and Saskatchewan. Cool, rainy conditions in the northern areas slowed the harvest in the middle of September, but the return of warm, dry conditions by the end of the month allowed the harvest to proceed rapidly.

Production and grade information

Although Statistics Canada does not publish official production statistics for solin, the industry consensus is that solin acres were somewhat higher than in 2002. The grade pattern of the 2003 solin crop was not negatively affected by the hot, dry conditions of 2003. The early solin harvest produced a sound seed with minimal visible damage or discoloration. However, as discussed below, the extremely hot weather in 2003 affected the intrinsic seed oil and protein contents plus the fatty acid composition of the oil.

Harvest survey samples

This year's solin harvest survey included 207 samples compared to only 86 in 2002. Two of the samples came from Alberta while 136 came from Saskatchewan and 69 came from Manitoba. The CGC's Industry Services Division graded 196 samples as No. 1 Canada Western solin, seven as No. 2 CW, three as No. 3 CW, and one as Sample Grade CW. One hundred fifty-four, or about 74% of the total, were identified as variety 2047. In addition, there were 42 samples, about 20%, identified as 1084 and eleven samples, about 5%, were not identified to variety. By comparison, 77% of the 2002 survey samples were identified as variety 1084.

The GRL received the solin samples representing the 2003 crop during the period September to December 2003. 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. For this report, composite samples were used for measuring complete fatty acid profiles by gas liquid chromatography. Composite samples were prepared by combining No. 1 CW samples by province and variety.

Acknowledgements

The CGC acknowledges the cooperation of solin producers and Agricore United for supplying the samples of solin harvested in 2003, and the Weather and Crop Surveillance department of the Canadian Wheat Board for providing the review of the 2003 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 western Canadian solin 2003

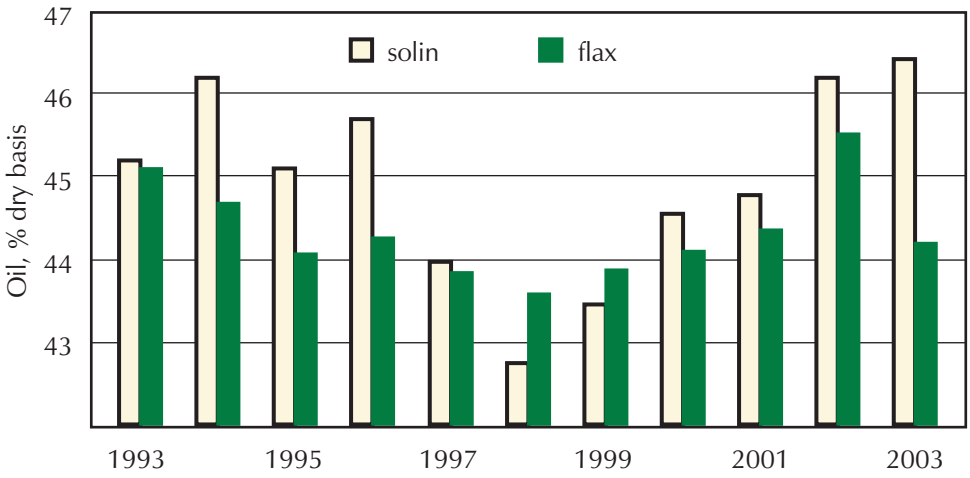
Quality data for No. 1 CW solin 2003 harvest survey samples are shown in Table 1, including oil content, protein content, fatty acid composition and iodine value. Data for No. 1 CW solin are also summarized by province in Table 2 and by variety in Table 3. The quality of solin and conventional flaxseed from 2003 and 2002 is compared to the long-term means 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 2003 NIR survey data can be found at: http://grainscanada.gc.ca/Quality/Solin/solinmenu-e.htm.

Oil content

The mean oil content of No. 1 CW solin 2003 survey samples is 46.4%, an increase of 0.2% compared to 2002. The average oil content of Manitoba samples was 0.8% higher than those from Saskatchewan. The oil content of No. 1 CW solin samples from producers across western Canada varied from 42.9% to 49.4%. Figure 1 shows that in 2003 solin did not have a decrease in the mean oil content while conventional flaxseed did decrease significantly.

Despite the stressful growing conditions in many parts of the solin growing regions of the prairies, the average oil content in 2003 increased slightly and was much higher than the long-term mean. The introduction of variety 2047 in 2002 is likely a major influence on average oil contents. In 2002, No. 1 CW survey samples of 2047 had an oil content of 48.3%, which was 2.5% higher than the 1084 samples. This year, in spite of the heat and drought stress, 2047 still had a mean oil content of 46.8% which was 1.8% higher than 1084 (Table 3). The varietal improvements in solin oil content potential contributed significantly to an average oil content in 2003 that was 1.4% above the ten-year mean of 45.0%.

Figure 1 - No. 1 Canada western solin and flaxseed
Oil content of harvest survey samples, 1993-2003



Protein content

The average protein content of No. 1 CW solin from the 2003 survey was 26.0%, an increase of 3.3% from 2002. On average, Saskatchewan solin contained 0.8% more protein than the Manitoba samples. The protein content of No. 1 CW solin samples from producers across western Canada varied from 20.6% to 29.9%. The average protein content of the newer variety, 2047, was 1.3% higher than that of the variety 1084 (Table 3). This contributed to an average protein content in 2003 that was well above the ten-year mean of 22.5%. Both solin and flaxseed showed increases in protein content that were due to the result of heat and drought stress. (Figure 2).

Figure 2 - No. 1 Canada western solin and flaxseed
Protein content of harvest survey samples, 1993-2003

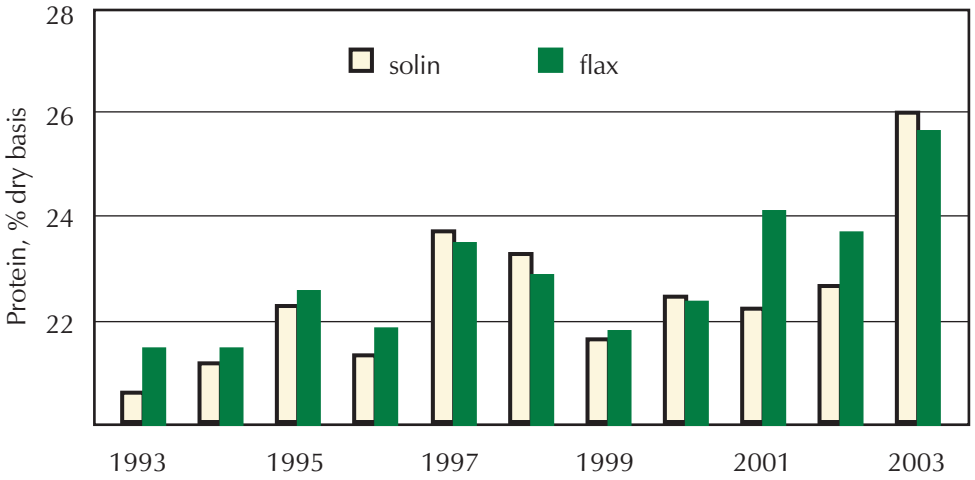
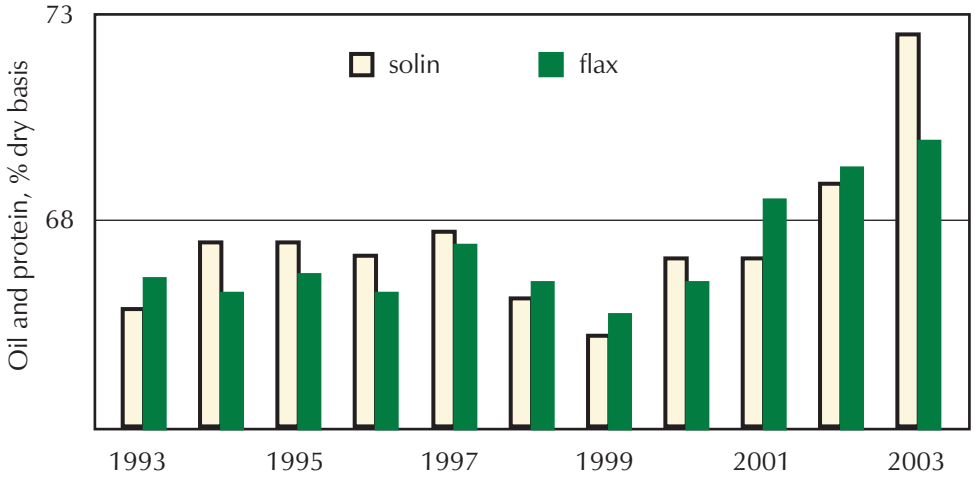


Figure 3 - No. 1 Canada western solin and flaxseed
Sum of oil and protein contents of harvest survey samples, 1993-2003



Fatty acid composition

The mean linolenic acid (C18:3) content of the 2003 solin samples was 1.8%, lower than the 2.1% in 2002. This is well below the maximum 5% linolenic acid specified for solin. The linolenic acid of No. 1 CW solin samples from producers across western Canada varied from 1.4% to 2.1%. The mean linoleic acid (C18:2) content of the 2003 solin survey samples decreased to 68.3% from 72.6% in 2002. The linoleic acid of No. 1 CW solin samples from producers across western Canada varied from 64.4% to 72.2%.
In 2003, both day and night temperatures were extremely high for a long period of time during seed development and the solin plants responded to this by producing a much less unsaturated oil. Figure 4 illustrates that both the solin and flaxseed crops had lower iodine values compared to 2002. In the 2003 survey, the variety 2047 contained higher amounts of linoleic acid than 1047 (Table 3). This suggests the mean linoleic acid content of the 2003 survey samples may have been even lower had there not been a high percentage of 2047 planted in 2003.

Figure 4 - No. 1 Canada western solin and flaxseed Iodine value of harvest survey samples, 1993-2003

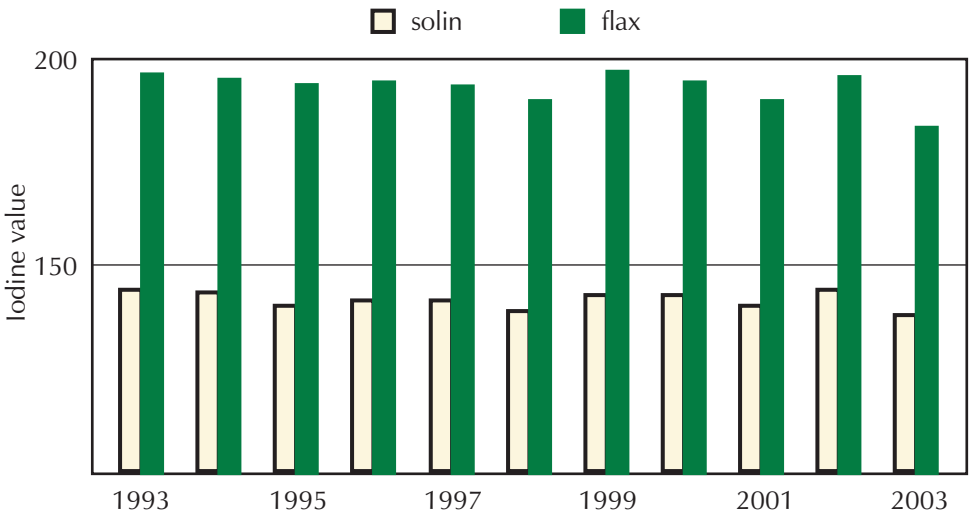


Table 1 - No. 1 Canada western solin
Quality data for 2003 harvest survey

Quality parameter	Mean	Standard deviation	Minimum	Maximum	Range
Oil content[1], %	46.4	1.4	42.9	49.4	6.5
Protein content[2], %	26.0	1.6	20.6	29.9	9.3
Palmitic acid[3], %	5.9	0.4	5.2	6.5	1.3
Stearic acid[3], %	4.0	0.4	3.2	4.4	1.2
Oleic acid[3], %	18.3	1.9	15.0	21.7	6.7
Linoleic acid[3], %	68.3	2.1	64.4	72.4	8.0
Linolenic acid[3], %	1.8	0.1	1.4	2.1	0.7
Iodine value	138.9	2.0	135.0	143.6	8.6

[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 2003 harvest survey by province

Province	Number of samples	Average oil content[1]	Average protein content[2]	Average linolenic content[3]	Average linoleic content[3]	Average iodine value
		%	%	%	%	
Manitoba	66	47.0	25.5	1.8	69.0	139.4
Saskatchewan	128	46.2	26.3	1.8	67.9	138.7
Alberta	2	44.2	26.8	1.7	66.7	137.5
Western Canada	**196**	**46.4**	**26.0**	**1.8**	**68.3**	**138.9**

[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 2003 harvest survey by variety

Variety	2047	1084	All
Number of samples	143	39	196
Oil content[1], %	46.8	45.0	46.4
Protein content[2], %	26.3	25.1	26.0
Palmitic acid[3], %	6.1	5.3	5.9
Stearic acid[3], %	3.7	4.4	4.0
Oleic acid[3], %	17.5	20.2	18.3
Linoleic acid[3], %	69.2	66.7	68.3
Linolenic acid[3], %	1.8	1.7	1.8
Iodine value	139.8	137.5	138.9

[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 conventional flaxseed
Quality data for 2003, 2002, and historical harvest surveys

	2003		2002		1993-2002	
Parameter	Solin	Flaxseed	Solin	Flaxseed	Solin	Flaxseed
Oil content[1], %	46.4	44.2	46.2	45.5	44.8	44.4
Protein content[2], %	26.0	25.6	22.7	23.7	22.2	22.6
Palmitic acid[3], %	5.9	5.2	5.3	4.9	6.0	5.3
Stearic acid[3], %	4.0	3.7	3.5	3.1	3.8	3.3
Oleic acid[3], %	18.3	22.4	15.7	17.3	15.6	17.8
Linoleic acid[3], %	68.3	15.0	72.6	15.1	71.4	14.7
Linolenic acid[3], %	1.8	52.9	2.1	58.9	2.0	58.5
Iodine value	139	184	145	195	143	194

[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)