Quality of western Canadian canola

1998

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Summary

The 1998 western Canadian canola crop was above average in quality, with some additional changes in fatty acid composition.

Compared to 1997, the oil, 43.0%, and protein, 21.3%, contents were similar. The oil content was 0.7 percentage units higher and the protein content 0.4 percentage units higher than the 10-year mean. The mean chlorophyll content for No. 1 Canada canola was 13 mg/kg, slightly higher than the 11 mg/kg in 1997.

Because of a continuing trend toward more *Brassica napus* plantings, the fatty acid composition showed

- lower iodine value, 111 units
- lower linolenic acid content, 8.5%
- an increase in total saturated fatty acids, 7.4%
- higher oleic acid content, 62.3%

Both the erucic acid, 0.3%, and the total glucosinolates, 11 µmol/gram, were similar to those in 1997.

Table 1 • Quality data for harvest survey No. 1 Canada canola

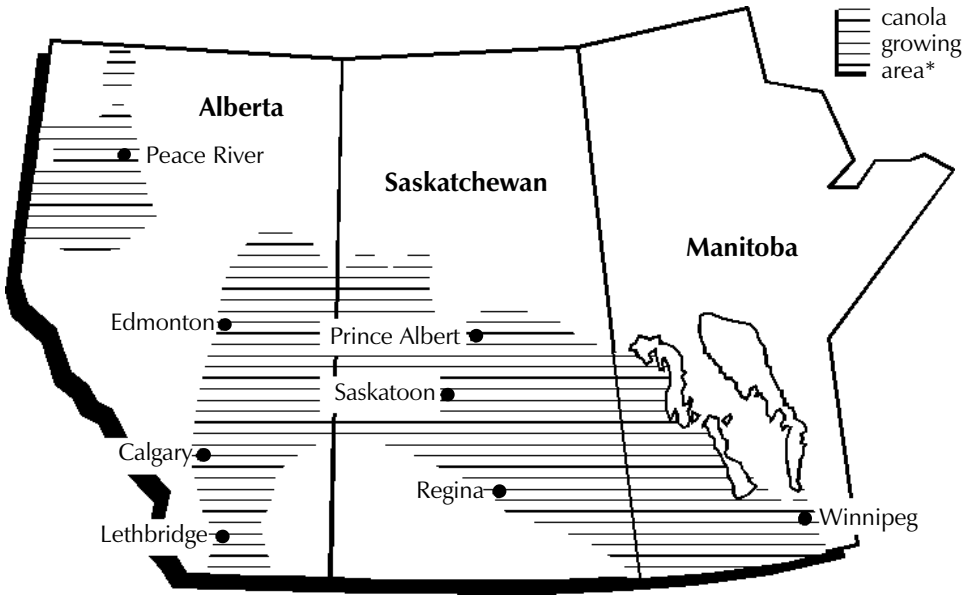
Quality parameter	1998	1997	1988–97 Mean
Oil content, % (8.5% moisture basis)	43.0	42.6	42.2
Protein content, % N x 6.25 (8.5% moisture basis)	21.3	21.2	20.9
Oil-free protein content, % N x 6.25 (8.5% moisture basis)	40.2	39.7	38.8
Seed chlorophyll content, mg/kg	13	11	12
Total glucosinolates, µmol/g (8.5% moisture basis)	11	12	15
Free fatty acids, %	0.2	0.3	0.3
Erucic acid, % in oil	0.3	0.3	0.5
Linolenic acid, % in oil	8.5	9.7	10.7
Oleic acid, % in oil	62.3	61.0	59.8
Total saturated fatty acids*, % in oil	7.4	7.0	6.5
Iodine value	111	113	116

* Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

Introduction

This report presents information on the major quality parameters for the 1998 crop of western Canadian canola. Included is information on the oil, protein, chlorophyll, glucosinolate, free fatty acid content and the fatty acid composition of harvest samples. Quality data are from analyses of canola samples submitted to the Grain Research Laboratory throughout the harvest period by producers, grain companies and oilseed crushing companies. The map shows the traditional growing areas for canola in western Canada.

Figure 1 • Map of Canadian prairies showing traditional growing area for canola



*Source: Canola—Canada's Rapeseed Crop
Publication No. 56, Canola Council of Canada

Weather and production review

Western Canadian farmers planted 5.44 million hectares of canola in 1998, which was a 12 percent increase from last year's area (Table 2). With above average yields, total canola production in western Canada was a record 7.51 million tonnes (Statistics Canada, *Field Crop Reporting Series No. 8,* December 7, 1998). Saskatchewan accounted for 43 percent of production in 1998, Alberta for 33 percent and Manitoba for 24 percent. The final 1998 yield estimate of 1395 kg/ha was well above 1290 kg/ha in 1997 and the 10-year value of 1270 kg/ha.

The planting of canola in 1998 began much earlier than normal, depending on the degree of frost risk producers were willing to take. Canola sowing was essentially complete by early May, and those regions with sufficient soil moisture got an early start to crop development. Soil temperatures were much warmer than normal by early May, due to the early start of spring and the absence of spring frosts. In western Saskatchewan and eastern Alberta, the seeding of canola was delayed because of a lack of topsoil moisture. Most of western Canada was dry until the middle of June. Top soil moisture was not as limiting north of Lethbridge, Alberta.

Dry weather prevailed across the western Prairies until the middle of June, and some canola was seeded into dry topsoil. There were widespread areas of uneven germination in regions that had been dry at the outset, particularly in west central and northwest Saskatchewan. Eastern portions of the Prairies had more favorable soil moisture reserves.

In late May and early June, freezing temperatures occurred on more than one night to most of Saskatchewan and western Manitoba. Crop development had varied considerably across the region and damage varied accordingly. Temperatures were coolest in eastern and northern Saskatchewan as well as western Manitoba.

Dry weather prevailed until the middle of June, when most of western Canada received at least 25 mm of precipitation. While these rains prevented significant yield losses, they promoted secondary germination in fields that had germinated unevenly under dry conditions. Western Manitoba and the eastern one-third of Saskatchewan received excessive precipitation, making spraying operations difficult. The risk of sclerotinia in eastern Saskatchewan and western Manitoba also increased due to high humidity levels and surface flooding. Drown out in low spots was common throughout the region.

Conditions were dry again in western Canada for the first half of July, but the rains returned by the middle of the month, worsening wet conditions in parts of the eastern Prairies. Rains and muddy conditions prevented surface fungicide application in the wettest regions of the eastern Prairies. Precipitation from mid-June to mid-July was average overall, but was below normal in the Peace River district and eastern Alberta. Lygus bug populations were high in the Peace River region and other northern regions of Alberta in late July, and reduced yields throughout the region. Hot, dry weather in the latter half of July and early August affected late-planted canola stands. Heat stress in portions of western Saskatchewan limited canola flowering to two or three days compared to two to three weeks farther east. Canola pollination was reduced and seed set lowered in those areas.

The canola harvest began by the middle of August. The hot weather accelerated maturation, and shattering was common. Warm, dry weather in western Canada continued into September and producers were able to complete the majority of the harvest two weeks earlier than normal. Half of the prairie-wide canola crop and nearly seventy percent of the Alberta crop was harvested by early September.

Table 2 • Seeded area and production for the 1998 and 1997 crops of western Canadian canola and average annual canola production for the 10-year period 1988 to 1997

	Seeded area[1] thousand hectares		Production[1] thousand tonnes		Average production[2] thousand tonnes
	1998	1997	1998	1997	1988–97
Manitoba	1113	959	1782	1497	937
Saskatchewan	2529	2266	3221	2700	2061
Alberta[3]	1801	1649	2511	2132	1878
Western Canada	**5443**	**4874**	**7514**	**6329**	**4876**

[1] source—*Field Crop Reporting Series*, *No. 8*, December 7, 1998, Statistics Canada
[2] source—*Field Crop Reporting Series*, revised final estimates for 1988–97
[3] includes the part of the Peace River area that is in British Columbia

Figure 2 • Progress of harvest of 1998 western Canadian canola by province

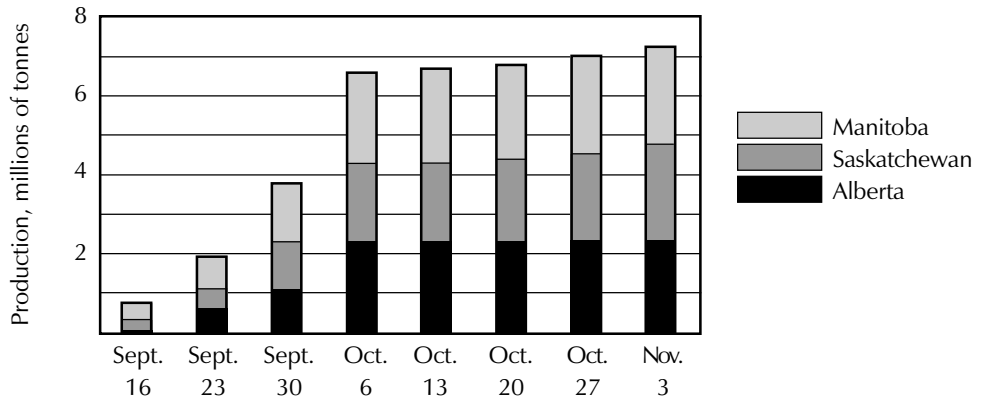
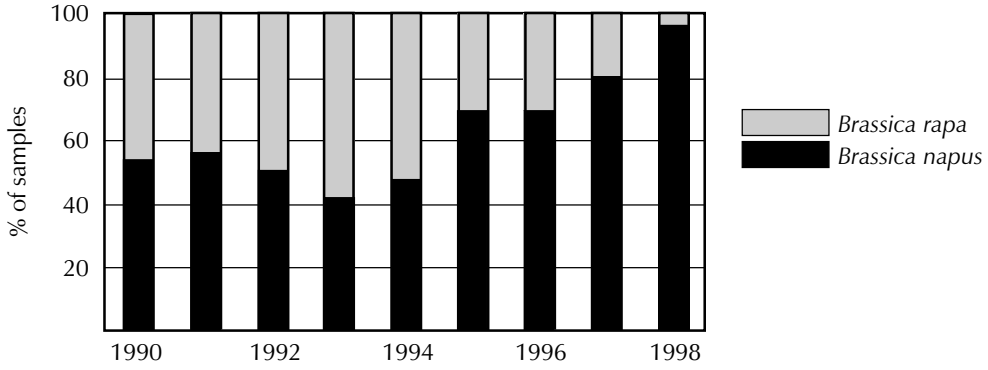


Figure 3 • Proportion of *Brassica rapa* and *Brassica napus* samples in GRL harvest surveys



Quality of 1998 canola

Tables 3, 4 and 5 show detailed information on the quality of Canadian canola harvested in 1998. Table 6 compares the quality of recent canola exports. The numbers of samples in each grade or province may not represent the actual production or grade distribution. However, there were sufficient samples to provide good quality information for each province. Provincial means were calculated from results for each crop district, weighted by a combination of five-year average production by crop district, and an estimate of grade distribution from line elevator companies. To calculate western Canadian averages for each grade, provincial averages are weighted by the Statistics Canada production estimate and the estimate of grade distribution.

Table 3 • Quality data for 1998 canola harvest survey by grade and province

	Number of samples tested	Oil content[1] %			Protein content[2] %			Chlorophyll content mg/kg		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
No. 1 Canada										
Manitoba	282	43.1	37.4	47.5	21.6	18.0	25.6	15	4	28
Saskatchewan	519	43.2	35.8	48.9	20.8	15.9	27.1	12	0	25
Alberta[3]	416	42.5	35.2	48.3	21.8	17.0	29.9	13	0	30
Western Canada[4]	**1217**	**43.0**	**35.2**	**48.9**	**21.3**	**15.9**	**29.9**	**13**	**0**	**30**
No. 2 Canada										
Manitoba	43	42.2	39.3	45.5	22.4	19.6	24.8	30	20	43
Saskatchewan	60	42.7	38.0	49.7	21.7	16.7	27.6	28	11	42
Alberta[3]	58	42.3	36.9	46.3	22.3	17.6	27.4	30	11	45
Western Canada[4]	**161**	**42.5**	**36.9**	**49.7**	**22.0**	**16.7**	**27.6**	**29**	**11**	**45**
No. 3 Canada										
Manitoba	2	44.4	43.6	45.2	22.8	22.3	23.3	50	46	54
Saskatchewan	0									
Alberta[3]	6	41.6	39.2	43.7	22.4	21.0	24.3	42	12	52
Western Canada[4]	**8**	**42.3**	**39.2**	**45.2**	**22.5**	**21.0**	**24.3**	**44**	**12**	**54**

[1] 8.5% moisture basis

[2] % N x 6.25 (8.5% moisture basis)

[3] includes part of the Peace River area that is in British Columbia

[4] values are weighted averages based on estimated production by province (Statistics Canada)

Table 4 • Quality data for 1998 canola harvest survey by grade and province

	Number of samples in composite	Glucosinolates[1]			Free fatty acids
		µmol/g			%
		Mean	Min.	Max.	
No. 1 Canada					
Manitoba	282	11	7	21	0.27
Saskatchewan	519	10	5	24	0.17
Alberta[2]	416	13	6	32	0.28
Western Canada[3]	**1217**	**11**	**5**	**32**	**0.23**
No. 2 Canada					
Manitoba	43	12	8	17	0.53
Saskatchewan	60	12	6	17	0.21
Alberta[2]	58	13	7	23	0.40
Western Canada[3]	**161**	**12**	**6**	**23**	**0.32**
No. 3 Canada					
Manitoba	2	12	10	15	0.23
Saskatchewan	0				
Alberta[2]	6	14	11	18	0.23
Western Canada[3]	**8**	**13**	**10**	**18**	**0.23**

[1] 8.5% moisture basis, total glucosinolates

[2] includes part of the Peace River area that is in British Columbia

[3] values are weighted averages based on estimated production by province (Statistics Canada)

Table 5 • Fatty acid composition for the 1998 harvest survey canola by grade and province

	Fatty acid composition[1]								
	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1	C20:2
No. 1 Canada									
Manitoba	4.0	0.3	2.1	62.3	18.9	8.6	0.7	1.4	0.1
Saskatchewan	4.1	0.3	2.1	62.2	19.3	8.2	0.7	1.4	0.1
Alberta[4]	3.8	0.3	2.0	62.3	19.0	8.9	0.6	1.4	0.1
Western Canada[5]	**4.0**	**0.3**	**2.1**	**62.3**	**19.1**	**8.5**	**0.7**	**1.4**	**0.1**
No. 2 Canada									
Manitoba	4.0	0.3	2.1	62.1	19.0	8.9	0.7	1.4	0.1
Saskatchewan	4.1	0.3	2.1	61.7	19.4	8.6	0.7	1.4	0.1
Alberta[4]	3.9	0.3	2.1	62.2	18.9	8.7	0.7	1.4	0.1
Western Canada[5]	**4.0**	**0.3**	**2.1**	**62.0**	**19.1**	**8.7**	**0.7**	**1.4**	**0.1**
No. 3 Canada									
Western Canada[5]	**3.9**	**0.3**	**2.3**	**63.9**	**18.0**	**8.1**	**0.7**	**1.3**	**0.1**

	C22:0	C22:1	C24:0	C24:1	Total saturates[2]	Iodine value[3]
No. 1 Canada						
Manitoba	0.4	0.2	0.2	0.2	7.4	111
Saskatchewan	0.3	0.2	0.2	0.2	7.6	110
Alberta[4]	0.3	0.3	0.2	0.2	7.1	111
Western Canada[5]	**0.3**	**0.3**	**0.2**	**0.2**	**7.4**	**111**
No. 2 Canada						
Manitoba	0.4	0.1	0.2	0.2	7.5	111
Saskatchewan	0.3	0.2	0.2	0.2	7.5	111
Alberta[4]	0.3	0.3	0.2	0.2	7.3	111
Western Canada[5]	**0.3**	**0.2**	**0.2**	**0.2**	**7.4**	**111**
No. 3 Canada						
Western Canada[5]	**0.3**	**0.1**	**0.2**	**0.2**	**7.6**	**109**

[1] % of total fatty acids including palmitic (C16:0), palmitoleic (C16:1), stearic (C18:0), oleic (C18:1), linoleic (C18:2), linolenic (C18:3), arachidic (C20:0), gadoleic (C20:1), eicosadienoic (C20:2), behenic (C22:0), erucic (C22:1), lignoceric (C24:0), nervonic (C24:1)

[2] total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

[3] calculated from fatty acid composition

[4] includes part of the Peace River area that is in British Columbia

[5] values are weighted averages based on estimated production by province (Statistics Canada)

Table 6 • Quality of No. 1 Canada canola. Comparison of data for 1998 harvest survey with data for recent export shipments

Quality parameter	1998 survey	October 1998 exports		1997–98 exports	
		Thunder Bay	Vancouver	Thunder Bay	Vancouver
Oil content, %	43.0	40.8	41.6	41.2	42.7
Protein content, %	21.3	22.5	21.6	22.3	20.9
Oil-free protein content, %	40.2	40.5	39.6	40.6	39.2
Seed chlorophyll, mg/kg	13	20	17	19	15
Total glucosinolates, µmol/g	11	12	12	11	11
Free fatty acids, %	0.2	0.8	0.4	0.5	0.6
Erucic acid, % in oil	0.3	0.2	0.3	0.2	0.5
Linolenic acid, % in oil	8.5	8.4	8.7	9.8	10.0
Oleic acid, % in oil	62.3	62.7	62.5	61.0	60.6
Total saturated fatty acids*, % in oil	7.4	7.3	7.1	7.3	6.9
Iodine value	111	111	111	110	114

* Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

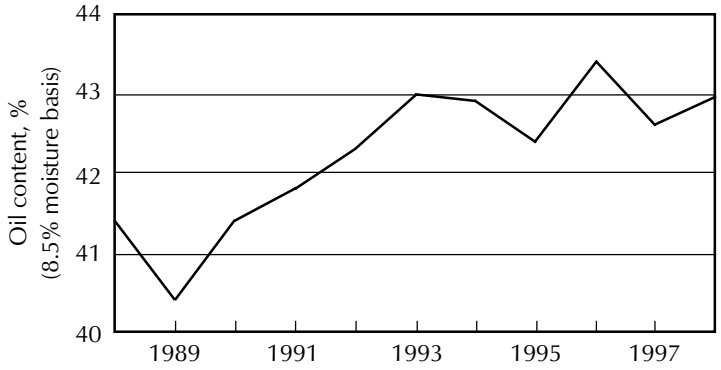
Oil content

The oil content of 43.0% for No. 1 Canada canola from the 1998 harvest survey is similar to 42.6% in 1997 and well above the 10-year mean of 42.2%. The Alberta oil content of 42.5% is lower than the 43.2% value for Saskatchewan and the 43.1% value for Manitoba. Compared to 1997, mean oil contents have decreased by 0.7 percentage units for Alberta while they have increased by 1.2 percentage units and 0.7 percentage units for Manitoba and Saskatchewan, respectively. No.1 Canada canola samples from producers across western Canada varied in oil content from 35.2% to 48.9%. The mean oil contents decreased with lower grades of canola.

As Table 6 shows, the oil content of canola exports from Vancouver was 41.6% by October 1998, about 1% lower than the 1997–98 average. These shipments comprised seed primarily from the western Prairies. The oil content of the remaining Vancouver exports in the 1998–99 shipping season may increase slightly from the October value if more of eastern prairie crop enters the system.

The oil content of the October 1998 Thunder Bay canola exports was 40.8%, slightly lower than the 1997–98 average of 41.2%. Exports from Thunder Bay are made up largely of seed from the eastern Prairies. Therefore the mean oil content of Thunder Bay exports should remain near 41% during the 1998–99 shipping season.

Oil content of harvest survey samples of No. 1 Canada canola, 1988–98



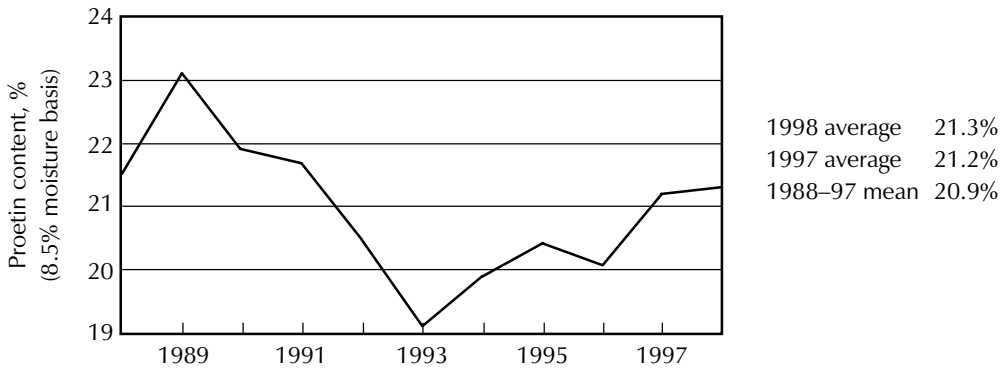
Protein content

The seed protein content of 21.3% for No. 1 Canada canola from the 1998 harvest survey is similar to 21.2% for 1997, and slightly above the 10-year mean of 20.9%. The 1998 protein content is 40.2%, calculated on an oil-free, 8.5% moisture basis compared to 39.7 % in 1997. The Saskatchewan protein content of 20.8% is significantly lower than 21.6% in Manitoba and 21.8% in Alberta. Compared to 1997, mean protein contents have increased by 1.5 percentage units for Alberta while they have decreased by 0.5 percentage units and 0.6 percentage units for Manitoba and Saskatchewan, respectively. No. 1 Canada canola samples from producers across western Canada varied in protein content from 15.9% to 29.9%. The mean protein contents increased with lower grades of canola.

As Table 6 shows, the protein content of canola exports from Vancouver, which averaged 20.9% during the 1997–98 shipping season, increased to 21.6% by October 1998. However, the protein content in Vancouver exports could be slightly lower in the remainder of the 1998–99 shipping season as more of the central prairie crop enters the

system. The average protein content of canola exports from Thunder Bay increased slightly to 22.5% by October 1998, reflecting the protein levels in Manitoba canola.

Protein content of harvest survey samples of No. 1 Canada canola, 1988–98

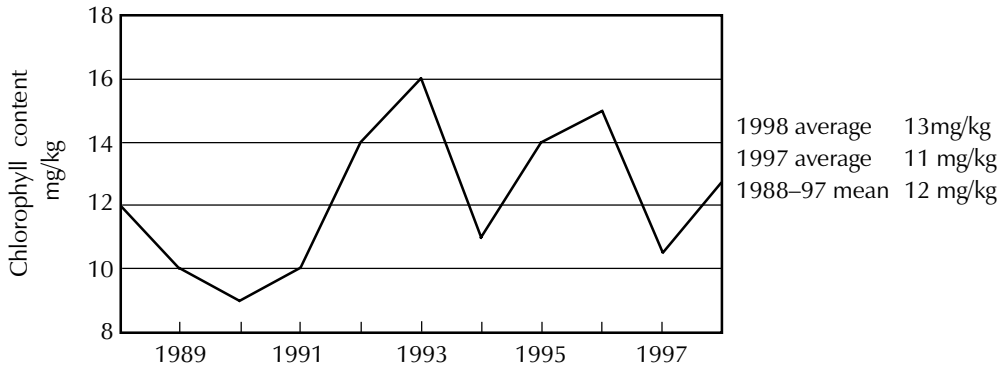


Chlorophyll content

Farm deliveries of No. 1 Canada canola averaged 13 mg/kg chlorophyll in the 1998 survey, slightly higher than the 11 mg/kg in the 1997 harvest. The chlorophyll levels of 15 mg/kg for Manitoba were slightly higher than 13 mg/kg for Alberta and 12 mg/kg for Saskatchewan. Provincial differences in chlorophyll levels were less noticeable than in previous years due to the higher amounts of *Brassica napus* in all growing regions.

As Table 6 shows, the average chlorophyll content of the October 1998 Vancouver exports was 17 mg/kg, an increase from the 1997–98 value of 15 mg/kg. The October 1998 shipments of canola leaving Thunder Bay had an average chlorophyll level of 20 mg/kg, slightly higher than the 19 mg/kg of chlorophyll in 1997-98 exports.

Chlorophyll content of harvest survey samples of No. 1 Canada canola, 1988–98

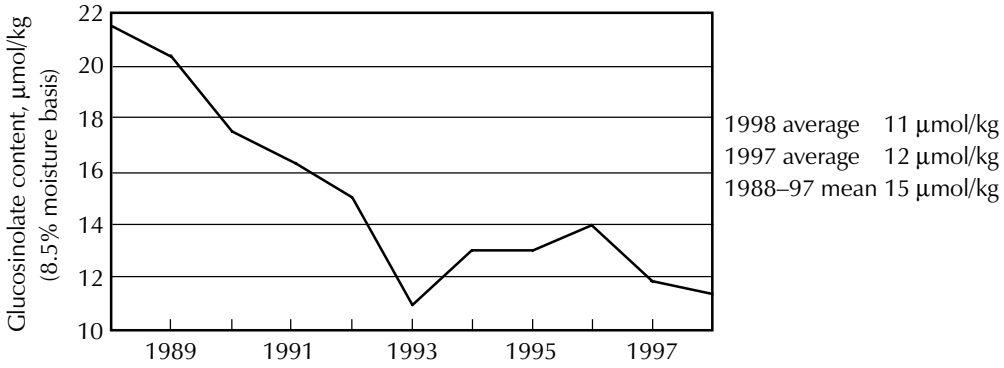


Glucosinolate content

For the 1998 survey, the total seed glucosinolate content of No. 1 Canada canola averaged 11 µmol/g, similar to the 1997 value of 12 µmol/g. The continuing low level of glucosinolates is due largely to increased use in 1998 of new *Brassica napus* varieties.

Table 6 shows that the average level of total seed glucosinolates, 12 µmol/g, in the October 1998 Vancouver canola exports was similar to the average of the 1997–98 shipping season, and should remain so. The average level of total glucosinolates, 12 µmol/g, in the October 1998 Thunder Bay canola exports was also similar to the 1997–98 level of 11 µmol/g.

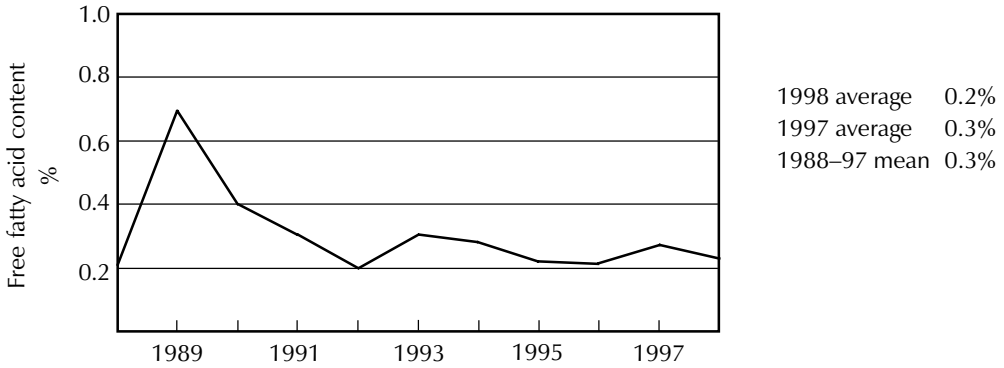
Total seed glucosinolate content of harvest samples of No. 1 Canada canola, 1988–98



Free fatty acid content

The 1998 harvest survey No.1 Canada canola had a mean free fatty acid content of 0.2%. This remains similar to the long-term mean of 0.3%. The FFA content, 0.2%, of Saskatchewan seed is slightly lower than 0.3% in Manitoba samples and 0.3% in Alberta samples. The FFA content, 0.2%, of Saskatchewan seed is slightly lower than the 0.3% in Manitoba and Alberta samples. The free fatty acid content of late harvested material could be significantly higher. For exports, FFA levels are expected to remain at levels similar to 1997–98 as shown in Table 6.

Free fatty acid content of harvest survey samples of No. 1 Canada canola, 1988–98



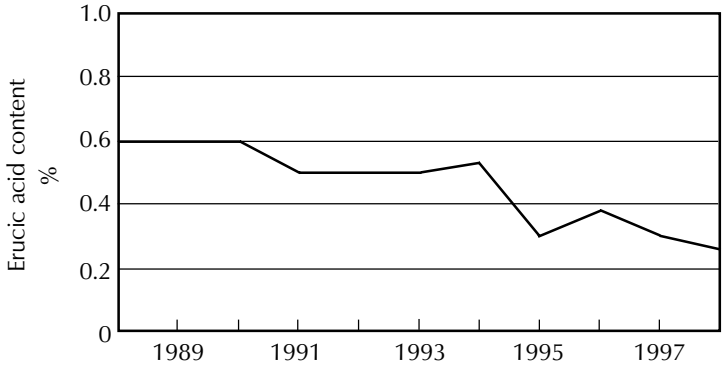
Fatty acid composition

The mean iodine value of the 1998 harvest survey samples was 111 units compared to 113 units in 1997. The linolenic acid was 8.5% in 1998, which was significantly lower than 1997 at 9.7% and the 10-year mean at 10.7%. At 8.2%, the linolenic acid in Saskatchewan was significantly lower than in Manitoba, 8.6%, and Alberta, 8.9%. The decrease in the linolenic acid content and iodine value of the 1998 crop are largely due to the increased percentage of *Brassica napus* plantings this year. However, as a result of the increased *B. napus* plantings, the oleic acid content of the 1998 crop increased to 62.3% from 61.0% in 1997.

The October 1998 export data in Table 6 shows that the linolenic acid in both Vancouver and Thunder Bay export shipments are expected to remain under 9%. The export data for October 1998 suggests the iodine value will be 111 units for the 1998–99 shipping season.

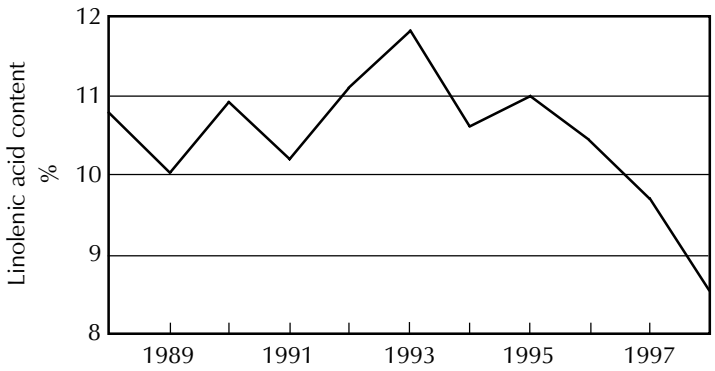
The average level of erucic acid in the 1998 crop was 0.3%, similar to 1997 and below the 10-year mean of 0.5%. The mean level of saturated fatty acids was 7.4% in 1998, higher than the 7.0% in 1997. The levels of saturated fatty acids were significantly higher in Manitoba, 7.4%, and Saskatchewan, 7.6%, than in Alberta, 7.1%. The level of saturated fatty acids in No. 1 Canada canola exports will likely remain above 7% as shown in Table 6.

Erucic acid content of harvest survey samples of No. 1 Canada canola, 1988–98



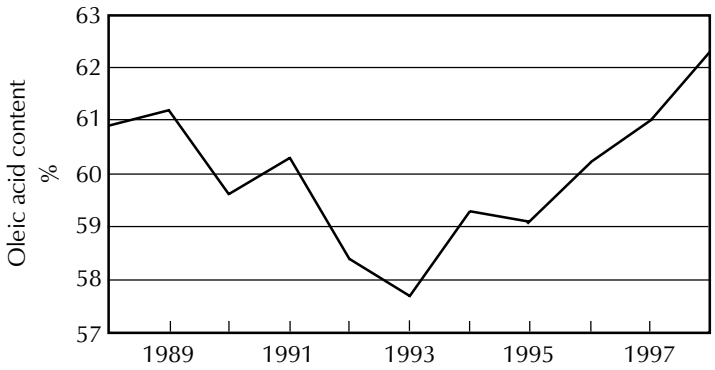
1998 average	0.3%
1997 average	0.3%
1988–97 mean	0.5%

Linolenic acid content of harvest survey samples of No. 1 Canada canola, 1988–98



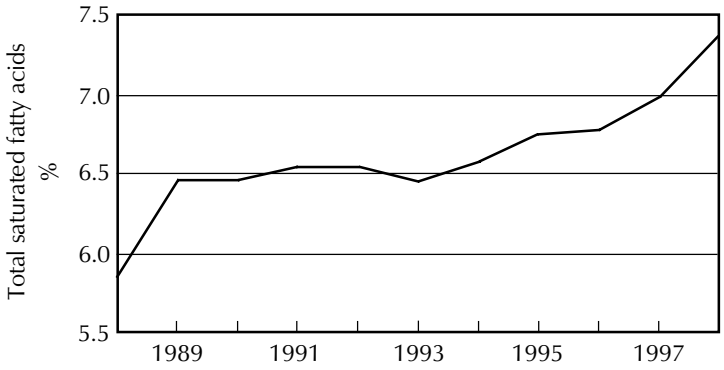
1998 average	8.5%
1997 average	9.7%
1988–97 mean	10.7%

Oleic acid content of harvest survey samples of No. 1 Canada canola, 1988–98



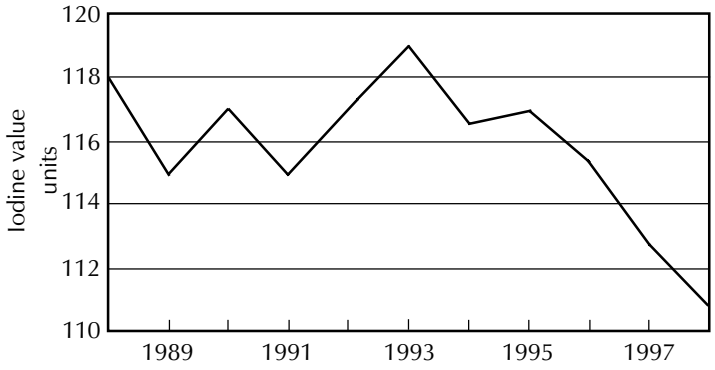
1998 average	62.3%
1997 average	61.0%
1988–97 mean	59.8%

Total saturated fatty acids of harvest survey samples of No. 1 Canada canola, 1988–98



1998 average	7.4%
1997 average	7.0%
1988–97 mean	6.5%

Iodine value of harvest survey samples of No. 1 Canada canola, 1988–98



1998 average	111
1997 average	113
1988–97 mean	116

Methods and definitions

Harvest survey

Samples of canola grown in 1998 were submitted to the Grain Research Laboratory by producers, crushing plants and grain handling offices from across western Canada. The individual samples were cleaned to remove dockage and then analyzed for oil, protein, chlorophyll and total glucosinolate content with a NIRSystems 6500 scanning near infra-red (NIR) spectrometer. The NIR instrument was calibrated to and verified against the appropriate listed reference method. Composite samples were tested for free fatty acids and fatty acid composition. Composite samples were prepared as follows:

- samples grading No. 1 Canada were combined by provincial crop district
- samples grading No. 2 and No. 3 Canada were combined by province

This year's harvest survey included 1386 samples from across western Canada: 327 from Manitoba, 579 from Saskatchewan, and 480 from Alberta and the Peace River area that is in British Columbia. Results are based on samples received during the harvest period, August 15 to October 31,1998. Weighting factors used to calculate provincial and western Canadian means are derived from the previous five-year average production for each crop district and the 1998 provincial production estimates in Statistics Canada's *Field Crop Reporting Series No. 8*, December 7, 1998. Factors used to calculate grade distributions were from crop reports published by the line elevator companies.

Oil content

Oil content is determined by nuclear magnetic resonance according to International Organization for Standardization method ISO 10565:1993(E) *Oilseeds - Simultaneous determination of oil and moisture contents - Method using pulsed nuclear magnetic resonance spectroscopy*. Results were obtained with a Bruker NMS 110 Minispec NMR Analyzer and are reported as percentage, calculated to an 8.5% moisture basis.

Protein content

Protein content is determined by the AOCS Official Method Ba 4e-93 using a LECO FP-428 Nitrogen Determinator. Results are reported as percentage protein measured as percent of nitrogen x 6.25, calculated to an 8.5% moisture basis.

Chlorophyll content

Chlorophyll content is determined by International Organization for Standardization method ISO 10519: 1993 (E), *Rapeseed- Determination of chlorophyll content- Spectrometric method*. Results are expressed as milligrams per kilogram, seed basis.

Glucosinolate content

Glucosinolate content is determined by ISO 9167-1:1993 (E), *Rapeseed-Determination of glucosinolate content Part 1: Method using high performance liquid chromatography*. Results are total glucosinolates on a whole seed basis expressed as micromoles per gram; 8.5% moisture basis.

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 percent free fatty acids in the oil (as oleic acid).

Fatty acid composition

Fatty acid composition is determined by ISO 5508:1990 (E), *Animal and vegetable fats and oils - Analysis by gas chromatography of methyl esters of fatty acids*. A 15 m by 0.32 mm column with a 0.5 micrometer Supelcowax 10 coating is used.

Total saturated fatty acids

Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

Iodine value

Iodine value is calculated from the fatty acid composition, according to AOCS Recommended Practice Cd 1c-85. Major and important minor fatty acids are reported, although samples may also contain as much as 1% of other minor fatty acids which are included in the calculations.

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Tables

Figures