Quality of Western Canadian Canola

1997

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Summary

The 1997 western Canadian canola crop was above average in quality, with some noticeable changes in fatty acid composition.

Warmer, drier weather compared to 1996 contributed to a crop with lower oil content but higher protein content (Table 1). The oil content was 0.5 percentage units higher and the protein content 0.3 percentage units higher than the 10-year mean. The mean chlorophyl content for No. 1 Canada canola was significantly lower than last year.

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

- A lower linolenic acid content
- A higher oleic acid content
- An increase in total saturated fatty acids
- A lower iodine value

Both the erucic acid and the total glucosinolates were lower than in 1996.

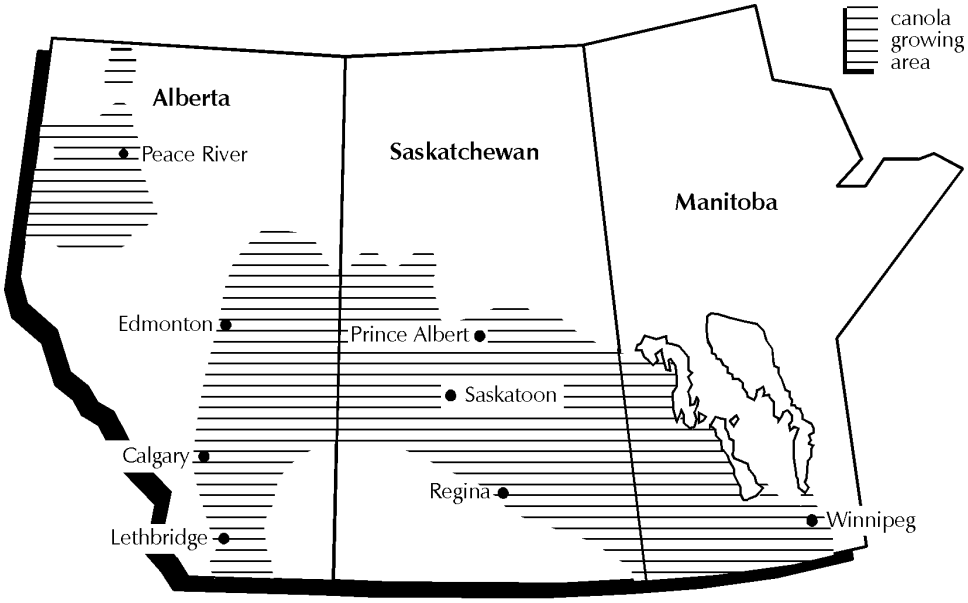
Table 1 • Quality data for harvest survey No. 1 Canada canola

Quality parameter	1997	1996	1987–96 Mean
Oil content, % (8.5% moisture basis)	42.6	43.4	42.1
Protein content, % N x 6.25, 8.5% moisture basis	21.2	20.1	20.9
Oil-free protein content, % N x 6.25, 8.5% moisture basis	39.7	38.2	38.6
Seed chlorophyl content, mg/kg	11	15	12
Total glucosinolates, µmol/g (8.5% moisture basis)	12	14	16
Free fatty acids, %	0.3	0.2	0.3
Erucic acid content, % in oil	0.3	0.4	0.5
Linolenic acid content, % in oil	9.7	10.4	10.8
Oleic acid, % in oil	61.0	60.2	59.7
Saturated fatty acids, % in oil	7.0	6.8	6.4
Iodine value	113	115	117

Introduction

This report presents information on the major quality parameters for the 1997 crop of western Canadian canola. Included is information on the oil, protein, chlorophyl, glucosinolate, and free fatty acid content, and the fatty acid composition of harvest samples. Quality data presented are obtained from analyses of canola samples submitted to the Grain Research Laboratory throughout the harvest period by producers, grain companies and oilseed crushing companies. Figure 1 shows the traditional growing areas for canola in western Canada.

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



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

Weather and production review

Western Canadian farmers planted 4.87 million hectares of canola in 1997, which was a 38 percent increase from last year's area (Table 2). However, because of below average yields in some areas, total canola production was only 20 percent higher, at 6.00 million tonnes (Statistics Canada, *Field Crop Reporting Series No. 7*, October 8, 1997). Saskatchewan accounted for 43 percent of production in 1997, Alberta, for 34 percent, and Manitoba, for 23 percent. The final yield estimate of 1250 kg/ha was well below the 1996 mean of 1440 kg/ha but was similar to the long-term mean of 1260 kg/ha.

Cool, wet conditions over much of the prairies early in the 1997 season delayed the start of seeding. Seeding started in the western areas of the prairie region in the first half of May, while eastern and extreme northern regions had to wait until the last half of May to begin planting. Delays in seeding were caused by flooding in the Red River Valley of Manitoba, where seeding did not start until early to mid-June, and dryness in the eastern regions of Saskatchewan and western Manitoba.

June temperatures were warmer than normal in the eastern prairies, while western areas experienced mostly normal temperatures. Rainfall in June was variable, with western areas receiving close to normal amounts and eastern regions receiving below-normal amounts. The dry weather was particularly stressful for canola in southwestern Manitoba and southeastern Saskatchewan. The dryness in these regions caused poor germination and limited the yield potential of the crop. The normal to above-normal rainfall in the western regions was welcomed in the south, but the northern areas of Alberta did not need the moisture.

July temperatures were normal initially, but were above normal in the latter half of the month. July rainfall was below normal in most of the prairie regions, with the exception of Manitoba. The combination of above-normal temperatures and reduced precipitation in the rest of the prairies caused crop conditions to decline in the last half of July. The dry, hot weather continued for the first two weeks of August, which caused stress to the canola crop. Stress during flowering resulted in a reduced pod set which led to lower yields. Rains returned to the prairie region in mid-August, which helped to improve conditions in some northern areas but was too late to improve yields significantly.

The 1997 harvest began by the middle of August, and over 50 percent was combined by mid-September (Figure 2). As of October 7, 1997, the Weather and Crop Surveillance Department of the Canadian Wheat Board estimated the 1997 canola crop to be completed in Saskatchewan and Manitoba but only 89 percent combined in Alberta. Some farmers in the Peace River region in northern Alberta and British Columbia were forced to leave a portion of their crops unharvested. The proportion of *Brassica napus* samples in the 1997 harvest increased to 80 percent (Figure 3).

Table 2 • Seeded area and production for the 1997 and 1996 crops of western Canadian canola and average annual canola production for the 10-year period 1987 to 1996

	Seeded area[1] thousand hectares		Production[1] thousand tonnes		Average production[2] thousand tonnes
	1997	1996	1997	1996	1987–96
Manitoba	931	635	1354	1068	852
Saskatchewan	2266	1578	2581	2223	1937
Alberta[3]	1660	1301	2067	1720	1843
Western Canada	**4866**	**3515**	**6002**	**5011**	**4632**

[1] source—*Field Crop Reporting Series*, *No. 7*, October 8, 1997, Statistics Canada
[2] source—*Field Crop Reporting Series*, revised final estimates for 1987–96
[3] includes the part of the Peace River area that is in British Columbia

Figure 2 • Progress of harvest of 1997 western Canadian canola by province

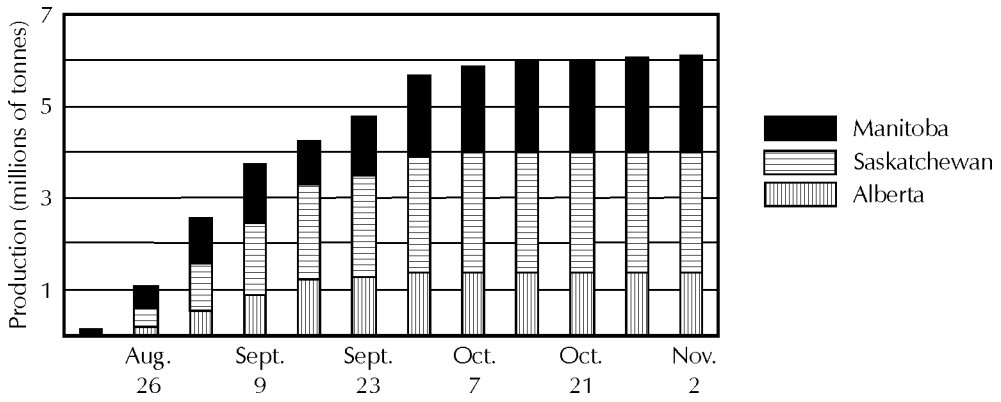
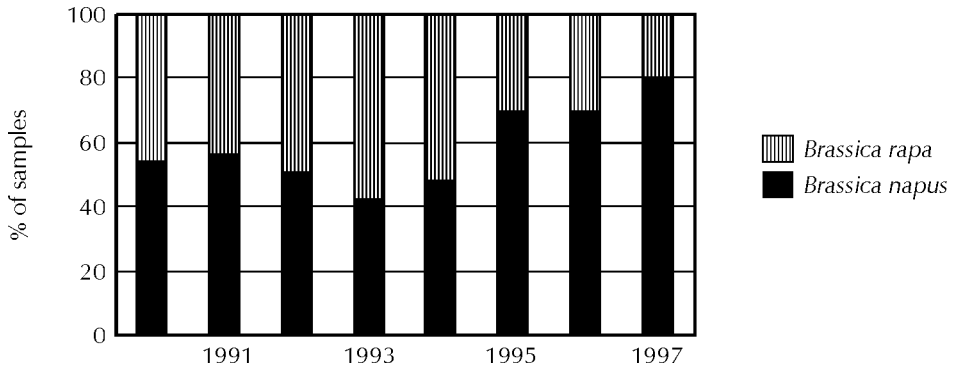


Figure 3 • Proportion of *Brassica rapa* and *Brassica napus* samples in GRL harvest surveys



Quality of 1997 canola

Tables 3, 4 and 5 show detailed information on the quality of Canadian canola harvested in 1997. Table 6 compares the quality of recent canola exports. The number of samples in each grade or province is not representative of the actual production or grade distribution. However, samples are drawn so as to provide good quality information for each grade or province. To calculate provincial means, results for each crop district are weighted by a combination of five-year average production by crop district and an estimate of grade distribution based on data published by the 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 1997 canola crop by grade and province

	Number of samples tested	Oil content[1] %			Protein content[2] %			Chlorophyl content mg/kg		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
No. 1 Canada										
Manitoba	340	41.9	34.8	48.9	22.1	16.9	29.4	14	0	30
Saskatchewan	795	42.5	36.1	49.2	21.4	16.2	28.1	10	0	31
Alberta[3]	599	43.2	35.0	50.9	20.3	15.2	28.1	9	0	36
Western Canada[4]	**1734**	**42.6**	**34.8**	**50.9**	**21.2**	**15.2**	**29.4**	**11**	**0**	**36**
No. 2 Canada										
Manitoba	85	41.0	34.9	46.8	23.0	18.4	26.7	24	6	49
Saskatchewan	103	41.3	36.1	47.5	22.8	17.1	28.2	24	6	63
Alberta[3]	86	42.6	35.3	48.1	21.3	16.6	28.4	21	6	68
Western Canada[4]	**274**	**41.6**	**34.9**	**48.1**	**22.4**	**16.6**	**28.4**	**23**	**6**	**68**
No. 3 Canada										
Manitoba	6	40.8	39.0	43.9	23.1	22.2	24.2	40	16	94
Saskatchewan	17	42.6	39.2	46.3	21.1	17.8	24.3	25	2	46
Alberta[3]	5	41.1	38.1	44.3	21.8	19.5	26.8	46	14	82
Western Canada[4]	**28**	**41.4**	**38.1**	**46.3**	**21.8**	**17.8**	**26.8**	**41**	**2**	**94**

[1] 8.5% moisture basis

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

[3] includes part of the Peace River area (Crop District No. 7) that is in British Columbia

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

Table 4 • Quality data for 1997 canola crop by grade and province

	Number of samples in composite	Glucosinolates[1]			Free fatty acids
		µmol/g			%
		Mean	Min.	Max.	
No. 1 Canada					
Manitoba	340	11	7	18	0.31
Saskatchewan	795	12	6	22	0.19
Alberta[2]	599	13	6	32	0.35
Western Canada[3]	**1734**	**12**	**6**	**32**	**0.27**
No. 2 Canada					
Manitoba	85	13	8	20	0.30
Saskatchewan	103	14	7	23	0.31
Alberta[2]	86	14	7	25	0.52
Western Canada[3]	**274**	**14**	**7**	**25**	**0.37**
No. 3 Canada					
Manitoba	6	13	11	16	0.31
Saskatchewan	17	13	9	22	0.32
Alberta[2]	5	12	10	15	0.34
Western Canada[3]	**28**	**13**	**9**	**22**	**0.33**

[1] 8.5% moisture basis, total glucosinolates

[2] includes part of the Peace River area (Crop District No. 7) 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 1997 crop of Canada 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	3.9	0.3	2.1	61.3	18.8	9.6	0.7	1.4	0.1
Saskatchewan	3.9	0.3	2.0	61.4	19.1	9.2	0.7	1.4	0.1
Alberta[3]	3.6	0.3	1.9	60.4	19.3	10.3	0.6	1.4	0.1
Western Canada[4]	**3.8**	**0.3**	**2.0**	**61.0**	**19.1**	**9.7**	**0.7**	**1.4**	**0.1**
No. 2 Canada									
Manitoba	3.9	0.3	2.1	61.1	18.5	9.9	0.7	1.5	0.1
Saskatchewan	3.9	0.3	2.0	60.7	19.2	9.4	0.7	1.5	0.1
Alberta[3]	3.7	0.3	1.9	60.2	19.1	10.3	0.7	1.5	0.1
Western Canada[4]	**3.8**	**0.3**	**2.0**	**60.7**	**19.0**	**9.8**	**0.7**	**1.5**	**0.1**
No. 3 Canada									
Manitoba	3.9	0.3	2.0	60.9	19.0	9.6	0.7	1.5	0.1
Saskatchewan	3.9	0.3	2.0	60.2	19.6	9.1	0.7	1.4	0.2
Alberta[3]	4.0	0.3	2.2	61.7	18.6	7.8	0.8	1.4	0.2
Western Canada[4]	**4.0**	**0.3**	**2.2**	**61.3**	**18.9**	**8.3**	**0.8**	**1.4**	**0.2**

	C22:0	C22:1	C24:0	C24:1	Total saturates	Iodine value[2]
No. 1 Canada						
Manitoba	0.4	0.2	0.2	0.2	7.2	112
Saskatchewan	0.3	0.3	0.2	0.2	7.1	112
Alberta[3]	0.3	0.5	0.2	0.2	6.6	114
Western Canada[4]	**0.3**	**0.3**	**0.2**	**0.2**	**7.0**	**113**
No. 2 Canada						
Manitoba	0.4	0.3	0.2	0.2	7.3	113
Saskatchewan	0.4	0.3	0.2	0.2	7.3	112
Alberta[3]	0.4	0.5	0.2	0.2	6.9	114
Western Canada[4]	**0.4**	**0.3**	**0.2**	**0.2**	**7.2**	**113**
No. 3 Canada						
Manitoba	0.4	0.2	0.2	0.2	7.2	112
Saskatchewan	0.4	0.4	0.2	0.2	7.3	111
Alberta[3]	0.5	0.3	0.2	0.2	7.8	108
Western Canada[4]	**0.5**	**0.3**	**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] calculated from fatty acid composition

[3] includes part of the Peace River area (Crop District No. 7) that is in British Columbia

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

Table 6 • Quality of No. 1 Canada canola. Comparison of data for 1997 harvest survey with data for recent export shipments

Quality parameter	1997 survey	October 1997 exports		1996–97 exports	
		Thunder Bay	Vancouver	Thunder Bay	Vancouver
Oil content, %	42.6	41.2	42.7	40.6	43.3
Protein content, %	21.2	22.2	21.1	21.7	19.8
Oil-free protein content, %	39.7	40.3	39.5	38.9	37.6
Seed chlorophyl, mg/kg	11	19	14	22	18
Total glucosinolates, µmol/g	12	12	11	13	14
Free fatty acids, %	0.3	0.6	0.8	0.6	0.6
Erucic acid, % in oil	0.3	0.2	0.4	0.2	0.6
Linolenic acid, % in oil	9.7	9.8	9.9	9.6	10.6
Oleic acid, % in oil	61.0	61.2	61.0	61.0	59.5
Total saturates, % in oil,	7.0	7.3	6.9	7.4	6.7
Iodine value	113	113	113	113	116

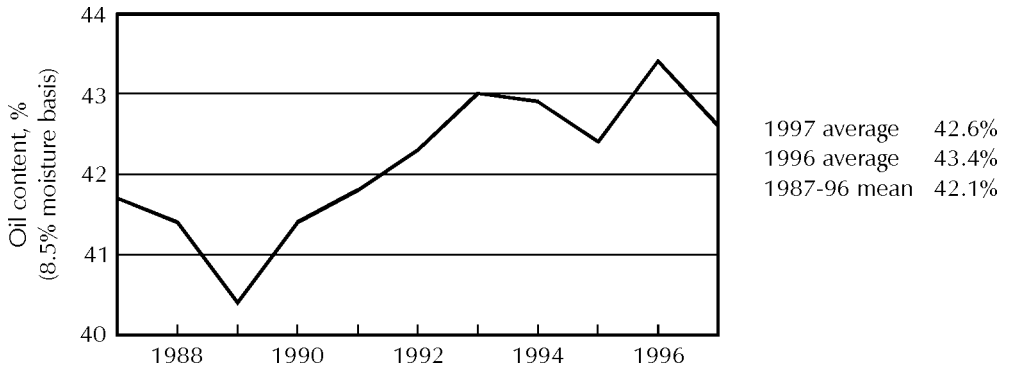
Oil content

The oil content of top grade 1997 western Canadian canola at 42.6% is 0.8 percentage units lower than in 1996 but above the 10-year mean of 42.1%. In Alberta the oil content (43.2%) is higher than in Saskatchewan (42.5%), and Manitoba (41.9%). Compared to 1996, mean oil contents have decreased by 0.2 percentage units for Manitoba, 0.7 percentage units for Alberta, and 1.1 percentage units for Saskatchewan.

As Table 6 shows, the oil content of canola exports from Vancouver was 42.7% by October 1997, lower than the 1996–97 average of 43.3%. These shipments comprise seed primarily from the western prairies. The remaining Vancouver exports in the 1997–98 shipping season may decrease slightly from the October value if more of the eastern prairie crop enters the system.

The oil content of the October 1997 Thunder Bay canola exports was 41.2%, higher than the 1996–97 average of 40.6%. Exports from Thunder Bay are made up largely of seed from the eastern prairies. Therefore the mean oil content of Thunder Bay exports remains lower than the oil content for Vancouver exports, but should remain near 41% during the 1997–98 shipping season.

Oil content of harvest survey samples of No. 1 Canada canola, 1987–97

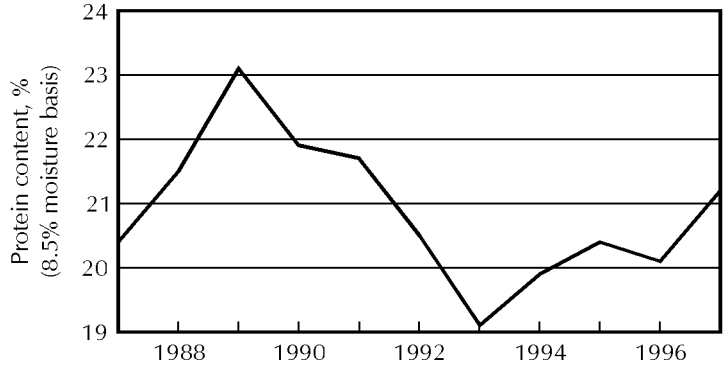


Protein content

At 21.2%, the seed protein content of top grade canola from the 1997 harvest is 1.1 percentage units higher than in 1996 and similar to the 10-year mean of 20.9%. The 1997 protein content is 39.7%, calculated on an oil-free, 8.5% moisture basis, compared to 38.2% in 1996. In Manitoba, protein content (22.1%) is significantly higher than in Saskatchewan (21.4%), and Alberta (20.3%).

As Table 6 shows, the protein content of canola exports from Vancouver, which averaged 19.8% during the 1996–97 shipping season, increased to 21.1% by October 1997. However, the protein content in Vancouver exports could be slightly higher in the remainder of the 1997–98 shipping season as more of the eastern prairie crop enters the system. The average protein content of canola exports from Thunder Bay increased to 22.2% by October 1997, reflecting the high protein levels in Manitoba canola.

Protein content of harvest survey samples of No. 1 Canada canola, 1987–97



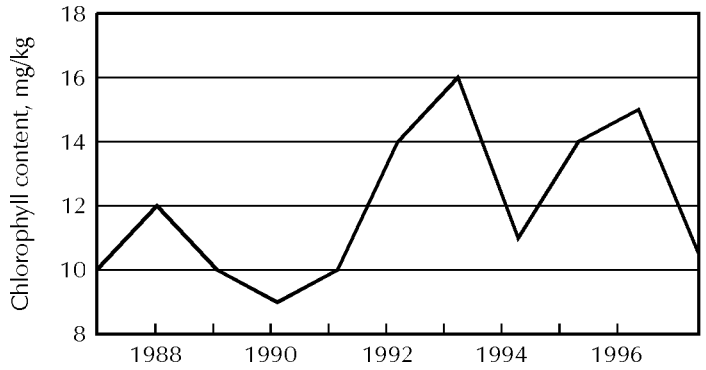
1997 average	21.2%
1996 average	20.1%
1987-96 mean	20.9%

Chlorophyl content

Farm deliveries of No. 1 Canada canola averaged 11 mg/kg chlorophyl in the 1997 survey, lower than the 15 mg/kg found in the 1996 harvest. The chlorophyl levels in Manitoba at 14 mg/kg were significantly higher than the 10 mg/kg in Saskatchewan and the 9 mg/kg in Alberta.

As Table 6 shows, the average chlorophyl content of the October 1997 Vancouver exports was 14 mg/kg, a decrease from the 1996–97 value of 18 mg/kg. The October 1997 shipments of canola leaving Thunder Bay had an average chlorophyl content of 19 mg/kg, also lower than the 22 mg/kg of chlorophyl in 1996–97 exports.

Chlorophyl content of harvest survey samples of No. 1 Canada canola, 1987–97



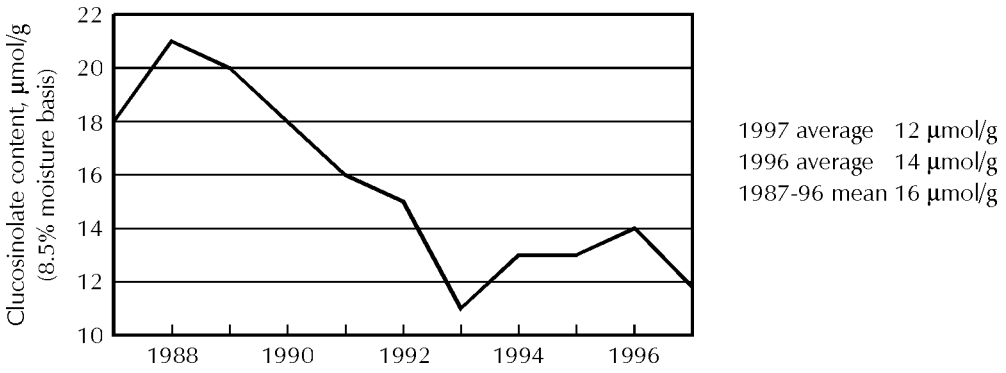
1997 average	11 mg/kg
1996 average	15 mg/kg
1987-96 mean	12 mg/kg

Glucosinolate content

The total seed glucosinolate content of the 1997 canola crop averaged 12 µmol/g, lower than the 1996 value of 14 µmol/g and well below the anticipated new canola specification of 18 µmol/g. The continuing low level of glucosinolates is due largely to increased use of new cultivars that were mainly of the *Brassica napus* types in 1997.

Table 6 shows that the average level of total seed glucosinolates, 11 µmol/g, in the October 1997 Vancouver canola exports was lower than the average of the 1996–97 shipping season, and should remain so. The average level of total glucosinolates, 12 µmol/g, in the October 1997 Thunder Bay canola exports was similar to the 1996–97 level, 13 µmol/g.

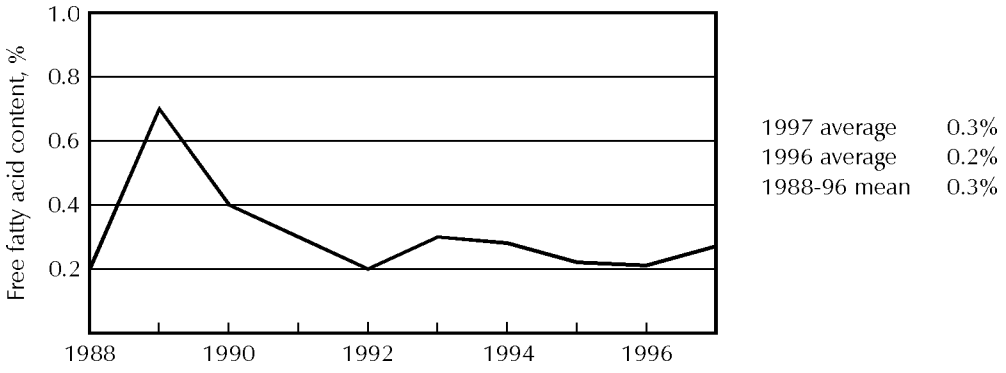
Total seed glucosinolate content of harvest samples of No. 1 Canada canola, 1987–97



Free fatty acid content

The 1997 average level of free fatty acids in No. 1 Canada canola, 0.3%, remained similar to the nine-year mean of 0.3%. Regions that experienced wet and delayed harvests had slightly higher free fatty acid levels. The free fatty acid content of spring harvested seed could be significantly higher. The mean free fatty acid content of 1997–98 exports should be similar to the 1996–97 averages, as shown in Table 6.

Free fatty acid content of harvest survey samples of No. 1 Canada canola, 1988–97



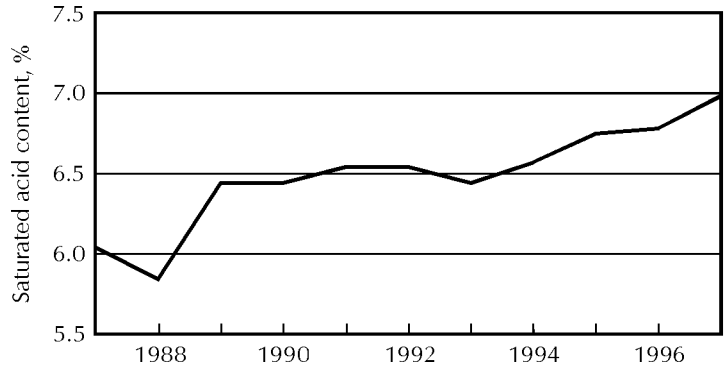
Fatty acid composition

Table 5 shows the fatty acid composition for the 1997 crop, which produced an oil with a lower iodine value of 113 units compared to 1996 at 115 units. The linolenic acid was 9.7% in 1997, which was significantly lower than 1996 at 10.4% and the 10-year mean at 10.8%. At 10.3%, the linolenic acid in Alberta was significantly higher than in Manitoba, 9.6%, and Saskatchewan, 9.2%. The decrease in the linolenic acid content and iodine values of the 1997 crop can be attributed largely 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 1997 crop increased to 61.0% from 60.2% in 1996.

The October 1997 export data in Table 6 shows that the linolenic acid in both Vancouver and Thunder Bay export shipments will be under 10%. The export data for October suggest the Iodine Value will be close to 113 units for the 1997–98 shipping season.

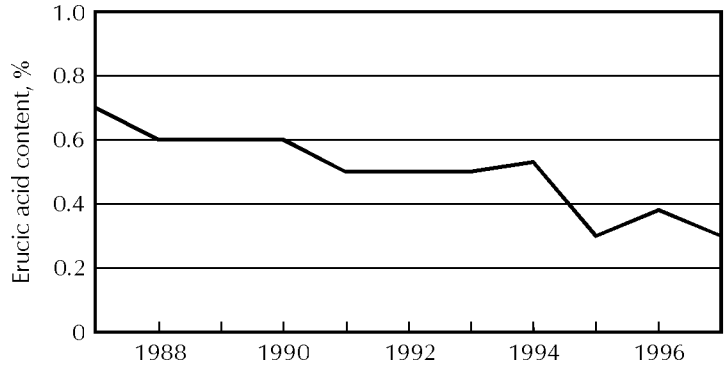
The average level of erucic acid in the 1997 crop, 0.3%, was lower than both 1996 at 0.4%, and the 10-year mean, 0.5%. The mean level of saturated fatty acids was 7.0% in 1997, higher than 1996 at 6.8%. The levels of saturated fatty acids were significantly higher in Manitoba, 7.2%, and Saskatchewan, 7.1%, than in Alberta, 6.6%. As Table 6 shows, the level of saturated fatty acids in No. 1 Canada canola exports from Vancouver will likely remain near 7% while those from Thunder Bay will be slightly above 7%.

Saturated acid content of harvest survey samples of No. 1 Canada canola, 1987–97



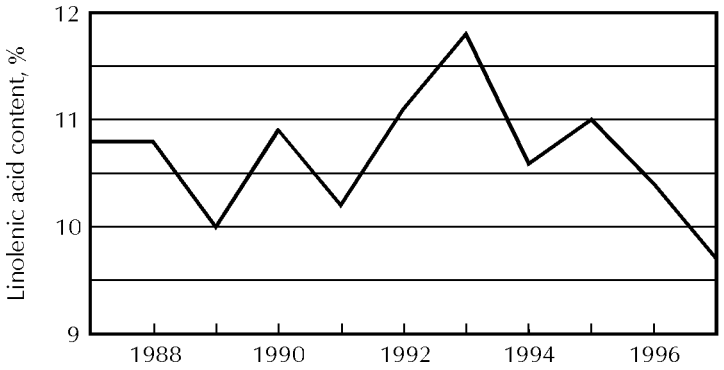
1997 average	7.0%
1996 average	6.8%
1987-96 mean	6.4%

Erucic acid content of harvest survey samples of No. 1 Canada canola, 1987–97



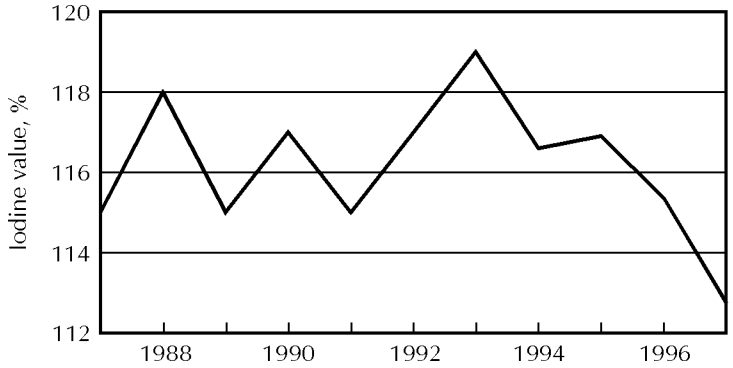
1997 average	0.3%
1996 average	0.4%
1987-96 mean	0.5%

Linolenic acid content of harvest survey samples of No. 1 Canada canola, 1987–97



1997 average	9.7%
1996 average	10.4%
1987-96 mean	10.8%

Iodine value of harvest survey samples of No. 1 Canada canola, 1987–97



1997 average	113
1996 average	115
1987-96 mean	117

Methods and definitions

Samples of canola grown in 1997 were submitted to the Grain Research Laboratory by producers, crushing plants, and grain handling offices across western Canada. The samples were cleaned to remove dockage and then were graded by the Canadian Grain Commission, Industry Services. Oil, protein, chlorophyl, and total glucosinolate measurements were made on all individual samples using an NIRS 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 by provincial crop district for No. 1 grades and by province for No. 2 and No. 3 grades.

This year's harvest survey report included 2036 samples from across Western Canada: 431 from Manitoba, 915 from Saskatchewan and 690 from Alberta, including the Peace River area that is in British Columbia. Samples were received during the harvest period from August 15 to October 24, 1997. Weighting factors used to calculate provincial and western Canadian mean values were derived from the previous five years' average production for each crop district and the 1997 provincial production estimates in Statistics Canada's *Field Crop Reporting Series No. 7*, October 8, 1997. Factors used to calculate grade distribution were obtained from crop bulletins 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 A.O.C.S. Official Method Ba 4e-93 using a LECO FP-428 Nitrogen Determinator. Results are reported as percentage protein (percentage of nitrogen x 6.25), calculated at an 8.5% moisture basis.

Chlorophyl content

Chlorophyl content is determined by International Organization for Standardization method ISO 10519: 1993 (E), *Rapeseed- Determination of chlorophyl 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.

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.

Iodine value

Iodine value is calculated from the fatty acid composition, according to AOCS Recommended Practice Tz 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.

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).

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Tables

Figures