
Quality of Ontario soybeans • 2000

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Summary

The 2000 harvest survey shows Ontario soybeans are slightly below average in oil content and equal to the 10-year mean in protein content.

When compared to 1999, the oil content for 2000 is 20.2%—1.3% lower—while the protein content is unchanged at 41.9%.

Table 1 • Seeded area and production for Canadian soybeans

Year	Seeded area	Production	Yield
	hectares	tonnes	tonnes/ha
1990	491 200	1 292 000	2.63
1991	575 500	1 459 900	2.44
1992	643 600	1 455 300	2.34
1993	728 700	1 851 300	2.57
1994	820 100	2 250 700	2.74
1995	826 000	2 293 000	2.78
1996	875 300	2 170 400	2.51
1997	1 058 900	2 737 700	2.59
1998	977 800	2 730 500	2.80
1999	1 002 000	2 775 500	2.80
2000	1 068 700	2 703 000	2.50

Source: Statistics Canada, *Field Crop Reporting Series, No. 8, 1990-00*

**Table 2 • No. 1 and No. 2 Canada grades of soybeans¹
Quality data for 2000 harvest survey**

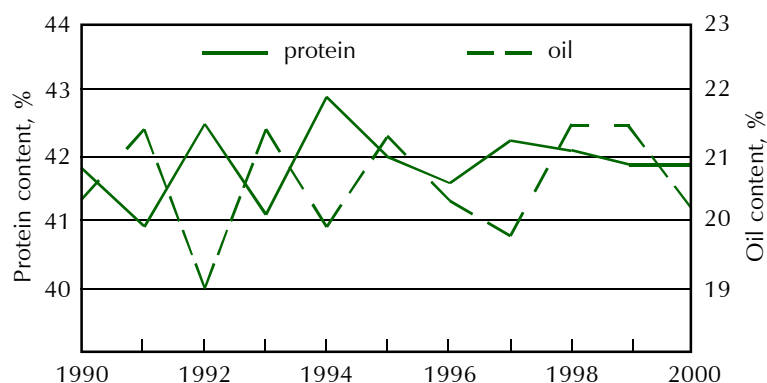
Quality parameter	2000	1999	1990–99
Oil content ² ,%	20.2	21.5	20.6
Protein content ³ ,%	41.9	41.9	41.9

¹ Means for the combined grades

² Moisture-free basis

³ N x 6.25; moisture-free basis

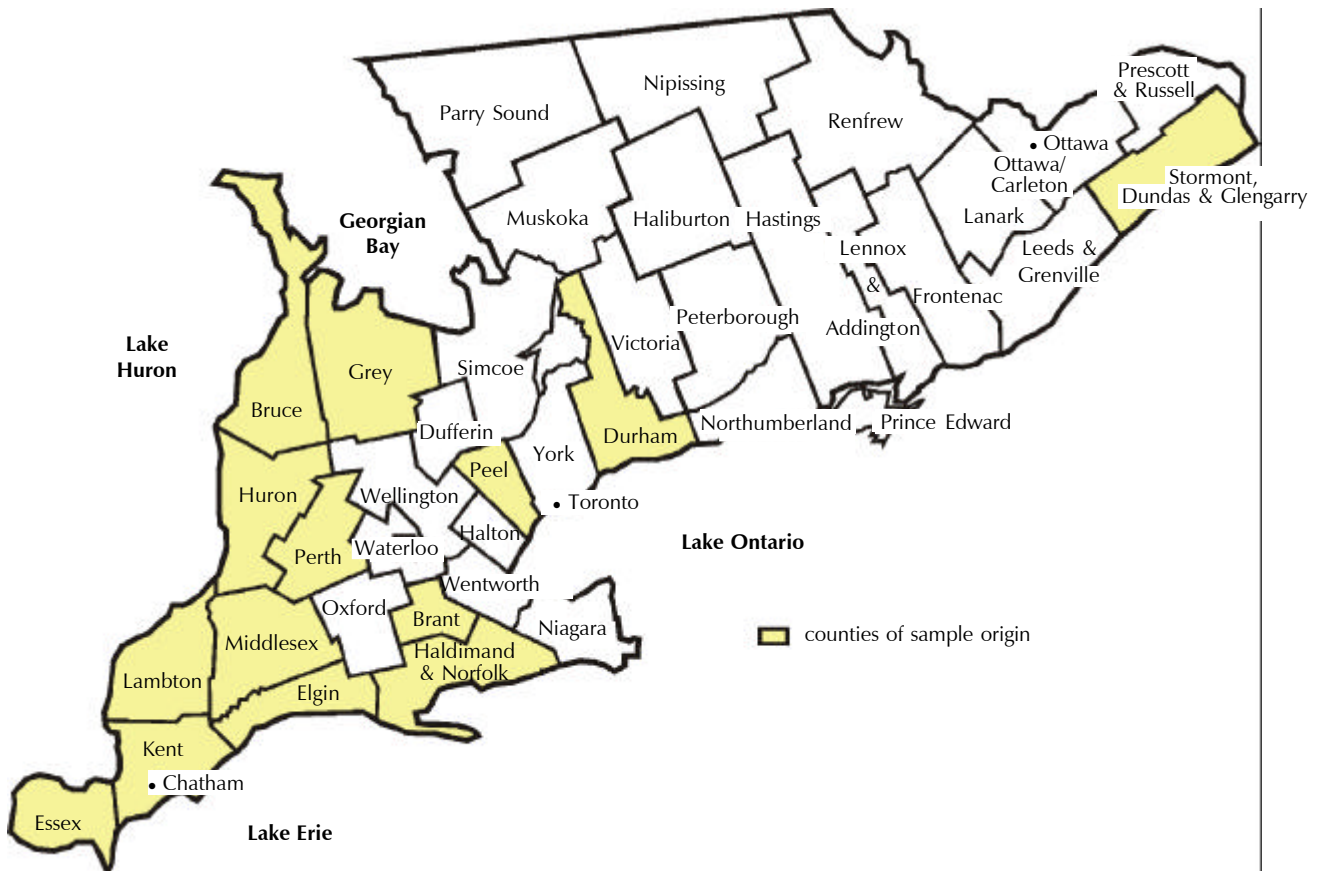
Figure 1 • Average oil and protein contents of Ontario soybeans 1990 to 2000



Introduction

This report presents quality data and information based on the Canadian Grain Commission (CGC) 2000 harvest survey of Ontario soybeans. Oil and protein contents and fatty acid composition of harvest survey samples are reported. Quality data is based on analyses of soybean samples submitted to the CGC by the Ontario Soybean Growers' Marketing Board in Chatham. The map shows the counties of origin for the 2000 harvest survey samples.

Figure 2 • Map of southern Ontario showing counties of origin for 2000 soybean survey samples



Weather and production review

Weather review

The weather and crop review for 2000 Ontario soybeans is based on information published in the Ontario Ministry of Agriculture, Food and Rural Affairs 2000 Field Crop Reports (<http://www.gov.on.ca/OMAFRA/english/crops/field/reports/index.html>) and the Agriculture and Agri-Food Canada Crop Conditions Reports (http://www.agr.ca/policy/crop/home_e.html).

Seeding

A mild, warm winter, followed by a dry March and April created good planting conditions for the 2000 Ontario soybean crop. Although the planting season started in early May in some areas, it was delayed significantly by rainfall during the rest of May and June in many other areas. In these locations growers planted soybeans late or not at all. Unplanted soybean acreage ranged from five to 50%, depending on the region. The majority of soybeans were planted at the end of May and first week of June.

Growing conditions

Rainfall during May, June and well into July was well above normal for many areas. Cool, damp conditions slowed crop emergence. For the remainder of the summer, cooler temperatures and higher than normal precipitation characterized the majority of the soybean growing areas. Wet conditions increased the threat of disease and stunted growth in some areas.

Harvest conditions

Although dry weather returned in the fall, the soybean harvest was generally late. Early-planted soybeans were harvested in mid to late September and escaped widespread frosts that struck in early October. Late planted soybeans had not reached maturity before the killing frosts and this reduced quality for food-grade markets. Yields were highly variable on the sandy soils of the region, ranging from 50% below normal to above average. By November 3, approximately 80% of the Ontario soybean crop had been harvested. Yields were generally below average for all crops throughout the province.

Production and grade information

Ontario accounted for about 96% of Canadian soybean production of 2.70 million tonnes in 2000. For Ontario, 904 500 hectares of harvested soybean yielded an average of 2.60 tonnes per hectare (38.0 bushels per acre) for a total crop of 2.31 million tonnes.

Harvest survey samples

The Ontario Soybean Growers' Marketing Board (OSGMB) in Chatham collected samples for the 2000 CGC harvest survey from producers in 15 different counties. The majority of samples originated from the counties of Lambton (51), Kent (24), Perth (10) and Bruce (9).

The OSGMB forwarded a total of 144 samples to CGC Industry Services in Chatham for cleaning and grading. According to Chatham grain inspectors, 71 of the samples graded No. 1 Canada, 72 graded No. 2 Canada, and one sample graded No. 3 Canada. Of the 144 samples, 78 were dark-hilum varieties and 66 were white-hilum varieties.

All samples were analyzed for oil and protein content using a Tecator Infratec 1229 Grain Analyzer near-infrared (NIR) spectrometer calibrated and verified against the appropriate laboratory reference method. Only composite samples were analyzed for fatty acid composition. Grade composites were prepared from 71 No. 1 Canada and 72 No. 2 Canada samples.

Quality of soybeans

There are two major types of soybeans grown in Canada, commonly referred to as oil beans and food beans. A listing of Canadian soybean varieties is provided in *List of Varieties which are Registered in Canada*, Variety Registration Office, Variety Section, Plant Health and Production Division, Canadian Food Inspection Agency (<http://www.cfia-acia.agr.ca/english/plaveg/variet/liste.shtml>).

Oil beans make up the majority of soybeans grown for producing oil and high-protein meal. Soybean oil is used in salad oil, shortening and margarine products. Defatted soybean meal is used as a protein supplement in livestock rations. Key quality factors for oil beans are oil content, protein content, and the fatty acid composition. Oil and protein content give quantitative estimates of the beans as a source of oil, and of the defatted meal as a source of protein for animal feed. The fatty acid composition provides information about the nutritional, physical and chemical characteristics of the oil extracted from the beans.

Food beans are varieties of soybeans that have been bred for specific qualities required in the production of traditional soyfoods. The quality of these beans is measured by such attributes as a clear or white hilum, larger seed size, and a higher protein content. White-hilum soybeans that do not meet quality standards for food processing are used as oil beans.

Soyfoods are divided roughly into two classes—nonfermented and fermented. Nonfermented soyfoods include soymilk, soybean curd or tofu, toasted soy powder, and bean sprouts. Fermented products include soy sauce, miso, tempeh, and natto.

Oil and protein content

The harvest survey samples for 2000 have an average oil content of 20.2%, significantly lower than 1999, and 0.4 percentage units lower than the 10-year mean. Individual producer samples vary in oil content from 14.5% to 22.3%.

The 2000 average protein content of 41.9% is similar to both the 1999 average and the 10-year mean. Individual producer samples vary in protein content from 37.4% to 50.6%.

The No. 1 Canada grade of soybean is slightly lower in oil content, but is significantly higher in protein content than the No. 2 Canada grade. On average, white-hilum soybean samples contained more protein and less oil than the dark-hilum samples.

Tables 4 and 5 summarize oil and protein data by grade and county.

Fatty acid composition

The fatty acid compositions of the three grade composites for 2000 show few between-grade differences as detailed in Table 6. Compared to 1999, however, the grade composites show slight changes in the fatty acid profiles. There were decreases in oleic acid of 0.9% in the No. 1 grade composite, and 1.4% in the No. 2 grade composite. Both these grade composites also had increases in palmitic, linoleic and linolenic acid content. The sum of the two major saturated fatty acids—palmitic plus stearic acid—were 0.6% and 0.8% lower than their equivalent 1999 composites.

Table 3 • Ontario soybeans—2000 harvest survey
Quality data by grade and hilum type

Type	Oil content ¹ , %			Grade	Protein content ² ,%			No. of samples
	mean	min.	max.		mean	min.	max.	
No. 1 Canada								
Dark hilum	20.2	14.5	22.3		42.2	37.8	50.6	33
White hilum	19.9	18.3	21.8		42.6	39.1	45.5	38
All types	20.0	14.5	22.3		42.4	37.8	50.6	71
No. 2 Canada								
Dark hilum	20.5	18.2	21.7		41.0	38.4	44.4	44
White hilum	20.2	18.4	21.9		42.0	27.4	45.3	28
All types	20.4	18.2	21.9		41.4	37.4	45.3	72
No. 3 Canada								
Dark hilum	19.8	19.8	19.8		42.7	42.7	42.7	1
White hilum								0
All types	19.8	19.8	19.8		42.7	42.7	42.7	1
All								
Dark hilum	20.4	14.5	22.3		41.5	37.8	50.6	78
White hilum	20.0	18.3	21.9		42.3	37.4	45.5	66
All grades	20.2	14.5	22.3		41.5	37.4	50.6	144

¹ Moisture-free basis

² N x 6.25; moisture-free-basis

**Table 4 • Ontario soybeans—2000 harvest survey
Oil and protein content by county and grade**

County	Oil content ¹ , %			Protein content ² , %			No. of samples
	mean	min.	max.	mean	min.	max.	
No. 1 Canada							
Brant	21.1	20.3	21.8	41.4	40.1	42.7	2
Bruce	19.3	18.6	19.7	42.3	42.1	42.5	3
Durham-West	21.3	21.3	21.3	39.6	39.6	39.6	1
Elgin	18.6	14.5	20.9	45.1	40.9	50.6	4
Essex	20.8	20.4	21.2	42.4	41.5	44.1	5
Glengarry	21.8	21.8	21.8	39.2	39.2	39.2	1
Grey	19.1	18.3	19.9	42.4	40.1	44.6	2
Haldimand	21.1	20.0	22.3	40.6	37.8	42.5	3
Huron	19.2	18.8	19.6	43.8	43.5	44.1	2
Kent	20.4	18.6	21.5	42.4	38.6	46.0	13
Lambton	19.9	18.7	21.2	42.7	39.4	46.6	27
Peel	19.5	19.5	19.5	39.9	39.9	39.9	1
Perth	20.3	19.7	21.0	41.4	39.1	44.2	6
Stormont	18.6	18.6	18.6	42.8	42.8	42.8	1
All counties	20.0	14.5	22.3	42.4	37.8	50.6	71
No. 2 Canada							
Brant	21.0	20.3	21.5	40.0	38.9	40.9	3
Bruce	20.6	18.4	21.9	40.7	37.4	42.6	6
Durham-West	21.1	20.7	21.4	40.0	39.7	40.2	2
Elgin	20.4	19.7	21.4	41.5	39.7	43.4	4
Essex	21.4	21.4	21.4	39.6	39.6	39.6	1
Glengarry	19.9	19.7	20.1	42.2	41.7	42.6	2
Grey	20.0	19.0	21.1	41.4	38.4	44.4	2
Haldimand	20.7	20.0	21.6	40.8	39.0	43.7	4
Huron	19.5	18.2	20.3	41.3	38.8	43.3	6
Kent	20.4	19.0	21.3	42.4	38.8	45.2	11
Lambton	20.3	18.8	21.5	41.6	38.8	45.3	24
Middlesex	20.7	20.7	20.7	41.5	41.5	41.5	1
Peel	21.2	21.0	21.3	39.4	39.1	39.6	2
Perth	19.9	19.5	20.4	42.6	40.9	43.7	4
All counties	20.4	18.2	21.9	41.4	37.4	45.3	72

¹ Moisture-free basis

² N x 6.25; moisture-free-basis

**Table 5 • Ontario soybeans—2000 harvest survey
Oil and protein content by county—No. 1 and No. 2 Canada grades combined**

County	Oil content ¹ , %			Protein content ² , %			No. of samples
	mean	min.	max.	mean	min.	max.	
Brant	21.0	20.3	21.8	40.5	38.9	42.7	5
Bruce	20.2	18.4	21.9	41.2	37.4	42.6	9
Durham-West	21.1	20.7	21.4	39.8	39.6	40.2	3
Elgin	19.5	14.5	21.4	43.3	39.7	50.6	8
Essex	20.9	20.4	21.4	41.9	39.6	44.1	6
Glengarry	20.5	19.7	21.8	41.2	39.2	42.6	3
Grey	19.6	18.3	21.1	41.9	38.4	44.6	4
Haldimand	20.9	20.0	22.3	40.7	37.8	43.7	7
Huron	19.5	18.2	20.3	41.9	38.8	44.1	8
Kent	20.4	18.6	21.5	42.4	38.6	46.0	24
Lambton	20.1	18.7	21.5	42.2	38.8	46.6	51
Middlesex	20.7	20.7	20.7	41.5	41.5	41.5	1
Peel	20.6	19.5	21.3	39.5	39.1	39.9	3
Perth	20.1	19.5	21.0	41.9	39.1	44.2	10
Stormont	18.6	18.6	18.6	42.8	42.8	42.8	1
All counties	20.2	14.5	22.3	41.9	37.4	50.6	143

¹ Moisture-free basis

² N x 6.25; moisture-free-basis

**Table 6 • Ontario soybeans—2000 harvest survey
Fatty acid composition of grade composites**

Grade	Fatty acid composition ¹ , %					Iodine value ²	No. of samples
	C16:0	C18:0	C18:1	C18:2	C18:3		
No. 1 Canada	10.1	3.7	22.9	52.8	9.2	135	70
No. 2 Canada	10.1	3.8	22.3	53.4	9.2	136	71
No. 3 Canada	10.1	3.7	22.9	52.8	9.2	135	1

¹ Percentage of total fatty acids including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

² Calculated from the fatty acid composition

Methods • Oilseeds

- 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 ($\mu\text{mol/g}$), 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, $N \times 6.25$, 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.