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# Quality of Canadian non-food grade soybeans

## 2014

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## Summary

In 2014, the average oil content for Soybean, No.1 and No. 2 grades combined was 20.9% on a dry matter basis (Table 2). The average was similar to last year's average of 21.0% and slightly lower than the 5-year average (2009-2013) of 21.4%. The average protein content for Soybean, No.1 and No. 2 grades combined was 39.6%, which is slightly lower than last year's average (40.2%) and similar to the 5-year average (39.6%).

Average oil and protein content for No. 1 and No. 2 grades combined varied between eastern and western provinces. For Manitoba, oil content was 20.9% and protein content was 37.2%, whereas for Saskatchewan, oil content was 19.3% and protein content was 37.8%. For Ontario, oil content was 20.9% and protein content was 40.7%. For Quebec, oil content was 20.8% and protein content was 39.9%. For Prince Edward Island, oil content was 22.2% and protein content was 37.0%. For New Brunswick, oil content was 22.5% and protein content was 35.8%.

## Introduction

This report presents quality data and information based on samples of non-food grade soybeans from the Canadian Grain Commission's Harvest Sample Program. It is based on 346 samples submitted to the Grain Research Laboratory: 76 samples from Manitoba, 19 from Saskatchewan, 216 from Ontario, 28 from Quebec, 4 from New Brunswick, and 3 from Prince Edward Island. There were more samples submitted this year than last year (318). Of the samples submitted, 16% were graded as Soybean, No. 1 Canada; 81% were graded as Soybean No. 2 Canada; and 3% were graded as Soybean, No. 3 Canada and Soybean, No. 4 Canada.

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# Weather and production review

## Weather review

It was a challenging growing season for soybeans in the eastern Canada. The majority of the soybeans were planted in the last week of May and first week of June. The growing season was relatively cool and wet, which resulted in a later-maturing crop and a late harvest.

Source: <http://www.omafra.gov.on.ca>

Climate across the Prairies was quite varied during the 2014 growing season. Spring temperatures were 4 to 5 degrees lower than average, which delayed seeding by about 2 to 3 weeks. The majority of seeding was complete by late May and early June. Most of the soybean growing regions received a lot of precipitation, which also delayed harvest. The harvest was completed by the 3<sup>rd</sup> week of October.

Source: <http://www.agr.gc.ca/DW-GS/historical-historiques.aspx?lang=eng&jsEnabled=true>

## Production and grade information

Soybean production in Canada increased from 5.3 million tonnes in 2013 to 6.0 million tonnes in 2014 (Table 1). In Ontario, production was 3.8 million tonnes, an increase from 2013. Production was higher in 2014 in both Quebec (898,000 tonnes) and Manitoba (1.1 million tonnes) (Table 1).

Harvest samples submitted to the Canadian Grain Commission from Ontario, Quebec, Prince Edward Island, New Brunswick, Manitoba and Saskatchewan were graded by Canadian Grain Commission inspectors.

Of the samples submitted, 97% were in the top 2 grades. More than half of these samples came from eastern Canada. The remaining 3% of samples received were graded Soybean, No. 3 Canada and lower.

**Table 1 - Seeded area and production for eastern and western Canadian soybean<sup>1</sup>**

	Seeded area		Production <sup>1</sup>		Average production
	2014	2013	2014	2013	2009-2013
	hectares		tonnes		tonnes
Manitoba	514,000	424,900	1,107,700	1,068,200	601,720
Saskatchewan	109,300	68,800	163,300	118,400	23,680
<b>Western Canada</b>	<b>623,300</b>	<b>493,700</b>	<b>1,271,000</b>	<b>1,186,600</b>	<b>625,400</b>
Ontario	1,242,400	1,052,200	3,791,100	3,238,600	3,130,860
Quebec	348,000	288,500	898,000	847,000	768,600
PEI	26,300	24,300	60,100	61,500	47,040
New Brunswick	6,100	6,500	13,600	13,200	8,000
Nova Scotia	4,900	4,000	14,800	12,000	7,700
<b>Eastern Canada</b>	<b>1,627,700</b>	<b>1,375,500</b>	<b>4,777,600</b>	<b>4,172,300</b>	<b>3,962,200</b>
<b>Total Canada</b>	<b>2,251,000</b>	<b>1,869,200</b>	<b>6,048,600</b>	<b>5,358,900</b>	<b>4,587,600</b>

<sup>1</sup> Statistics Canada. Table 001-0010 - Estimated areas, yield, production and average farm price of principal field crops, in metric units. <http://www5.statcan.gc.ca>

## Harvest samples

All samples were analyzed for oil and protein content using an Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer, calibrated and verified against the appropriate laboratory reference method. Grade composite samples were analyzed for fatty acid composition and free fatty acids. The reference procedures are listed under Oilseeds Methods <http://grainscanada.gc.ca/oilseeds-oleagineux/method-methode/omtm-mmao-eng.htm>.

Due to a low number of samples received from Saskatchewan (18), New Brunswick (4) and Prince Edward Island (3), the data presented in this report for these areas might not truly reflect the quality of the crop for these areas.

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## Uses for non-food grade soybeans

There are two major types of soybeans grown in Canada: those commonly referred to as oil (or “crush”) beans and food grade beans. This report deals with the “non-food grade” samples and could be considered those for the feed or crushing industry. A list 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.inspection.gc.ca/plants/variety-registration/registered-varieties-and-notifications/crop-type/soybean/eng/1411113376783/141111337626>

Oil beans are 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 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. Fatty acid composition provides information about the nutritional, physical and chemical characteristics of the oil extracted from the beans.

## Oil and protein content

Oil and protein data in Table 2 are based on the means of Soybean, No. 1 and No. 2 Canada grades combined for all non-food grade samples received from Ontario, Quebec, New Brunswick, Prince Edward Island, Saskatchewan and Manitoba. A comparison of means by all grades and provinces is provided in Table 3.

The average oil content was 20.9%, which was similar the 2013 average of 21.0% and slightly lower than 5-year average (2009-2013) of 21.4% (Table 2). Oil content ranged from 16.8% to 24.5% for individual samples that were graded No. 1 and 2 (Table 3).

The average protein content was 39.6%, which was lower than last year’s average of 40.2% and similar to the 5-year average (2009-2013) of 39.4% (Table 2). Protein content ranged from 31.3% to 45.1% for individual samples that were graded No. 1 and 2 (Table 3).

As Table 2 shows, in Ontario, the average oil and protein content (20.9%, 40.7%) stayed relatively similar to 2013 averages (21.1%, 40.5%). In Quebec, oil content increased to 20.8%, while protein content decreased to 39.9. In Manitoba, the average oil content (20.9%) stayed relatively similar to 2013 averages (21.1%), whereas there was a decrease in the protein content in 2014 (37.2%). In Prince Edward Island, the average oil content was 22.2% and the average protein content was 37.0%. In New Brunswick, the average oil content was 22.5% and the average protein content was 35.8%.

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Variations in protein content between eastern and western provinces can be seen in the top 2 grades. While quality parameters can be strongly affected by environmental conditions, the variety of soybean planted, plus soil fertility, can also affect quality parameters. The inverse relationship between oil and protein content is illustrated in Figure 1 for eastern and western Canada.

## Fatty acid composition

Table 4 shows fatty acid composition for No. 1 and 2 grade composites from the provinces.

Ontario composites of the top 2 grades showed some differences in their fatty acid profiles. For Soybean, No. 1 Canada, the linoleic value was 54.0%, the alpha-linolenic value was 8.8%, and iodine value was 135 units. For Soybean, No. 2 Canada, the linoleic value was 54.2%, the alpha-linolenic value was 9.4%, and iodine value was 137 units.

For the Quebec composite of Soybean, No. 1 Canada, the linoleic value was 54.2%, the alpha-linolenic value was 9.0%, and iodine value was 136 units. For Soybean, No. 2 Canada, the linoleic value was 54.9%, the alpha-linolenic value was 9.4%, and iodine value was 137 units.

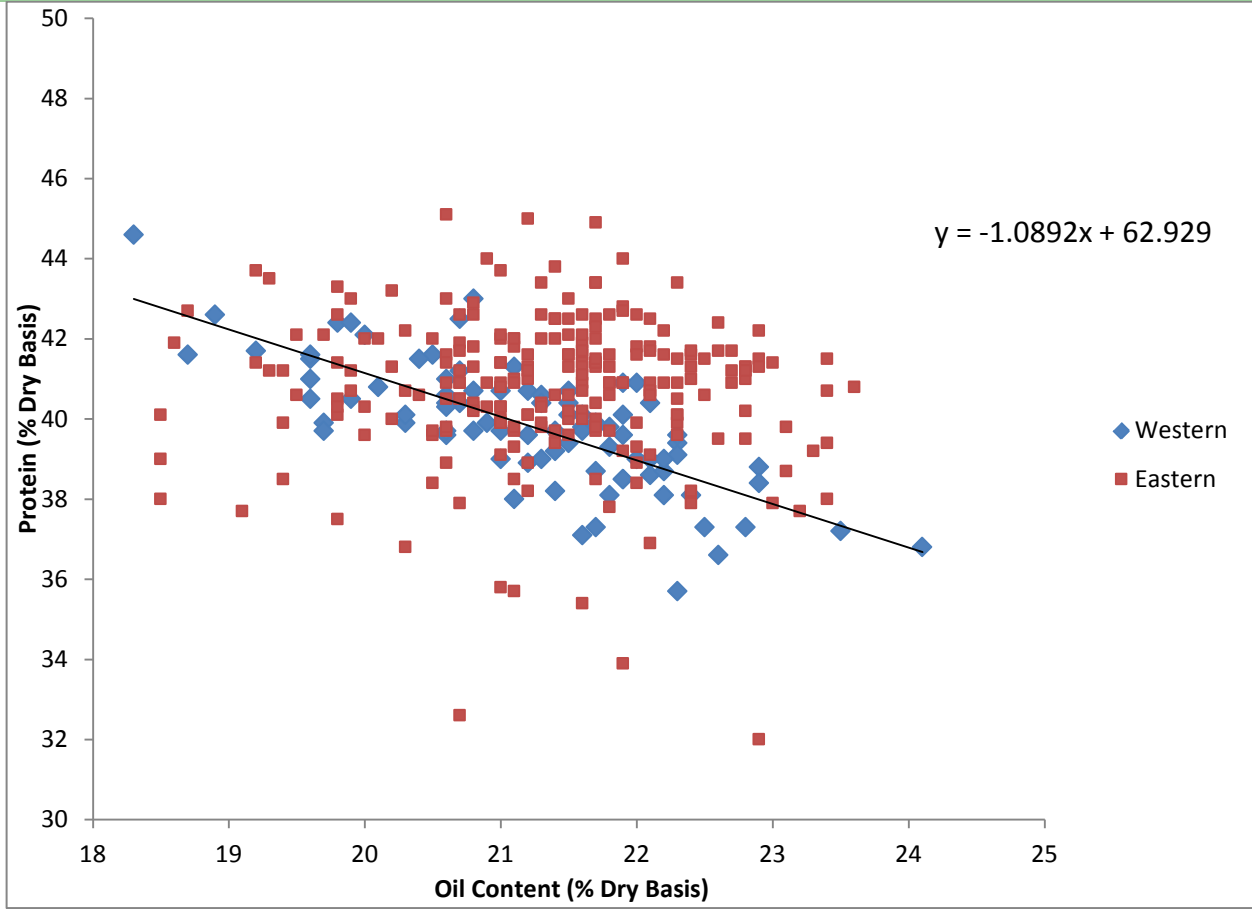
Manitoba composites of the top 2 grades showed slight differences in their fatty acid profiles. For Soybean, No. 1 Canada, the linoleic value was 56.6%, the alpha-linolenic value was 10.9%, and iodine value was 141 units. For Soybean, No. 2 Canada, the linoleic value was 56.2%, the alpha-linolenic value was 10.2%, and iodine value was 140 units.

Variety selection, soil fertility and environmental growing conditions also contributed to the difference in the fatty acid composition between provinces.

## Free fatty acid (FFA) content

Grade composites showed free fatty acid levels averaging 0.15% for Soybean, No. 1 Canada and 0.16% for Soybean, No. 2 Canada (Table 4). Higher free fatty acid values are mainly due to seed damage, which results from exposure to moisture and oxygen, wet harvesting conditions and improper storage.

Figure 1 – Oil and protein content trend for eastern and western Canada 2014





**Table 2 – Comparison of 2014 and 2013 non-food grade soybean data with 5-year means****Soybean, No. 1 and No. 2 Canada grades combined**

Year and region	Oil content <sup>1</sup> %	Protein content <sup>2</sup> %	Sum of oil and protein <sup>2</sup> %
<b>2014</b>			
All Provinces	20.9	39.6	60.5
Manitoba	20.9	37.2	58.1
Saskatchewan	19.3	37.8	57.1
Ontario	20.9	40.7	61.6
Quebec	20.8	39.9	60.7
PEI	22.2	37.0	59.3
New Brunswick	22.5	35.8	58.3
<b>2013</b>			
All provinces	21.0	40.2	61.2
Manitoba	21.1	39.7	60.7
Saskatchewan	20.7	39.6	60.3
Ontario	21.1	40.5	61.6
Quebec	18.6	41.3	59.8
PEI and New Brunswick	21.0	38.6	59.6
<b>2009-2013 means</b>			
All provinces	21.4	39.6	61.0
Manitoba	22.0	37.6	59.5
Saskatchewan	20.7	39.0	59.7
Ontario	21.4	40.3	61.7
Quebec	20.4	40.9	61.2

<sup>1</sup> Dry matter basis

<sup>2</sup> N x 6.25; dry matter basis

n/a No Soybean, No. 1 or No. 2 Canada samples

**Table 3 – Oil and protein content of non-food grade soybean samples by province and grade, 2014 Harvest Sample Program**

Province	Number of samples	Oil content <sup>1</sup>			Protein content <sup>2</sup>		
		mean	min.	max.	mean	min.	max.
<b>Soybean, No. 1 Canada</b>							
Manitoba	1	19.7	19.3	19.3	38.4	38.8	38.8
Ontario	53	21.2	19.0	23.0	40.7	39.0	45.0
Quebec	1	20.7	20.7	20.7	40.4	40.4	40.4
<b>All provinces</b>	<b>55</b>	<b>21.2</b>	<b>19.0</b>	<b>23.0</b>	<b>40.7</b>	<b>38.8</b>	<b>45.0</b>
<b>Soybean, No. 2 Canada</b>							
Manitoba	71	20.9	18.2	24.5	37.2	31.3	41.0
Saskatchewan	18	19.3	16.8	22.1	37.8	32.0	41.1
Ontario	159	20.8	18.7	23.3	40.7	36.8	45.1
Quebec	25	20.8	18.9	24.3	39.9	32.6	42.1
New Brunswick	4	22.5	21.4	23.7	35.8	33.9	38.5
PEI	3	22.2	21.8	23.6	37.0	37.5	38.0
<b>All provinces</b>	<b>280</b>	<b>20.8</b>	<b>16.8</b>	<b>24.5</b>	<b>39.4</b>	<b>31.3</b>	<b>45.1</b>
<b>Soybean, No. 3 Canada</b>							
WEST	4	20.4	18.4	23.4	37.5	35.3	40.1
EAST	4	19.0	19.9	20.2	43.0	41.3	44.9
<b>All provinces</b>	<b>8</b>	<b>19.7</b>	<b>18.4</b>	<b>23.4</b>	<b>40.3</b>	<b>35.3</b>	<b>44.9</b>
<b>Soybean, No. 4 Canada</b>							
WEST	1	18.7	18.7	18.7	40.6	40.6	40.6
EAST	2	20.4	20.3	21.5	39.2	38.2	40.9
<b>All provinces</b>	<b>3</b>	<b>19.8</b>	<b>18.7</b>	<b>21.5</b>	<b>39.7</b>	<b>38.2</b>	<b>40.9</b>
<b>Soybean, All Grades</b>							
Manitoba	72	20.9	19.7	20.9	37.2	37.2	38.4
Saskatchewan	18	19.3	19.3	19.3	37.8	37.8	37.8
Ontario	212	20.9	20.8	21.2	40.7	40.7	40.7
Quebec	26	20.8	20.7	20.8	39.9	35.8	40.4
New Brunswick	4	22.5	21.4	23.7	35.8	33.9	38.5
PEI	3	22.2	21.8	23.6	37.0	37.5	38.0
WEST	5	20.1	18.7	20.4	38.1	37.5	40.6
EAST	6	19.5	19.0	20.4	41.7	39.2	43.0
<b>All provinces</b>	<b>346</b>	<b>20.8</b>	<b>18.7</b>	<b>23.7</b>	<b>39.7</b>	<b>33.9</b>	<b>43.0</b>

<sup>1</sup> Dry matter basis

<sup>2</sup> N x 6.25; dry matter basis

**Table 4 – Fatty acid composition and FFA content of non-food grade soybean grade composites, 2014 Harvest Sample Program**

Province <sup>2</sup>	Number of Samples	Fatty acid composition <sup>1</sup>					Free fatty acids	
		C16:0	C18:0	C18:1	C18:2	C18:3	Iodine value <sup>3</sup>	%
<b>Soybean, No. 1 Canada</b>								
Manitoba	1	10.8	3.2	17.1	56.6	10.9	141	0.15
Ontario	53	10.4	3.7	21.7	54.0	8.8	135	0.15
Québec	1	10.4	3.7	21.3	54.2	9.0	136	0.29
<b>All Provinces</b>	<b>55</b>	<b>10.5</b>	<b>3.7</b>	<b>21.6</b>	<b>54.0</b>	<b>8.8</b>	<b>135</b>	<b>0.15</b>
<b>Soybean, No. 2 Canada</b>								
Manitoba	71	10.3	3.7	18.0	56.2	10.2	140	0.12
Saskatchewan	18	10.3	3.8	16.5	56.3	11.6	142	0.28
Ontario	159	10.4	3.7	20.8	54.2	9.4	137	0.18
Québec	25	10.2	4.0	20.0	54.9	9.4	137	0.12
New Brunswick	4	10.1	3.7	19.1	55.4	10.0	139	0.27
PEI	3	10.8	3.7	18.3	56.5	9.2	138	0.16
<b>All Provinces</b>	<b>280</b>	<b>10.4</b>	<b>3.7</b>	<b>19.7</b>	<b>54.0</b>	<b>9.1</b>	<b>135</b>	<b>0.16</b>

<sup>1</sup> Percentage of total fatty acids including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3); other minor fatty acids totaled 1.4% to 2.0%

<sup>2</sup> As designated on the sample envelope

<sup>3</sup> Calculated from the fatty acid composition

<sup>4</sup> Weighted averages