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Quality of Canadian non-food grade soybeans

2012

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Summary

In 2012 the average oil content for Soybean, No.1 and No. 2 grades combined was 21.9% on dry matter basis, which was lower than last year's average of 22.4% and similar to the five year average (2007-2011) of 21.6%. The average protein content for Soybean, No.1 and No. 2 grades combined was 39.3%, which was higher than last year's average (38.1%) and similar to the five year average (39.6%).

The 2012 soybean crop showed regional variations in oil and protein contents. Manitoba had an oil content of 22.1% and a protein content of 36.3%. Ontario and Québec had an oil content of 21.9% and 20.7% and protein content of 41.0% and 39.5% respectively.

Introduction

The 2012 soybean harvest survey quality report is based on 298 non-food grade samples submitted to the Grain Research Laboratory (GRL), which was more than the 139 samples submitted last year. The 2012 samples included 64 from Manitoba, 3 from Saskatchewan, 221 from Ontario, 8 from Québec and 2 from New Brunswick. Of the samples submitted, 29% were graded as Soybean, No. 1 Canada, 68% of samples submitted were graded as Soybean No. 2 Canada and 1.3% of samples submitted were graded as Soybean, No. 3 Canada, and 1.3% of the samples submitted were graded lower than Soybean, No. 3 Canada. The sample collection was assisted by the Canadian Soybean Council.

Weather and production review

Weather review

Soybeans are mainly grown in southern Ontario and southern Quebec. These regions experienced hot dry growing season. Seeding occurred early for Ontario and Quebec due to warm temperatures and dry soil conditions. Daily maximum temperatures ranged from +14 to +23 degrees Celsius in Ontario and from +18 to +23 degrees Celsius in Quebec. Precipitation was relatively low for July and Aug. Total accumulated precipitation for the month of July ranged from 30-40mm for Ontario and 40-50mm for Quebec. The warm dry conditions persisted into the fall which resulted in an early harvest.

The growing season in the west was more variable with extremes in weather conditions across the Western Prairies, which included excess moisture, heat stress and extreme winds.

Seeding occurred earlier than normal in Manitoba due to warmer and dryer conditions in April and May. Extreme winds in early May caused wind damage to newly emerged seedlings in parts of the Prairie Provinces.

Hot, dry conditions persisted throughout most of the growing season. Daily maximum temperatures ranged from +25 degrees Celsius to +34 degrees Celsius, and less than 10 mm of precipitation fell in July and August, when compared to average monthly precipitation.

The warm and dry conditions continued through out August allowing for harvest to commence earlier than normal.

Weather maps for the whole growing season can be found at:

<http://www4.agr.gc.ca/DW-GS/historical-historiques.aspx?lang=eng&jsEnabled=true>

Production and grade information

Soybean production in Canada for 2012 increased to 4.9 million tonnes when compared to last year's production averages of 4.2 million tonnes (Table 1). In Ontario production increased in 2012 with 3.2 million tonnes. In Quebec and Manitoba production increased to 825 000 tonnes and 759 300 tonnes respectively. Yields on harvested areas, in both the eastern and western regions increased when compared to 2011 yields. In Ontario yields for 2012 harvested area was 3.1 tonnes/ha, an increase from last year's 3.0 tonnes/ha. The harvested yield for Manitoba in 2012 was 2.3 tonnes/ha an increase from last year's 1.8 tonnes/ha and in Quebec the harvested yield was 3.0 tonnes/ha an increase from last year's 2.7 tonnes/ha.

Harvest survey samples submitted to the CGC from Ontario, Quebec, Manitoba and Saskatchewan were graded by Industry services at the Canadian Grain Commission in Winnipeg, Manitoba.

The 2012 CGC survey showed that 98% of the samples submitted to the harvest survey program, were in the top two grades with more than half the samples coming in from the eastern regions. The remaining 2% of the samples received had grades of Soybean, No. 3, Canada, and lower.

	hectares	tonnes	tonnes/ha
Table 1 - Production of Canadian soybeans			
Year	Seeded area	Production	Yield
	hectares	tonnes	tonnes/ha
2001	1 058 000	1 594 100	1.5
2002	974 700	2 220 100	2.3
2003	1 050 800	2 268 300	2.2
2004	1 225 900	3 041 500	2.6
2005	1 176 400	3 161 300	2.7
2006	1 213 500	3 465 500	2.9
2007	1 180 100	2 695 700	2.3
2008	1 202 400	3 335 900	2.8
2009	1 394 400	3 503 700	2.5
2010	1 483 000	4 345 300	2.9
2011	1 549 900	4 297 700	2.8
2012	1 680 400	4 929 600	2.8

Source: Statistics Canada, CANSIM table 001-0010

Harvest survey 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 on the CGC web site under Oilseeds Methods <http://grainscanada.gc.ca/oilseeds-oleagineux/method-methode/omtm-mmao-eng.htm>.

Table 2 – Quality data for harvest survey soybeans – non-food types

Soybean, No. 1 and No. 2 Canada grades combined data¹

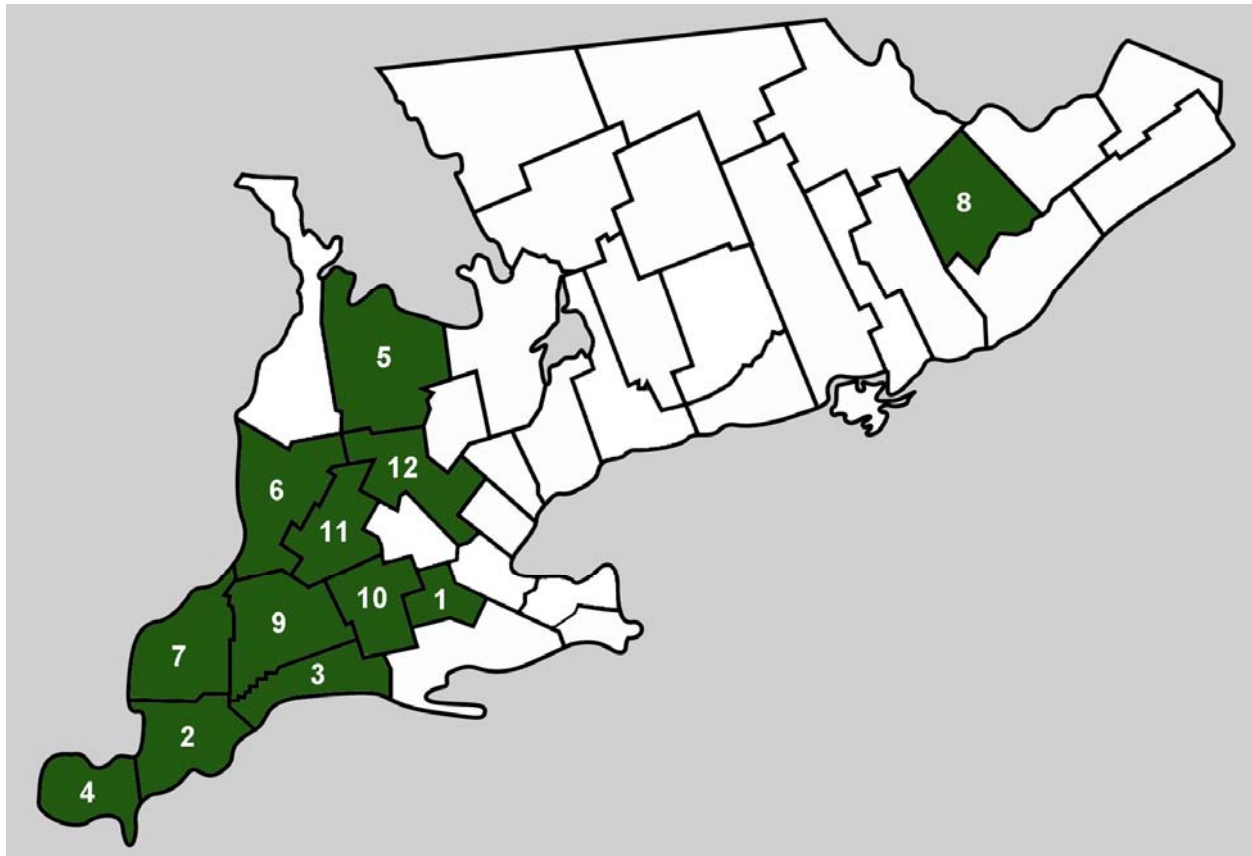
Quality parameter	2012	2011	2010	2009	2007-2011
Oil content ² ,%	21.9	22.0	21.4	21.3	21.6
Protein content ³ ,%	39.3	38.1	39.9	39.9	39.6

¹ Means for the combined grades

² Dry matter basis

³ N x 6.25, dry matter basis

Figure 1 – Map of southern Ontario showing counties of origin for 2012 non-food grade soybean survey samples



- | | |
|-----------------|----------------|
| 1. Brant | 8. Lanark |
| 2. Chatham-Kent | 9. Middlesex |
| 3. Elgin | 10. Oxford |
| 4. Essex | 11. Perth |
| 5. Grey | 12. Wellington |
| 6. Huron | |
| 7. Lambton | |

Figure 2 – Map of southern Prairies showing crop districts of origin for 2012 non-food grade soybean survey samples

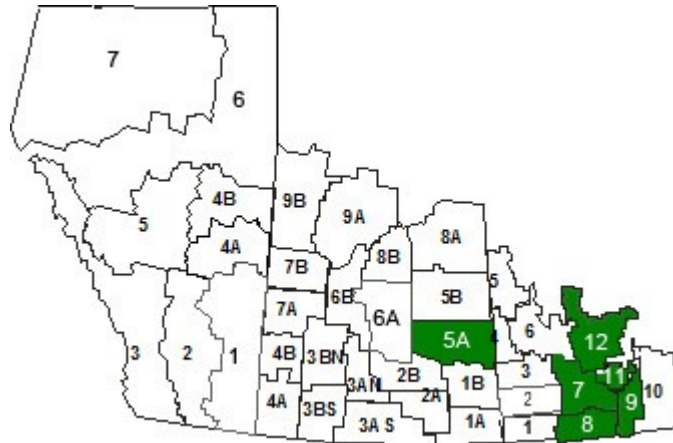
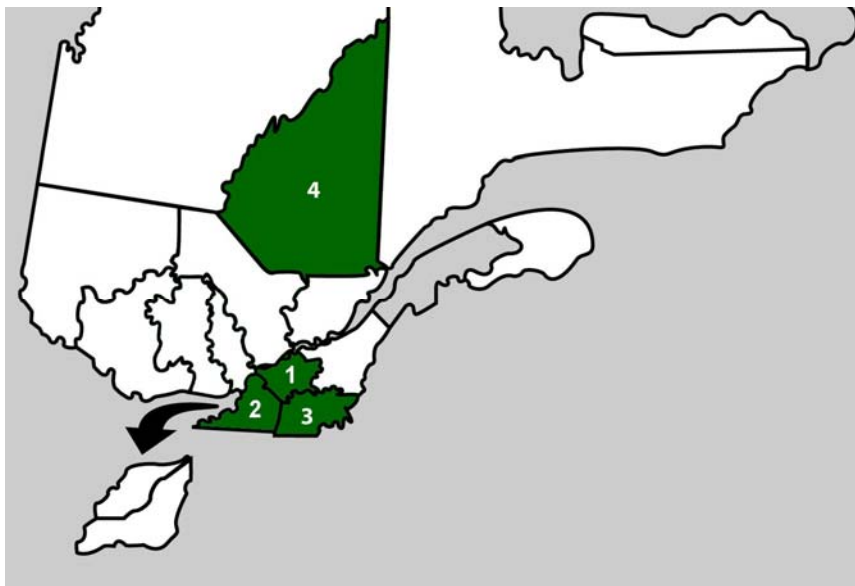


Figure 3 – Map of Québec showing regions of origin for 2012 non-food grade soybean survey samples



1. Centre Du
Quebec
2. La Vallée du
Richelieu
3. Montérégie
4. Saguenay-Lac
St. Jean Région

Quality of Canadian non-food grade soybeans – 2012

There are two major types of soybeans grown in Canada, 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 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.inspection.gc.ca/english/plaveg/variet/soysoje.shtml>)

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 the fatty acid composition. Oil and protein content give quantitative estimates of the beans as a source of oil, and 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.

Oil and protein contents

The data in the following oil and protein discussions is based on the Soybean, No. 1 and No. 2 Canada “combined grade means” for the entire non-food grade samples received from Ontario, Québec, New Brunswick, Saskatchewan and Manitoba (Table 2). In addition, a comparison by all grades and provinces is provided in Table 3.

The average oil content for the 2012 harvest survey sample program was 21.9% which was similar to the 2011 average oil content of 22.0%, and to the five year average (2007-2011) of 21.6%. Individual producer samples ranged from 18.4% to 25.3%.

The average protein content for 2012 was 39.3% which was higher than last year’s average of 38.1% and similar to the five year average (2007-2011) of 39.6% (Table 2). Individual producer samples ranged from 32.4% to 42.5%.

In Ontario the 2012 oil content was 0.3% higher than 2011 at 21.9%, while the protein content for 2012 increased to 40.0%. In Québec the oil and protein content slightly increased to 20.7% and 41.0% respectively when compared to 2011.

In Manitoba the average oil content in 2012 was 22.1%, a decrease of 0.9% when compared to 2011. The average protein content for Manitoba in 2012 was 36.3% which is similar to the 2011 average protein content of 36.4%.

Variations in the oil and protein content between eastern and western regions can be seen in the top two 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 4 for both growing regions.

Fatty acid composition

The 2012 Ontario soybean grade composition of the top two grades showed minor differences in the fatty acid profile. Soybean No. 1 Canada had an alpha-linolenic value of 8.0% and an iodine value of 131.9 units. Soybean No. 2 Canada's alpha-linolenic value was the same at 8.0% and iodine value of 132.4 units.

The 2012 Québec soybean grade composition of the top two grades showed some differences in the fatty acid profile. Soybean No. 1 Canada had an alpha-linolenic value of 8.2% and an iodine value of 132.9 units. Soybean No. 2 Canada's alpha-linolenic value was at 9.8% and also had a higher iodine value of 136.1 units.

The 2012 Manitoba soybean grade composition of the top two grades showed slight variations in the fatty acid profile. Soybean No. 1 Canada had an alpha-linolenic value of 7.6% and an iodine value of 130.2 units. Soybean No. 2 Canada's alpha linolenic value was at 8.1% and also had a similar iodine value of 130.9 units.

Variety selection, soil fertility and environmental growing conditions will also contribute to the difference in the fatty acid composition between the Eastern Regions and the Prairies.

Free fatty acid (FFA) content

The 2012 soybean grade composites showed low free fatty acid levels, averaging 0.08% for Soybean, No. 1 Canada and 0.07% for Soybean, No. 2 Canada. Higher FFA values are mainly due to seed damage resulting in exposure to moisture and oxygen, wet harvesting conditions and improper storage.

Figure 4 – Relationship between oil and protein content for 2012

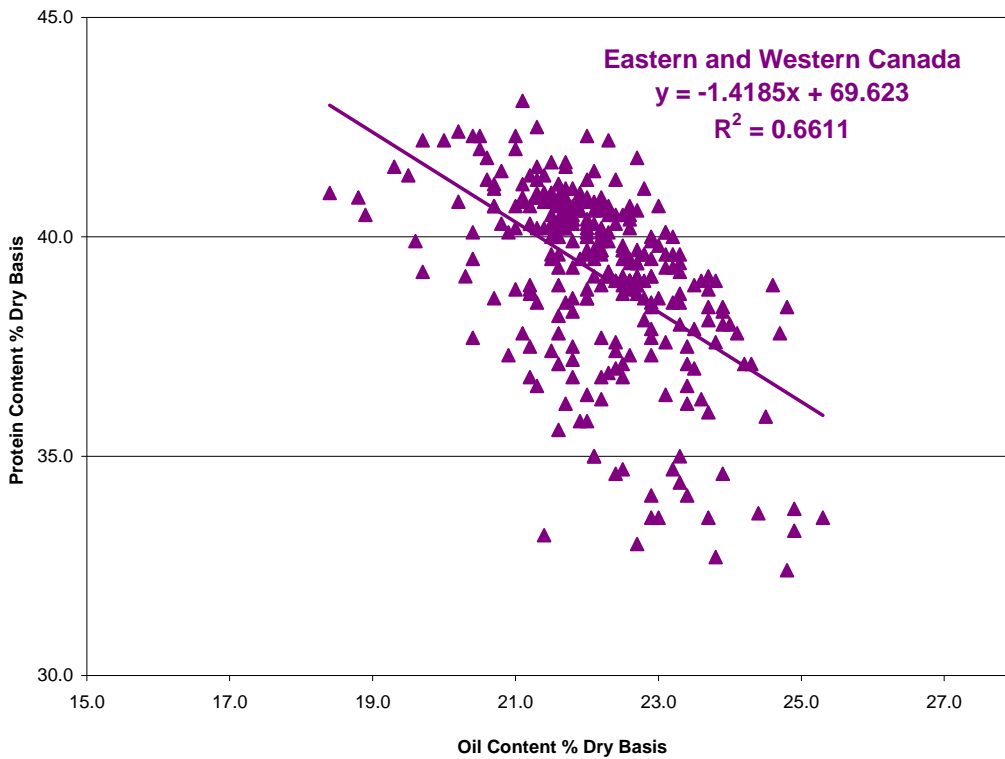


Table 3 – Oil and protein content of 2012 soybean survey by province and grade

Province	Number of samples	Oil content ¹			Protein content ²		
			%			%	
		mean	min.	max.	mean	min.	max.
Soybean, No. 1 Canada							
Manitoba	3	21.2	21.1	22.8	37.0	36.6	38.1
Ontario	80	21.7	19.7	24.6	40.3	37.1	42.3
Québec	3	21.7	21.6	21.9	41.1	40.6	41.6
New Brunswick	1	19.6	N/A	N/A	39.9	N/A	N/A
All provinces	87	21.7	19.7	24.6	40.1	36.6	42.3
Soybean, No. 2 Canada							
Manitoba	55	22.2	20.4	24.9	36.3	32.4	40.3
Saskatchewan	3	19.8	18.4	21.4	38.1	33.2	41.0
Ontario	140	21.9	20.0	25.3	39.9	33.6	42.5
Québec	5	20.4	19.3	22.7	40.8	39.4	41.6
New Brunswick	1	23.2	N/A	N/A	39.6	N/A	N/A
All provinces	204	21.9	18.4	25.3	38.9	32.4	42.5
Soybean, No. 3 Canada							
Manitoba	3	23.7	23.2	24.9	34.4	33.3	34.7
Ontario	1	20.7	N/A	N/A	43.0	N/A	N/A
All provinces	4	22.9	23.2	24.9	36.5	33.3	34.7
Soybean, No. 4 Canada							
Manitoba	3	21.3	18.9	23.4	38.8	36.4	40.5
All provinces	3	21.3	18.9	23.4	38.8	36.4	40.5
Soybean, All Grades							
Manitoba	64	22.1	18.9	24.9	36.3	32.4	40.5
Saskatchewan	3	19.8	18.4	24.9	38.1	32.4	41.0
Ontario	221	21.9	19.7	25.3	40.1	33.6	42.5
Québec	8	20.7	18.4	25.3	40.9	32.4	42.5
New Brunswick	2	19.6	N/A	N/A	39.9	N/A	N/A
All provinces	298	21.9	18.4	25.3	39.2	32.4	42.5

¹ Dry matter basis² N x 6.25; dry matter basis

Table 4 – Comparison of 2012 and 2011 soybean data with 5 year means

Soybean, No. 1 and No. 2 Canada grades combined

Year and region	Oil content ¹ %	Protein content ² %	Sum of oil and protein ² %
2012			
All regions	21.9	39.3	61.2
Manitoba	22.1	36.3	58.4
Saskatchewan	19.8	38.1	57.9
Ontario	21.9	40.0	61.9
Québec	20.7	40.9	61.6
New Brunswick	21.3	39.5	60.8
2011			
All regions	22.0	38.1	60.1
West OA	22.9	36.5	59.4
Ontario	21.6	38.8	60.4
Québec	20.2	40.7	60.9

2007-2011 means			
All regions	21.5	40.0	61.5
Manitoba	22.2	37.3	59.5
Saskatchewan	22.0	36.6	58.5
Ontario	21.4	40.7	62.2
Québec	20.7	41.0	61.7

¹ Dry matter basis

² N x 6.25; dry matter basis

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

Table 5 – Fatty acid composition and FFA content for 2012 harvest survey soybean grade composites

								Free fatty acids
Province	Number of Samples	Fatty acid composition ¹					Iodine value ³	%
		C16:0	C18:0	C18:1	C18:2	C18:3		
Soybean, No. 1 Canada								
Manitoba	3	9.95	4.63	25.26	50.90	7.64	130.17	0.06
Ontario	80	10.29	4.56	23.25	52.44	7.95	131.90	0.08
Québec	3	10.42	4.18	22.70	52.89	8.22	132.89	0.11
New Brunswick	1	9.76	3.54	20.08	54.98	10.01	139.00	0.08
Soybean, No. 2 Canada								
Manitoba	55	9.70	4.94	24.62	50.90	8.13	130.86	0.05
Saskatchewan	3	9.58	3.85	20.33	54.55	10.15	138.80	0.03
Ontario	140	10.25	4.69	22.43	53.01	8.03	132.40	0.08
Québec	5	10.55	3.65	21.54	53.02	9.75	136.14	0.12
New Brunswick	1	9.07	3.77	20.59	56.84	8.16	137.81	0.13
Soybean, No. 3 Canada								
Ontario	3	11.95	4.64	20.86	52.02	8.79	131.27	0.25
Manitoba	3	10.19	5.04	25.30	50.24	7.52	128.75	0.03
Soybean, No. 4 Canada								
Manitoba	4	9.96	4.60	23.14	52.39	8.09	132.13	0.03

¹ 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%

² As designated on the sample envelope

³ Calculated from the fatty acid composition