Canadian Grain Commission | Commission canadienne des grains

ISSN 1705-9453

Quality of Canadian soybeans 2009

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In 2009 the average oil content for Soybean, No.1 and No. 2 grades combined was 21.3% at a dry matter basis, which was 0.3% lower than last year's average of 21.6% and similar to the six year average (2003-2008) of 21.2%. The average protein content for Soybean, No.1 and No. 2 grades combined was 39.9%, which was the same as last year's average, and 0.7% lower than the six year average of 40.6%.

The 2009 soybean crop showed regional variations in oil and protein contents. Manitoba and Saskatchewan displayed higher oil contents, where as Ontario and Quebec displayed higher protein contents. Manitoba had an oil content at 22.3% and a protein content of 37.8%. Saskatchewan had an oil content of 21.9% and a protein content of 36.3%, while Ontario and Quebec had similar oil contents at 21.0% and protein contents of 40.5% and 40.8% respectively.

Introduction

The 2009 soybean harvest survey quality report reflects 152 non food grade samples submitted to the Grain Research Laboratory (GRL), which is less than the samples submitted last year at 180. These samples include 40 from Manitoba, 3 from Saskatchewan, 91 from Ontario and 18 from Quebec. Of the samples submitted, 38% were graded as Soybean, No. 1 Canada, 52.6% of samples submitted were graded as Soybean No. 2 Canada and 6.5% of samples submitted were graded as Soybean, No. 3 Canada. Samples with grades of Soybean, No. 4 and No. 5 Canada were also submitted to the GRL but at very low quantities. The sample collection was coordinated by the Canadian Soybean Council.

Weather and production review

Weather review

Details of the entire Ontario and Manitoba growing seasons can be found at http://www.omafra.gov.on.ca/english/crops/field/reports/2009summary-soybean.htm and http://web2.gov.mb.ca/agriculture/mwcr/index.php respectively. The Weather and crop surveillance department at the Canadian Wheat Board and AAFC provided majority of the detailed weather review for the 2009 crop year.

The 2009 soybean growing season was characterized by a cool wet summer, followed by a warm fall. Excessive moisture in the eastern regions during seeding, and cool growing conditions in the summer for both eastern and western regions delayed crop development by several weeks. Warm temperatures in September allowed for later developing crops to mature.

In the eastern regions, soybean is mainly grown in Southern Ontario and Southern Quebec. Cool and wet conditions in these regions delayed seeding in May, however by the end of the month 95% of the crops had been planted. The cooler growing temperatures delayed crop development but a warm dry September allowed for later developing crops to mature. In Ontario harvest progressed slowly with 80% of the crops harvested by the end of October.

Cool temperatures hampered crop development in the Prairies. Crops took an average of 2-3 weeks to germinate due to cool soil temperatures. Average monthly temperatures were 3-6 degrees Celsius below normal, which delayed crop maturation by about 3 to 4 weeks. Precipitation in June was below normal but increased in July and August which aided in crop development. Warm temperatures in September pushed back the first frost date, which gave later developing crops the opportunity to mature. Harvest in southern Manitoba progressed slowly with initial harvest beginning in late September and completing in November.

Production and grade information

Soybean production in Canada for 2009 increased to 3.5 million tonnes when compared to last year's production averages of 3.34 million tonnes (Table 1). In Ontario production increased to 2.62 million tonnes from the 2008 production averages of 2.48 million tonnes. In Quebec, production decreased to 530 000 tonnes and in Manitoba increased to 321 000 tonnes respectively. Yields on harvested areas, in both the eastern and western regions decreased when compared to 2008 yields. In Ontario yields for 2009 harvested area was 2.7 tonnes/ha, a decrease from last year's 2.9 tonnes/ha. The harvested yield for Manitoba in 2009 was 2.0 tonnes/ha a decrease from last year's 2.2 tonnes/ha and in Quebec the harvested yield was 2.2 tonnes/ha a decrease from last year's 2.6 tonnes/ha.

The 2009 CGC survey showed that out of 152 samples submitted to the harvest survey program, 138 samples were in the top two grades with more than half the samples coming in from the eastern regions. 10 samples were graded as Soybean, No. 3, 1 sample from Manitoba was graded as Soybean, No. 4 and 3 samples from Ontario and Manitoba were graded as Soybean No. 5.

Table 1 - Production of Canadian soybeans

Year	Seeded area	Production	Yield
	hectares	tonnes	tonnes/ha
1999	1 002 000	2 775 000	2.8
2000	1 066 500	2 698 300	2.5
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

Source: Statistics Canada, *Field Crop Reporting Series*, *No.8*, 1999-2009

Harvest survey samples

The 2009 harvest survey program received 152 non-food grade soybean samples submitted to the Grain Research Lab from Ontario, Quebec, Manitoba and Saskatchewan. Industry services at the Canadian Grain Commission in Winnipeg, Manitoba graded the survey samples.

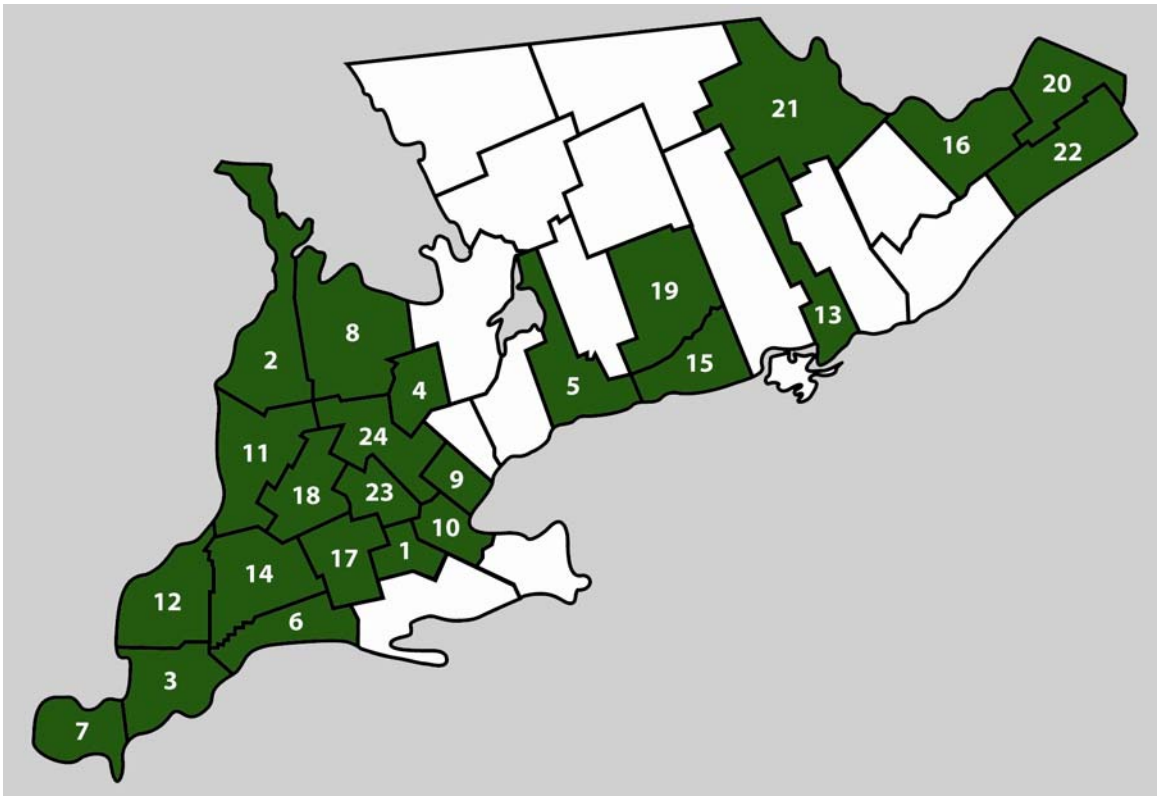
All samples were analyzed for oil and protein content using a Tecator Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer calibrated and verified against the appropriate laboratory reference method. Grade composite samples were analyzed for fatty acid composition and free fatty acids. The reference 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 data[1]

Quality parameter	2009	2008	2007	2006	2003-2008
Oil content[2],%	21.3	21.6	21.7	21.6	21.2
Protein content[3],%	39.9	39.9	40.3	40.0	40.6

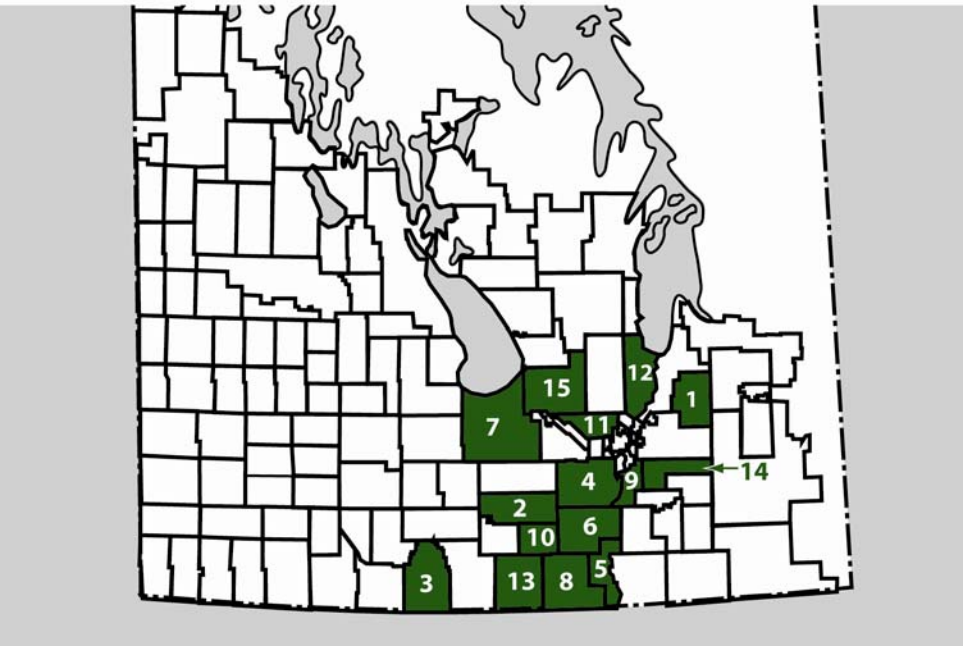
[1] Means for the combined grades
[2] Dry matter basis
[3] N x 6.25, dry matter basis

Figure 1 – Map of southern Ontario showing counties of origin for 2009 soybean survey samples



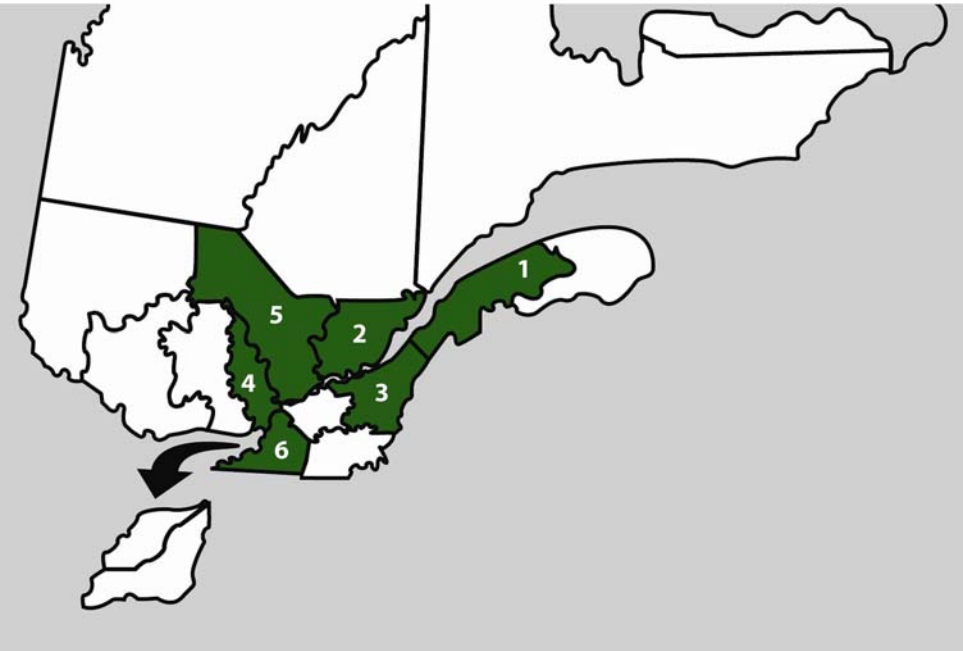
1. Brant
2. Bruce
3. Chatham-Kent
4. Dufferin
5. Durham
6. Elgin
7. Essex
8. Grey
9. Halton
10. Hamilton-Wentworth
11. Huron
12. Lambton
13. Lennox & Addington
14. Middlesex
15. Northumberland
16. Ottawa-Carleton
17. Oxford
18. Perth
19. Peterborough
20. Prescott & Russell
21. Renfrew
22. Stormont, Dundas & Glengarry
23. Waterloo
24. Wellington

Figure 2 – Map of southern Manitoba showing rural municipalities of origin for 2009 soybean survey samples



1. Brokenhead
2. Dufferin
3. Louise
4. Macdonald
5. Montcalm
6. Morris
7. Portage la Prairie
8. Rhineland
9. Ritchot
10. Roland
11. Rosser
12. St. Andrews
13. Stanley
14. Tache
15. Woodlands

Figure 3 – Map of Quebec showing regions of origin for 2009 soybean survey samples



1. Bas-Saint Laurent
2. Capitale-Nationale
3. Chaudière-Appalaches
4. Lanaudière
5. Mauricie
6. Montérégie

Quality of Canadian soybeans – 2009

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.

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 higher protein content. White-hilum soybeans that do not meet quality standards for food processing are used as oil beans or feed beans. Quality of the designated Canadian food grade samples is not discussed in this report.

Oil and protein content

The oil and protein data in this report was collected using a Tecator Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer calibrated and verified with the reference procedures listed under the Oilseeds Methods section. 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, 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 2009 harvest survey sample program was 21.3% which is 0.3% lower than the 2008 average oil content of 21.6%, and similar to the six year average (2003-2008) of 21.2%. Individual producer samples ranged from 16.7% to 25.5%.

The average protein content for 2009 was 39.9% which was the same as last year's average and 0.7% lower than the six year average (2003-2008) of 40.6% (Table 2). Individual producer samples ranged from 32.7% to 48.7%.

In Ontario the 2009 oil content was 0.6% lower than 2008 at 21.0%, while the protein content for 2009 remained the same as 2008 at 40.5%. In Quebec the oil content in 2009 decreased by 0.2% to 21.0% and protein content increased by 0.3% to 40.8% when compared to 2008.

In Manitoba the average oil content in 2009 was 22.3%, an increase of 0.4% when compared to 2008. The average protein content for Manitoba in 2009 was 37.7% an increase of 0.2% from 2008. In Saskatchewan the average oil content in 2009 was 21.9% an increase of 0.8% from 2008. The average protein content for Saskatchewan was 36.3% an increase of 2.5% from last year's average of 33.8%.

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 strong inverse relationship between oil and protein content is illustrated in Figure 4 for both growing regions.

Fatty acid composition

The 2009 Ontario soybean grade compositions of the top two grades, showed minor differences in the fatty acid profile. When comparing the fatty acid profile to 2008, there is a 0.5% increase in linolenic acid and 0.4% decrease in the sum of the two main saturated fatty acids, palmitic and steric. The iodine value for the 2009 Ontario Soybean, No. 1 Canada and No. 2 Canada grade composites were 2.6 units higher than in 2008.

The 2009 Quebec soybean grade compositions of the top two grades, showed slight variations in the fatty acid profile. Linolenic acid for Soybean, No.1 Canada was 1.4% lower than Soybean No. 2 Canada. When comparing the fatty acid profile to 2008 there was a 0.4% increase in linolenic acid for both grades, and a 0.2% increase in the sum of the two main saturated fatty acids, palmitic and steric. Iodine value for 2009, Soybean No. 1 Canada was 0.5 units lower than 2008, and for Soybean, No. 2 Canada was 2.8 units higher than in 2008.

The 2009 Manitoba soybean grade compositions of the top two grades, showed minor differences in the fatty acid profile. When comparing the fatty acid profile to 2008 there is an increase of 0.7% in linolenic acid and a decrease of 0.3% in the sum of the two main saturated fatty acids, palmitic and steric. The iodine value for the 2009 Manitoba Soybean, No. 1 Canada and No. 2 Canada grade composites were the same as in 2008.

The growing conditions and variety selection likely contributed to the differences in the fatty acid composition between the Manitoba and Ontario top grade composites (Table 5). The Manitoba Soybean, No. 1 and No. 2 Canada grade composites had significantly more linolenic and oleic acid but less linoleic acid than the Ontario composites in 2009. In addition, the Manitoba composites had an overall iodine value that was 0.7 units higher than the Ontario Soybean, No. 1 and No. 2 Canada grade composites.

Free fatty acid (FFA) content

The 2009 soybean grade composites show low free fatty acid levels, averaging 0.1% for Soybean, No. 1 Canada and 0.2% 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.

Table 3 – Oil and protein content of 2009 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	5	22.2	19.7	25.5	37.7	32.7	39.8
Ontario	46	21.2	18.3	23	40.8	37.8	43.8
Québec	7	21.8	20.6	23.6	40.5	39.1	41.5
All provinces	**58**	**21.3**	**18.3**	**25.5**	**40.5**	**32.7**	**43.8**
Soybean, No. 2 Canada							
Manitoba	27	22.4	20.4	24.6	37.8	34.6	41.4
Saskatchewan	2	21.9	21.1	22.6	36.3	35.2	37.3
Ontario	40	20.7	18.1	23.4	40.2	32.8	44.1
Québec	11	20.1	16.7	22.8	41.1	36.2	48.7
All provinces	**80**	**21.2**	**16.7**	**24.6**	**39.4**	**32.8**	**48.7**
Soybean, No. 3 Canada							
Manitoba	5	22	20.5	23.5	39.1	36.1	41.4
Saskatchewan	1	23.9	23.9	23.9	34.5	34.5	34.5
Ontario	4	19	17.7	20.2	41.4	40.2	42.3
All provinces	**10**	**21**	**17.7**	**23.9**	**39.6**	**34.5**	**42.3**
Soybean, No. 4 Canada							
Manitoba	1	23.2	23.2	23.2	35.9	35.9	35.9
All provinces	**1**	**23.2**	**23.2**	**23.2**	**35.9**	**35.9**	**35.9**
Soybean, No. 5 Canada							
Manitoba	2	22.7	22.7	22.9	39.6	39.2	40
Ontario	1	21.2	21.2	21.2	36.4	36.4	36.4
All provinces	**3**	**22.2**	**21.2**	**22.9**	**38.5**	**36.4**	**40**
Soybean, All Grades							
Manitoba	40	22.4	19.7	23.2	38.2	32.7	41.4
Saskatchewan	3	22.6	21.1	23.9	35.7	34.5	37.3
Ontario	91	20.9	17.7	21.2	40.5	32.8	44.1
Québec	18	20.8	16.7	20.6	41	36.2	48.7
All provinces	**152**	**21.4**	**16.7**	**23.9**	**39.9**	**32.7**	**48.7**

[1] Dry matter basis
[2] N x 6.25; dry matter basis

Table 4 – Comparison of 2006 to 2009 soybean data with six 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] %
2009			
All regions	21.3	39.9	61.2
Manitoba	22.3	37.7	60.0
Ontario	21.0	40.5	61.5
Québec	21.0	40.8	61.8
Saskatchewan	21.9	36.3	58.2
2008			
All regions	21.6	39.9	61.5
Manitoba	21.9	37.5	59.3
Ontario	21.6	40.5	62.2
Québec	21.2	41.1	62.3
Saskatchewan	21.1	33.8	54.9
2007			
All regions	21.7	40.3	62.0
Manitoba	21.8	37.2	59.0
Ontario	21.9	41.1	62.9
Québec	20.2	40.9	61.1
Saskatchewan	22.7	36.0	58.7
2006			
All regions	21.6	40.0	61.6
Alberta	22.0	38.4	60.4
Manitoba	23.5	36.8	60.3
Ontario	21.4	40.5	61.9
Québec	20.0	41.6	61.6
Saskatchewan	22.6	38.7	61.3
2003-2008 means			
All regions	21.2	40.6	61.8
2003-2008 Ontario	21.5	41.1	62.6
2003-2008 Manitoba	21.7	39.3	61.0
2003-2008 Québec	20.8	41.4	62.2

[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 2009 harvest survey soybean grade composites

Province	Fatty acid composition[1]					Iodine value[3]	Free fatty acids %
	C16:0	C18:0	C18:1	C18:2	C18:3		
Soybean, No. 1 Canada							
Manitoba	9.9	3.9	21.5	52.6	10.7	137.6	0.1
Ontario	9.6	4.2	21.0	54.6	9.2	136.7	0.0
Québec	9.9	4.1	19.9	56.3	8.4	136.5	0.1
Soybean, No. 2 Canada							
Manitoba	9.9	3.8	21.0	53.1	10.6	137.9	0.2
Saskatchewan	9.6	4.1	21.7	51.9	11.0	137.3	0.4
Ontario	9.4	4.2	20.7	54.4	9.8	137.5	0.1
Québec	9.4	3.7	19.2	56.3	9.8	139.8	0.1
Soybean, No. 3 Canada							
Manitoba	10.0	3.8	20.5	53.7	10.5	138.2	0.3
Saskatchewan	9.8	4.1	23.2	50.6	10.6	135.2	0.4
Ontario	9.2	3.9	20.9	54.1	10.5	138.9	0.4
Soybean, No. 4 Canada							
Manitoba	10.1	3.7	21.3	53.0	10.6	137.7	0.1
Soybean, No. 5 Canada							
Manitoba	10.2	3.6	19.3	54.9	10.2	138.3	0.7

[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

Figure 4 – Relationship between oil and protein content for 2009