



Canadian Grain
Commission

Commission canadienne
des grains

ISSN 1705-9453



Quality of Canadian non-food grade soybeans

2011

Ann S. Puvirajah

Chemist, Oilseed Services

Contact: Ann S. Puvirajah

Chemist, Oilseeds Services

Tel : 204 983-3354

Email: ann.puvirajah@grainscanada.gc.ca

Fax : 204-983-0724

Grain Research Laboratory

Canadian Grain Commission

1404-303 Main Street

Winnipeg MB R3C 3G8

www.grainscanada.gc.ca

Canada 

Quality

Innovation

Service

Table of contents

Summary	3
Introduction.....	3
Weather and production review.....	4
Weather review.....	4
Production and grade information.....	5
Harvest Survey Samples	6
Quality of Canadian non-food grade soybeans – 2011.....	9
Oil and protein content.....	9
Fatty acid composition.....	10
Free fatty acid (FFA) content.....	10

Tables

Table 1 – Production of Canadian non-food grade soybeans	5
Table 2 – Quality data for harvest survey non-food grade soybeans – non-food types Soybean, No. 1 and No. 2 Canada grades combined	6
Table 3 – Oil and protein content of 2011 non-food grade soybean survey by province and grade	12
Table 4 – Comparison of 2008 to 2011 non-food grade soybean data with 5 year means Soybean, No. 1 and No. 2 Canada grades combined	13
Table 5 – Fatty acid composition and FFA content of 2011 harvest survey composites	14

Figures

Figure 1 – Map of southern Ontario showing counties of origin for 2011 non-food grade soybean survey samples.....	7
Figure 2 – Map of southern Manitoba showing rural municipalities of origin for 2011 non-food grade soybean survey samples.....	8
Figure 3 – Map of Québec showing regions of origin for 2011 non-food grade soybean survey samples.....	8
Figure 4 – Relationship between oil and protein content for 2011	11

Summary

In 2011 the average oil content for Soybean, No.1 and No. 2 grades combined was 22.0% on dry matter basis, which was higher than last year's average of 21.4% and higher than the five year average (2006-2010) of 21.5%. The average protein content for Soybean, No.1 and No. 2 grades combined was 38.1%, which was lower than last year's average (39.9%) and the five year average (40.0%).

The 2011 soybean crop showed regional variations in oil and protein contents. Manitoba had an oil content of 23.0% and a protein content of 36.4% whereas Saskatchewan had an oil content of 19.9% and a protein content of 40.1%. Ontario and Québec had an oil content of 21.6% and 20.2% and protein content of 38.8% and 40.7% respectively.

Introduction

The 2011 soybean harvest survey quality report is based on 139 non-food grade samples submitted to the Grain Research Laboratory (GRL), which was slightly more than the 133 samples submitted last year. The 2011 samples included 60 from Manitoba, 3 from Saskatchewan, 1 from Alberta 61 from Ontario and 14 from Québec. Of the samples submitted, 21% were graded as Soybean, No. 1 Canada, 69% of samples submitted were graded as Soybean No. 2 Canada and 2.2% of samples submitted were graded as Soybean, No. 3 Canada, and 7.8% 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. Heavy spring rains were reported in these areas with some places experiencing greater than 60 mm of precipitation from normal making seeding very difficult. The growing season was further exasperated by almost drought like conditions in July and August, where parts of southern Quebec and southern Ontario had less than 50 mm precipitation from normal. Heavy rain in mid September and early October delayed the onset of Harvest.

The soybean growing season in the west was similar to east, with heavy spring rains, and a warm dry summer.

In May and June the southern parts of the prairies experienced excessive amounts of precipitation with greater than 60 mm of rain in some areas. In July and August, the southern regions were relatively warm and dry with less than 20mm of precipitation while central and northern regions were cool and wet with 20-30mm of precipitation in some areas and 60 mm precipitation in north central Alberta.

The month of September was 3-4 degrees above normal monthly mean temperatures, but a severe frost was reported in mid September. The warm dry weather continued into October aiding in the completion of Harvest.

Production and grade information

Soybean production in Canada for 2011 decreased to 4.2 million tonnes when compared to last year's production averages of 4.3 million tonnes (Table 1). In Ontario production remained the same as 2010 with 2.9 million tonnes. In Quebec and Manitoba production decreased to 800,000 tonnes and 413,700 tonnes respectively. Yields on harvested areas, in both the eastern and western regions decreased slightly when compared to 2010 yields. In Ontario yields for 2011 harvested area was 3.0 tonnes/ha, a decrease from last year's 3.1 tonnes/ha. The harvested yield for Manitoba in 2011 was 1.8 tonnes/ha a decrease from last year's 2.1 tonnes/ha and in Quebec the harvested yield was 3.0 tonnes/ha a decrease from last year's 3.1 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 2011 CGC survey showed that 90% 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. 10% of the samples received had grades of Soybean, No. 3, Canada, Soybean, No. 4 Canada and Soybean, No. 5 Canada.

Table 1 - Production of Canadian soybeans

Year	Seeded area hectares	Production tonnes	Yield 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	4 246 300	2.8

Source: Statistics Canada, *Field Crop Reporting Series, No.8, 2001-2011*

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

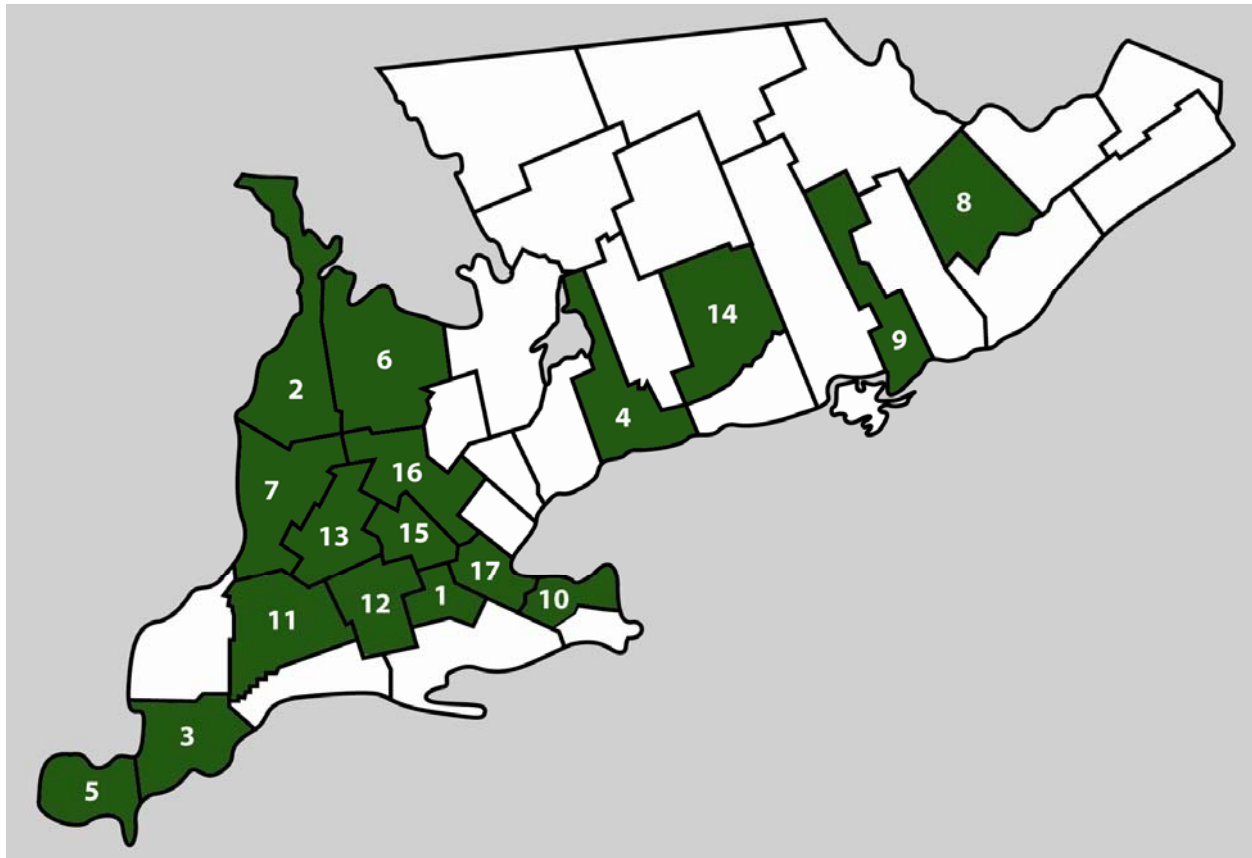
Quality parameter	2011	2010	2009	2008	2006-2010
Oil content ² ,%	22.0	21.4	21.3	21.6	21.5
Protein content ³ ,%	38.1	39.9	39.9	39.9	40.0

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 2011 non-food grade soybean survey samples



- 1. Brant
- 2. Bruce
- 3. Chatham-Kent
- 4. Durham
- 5. Essex
- 6. Grey
- 7. Huron

- 8. Lanark
- 9. Lennox & Addington
- 10. Lincoln
- 11. Middlesex
- 12. Oxford
- 13. Perth
- 14. Peterborough

- 15. Waterloo
- 16. Wellington
- 17. Wentworth

Figure 2 – Map of southern Prairies showing crop districts of origin for 2011 non-food grade soybean survey samples

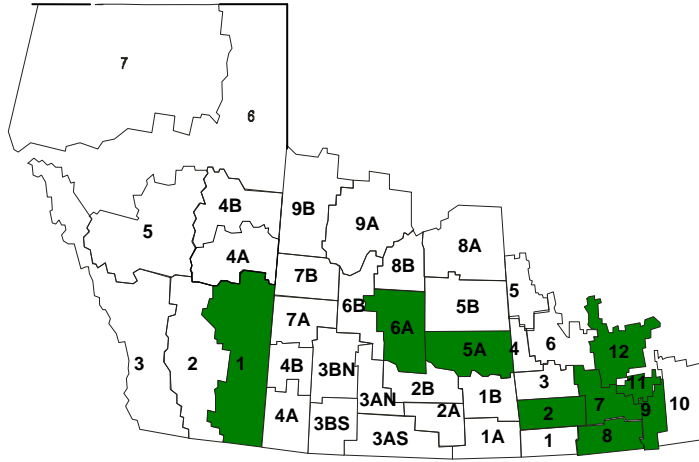
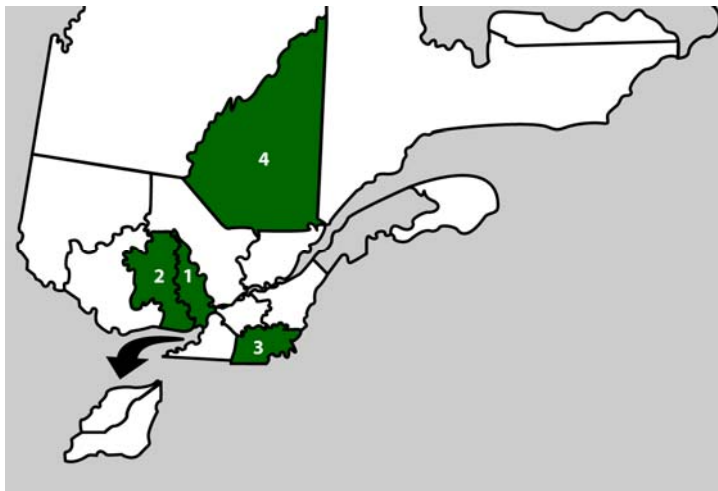


Figure 3 – Map of Québec showing regions of origin for 2011 non-food grade soybean survey samples



1. Lanaudière
2. Laurentides
3. Montérégie
4. Saguenay-Lac St. Jean Région

Quality of Canadian non-food grade soybeans – 2011

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, 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 2011 harvest survey sample program was 22.0% which was 0.6% higher than the 2010 average oil content of 21.4%, and higher than the five year average (2006-2010) of 21.5%. Individual producer samples ranged from 18.0% to 25.6%.

The average protein content for 2011 was 38.1% which was lower than last year’s average of 39.9% and 2.0% lower than the five year average (2006-2010) of 40.0% (Table 2). Individual producer samples ranged from 31.9% to 45.2%.

In Ontario the 2011 oil content was 0.3% higher than 2010 at 21.6%, while the protein content for 2011 decreased to 38.8%. In Québec the oil and protein content slightly decreased to 20.2% and 40.7% respectively when compared to 2010.

In Manitoba the average oil content in 2011 was 23.0%, an increase of 1.4% when compared to 2010. The average protein content for Manitoba in 2011 was 36.4% a decrease of 1.0% from 2010.

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 2011 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 9.2% and an iodine value of 135.3 units. Soybean No. 2 Canada's alpha-linolenic value was at 9.1% and had a similar iodine value of 135.3 units.

The 2011 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 8.6% and an iodine value of 136.4 units. Soybean No. 2 Canada's alpha-linolenic value was at 10.2% and also had a higher iodine value of 139.7 units.

The 2011 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 8.1% and an iodine value of 131.9 units. Soybean No. 2 Canada's alpha-linolenic value was at 8.5% and also had a higher iodine value of 132.1 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 2011 soybean grade composites showed low free fatty acid levels, averaging 0.06% for Soybean, No. 1 Canada and 0.10% 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 2011

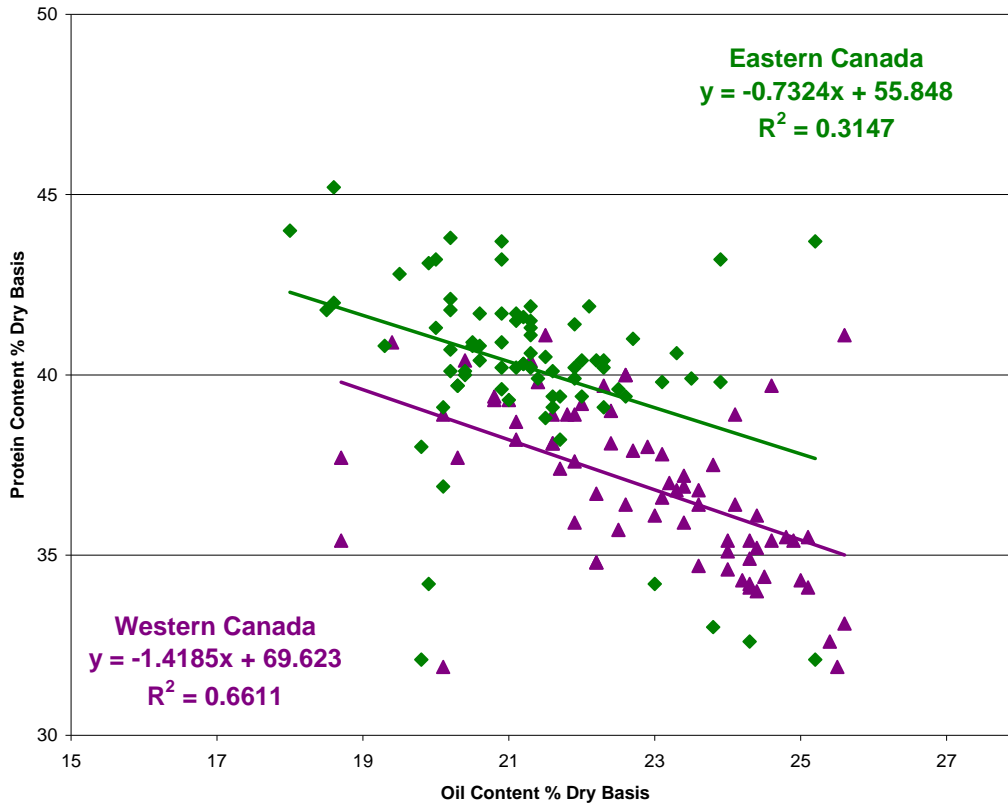


Table 3 – Oil and protein content of 2011 non-food grade soybean survey by province and grade

Province	Number of samples	Oil content ¹			Protein content ²		
		mean	min.	max.	mean	min.	max.
Soybean, No. 1 Canada							
Manitoba	3	24.3	24.3	25.1	34.4	34.1	35.5
Ontario	25	21.3	19.9	23.9	39.5	34.2	43.2
Québec	1	21.8	N/A	N/A	38.7	N/A	N/A
All provinces	29	21.6	19.9	25.1	38.9	34.1	43.2
Soybean, No. 2 Canada							
Manitoba	45	22.9	20.1	25.6	36.5	31.9	41.1
Saskatchewan	1	19.9	N/A	N/A	40.1	N/A	N/A
Alberta	1	20.8	N/A	N/A	37.4	N/A	N/A
Ontario	36	21.9	19.8	25.2	38.3	32.1	43.7
Québec	13	20.1	18.0	21.3	40.9	39.1	45.2
All provinces	96	22.1	18.0	25.6	37.8	31.9	45.2
Soybean, No. 3 Canada							
West OA ¹	7	23.1	21.9	24.1	36.3	35.9	38.9
All provinces	7	23.1	21.9	24.1	36.3	35.9	38.9
Soybean, No. 4 Canada							
West OA	5	22.1	18.7	24.6	36.9	35.4	39.7
All provinces	5	22.1	18.7	24.6	36.9	35.4	39.7
Soybean, No. 5 Canada							
West OA	2	22.2	22.2	22.6	37.1	34.8	40.0
All provinces	2	22.2	22.2	22.6	37.1	34.8	40.0
Soybean, All Grades							
Manitoba	48	23.0	20.1	25.6	36.4	31.9	41.1
Saskatchewan	1	19.9	N/A	N/A	40.1	N/A	N/A
Alberta	1	20.8	N/A	N/A	37.4	N/A	N/A
West OA ²	14	22.6	18.7	24.6	36.6	35.9	40.0
Ontario	61	21.6	19.8	25.2	38.8	34.2	43.2
Québec	14	20.2	18.0	21.3	40.7	39.1	45.2
All provinces	139	21.8	18.0	25.6	37.8	31.9	45.2

¹West Overall²Combination of Soybean, No. 3.4.5 Canada

Table 4 – Comparison of 2008 to 2011 non-food grade 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 %
2011			
All regions	22.0	38.1	60.1
West OA ³	22.9	36.5	59.4
Ontario	21.6	38.8	60.4
Québec	20.2	40.7	60.9
2010			
All regions	21.4	39.9	61.2
Manitoba	21.6	37.4	59.0
Saskatchewan	21.5	38.1	59.6
Ontario	21.3	41.1	62.4
Québec	21.0	40.8	61.8
2009			
All regions	21.3	39.9	61.2
Manitoba	22.3	37.7	60
Saskatchewan	21.9	36.3	58.2
Ontario	21.0	40.5	61.5
Québec	21.0	40.8	61.8
2008			
All regions	21.6	39.9	61.5
Manitoba	21.9	37.5	59.3
Saskatchewan	21.1	33.8	54.9
Ontario	21.6	40.5	62.2
Québec	21.2	41.1	62.3
2006-2010 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

³ West Overall – AB, MB, SK

Table 5 – Fatty acid composition and FFA content for 2011 harvest survey non-food grade Soybean grade composites

Province	Number of Samples	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	3	9.6	4.4	24.5	51.5	8.1	131.9	0.07
Ontario	25	10.6	4.0	21.0	53.6	9.2	135.3	0.05
Québec	1	10.3	3.8	20.4	55.5	8.6	136.4	0.05
Soybean, No. 2 Canada								
Manitoba	45	9.8	4.4	24.0	51.4	8.5	132.1	0.07
Saskatchewan	1	9.8	4.6	19.2	52.4	12.2	139.4	0.42
Alberta	1	9.3	4.6	21.5	51.2	11.7	138.0	0.07
Ontario	36	10.6	4.1	20.7	53.8	9.1	135.3	0.12
Québec	13	10.4	3.6	18.1	56.1	10.2	139.7	0.12
Soybean, No. 3 Canada								
West OA ⁴	7	9.6	4.3	23.4	52.2	8.6	133.2	0.06
Soybean, No. 4 Canada								
West OA	5	9.8	3.9	20.5	54.1	9.8	137.3	0.16
Soybean, No. 5 Canada								
West OA	2	9.9	4.8	22.7	51.4	9.3	133.2	0.10

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

⁴ West Overall