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Quality of Canadian food-type soybeans

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Ning Wang

Program Manager, Pulse Research

Contact: Ning Wang

Program Manager, Pulse Research

Tel : 204 983-2154

Email: ning.wang@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 

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Introduction

This report presents the quality data for the 2011 harvest survey for Canadian food-type soybeans conducted by the Canadian Grain Commission (CGC). Soybean samples for food uses such as, tofu, soymilk, miso and Natto, were submitted to the CGC's Grain Research Laboratory (GRL) for analysis by soybean producers and processors across Manitoba (MB), Ontario (ON) and Quebec (QC).

Canadian food-type soybeans _____ 2011

Harvest survey samples

A total of 107 food-type soybean samples consisting of 103 generic food and 4 Natto-type samples were received at the CGC for analysis. All samples were graded by the CGC's Industry Services (IS). Composite samples were prepared based on end uses (generic or Natto), grade (No. 1 Canada or No. 2 Canada) and province (Manitoba, Ontario or Quebec). All samples were tested for protein and oil content. Composites were analyzed for 100-seed weight, water absorption capacity, protein, oil, sugar and total isoflavone content. It is important to note that samples reported by grade do not necessarily represent the actual distribution of grade.

Quality of 2011 Canadian food-type soybeans

Protein and oil content

Protein content for 2011 Canadian food-type soybeans ranged from 35.9 g/100 g DM to 49.9 g/100 g DM (Table 1). The average protein content in 2011 was 42.3 g/100 g DM, which was similar to that in 2010. The average protein content for Manitoba in 2011 was 39.7 g/100 g DM, an increase of 1.2 g/100 g DM when compared to 2010 (Table 1). The mean protein content for Ontario in 2011 was 42.5 g/100 g DM, similar to that in 2010, while the average protein content for Quebec in 2011 was 42.1 g/100 g DM, 1.7 g/100 g DM lower than that in 2010. Manitoba exhibited lower mean protein content than Ontario and Quebec.

Oil content for 2011 Canadian food-type soybeans varied from 17.0 g/100 g DM to 24.2 g/100 g DM (Table 2). The average oil content in 2011 was 20.8 g/100 g DM, which was 0.2 g/100 g DM lower than that in 2010. The average oil content for Manitoba in 2011 was 21.6 g/100 g DM, 1.2 g/100 g DM higher as compared to 2010 (Table 1). The mean oil content for Ontario in 2011 was 20.9 g/100 g DM, 0.5 g/100 g DM lower than that in 2010. The average oil content for Quebec in 2011 was 20.5 g/100 g DM, 0.2 g/100 g DM higher than that in 2010. Manitoba displayed higher average oil content in 2011 than Ontario and Quebec.

Variations in protein and oil content for Canadian food-type soybeans can be affected by variety and growing environmental conditions. A strong inverse correlation between oil and protein content was observed (Fig. 1).

Canadian generic food-type soybeans

Table 3 shows the quality data for 2011 Canadian generic food-type soybeans used for tofu, soymilk and miso. Mean 100-seed weights for both 2011 soybean, No. 1 Canada and No. 2 Canada were 19.5 g and 19.0 g, respectively. Water absorption value of 2011 soybeans was 1.24 g H₂O/g seeds for No. 1 Canada and 1.28 g H₂O/g seeds for No. 2 Canada. Seed size and water uptake capacity are

important quality characteristics of food-type soybeans in the production of tofu, miso and soymilk.

The average protein contents for 2011 Canadian generic food-type soybeans for both No. 1 Canada and No. 2 Canada were 41.5 g/100 g DM and 42.1 g/100 g DM, respectively, while the mean oil contents for both No.1 Canada and No. 2 Canada were 21.1 g/100 g DM and 20.3 g/100 g DM, respectively (Table 3).

The mean sucrose content for 2011 Canadian generic food-type soybeans was 66.2 g/kg DM for No. 1 Canada, which was the same as for No. 2 Canada (Table 3). The average total oligosaccharide content for soybean, No. 1 Canada was 46.9 g/kg DM, which was slightly higher than soybean, No. 2 Canada (46.4 g/kg DM).

The average total isoflavone content for 2011 Canadian generic food-type soybeans was 2414 mg/kg DM for No.1 Canada, while for No. 2 Canada the mean total isoflavone content was 2649 mg/kg DM (Table 3).

Canadian Natto-type soybeans

Table 4 displays the quality data for 2011 Canadian Natto-type soybeans. Mean 100-seed weights for both 2011 soybean, No. 1 Canada and No. 2 Canada were 7.4 g and 7.5 g, respectively. Water absorption value of 2011 Natto soybeans was 1.31 g H₂O/g seeds for No. 1 Canada and 1.34 g H₂O/g seeds for No. 2 Canada, respectively.

The average protein contents for 2011 Canadian Natto-type soybeans for both No. 1 Canada and No. 2 Canada were 40.3 g/100 g DM and 41.8 g/100 g DM, respectively, while the mean oil contents for both No.1 Canada and No. 2 Canada were 20.5 g/100 g DM and 19.1 g/100 g DM, respectively (Table 4).

The average sucrose content for 2011 Canadian Natto-type soybeans was 61.5 g/kg DM for No. 1 Canada, while was 61.8 g/kg DM for No. 2 Canada (Table 4). The mean total oligosaccharide content for soybean, No. 1 Canada was 52.4 g/kg DM, which was higher than soybeans, No. 2 Canada (51.5 g/kg DM).

The average total isoflavone content for 2011 Canadian Natto-type soybeans was 2635 mg/kg DM for No.1 Canada, while for No. 2 Canada the mean total isoflavone content was 2844 mg/kg DM (Table 4).

Figure 1 – Correlation between protein and oil content of food-type soybeans

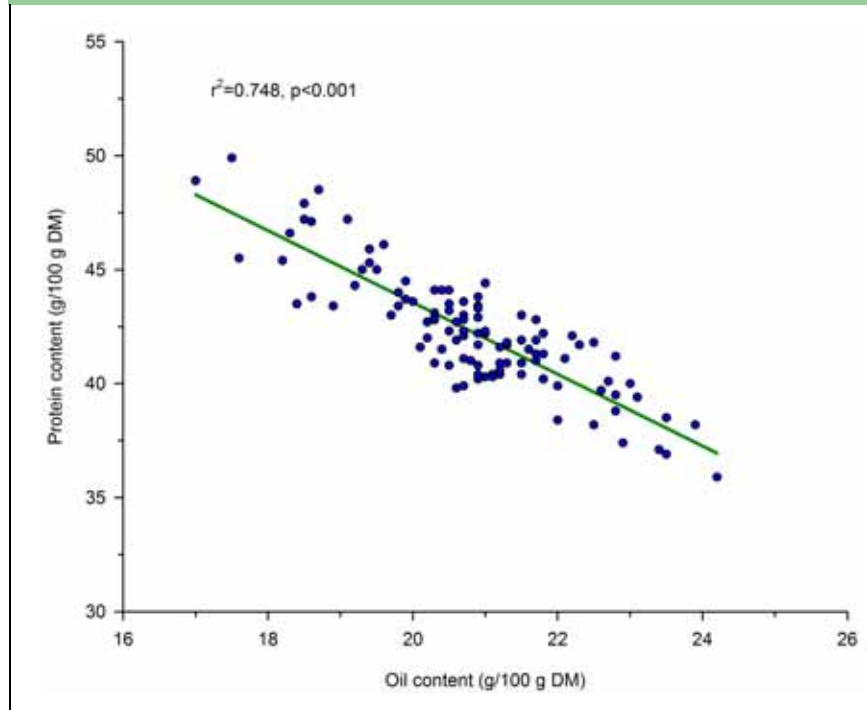


Table 1 – Mean protein content for 2011 Canadian food-type soybeans by grade and province¹

Grade	Protein content, g/100 g DM			
		2011		2010
	mean	min.	max.	mean
Manitoba				
Soybean, No. 1 Canada	38.2	38.2	38.2	40.1
Soybean, No. 2 Canada	41.1	41.1	41.1	38.1
All grades	39.7	38.2	41.1	38.5
Ontario				
Soybean, No. 1 Canada	41.9	35.9	48.5	42.4
Soybean, No. 2 Canada	43.5	38.5	49.9	42.8
All grades	42.5	35.9	49.9	42.6
Quebec				
Soybean, No. 1 Canada	43.5	43.5	43.5	41.8
Soybean, No. 2 Canada	42.0	38.4	45.5	44.6
All grades	42.1	38.4	45.5	43.8
Canada				
Soybean, No. 1 Canada	41.8	35.9	48.5	42.2
Soybean, No. 2 Canada	42.7	38.4	49.9	42.7
All grades	42.3	35.9	49.9	42.4

¹ Protein content (N x 6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

Table 2 – Mean oil content for 2011 Canadian food-type soybeans by grade and province¹

Grade	Oil content, g/100 g DM			
		2011		2010
	mean	min.	max.	mean
Manitoba				
Soybean, No. 1 Canada	22.5	22.5	22.5	19.7
Soybean, No. 2 Canada	20.7	20.7	20.7	20.6
All grades	21.6	20.7	22.5	20.4
Ontario				
Soybean, No. 1 Canada	21.1	18.5	24.2	21.6
Soybean, No. 2 Canada	20.4	17.0	23.5	21.1
All grades	20.9	17.0	24.2	21.4
Quebec				
Soybean, No. 1 Canada	20.5	20.5	20.5	20.9
Soybean, No. 2 Canada	20.5	17.4	23.0	20.1
All grades	20.5	17.4	23.0	20.3
Canada				
Soybean, No. 1 Canada	21.1	18.5	24.2	21.4
Soybean, No. 2 Canada	20.4	17.0	23.5	20.7
All grades	20.8	17.0	24.2	21.0

¹ Oil content is determined by near infrared measurement calibrated against the ISO 10565:1992(E) reference method.

Table 3 – Quality data for 2011 Canadian generic food-type soybean grade composites

Quality parameter	Soybean, No. 1 Canada		Soybean, No. 2 Canada	
	2011	2010	2011	2010
Physical characteristic				
100-seed weight, g/100 seeds	19.5	- ³	19.0	- ³
Water absorption, g H ₂ O/g seeds	1.24	-	1.28	-
Chemical composition (g/100 g DM)				
Protein content	41.5	-	42.1	-
Oil content	21.1	-	20.3	-
Sugar content (g/kg DM)				
Sucrose	66.2	-	66.2	-
Raffinose	7.8	-	7.6	-
Stachyose	38.1	-	37.9	-
Verbascose	1.0	-	0.9	-
Total oligosaccharides ¹	46.9	-	46.4	-
Isoflavones (mg/kg DM)				
Total isoflavones ²	2414	-	2649	-

¹ Sum of raffinose, stachyose and verbascose.

² Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

³ No data available.

Table 4 – Quality data for 2011 Canadian Natto-type soybean grade composites

Quality parameter	Soybean, No. 1 Canada		Soybean, No. 2 Canada	
	2011	2010	2011	2010
Physical characteristic				
100-seed weight, g/100 seeds	7.4	- ³	7.5	- ³
Water absorption, g H ₂ O/g seeds	1.31	-	1.34	-
Chemical composition (g/100 g DM)				
Protein content	40.3	-	41.8	-
Oil content	20.5	-	19.1	-
Sugar content (g/kg DM)				
Sucrose	61.5	-	61.8	-
Raffinose	7.4	-	6.7	-
Stachyose	43.6	-	43.2	-
Verbascose	1.4	-	1.6	-
Total oligosaccharides ¹	52.4	-	51.5	-
Isoflavones (mg/kg DM)				
Total isoflavones ²	2635	-	2844	-

¹ Sum of raffinose, stachyose and verbascose.

² Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

³ No data available.