



Canadian Grain
Commission

Commission canadienne
des grains

ISSN 1700-2222

Quality of western Canadian Canola 2015

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Acknowledgments

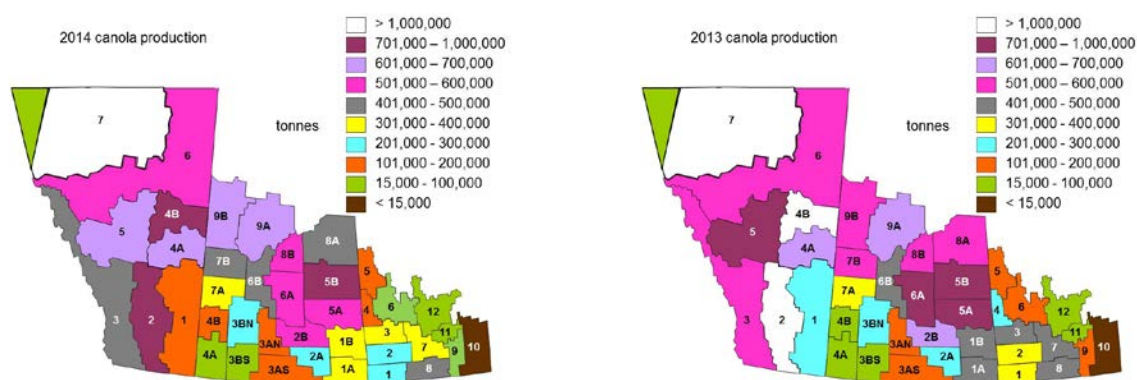
The Grain Research Laboratory acknowledges the cooperation of the canola producers, grain handling offices, and oilseed crushing plants in western Canada for supplying the samples of newly harvested canola. The assistance of the Industry Services Division of the Canadian Grain Commission in grading producer samples is also acknowledged. The technical assistance of the Oilseeds staff, Grain Research Laboratory is recognized.

Note: Samples for the Canadian Grain Commission's canola harvest sample program were collected from producers, crushing plants and grain handling offices across western Canada. The samples were cleaned to remove dockage prior to grading and testing. Industry Services grain inspectors assigned grade level based on the Official Grain Grading Guide for Canola and Rapeseed (Chapter 10) which can be found at: <http://www.grainscanada.gc.ca/oggg-gocg/ggg-gcg-eng.htm> . Individual harvest samples were analyzed for oil, protein, chlorophyll and total glucosinolates using a NIRSystems 6500 scanning near-infrared spectrometer. This report is based on the analyses by references methods of composite samples made of same grade samples per crop district and province. Composites were prepared by combining Canola, No. 1 Canada samples by provincial crop district; Canola, No. 2 by province, and Canola, No. 3 Canola and Sample Canada samples by western Canada.

Introduction

This report presents quality data and information based on the Canadian Grain Commission's 2015 harvest sample program of western Canadian canola. Quality parameters included are oil, protein, chlorophyll, glucosinolates, free fatty acids and the fatty acid composition of harvest samples. Quality data are from analyses of canola samples submitted to the Canadian Grain Commission throughout the harvest period by producers, grain companies and oilseed crushing companies. The maps (Figure 1) shows traditional growing areas for canola in western Canada with 2013 and 2014 production data per crop district.

Figure 1 – Maps of western Canada showing 2013 and 2014 canola production per crop district



Summary

The 2015 harvest showed a higher percentage of samples graded Canola, No. 1 Canada (91.5%) than the 2014 harvest (81.4%), this number was higher than the 10 year average (87.1%) (Figure 4). Large variations in grade distribution were observed. Alberta-Peace River area showed the lowest percent of samples graded Canola, No. 1 Canada (86.6%) when compare to Manitoba (93.6%) and Saskatchewan (93.8%) (Figure 5). The crop district 7 of Alberta and the Peace River area of British Columbia showed the lowest percent of samples graded Canola, No. 1 Canada (65.8%).

The 2015 western Canadian canola (Canola, No.1 Canada) crop was characterized by similar oil content (44.2%) and a slight increase in protein (20.7% versus 20.2%) when compared to the 2014 Canola, No.1 Canada crop (Table 1). Average chlorophyll content was similar in 2015 when compared to 2014 (11 mg/kg versus 13 mg/kg, respectively) (Table 1) with some areas showing averages higher than 15 mg/kg (Table 3). Samples from Manitoba and Saskatchewan showed similar chlorophyll content averages whereas Alberta-Peace River showed a higher average: 11 mg/kg for both Manitoba and Saskatchewan versus 14 mg/kg for Alberta-Peace River.

The 2015 canola crop had a slightly different oleic acid content, linoleic acid and α -linolenic acid contents when compared to the 2014 crop (62.6, 18.8 and 9.7% versus 63.2, 18.7 & 9.2% for oleic, linoleic acid, and α linolenic acid respectively). Total saturated fatty acid content was identical to what was observed in 2014 (6.7 %). This resulted in a slightly higher iodine value in the 2015 canola crop when compared to 2014 canola crop (113.1 versus 112.2 units in 2014). Mean free fatty acids average levels in 2015 Canola, No.1 Canada seed was identical to what was observed in 2014 (0.18%) (Table 1), however in Manitoba, some crop district averages were much higher than the Western Canadian average (Table 4).

Table 1 – Canola , No. 1 Canada: Quality data for 2014 harvest

Quality parameter	2015	2014	2010-14 Mean
Number of received samples	1941	1993	1841
Number of Canola, No. 1 Canada samples	1782	1623	1531
Oil content ¹ (% , 8.5% moisture)	44.2	44.2	44.4
Protein content ¹ (% , 8.5% moisture)	20.7	20.2	22.2
Oil-free protein of the meal ¹ -(%, 12% moisture)	38.6	37.4	37.9
Chlorophyll content (mg/kg in seed)	12	13	14
Total seed glucosinolates (μ mol/g, 8.5% moisture)	11	10	10
Oil-free total glucosinolates of the meal (μ mol/g, dry basis)	23	21	22
Free fatty acids (%)	0.18	0.18	0.14
Oleic acid (% in oil)	62.6	63.2	62.7
Linoleic acid (% in oil)	18.8	18.7	18.9
α -Linolenic acid (% in oil)	9.7	9.2	9.5
Erucic acid (% in oil)	0.01	0.01	0.01
Total saturated fatty acids ² (% in oil)	6.7	6.7	6.7
Iodine value	113.1	112.2	112.9
Total mono-unsaturated fatty acids (MUFA) ³ (% in oil)	64.2	64.9	64.4
Total poly-unsaturated fatty acids (PUFA) ⁴ (% in oil)	28.6	27.9	28.5

¹ Protein content calculated from nitrogen content using N x 6.25

² Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

³ Total mono-unsaturated fatty acids are the sum of palmitoleic (C16:1), oleic (C18:1), eicosenoic (C20:1), erucic (C22:1), and nervonic (C24:1) acids.

⁴ Total poly-unsaturated fatty acids are the sum of linoleic (C18:2), linolenic (C18:3) and eicosadienoic (C20:2) acids.

Weather and production review

Weather review and effects on seeding and harvest

The weather maps presented in Figures 2a and 2b were obtained from Agriculture and Agri-Food Canada (<http://www.agr.gc.ca/DW-GS/current-actuelles.aspx?lang=eng&jsEnabled=true>). Seeding and harvest progress for each provinces are presented in Figure 3. The graphs were done using the crop reports for each province. Manitoba: <http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html>. Saskatchewan: <http://www.agriculture.gov.sk.ca/crop-report> Alberta: [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sdd4191](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sdd4191).

As in 2014, extreme conditions were the norm for the 2015 growing season. Winter was warmer than what was observed in 2014 for the same period, so seeding started two weeks earlier in 2015 when compared to 2014 (Figure 2a). Weather in May was not cooperative; there were two cold spells with frost, one mid-May and another one at the end of the month with frost and snow. As a result, some areas were reseeded twice and some were not reseeded with canola (Figure 3). Manitoba alone had to reseed about 1 million acres. June temperatures were lower than normal in the southern Saskatchewan and Alberta and normal in the rest of the prairies. Warm temperatures started at the end of June and continued into July and August throughout the prairies. In September there was some cooling down in Alberta and northwestern Saskatchewan with lower than average temperatures whereas Manitoba and a big part of Saskatchewan had higher than normal temperatures.

Precipitation was a problem in 2015, both the lack of and too much at the wrong time. Moisture was in short supply from April to about early to mid-July for the prairies (Figure 2b); as a result the canola crop had difficulty emerging. Then there was enough moisture to ensure crop development in most of the prairies; however, some part of Alberta and the Peace River area of British Columbia suffered from lack of rain for most of the growing season. September had too much rain delaying the crop harvest because the fields were too wet for the machinery to operate. October was dry and warm enough to allow the harvest to progress with the harvest finally being completed by early November (Figure 3).

Figure 2a – Maps - Monthly mean temperature difference from normal in Canada (Prairies) during the 2015 growing season

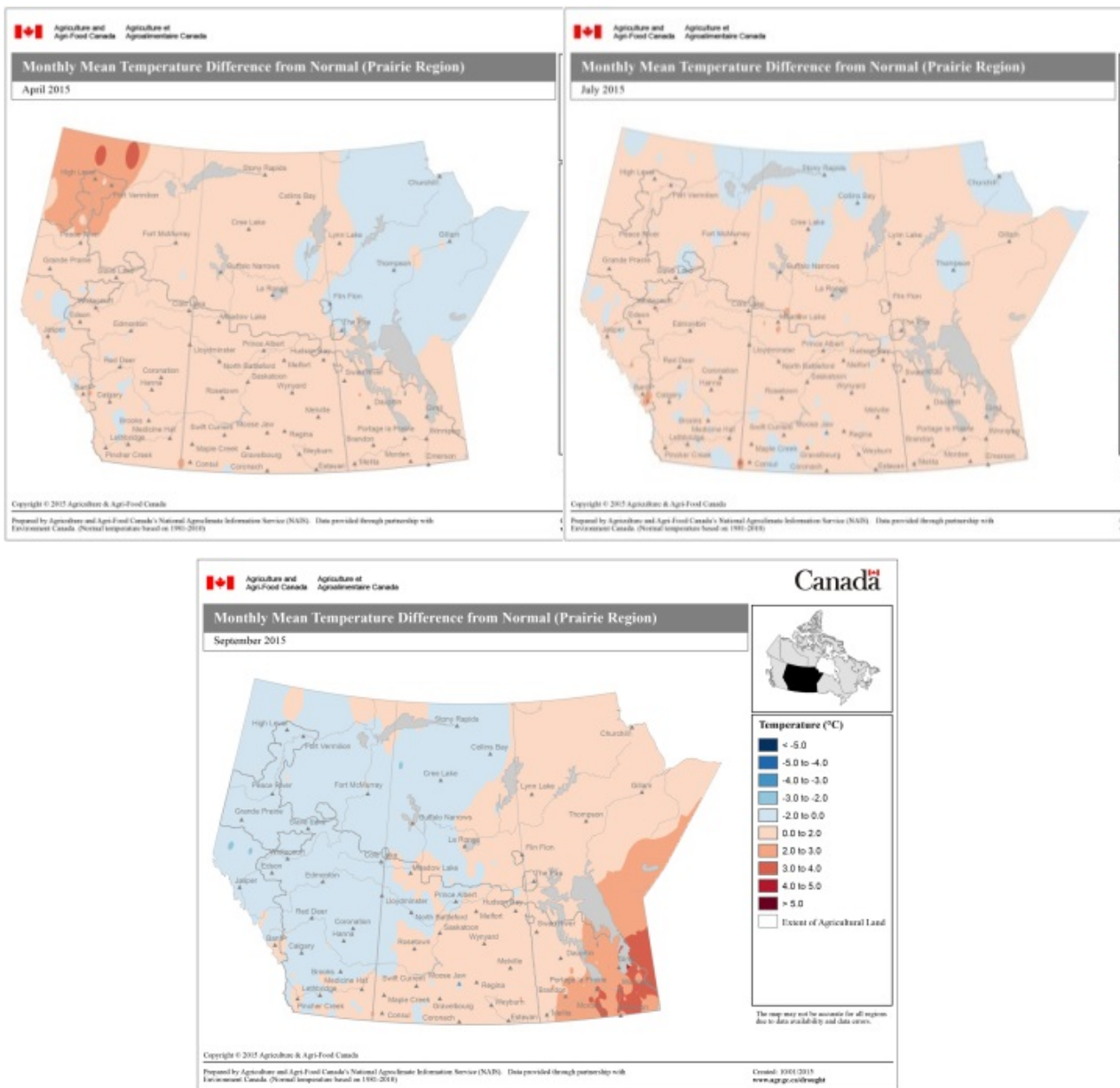
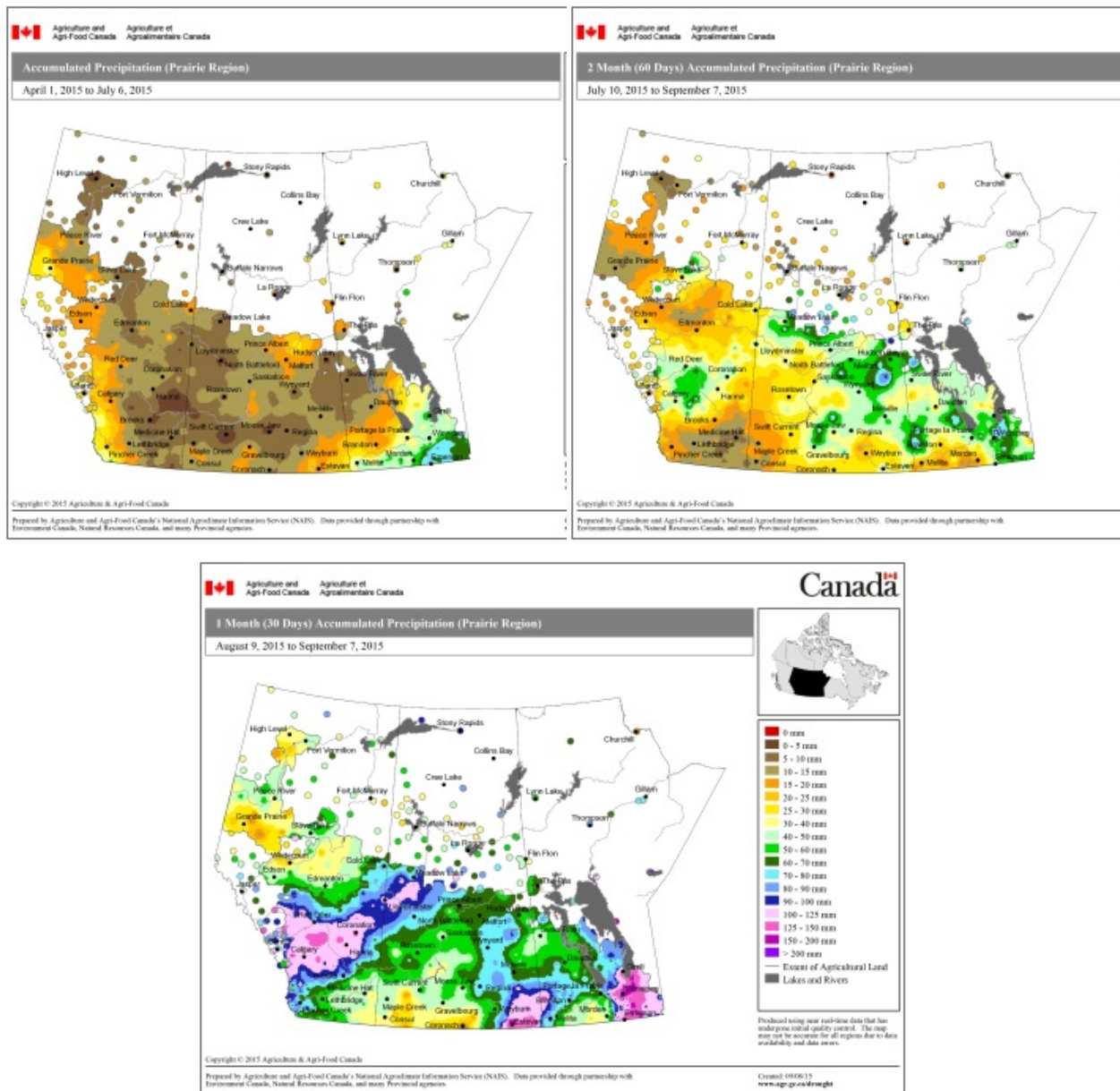
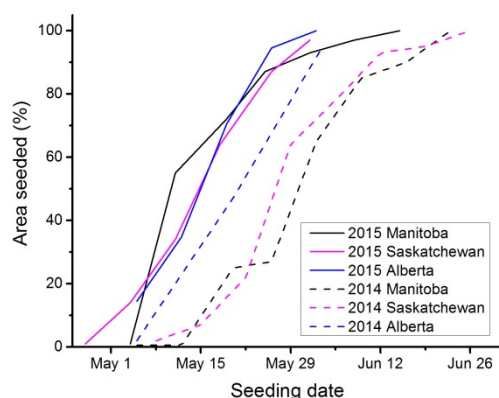


Figure 2b – Map - Accumulated precipitation and departure from normal in Canada (Prairies) during the 2015 growing season (April 1st to October 31st, 2015).

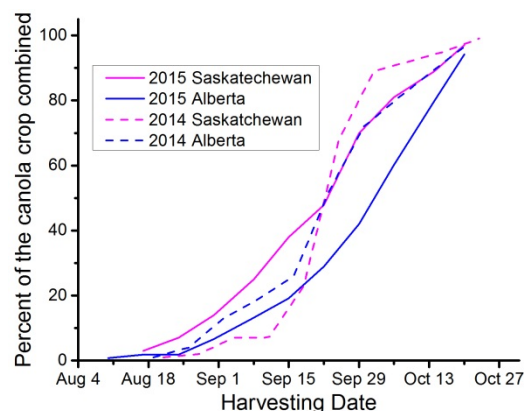


Source: <http://www4.agr.gc.ca/DW-GS/historical-historiques.aspx?lang=eng&jsEnabled=true>

Figure 3 – Seeding and harvest progress in Manitoba, Saskatchewan and Alberta for the 2014 and 2015 growing seasons



Seeding progress in 2014 and 2015



Harvest progress in 2014 and 2015

Production

Western Canadian farmers planted over 8.0 million hectares of canola in 2015, slightly over what was seeded in 2014 and about 1.8% more than the 5-year average (Table 2). Statistics Canada reported that the 2015 western Canada average yield was 2,100 kg/ha, below the record average yield observed in 2013 (2,200 kg/ha) but higher than the 5-year yield average of 1,886 kg/ha. The 2015 production for western Canada (17.171 million metric tonnes) was the second highest production recorded in Canada. It was only 700,000 tonne lower than the 2013 record production of 17.876 million metric tonnes and well above the 5-year average production (14.865 million tonnes).

In 2015, the provincial production for Manitoba, Saskatchewan, Alberta and British Columbia accounted for 16.6, 51.3, 31.7 and 0.4% (14.9, 49.2, 35.4 and 0.5% in 2014) of the total canola production, respectively (Table 2). The 2015 average yields were much higher in all the western provinces (Manitoba: 2,300, Saskatchewan: 2,000, Alberta: 2,200 and British Columbia 1,900 kg/ha) than last year yield averages (2,000, 1,800, 2,100 and 1,700 kg/ha for Manitoba, Saskatchewan, Alberta and British Columbia, respectively).

Table 2 - Seeded area and production for western Canadian canola

	Seeded area			Harvested area			Production ¹		
	thousand hectares			thousand hectares			thousand tonnes		
	2015	2014	2010-14	2015	2014	2010-14	2015	2014	2010-14
Manitoba	1,270.7	1,214.1	1,283.3	1,266.7	1,185.7	1,246.4	2,857.6	2,313.3	2,249.3
Saskatchewan	4,330.1	4,309.9	4,139.9	4,305.9	4,208.7	4,064.7	8,799.7	7,622.6	7,213.5
Alberta	2,468.5	2,630.5	2,493.0	2,448.3	2,612.2	2,470.6	5,443.1	5,488.5	5,334.5
British Columbia	36.4	42.5	41.6	36.4	42.1	41.2	70.8	71.9	67.8
Western Canada	8,105.8	8,197.0	7,957.8	8,057.3	8,048.7	7,957.8	17,171.2	15,496.3	14,865.1

¹ For all production data please consult Statistics Canada's website at:

<http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0010010&tabMode=dataTable&srchLan=-1&p1=-1&p2=9>

Harvest sample program samples and grade distribution

This report of quality data for the 2015 harvest is based on analyses of 1,941 individual canola samples. Composites of various grades from various crop districts composites from each province were made using all the samples. Specialty oil samples, such as high oleic acid, low linolenic acid, and high erucic acid, were excluded from this report. Slightly less canola samples were received in 2015 when compared to the 2014 harvest (1993 samples) or the 5-year average (1841 samples).

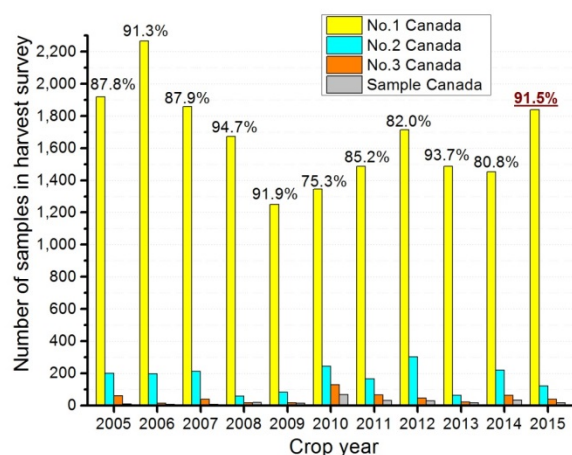
Exports of commercially cleaned canola exports (from August 2015 to December 2015) contained on average 2.01% dockage, ranging from 1.00 to 2.50%, which affects quality factors such as oil content, chlorophyll and free fatty acid (<https://www.grainscanada.gc.ca/canola/export-exportation/ceqd-dqec-eng.htm>). Canola exports containing over 2.5% dockage are considered not commercially clean (NCC) and have even greater reductions in measured quality components. The composition of 2015 samples was compared to 2014 results and to long-term sample program means (Table 1). Comparison with the quality of Canadian canola exports shipments is provided in Table 6 and in Figure 6.

In 2015, 91.5% of the samples were graded Canola, No. 1 Canada, compared to 80.8% in 2014 and 93.7% in 2013 (Figure 4). This number (91.5%) is much higher than the 5-year average of percentage of Canola, No. 1 Canada (83.4%).

The grade distribution of the 2015 canola crop varied from crop district to crop district (Figure 5). In some areas, the percentage of samples graded Canola, No. 1 Canada was lower than 70%. Saskatchewan had the highest percentage of samples graded Canola, No. 1 Canada (93.8%), followed by Manitoba (93.6%) while Alberta had the lowest percentage of samples graded Canola, No. 1

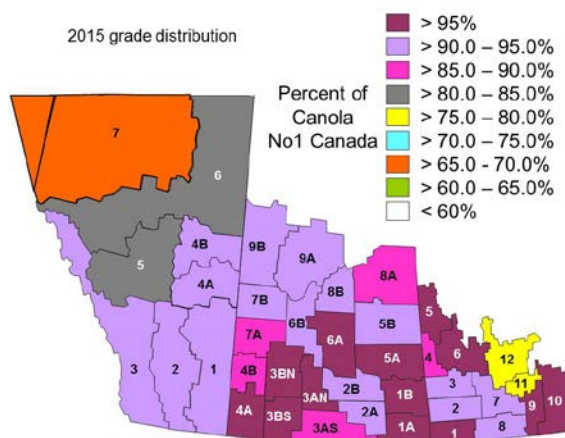
Canada (86.6%). The crop districts showing the lowest of samples in the top grade were Alberta-BC Peace-River No 5, 6 and 7 (82.6, 82.9 and 65.8%, respectively) and Manitoba No. 11 and 12 (75 and 80%, respectively).

Figure 4 – Canola samples received in harvest sample program and the historical grade distribution, 2005-15



The main degrading factor for Canola, No. 1 to Canola, No. 3 was high distinctly green seed counts. Distinctly green seed counts (DGR) were 0.50% in Canola, No. 1 Canada, 4.0% in Canola, No. 2 Canada, 7.3% in Canola, No. 3 Canada and 2.6% in Sample. Most of samples at the lowest grade (Sample) were downgraded because of admixtures and sprouting, not because of DGR counts. The Official Grain Grading Guide defines conspicuous admixture as material found in the sample after cleaning and is easily distinguished from canola without the use of magnification.

Figure 5 – Distribution of Canola, No. 1 Canada by crop district in western Canada samples received in 2015



Quality of western Canadian canola 2015

Tables 3 to 5 show detailed information on the quality of western Canadian canola harvested in 2015 whereas Table 6 compares the quality of 2015 harvest to the quality of recent canola exports. It is important to note that the numbers of samples in each grade or province may not be representative of the total production or grade distribution. However, there were sufficient samples to provide good quality information for each province and each grade. Provincial and western Canadian averages were calculated from results for each crop district, weighted by a combination of production by crop district using the 2014 total production (Statistics Canada production estimate) combined with an estimate of grade distribution per crop district using data presented in Figure 5.

All oil and protein content values discussed below are presented using the Canadian Grain Commission's historical 8.5% moisture basis in order to permit annual and regional comparisons. Protein and glucosinolate contents of the oil free meal are also presented at 12% moisture to reflect meal trading rules established by the Canadian Oilseed Processors Association (COPA).

Exports of commercially cleaned canola contained up to 2.5% dockage, which will affect quality factors such as oil content, chlorophyll and free fatty acids. Canola exports containing over 2.5% dockage are considered not commercially clean (NCC) and will have even greater reductions in measured quality components.

Oil content

For Canola, No.1 Canada, the 2015 mean oil content (44.2%) was identical to the 2014 average (44.2%) (Table 1). This average is much lower than the record average observed in 2011 (45.2%) (Figure 6). However, this average is close to the 5-year average (2010-2014) of 44.4% (Table 1, Figure 6). The oil content mean in Manitoba (43.4%) was lower than in Alberta-Peace River (43.8%) and Saskatchewan (44.6%) (Table 3). The oil content of individual Canola, No.1 Canada samples harvested in 2015 by producers across western Canada ranged from 39.1% to 49.0% in Manitoba, 39.1% to 49.7% in Saskatchewan and 36.1% to 50.5% in Alberta (Table 3).

Oil content for Canola, No. 2 Canada (42.5%) was lower than for Canola, No. 1 Canada (44.2%). Oil content for Canola, No. 2 Canada samples from western Canada ranged from 35.3% to 48.6% (Table 3).

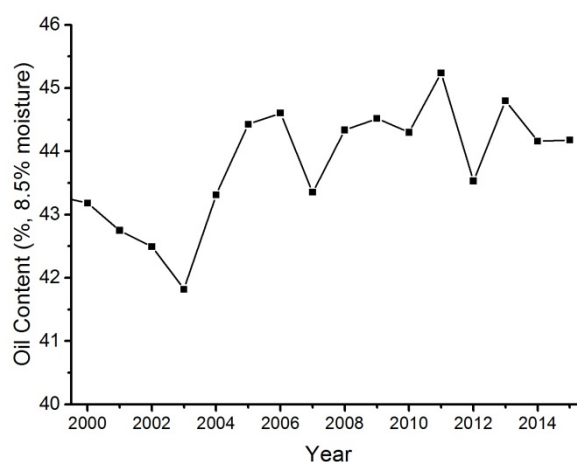
Oil content is influenced by both genetics and environment. For any known canola variety cool growing conditions will give higher oil content when compared to hot growing conditions.

Mean oil content of commercially clean canola exports of Canola, No.1 Canada was 43.0% in December 2015 and averaged 43.2% for the August-November 2015 exports (Table 6). Oil content average of the non-commercially clean exports was 43.1% for both August-November 2015 exports and December 2015 exports.

When compared to oil content of the harvest samples, the commercially clean and the non-commercially clean exports of Canola, No.1 Canada had lower oil content averages due to the dilution of the dockage. Harvest samples are completely cleaned (0.00% dockage) whereas the dockage averages for the August-November 2015 exports and December 2015 exports were 2.73 and 2.74% respectively, compared to 1.98% and 2.15% for the commercially clean exports for the same period.

It is expected that the mean oil content of Canadian exports will be in the 43.0% range for most of the 2015-16 shipping season.

Figure 6 – Canola, No. 1 Canada - harvest samples, 2000–2015
Oil content of the seed (% at 8.5% moisture)



Protein content

Crude protein content averages were 20.7% for Canola, No.1 Canada, 18.6% for Canola, No. 2 Canada, 21.6% for Canola, No. 3 Canada and 20.9% for Sample. Average protein content for Canola, No.1 Canada was higher in 2015 (20.7%) than in 2014 (20.2%). This is slightly higher than the 5-year average (20.2%) (Table 1). Protein content of individual producer samples ranged from 17.2 to 27.5% for Canola, No. 1 Canada samples and from 17.5 to 25.8% for Canola, No. 2 Canada samples (Table 3).

Average protein of Canola, No. 1 Canada commercially clean exports was 21.1% in December 2015. Average protein was 20.8% for commercially clean Canola, No. 1 Canada exports from August to November 2015 (Table 6). Protein content averages (Tables 6) for the actual shipping season are slightly higher to what was observed for last shipping season (20.3% for August 2014 to July 2015).

2015 protein content calculated to an oil-free meal at 12% moisture basis was 38.6%, which is significantly higher than what was observed in 2014 (37.5%) and higher than 37.7% calculated for the 5-year average (Table 1). The calculated protein content of the oil-free meal (100% defatted at 12% moisture) was much higher in Alberta-Peace River (39.5%) than in Manitoba (38.4%) and in Saskatchewan (38.1%). Trading rules for the North American sale of canola meal requires that

calculations for protein claims must be reported on a 12% moisture basis. To enable comparison according to the Canadian Oilseed Processors Association's meal trading rules, this year, the Canadian Grain Commission only reported the protein of oil-free meal at 12% moisture (Table 1, Figure 8). It is to be understood that the reported value is only an indication since this is the maximum meal protein content that could be obtained when a crushing plant is able to extract 100% of the oil from the seeds.

The calculated protein content average of oil-free meal was 38.0% at 12.0% moisture for December 2015 commercially clean exports of Canola, No. 1 Canada. The meal protein content average for the August-November 2015 exports was also 38.0% at 12% moisture. This result is about +0.8% higher than last shipping season average, the average being 37.2% for commercially clean exports of Canola, No. 1 from August 2014 to July 2015 at 12% moisture (Table 6).

It is expected that the protein content of Canadian exports will be similar, or slightly higher, than what was observed during last year shipping season.

Figure 7 – Canola, No. 1 Canada - harvest samples, 2000–2015
Protein content of the seed (% , at 8.5% moisture)

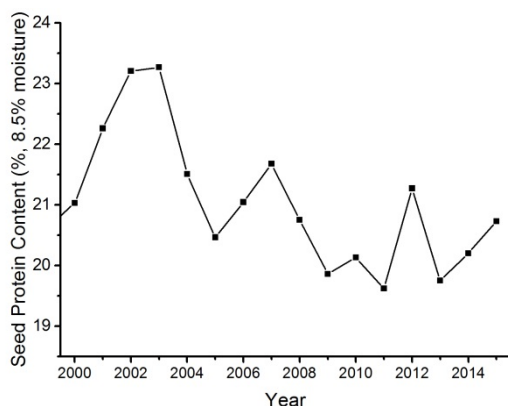
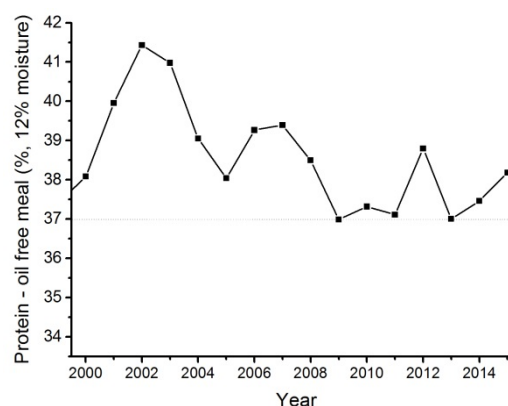


Figure 8 – Canola, No. 1 Canada - harvest samples, 2000–2015
Protein content of the meal (% , at 12% moisture)



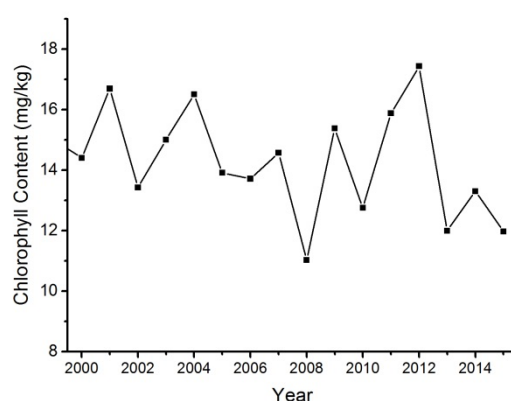
Chlorophyll content

Chlorophyll content averages of producer samples graded Canola, No. 1 Canada were 11, 11 and 14 mg/kg in Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 3). The overall average for Canola, No. 1 Canada was 12 mg/kg, similar to what was observed for the 2014 and the 2013 harvests (13 and 12 mg/kg, respectively) (Figure 9). Individual producer samples of Canola, No. 1 Canada from Manitoba, Saskatchewan and Alberta-Peace River had chlorophyll levels ranging

from 4 to 33 mg/kg, 4 to 32 mg/kg and 4 to 40 mg/kg, respectively (Table 3). The mean chlorophyll content varies greatly from year to year (Figure 9) due to environmental conditions. Once again, location had an important effect on chlorophyll levels in the analyzed samples. Crop District 5 from Alberta and Crop district 7 from Alberta-Peace River had the highest chlorophyll content averages for samples graded Canola, No.1 Canada (16 mg/kg).

Chlorophyll levels (Table 3) for Canola, No. 2 Canada samples averaged 31 mg/Kg, slightly lower than what was observed for the 2014 harvest (33 mg/kg). Samples graded Canola, No. 3 Canada showed an average chlorophyll content of 45 mg/kg, lower than what was observed in 2014 (68 mg/kg).

Figure 9 – Canola, No. 1 Canada - harvest samples, 2000–2015
Chlorophyll content of the seed (mg/Kg, as is moisture content)



To be graded Canola, No. 1 Canada, samples must contain no more than 2.00% distinctly green seeds. Distinctly green seed averages were 0.56, 0.45 and 0.57% in Manitoba (0.56% in 2014), Saskatchewan (0.55% in 2014) and Alberta-Peace River (0.68% in 2014) for Canola, No. 1 Canada samples, respectively.

The chlorophyll content of Canadian canola exports is affected by distinctly green seeds and dockage content (no more than 2.5% for commercially clean exports). Dockage averages for Canola, No. 1 Canada was 1.98 and 2.15% for commercially clean cargoes for December and August-to-December 2015 exports, respectively, whereas the dockage average for for the not-commercially clean August to December 2015 exports was 2.73%. Since August 1st, 2015, the distinctly green seed contents for individual cargoes of Canola, No. 1 Canada ranged from 0.2 to 1.7% and the chlorophyll content averages ranged from 12 to 24 mg/kg (Table 6). These chlorophyll content variations reflected the distinctly green seed variations within the exports (0.2 to 1.5%) and the variations between the exports (0.87%) and the harvest DGR averages (0.50%) (Table 6); the higher distinctly green seeds content and the higher chlorophyll content in exports (Table 6).

It is expected that chlorophyll data for the 2015-16 exports might be lower than chlorophyll average reported for the 2014-2015 shipping season with few cargoes of Canola, No. 1 Canada with chlorophyll contents higher than 25 mg/kg.

Glucosinolate content

The 2015 total glucosinolate content averaged 11 $\mu\text{mol/g}$, similar to what was observed in 2014 (10 $\mu\text{mol/g}$). Since 2009, total glucosinolate content averages remained in the 10 $\mu\text{mol/g}$ range (Table 1, Figure 10). There was no real difference in total glucosinolates content between various crop districts or provinces. This is a direct result of breeding efforts from various breeding programs to maintain low glucosinolate contents and linked to the Canadian canola registration program (Western Canadian Canola Rapeseed Registration Committee).

The average level of total seed glucosinolates in the December 2015 canola exports was 13 $\mu\text{mol/g}$ of seed, similar to what was observed in the 2015 harvest survey (Table 6). Glucosinolate contents of canola exports for the 2014-15 shipping season will remain similar to the averages observed during the 2013-14 shipping season (Table 6).

Figure 10 – Canola, No. 1 Canada - harvest samples, 2000–15

Total glucosinolate content of the seed ($\mu\text{mol/g}$ seed, at 8.5% moisture)

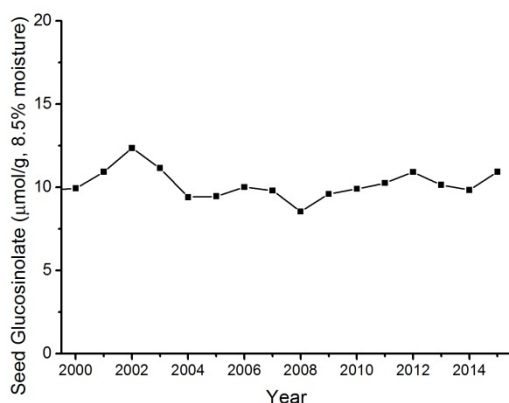
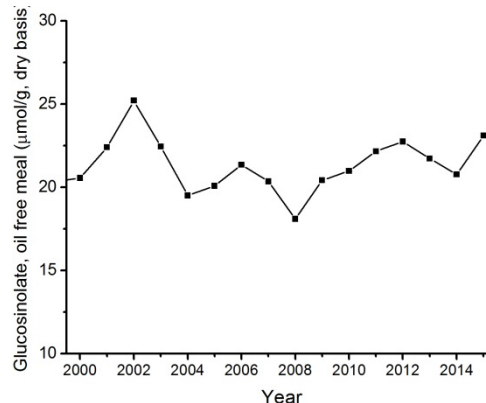


Figure 11 – Canola, No. 1 Canada - harvest samples, 2000–15

Total glucosinolate content of oil-free meal ($\mu\text{mol/g}$ seed, dry basis)



In 2015, 11 $\mu\text{mol/g}$ of total glucosinolates in the seed corresponded to 23 $\mu\text{mol/g}$ in oil-free meal on dry basis, very slightly higher than the 5-year average (21 $\mu\text{mol/g}$ dry basis) or the 2014 harvest average (22 $\mu\text{mol/g}$ dry basis) (Figure 11). This calculated value agrees to the canola definition (less than 30 μmol of total glucosinolates per g of oil-free meal on dry basis) but gives an overestimation of total glucosinolate in canola meal obtained from Canadian conventional crushing plants (expeller press followed by solvent extraction) since it assumes that 100% of the oil was

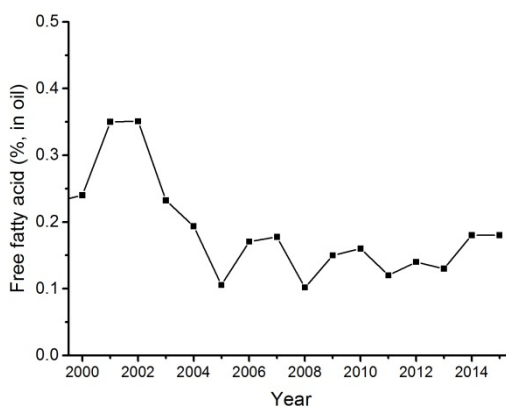
recovered from the seed during crushing and that no glucosinolate was destroyed during processing, which is not the case.

Free fatty acids content

The average free fatty acids content of the oil for the 2015 canola was 0.18%, identical to what was observed in 2014 (0.18%) (Tables 1 and 4, Figure 11). This level was also similar to the 5-year average of 0.14% (Table 1). Average free fatty acids levels in Canola, No. 1 Canada samples from Manitoba (0.33%) were higher than what was found in Saskatchewan (0.13%) and Alberta-Peace River (0.19%) (Table 4). The 2015 Manitoba average was much higher than what was observed in Manitoba last year (0.23%). Some Manitoba crop districts showed free fatty acid content averages well above what was normally observed, e.g. Manitoba crop district No. 7 and No 11 had FFA averaging 0.62 and 0.71%, respectively.

We have observed that free fatty acids in canola can be high due to field heat stress (high temperatures during the growing season) or to high seed moisture and sprouting because of precipitations at harvest. Both were observed this year (Figure 2a and 2b). Precipitations in September delayed and sometimes even prohibited the 2015 harvest to proceed normally (Figure 2b). This excess of moisture at harvest could further lead to an increase in free fatty acids content in the seed during storage and shipping. It also has shown that high moisture seeds at harvest could lead to bin heating/burning if seeds are improperly stored.

Figure 12 – Canola, No. 1 Canada - harvest samples, 2000–15
Free fatty acid content (in % as oleic acid)



In December, free fatty acids level of commercially clean Canola, No.1 Canada exports averaged 0.32% (0.39% for the 2015 August to November exports). The free fatty acids level of individual commercially

clean Canola, No.1 Canada exports ranged from 0.18 to 0.73%. These averages were similar to not commercially clean exports, 0.34% in December and 0.42% for the 2015 August to October exports, with individual cargoes ranging from 0.29 to 0.73%.

Free fatty acid content might be a problem with canola exports this year, it is expected that the FFA will remain higher this year than they were during last year's shipping season (0.36%). As it was observed in the August-December exports, it is likely that large variations will be observed with shipments showing high FFA levels.

Fatty acid composition

The average level of erucic acid in the 2015 crop was 0.01%, which is identical to what was observed for the last 4 years (0.01%) and to the 5-year average of 0.01% (Tables 1, 5, Figure 12). Similar to total glucosinolate content, these low values are a direct result of breeding efforts of the Canadian canola industry.

For Canola, No.1 Canada samples, mean α -linolenic acid (C18:3) was 9.7%, slightly higher than what was observed in 2014 (9.2%) and similar to the 5-year average (9.6%) (Table 1, Figure 13). This year, the α -linolenic acid averages were lower in Manitoba (9.2%) than in Saskatchewan (9.6%). Alberta-Peace River had the highest average (10.1%) (Table 5). This result agreed with the environment growing conditions that we had. For a given genetic, warmer growing conditions usually lead to higher oil saturation. The growing conditions and the September temperatures were very different in the Prairies (Figure 2a). The total content of poly-unsaturated fatty acids or PUFA was 28.5, 28.6 and 28.6% in Manitoba, Saskatchewan and Alberta-Peace River, for a Western Canada average of 28.6%. For canola, the PUFA contents are directly related to the contents α -linolenic acid (C18:3) and linoleic acid (C18:2). This year, the ratio omega-6/omega-3 (linoleic acid/ α -linolenic acid) was 1.94 compared to 2.03 in 2014.

For Canola, No.1 Canada samples, mean oleic acid (C18:1) content of the 2015 crop was 62.6%, lower than what was observed in 2014 (63.2%) and similar to the 5-year mean (62.7%) (Table 1, Figure 14). Oleic acid contents were similar in Manitoba (62.4%), Saskatchewan (62.6%) and Alberta-Peace River (62.6%) (Table 5). The total content of mono-unsaturated fatty acids or MUFA was 64.1, 64.2 and 64.3% in Manitoba, Saskatchewan and Alberta-Peace River, for a Western Canada average of 64.2%.

The fatty acid composition (oleic acid, linoleic acid and α -linolenic acid) of the 2015 crop presented some differences when compared to the 2014 fatty acid composition (-0.6%, +0.1% and +0.5% for oleic, linoleic and linolenic fatty acid contents). This led to a change in the iodine value average. The 2015 iodine value average was higher than the 2013 iodine value average by 0.9 units (112.2 units in 2014 versus 113.1 units in 2015) (Table 1, Figure 15). For Canola, No. 1 Canada, the iodine value averages were 112.4, 113.1 and 113.6 units for Manitoba, Saskatchewan and Alberta-Peace River, respectively, reflecting the α -linolenic acid (C18:3) differences. The iodine value of individual samples ranged from 107.4 to 120.1, 105.4 to 121.0 and 107.1 to 120.6 units, in Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 5).

Samples graded Canola, No. 2 Canada showed higher iodine value averages, with higher linoleic and α -linolenic acid contents and lower oleic acid contents than the samples Canola, No. 1 Canada (Table 5).

Average of saturated fatty acid content was 6.7% in 2015 as in 2014 (Tables 1 and 5). Since 2009, the saturated fatty acid content averages varied from 6.6 - 6.9% (Table 1, Figure 16). In 2015, the saturated fatty acid content averages were similar for the 3 provinces, (6.9, 6.7 and 6.6% for Manitoba, Saskatchewan and Alberta-Peace River, respectively). Total saturated fatty acids are usually affected by temperature, high temperatures lead to higher oil saturation.

For the first 5 months of the 2015-16 shipping season, α -linolenic acid averages for clean samples ranged from 8.7 to 10.5%, averaging 9.2 and 9.5% in December and in August-November respectively for commercially clean exports (Table 6). This is similar to what was observed during last shipping season (9.3%). When compared to last year's average, iodine value averages ranged from 111.3 to 114.8 units (until December 2015) similar to what was observed during the last shipping season (110.4 to 114.0 units). It is likely that the iodine value will remain similar to what was observed last year. The level of saturated fatty acids in the November 2015 canola exports remained very similar to 2014-15 means (6.7%). It is expected that levels of erucic acid will remain very low for the new shipping season (below 0.1%) since erucic acid contents were very low in the 2015 harvest.

Figure 13 – Canola, No. 1 Canada, erucic acid content of harvest samples, 2000-15

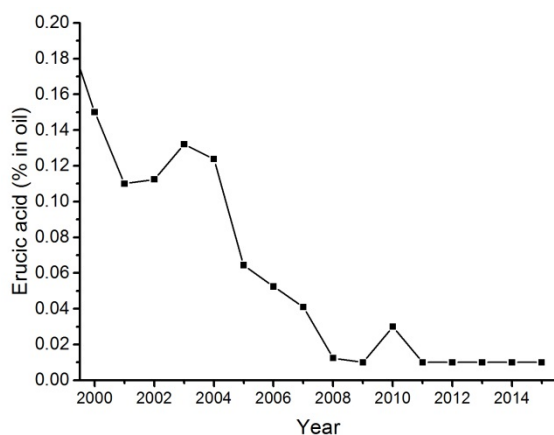


Figure 14 – Canola, No. 1 Canada, α -linolenic acid content of harvest samples, 2000-15

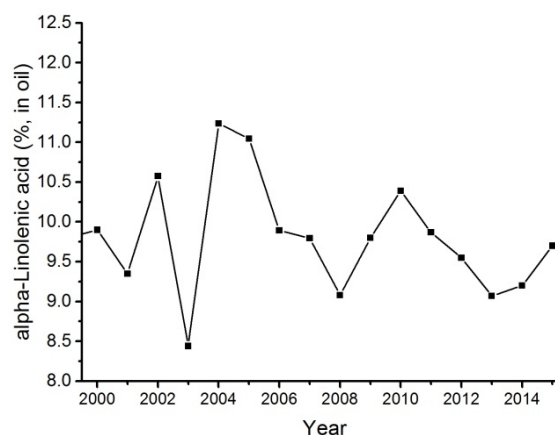


Figure 15 – Canola, No. 1 Canada, oleic acid content of harvest samples, 2000 - 15

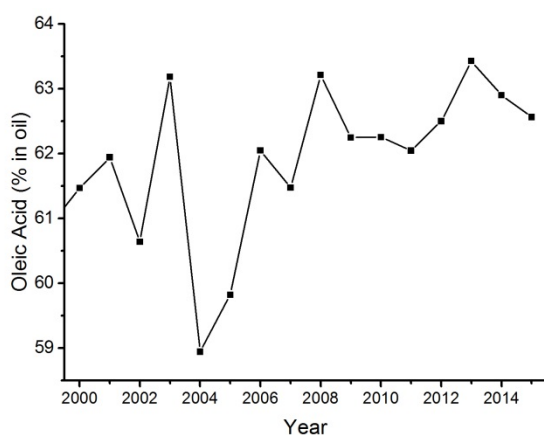


Figure 16 – Canola, No. 1 Canada, linoleic acid content of harvest samples, 2000 – 15

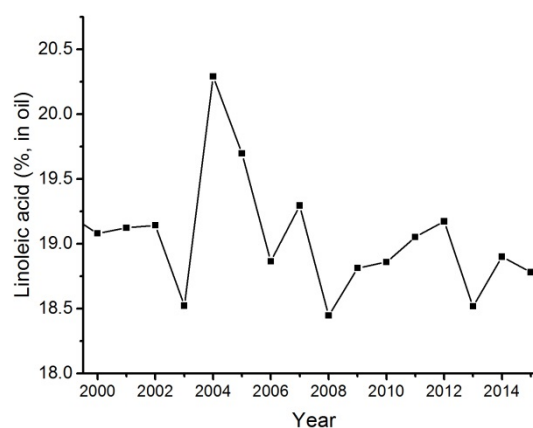


Figure 17 – Canola, No. 1 Canada, iodine value of harvest samples, 2000-15

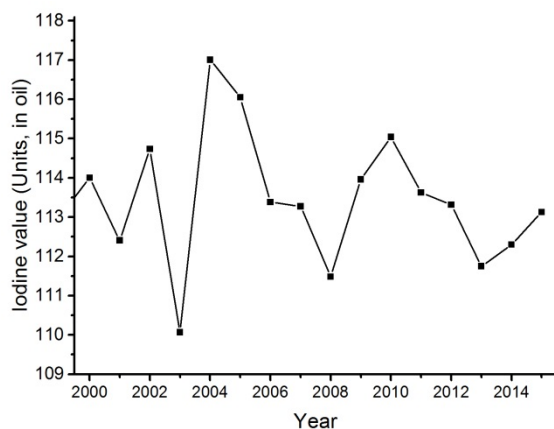


Figure 18 – Canola, No. 1 Canada, total Saturated fatty acid content of harvest samples, 2000-15

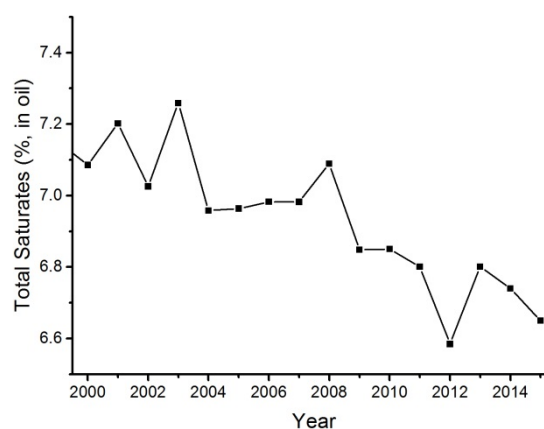


Table 3 – 2015 Harvest sample program
Canola quality data by grade and province – Oil, protein and chlorophyll contents

	Number of samples	Oil content ¹			Protein content ²			Chlorophyll content		
		%			%			mg/kg		
		mean	min.	max.	mean	min.	max.	Mean	min.	max.
Canola, No. 1 Canada										
Manitoba	403	43.4	39.1	49.0	21.0	17.2	24.7	11	4	33
Saskatchewan	834	44.6	39.1	49.7	20.3	15.7	27.0	11	4	32
Alberta-Peace River ³	545	43.9	36.1	50.5	21.4	17.0	27.5	14	4	40
Western Canada⁴	1782	44.2	36.1	50.5	20.7	15.70	27.5	12	4	40
Canola, No. 2 Canada										
Manitoba	21	41.8	35.3	44.8	21.8	20.3	25.8	18	9	30
Saskatchewan	31	42.9	40.0	48.6	21.3	17.5	25.2	33	7	44
Alberta-Peace River ³	53	42.5	38.0	47.4	22.1	18.8	26.1	34	4	57
Western Canada⁴	105	42.5	35.3	48.6	21.8	17.5	26.1	31	4	57
Canola, No. 3 Canada										
Western Canada⁴	36	39.9	34.3	45.0	21.8	19.6	27.0	45	7	81
Canola, Sample Canada										
Western Canada⁴	18	42.1	36.1	47.6	20.9	17.6	23.8	19	9	53

¹ 8.5% moisture basis

² N x 6.25; 8.5% moisture basis

³ Includes part of the Peace River area that is in British Columbia

⁴ Values are weighted averages based on production by province as estimated by Statistics Canada

Table 4 – 2015 Harvest sample program
Canola quality data by grade and province – glucosinolate and free acid acid contents

	Number of samples	Glucosinolates ¹ μmol/g			Free fatty acids (%)
		mean	min.	max.	Mean
Canola, No. 1 Canada					
Manitoba	403	11	6	17	0.33
Saskatchewan	834	11	6	19	0.13
Alberta –Peace River ²	545	12	5	20	0.19
Western Canada ³	1782	11	5	20	0.19
Canola, No. 2 Canada					
Manitoba	21	11	8	14	1.13
Saskatchewan	31	11	8	16	0.24
Alberta-Peace River ²	53	12	8	17	0.42
Western Canada ³	105	12	8	25	0.47
Canola, No. 3 Canada					
Western Canada ³	36	13	10	25	0.80
Canola, Sample Canada					
Western Canada ³	18	11	9	19	0.36

¹ 8.5% moisture basis

² Includes part of the Peace River area that is in British Columbia

³ Values are weighted averages based on production by province as estimated by Statistics Canada

Table 5 – 2015 Harvest sample program

Canola quality data by grade and province – fatty acid composition, total saturate content and iodine value of the oil

	Relative fatty acid composition of the oil (%)					Total saturates ³ (%)	Iodine value ⁴ (Units)
	C18:0	C18:1	C18:2	C18:3	C22:1		
<u>Canola, No. 1 Canada</u>							
Manitoba	1.8	62.4	19.2	9.2	0.00	6.9	112.4
Saskatchewan	1.7	62.6	18.9	9.6	0.01	6.7	113.1
Alberta-Peace River ¹	1.7	62.6	18.4	10.1	0.01	6.5	113.6
Western Canada²	1.7	62.6	18.8	9.7	0.01	6.7	113.1
<u>Canola, No. 2 Canada</u>							
Manitoba	1.8	62.8	18.9	8.9	0.00	6.9	111.4
Saskatchewan	1.6	60.5	19.9	10.4	0.00	6.8	115.2
Alberta-Peace River ¹	1.7	60.8	19.0	10.6	0.08	6.8	114.7
Western Canada²	1.7	61.0	19.3	10.3	0.04	6.8	114.4
<u>Canola, No. 3 Canada</u>							
Western Canada²	1.8	59.3	19.6	10.4	0.08	7.2	113.9
<u>Canola, Sample Canada</u>							
Western Canada²	1.7	61.9	19.1	9.8	0.00	6.8	113.5

¹ Includes part of the Peace River area that is in British Columbia

² Values are weighted averages based on production by province as estimated by Statistics Canada

³ Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0)

⁴ Calculated from fatty acid composition

Table 6 – Canola, No. 1 Canada
Comparison of the quality data of 2015 harvest sample averages with export shipment average

Canola, No. 1 Canada - only	2015 Harvest program	Exports			
		December 2015	August to November 2015	August to December 2015	Previous year 2014-15
Quality parameter		CC⁴	CC⁴	NCC⁵	CC⁴
Oil content¹ (%)	44.2	43.0	43.2	43.1	43.5
Protein content² (%)	20.7	21.0	20.8		20.3
Oil-free protein content² (%) at 12% moisture (%)	38.6	38.0	38.0		37.2
Chlorophyll (mg/kg seed)	12	18	17	16.9	19
Total glucosinolates¹ of the seed (µmol/g seed)	11	13	13	14	12
Free fatty acids, %	0.18	0.31	0.39	0.39	0.36
Erucic acid (% in oil)	0.01	0.02	0.03	0.01	0.03
Oleic acid (% in oil)	62.6	62.1	62.8	62.4	63.1
α-Linolenic acid (% in oil)	9.7	9.3	9.5	9.8	9.3
Total saturated fatty acids³ (% in oil)	6.7	6.6	6.6	6.6	6.7
Iodine value	113.1	114.0	112.7	113.4	112.2
MUFA	64.2	63.8	64.4	62.8	64.8
PUFA	28.6	29.0	28.3	28.7	28.0
Distinctly green seed (DGR, %)	0.5	0.98	0.87	0.8	1.1
Dockage (%)	0.00	2.18	1.98	2.7	1.89
Loading moisture (%)	NA	8.4	8.0	8.2	7.4
Number of export samples	NA	15	78	13	211
Tonnage	NA	534,526.2	2,760,890.3	471,914.9	7,753,639.3

¹ 8.5% moisture basis

² Calculated using N x 6.25

³ Total saturated fatty acids are the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0), and lignoceric (C24:0).

⁴ CC = Commercially Clean

⁵ NCC = Not commercially clean

NA = Non applicable