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# Quality of western Canadian Canola 2018

**Véronique J. Barthet**

Oilseeds Program Manager

**Contact: Véronique J. Barthet**

Oilseeds Program Manager

Tel : 204-984-5174

Email: [veronique.barthet@grainscanada.gc.ca](mailto:veronique.barthet@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](http://www.grainscanada.gc.ca)

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# Table of contents

<b>Introduction .....</b>	<b>5</b>
<b>Summary .....</b>	<b>5</b>
<b>Weather and production review .....</b>	<b>7</b>
Weather review .....	8
Production .....	11
<b>Harvest samples.....</b>	<b>12</b>
<b>Quality of 2018 canola .....</b>	<b>14</b>
Oil content .....	14
Protein content .....	15
Chlorophyll content .....	17
Glucosinolate content.....	19
Free fatty acids content.....	19
Fatty acid composition .....	21

## Tables

### Table 1 Canola, No. 1 Canada

Quality data for 2018 harvest .....	8
-------------------------------------	---

### Table 2 Seeded area and production for western Canadian canola..... 14

### Table 3 2018 harvest

Canola quality data by grade and province - Oil, protein and chlorophyll contents.....	28
----------------------------------------------------------------------------------------	----

### Table 4 2018 harvest

Canola quality data by grade and province - glucosinolate and free fatty acid contents .....	29
----------------------------------------------------------------------------------------------	----

### Table 5 2018 harvest

Canola quality data by grade and province - fatty acid composition, total saturate content and iodine value of the oil .....	30
------------------------------------------------------------------------------------------------------------------------------	----

### Table 6 Canola, No. 1 Canada

Comparisons of quality data for 2018 harvest with recent export shipment data.....	31
------------------------------------------------------------------------------------	----

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## Figures

Figure 1	Maps - Western Canada with the 2016 and 2017 canola production per crop district .....	7
Figure 2a	Maps – Monthly mean temperature difference from normal (Prairies) in Canada during the 2018 growing season .....	9
Figure 2b	Maps – Accumulated precipitation and departure from normal in Canada (Prairies) during the 2018 growing season .....	10
Figure 2c	Maps – Canadian drought conditions as of May 31 <sup>st</sup> , 2018 and August 31 <sup>st</sup> , 2018 .....	12
Figure 3	Seeding and harvest progress in Manitoba, Saskatchewan and Alberta for the 2016 to 2018 growing seasons.....	12
Figure 4	Canola samples received in harvest sample program and the historical grade distribution, 2008-2018 .....	15
Figure 5	Canola, No. 1 Canada Oil content of harvest samples, 2000 - 2018 .....	17
Figure 6	Canola, No. 1 Canada Protein content of harvest samples, 2000 - 2018 .....	18
Figure 7	Canola, No. 1 Canada Meal protein content, oil-free basis (12% moisture) of harvest samples, 2000 - 2018 .....	18
Figure 8	Canola, No. 1 Canada Chlorophyll content of harvest samples, 2000 - 2018 .....	20
Figure 9	Canola, No. 1 Canada Total seed glucosinolate content of harvest samples, 2000 - 2018.....	21
Figure 10	Canola, No. 1 Canada Total glucosinolate content oil-free meal (dry basis) of harvest samples, 2000 - 2018.....	21
Figure 11	Canola, No. 1 Canada Free fatty acid content of harvest samples, 2000 - 2018 .....	23
Figure 12	Canola, No. 1 Canada Erucic acid content of harvest samples, 2000 - 2018 .....	27
Figure 13	Canola, No. 1 Canada $\alpha$ -Linolenic acid content of harvest samples, 2000 - 2018.....	27
Figure 14	Canola, No. 1 Canada Oleic acid content of harvest samples, 2000 - 2018 .....	27
Figure 15	Canola, No. 1 Canada Linoleic acid content of harvest samples, 2000 - 2018.....	27
Figure 16	Canola, No. 1 Canada Iodine value of harvest samples, 2000 - 2018.....	27
Figure 17	Canola, No. 1 Canada Total saturates fatty acid content of harvest samples, 2000 - 2018.....	27

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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. Thanks to Multi-meida services for their assistance in drawing the new map to reflect the new production reporting areas.

**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.

Seed oil, protein and glucosinolates contents are reported on an 8.5% moisture basis. Meal protein content is reported on a 12% moisture basis whereas meal glucosinolates content is reported on dry basis.

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## Introduction

This report presents quality data and information based on the Canadian Grain Commission's 2018 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 map (Figure 1) shows traditional growing areas for canola in western Canada with 2016 and 2017 production data. Samples received from the Peace River area of British Columbia were combined with Alberta crop district No. 7 samples. Averages of these samples will be referred to as Alberta-Peace River.

In 2018, Statistics Canada changed the production reporting data, they used Census Agricultural Regions (CAR) instead of Small Area Data (SAD) corresponding the Crop Districts for the 2017 Canadian canola production. In Saskatchewan, the new CARs do not correspond to the Crop Districts, while all our historic data are based on Crop Districts. This year report still uses Crop District distribution however, this will change next year to reflect Statistics Canada changes.

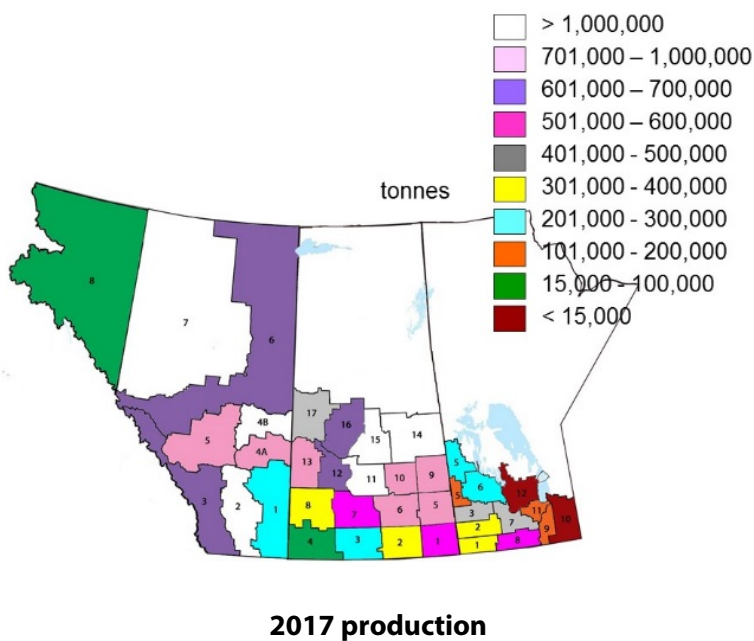
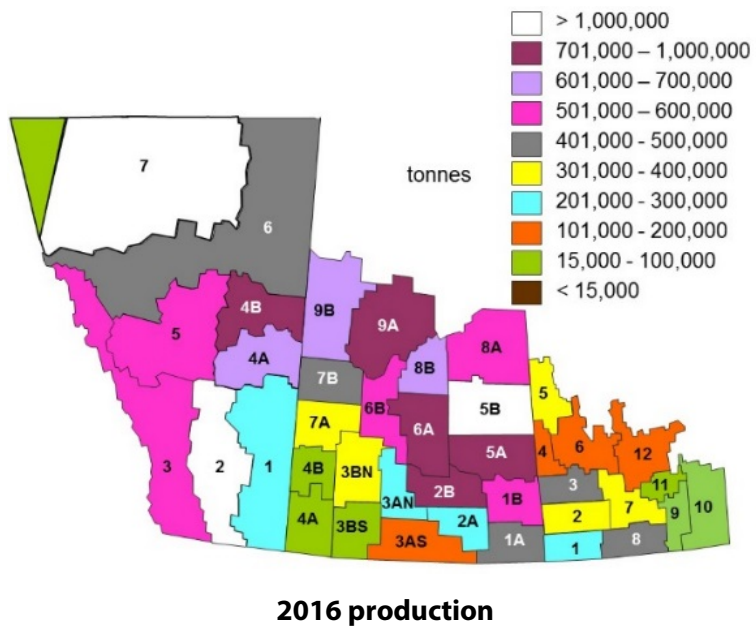
## Summary

The 2018 harvest showed a lower percentage of samples graded Canola, No. 1 Canada (74.8%) than the 2017 harvest (94.4%) and the 5-year average (91.5%) (Figure 4). Alberta-Peace River area showed the lowest percent of samples graded Canola, No. 1 Canada (52.1%) when compare to Manitoba (96.7%) and Saskatchewan (88.2%) (Figure 4). The crop district 7 of Alberta-Peace River (northwest section of the province) showed the lowest percent of samples graded Canola, No. 1 Canada (only 14.5%).

The 2018 western Canadian canola (Canola, No.1 Canada) crop was characterized by an oil content average lower than what was observed for the 2017 crop (44.1% in 2018 versus 45.0% in 2017) and a higher protein content average (21.1% in 2018 versus 20.1% in 2017) for samples graded Canola, No.1 Canada (Table 1). The chlorophyll content average for Canola, No.1 Canada samples were similar in 2018 and in 2017 (10 and 11 mg/kg, respectively) (Table 1) with some areas in Alberta-Peace River showing averages higher than 20 mg/kg (Table 3). Total seed glucosinolate averages were very similar to last year (10  $\mu\text{mol/g}$  in 2018 and 2017).

The oleic acid content average of the 2018 canola crop is much higher than what was observed in 2017 (64.3% versus 62.9%) leading to a decrease of the linoleic acid and  $\alpha$ -linolenic acid contents when compared to the 2017 crop (18.3 and 8.7% versus 18.9 & 9.5% for linoleic acid and  $\alpha$  linolenic acid in 2018 and 2017, respectively). Total saturated fatty acid content for the 2018 canola crop was slightly higher than what was observed in 2017 (6.7% versus 6.5%). This resulted in a very different iodine value for the 2018 canola crop when compared to the 2017 canola crop (111.1 units in 2018 versus 113.1 units for 2017).

**Figure 1 – Maps of western Canada showing 2016 and 2017 canola production per Crop Districts and Agricultural Census Regions**



Note: In 2017, Saskatchewan canola production data were reported by Agricultural Census Area instead of Crop district, there are now 17 Agricultural Census Area instead of 20 Crop Districts.

**Table 1 – Canola, No. 1 Canada: Quality data for 2017 and 2018 harvests plus the 5-year means**

Quality parameter	2018	2017	2013-17 Mean
Number of received samples	2505	2309	1967
Number of Canola, No. 1 Canada samples	1874	2180	1802
Oil content <sup>1</sup> (% , 8.5% moisture)	44.1	45.0	44.5
Protein content <sup>1</sup> (% , 8.5% moisture)	21.1	20.1	20.2
Oil-free protein of the meal <sup>1</sup> -(%, 12% moisture)	39.1	38.0	37.8
Chlorophyll content (mg/kg in seed)	10	11	13
Total seed glucosinolates (µmol/g, 8.5% moisture)	10	10	10
Oil-free total glucosinolates of the meal (µmol/g, dry basis)	22	23	21
Free fatty acids (%)	0.15	0.15	0.15
Oleic acid (% in oil)	64.3	62.9	62.9
Linoleic acid (% in oil)	18.3	18.9	18.7
α-Linolenic acid (% in oil)	8.7	9.5	9.4
Erucic acid (% in oil)	0.00	0.01	0.01
Total saturated fatty acids <sup>2</sup> (% in oil)	6.7	6.5	6.7
Iodine value	111.0	113.1	112.6
Total mono-unsaturated fatty acids (MUFA) <sup>3</sup> (% in oil)	65.8	64.6	64.6
Total poly-unsaturated fatty acids (PUFA) <sup>4</sup> (% in oil)	27.0	28.5	28.2

<sup>1</sup> Protein content calculated from nitrogen content using N x 6.25

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

<sup>3</sup> 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.

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

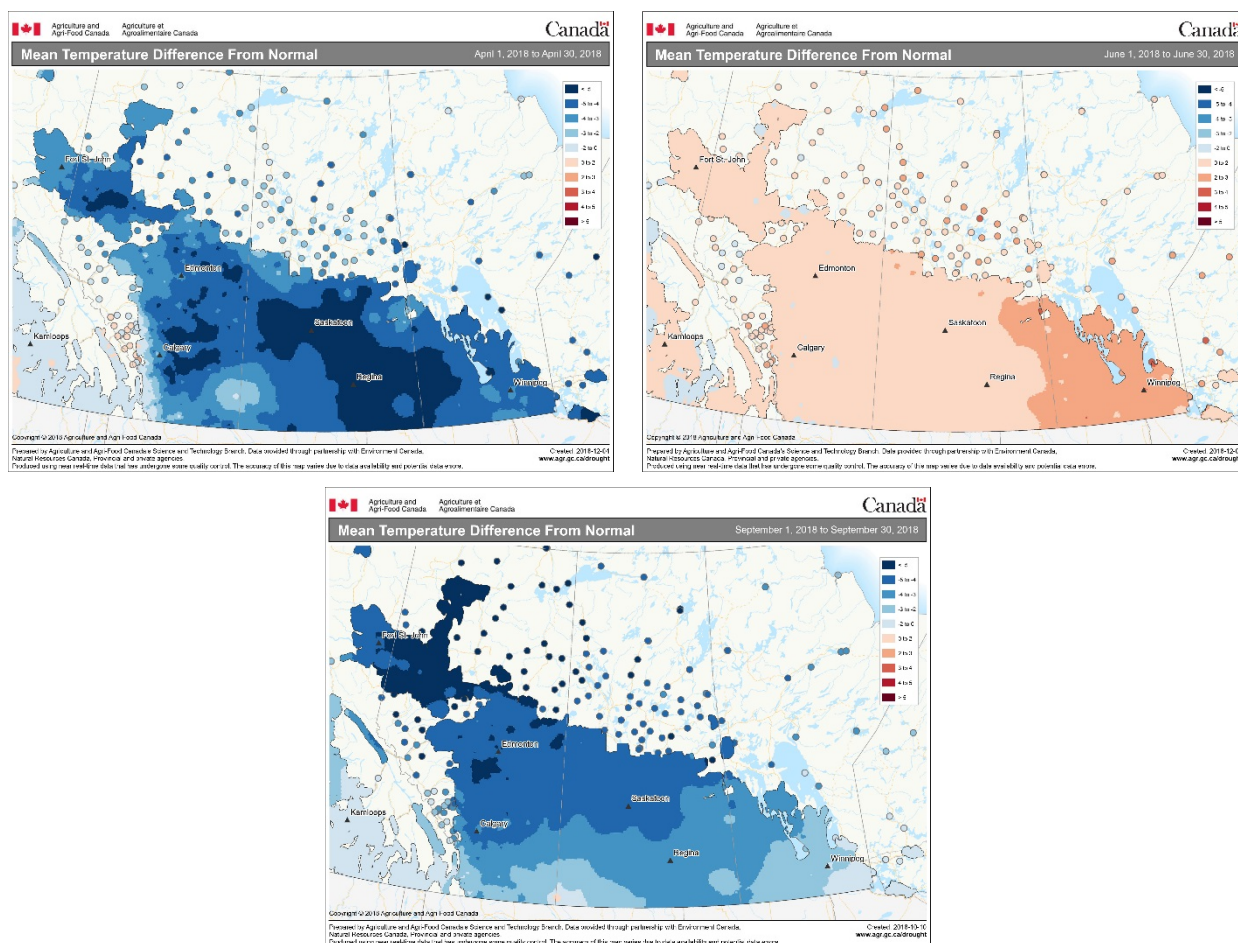
Mean free fatty acids average levels in 2018 Canola, No.1 Canada seed was similar to what was observed in 2017 (0.15%) (Table 1), however some crop district averages were higher than the western Canadian average due to the wet September harvest (Table 4).



# Weather and production review

## Weather review and effects on seeding and harvest

**Figure 2a – Maps - Monthly mean temperature difference from normal in Canada (Prairies) during the 2018 growing season (April and September 2018).**

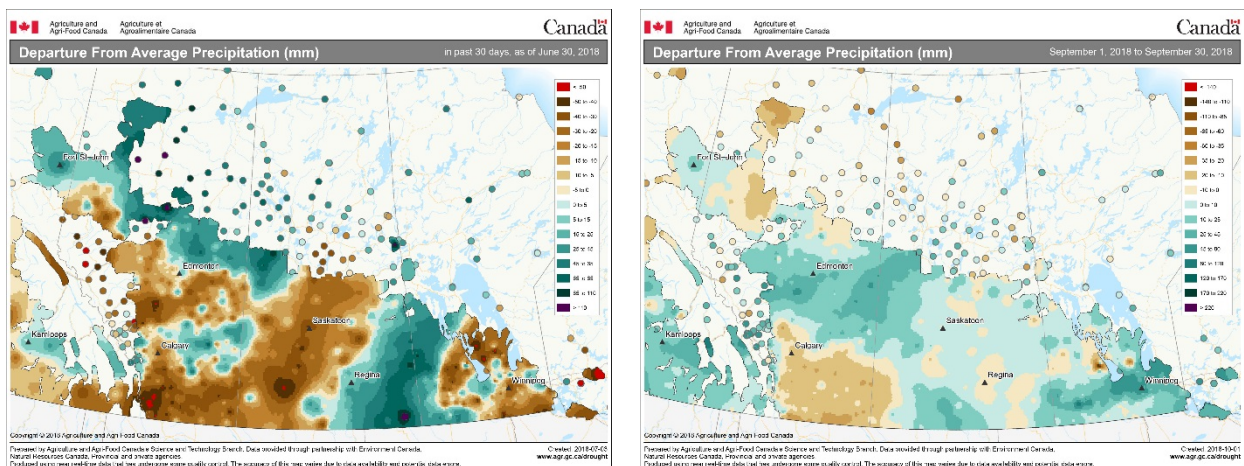


The weather review and weather maps (Figures 2a and 2b) were obtained from Agriculture and Agri-Food Canada (<http://www.agr.gc.ca/DW-GS/current-actuelles.aspx?lang=eng&jsEnabled=true>) and [http://www.agr.gc.ca/atlas/maps\\_cartes/canadianDroughtMonitor/monthlyAssessments/en/](http://www.agr.gc.ca/atlas/maps_cartes/canadianDroughtMonitor/monthlyAssessments/en/). Seeding and harvest progress for each province are presented in Figure 3. These graphs were made using data reported by the provincial reports that could be found at <https://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html> for Manitoba, <http://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/market-and-trade-statistics/crops-statistics/crop-report/2017-previous-weeks-crop-reports> for Saskatchewan and [http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/All/sdd4191](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/All/sdd4191) for Alberta.



**Seeding conditions:** In the prairies, the first part of April experienced much lower than normal temperatures. It got warmer by mid-April, the warmer second part of the month finally allowed the snow to melt, however field operations and seeding were still delayed in the three provinces. In May the overall temperatures were on average 3 to 4°C warmer than normal (Figure 2a). Seeding started early May and progressed steadily as warm temperatures and sparse rains prevailed for most of the month. By the end of May seeding was almost completed in the three provinces (Figure 3). Moisture was an issue as some areas received below normal precipitations, but overall timely rains allowed seeds to germinate.

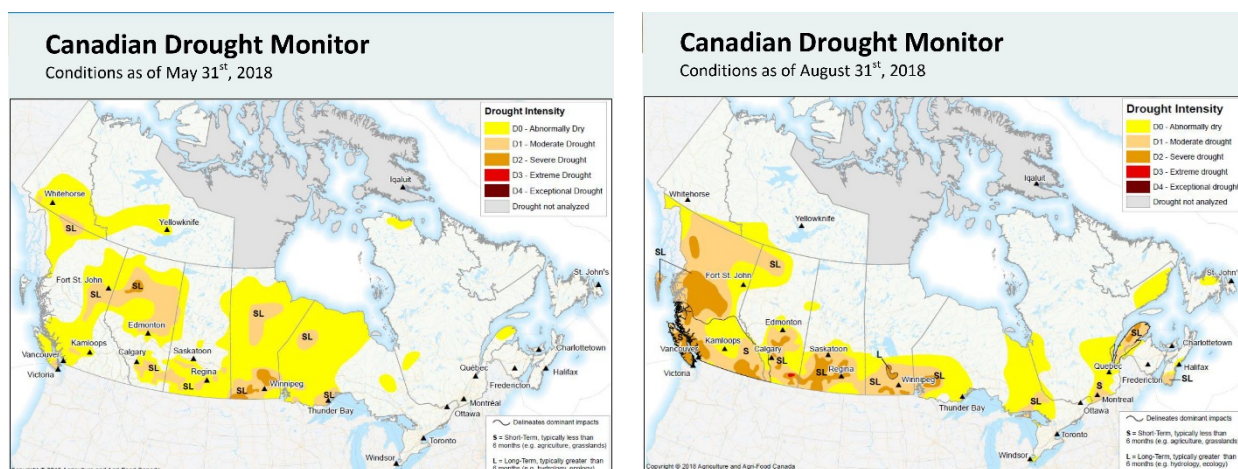
**Figure 2b – Maps - Accumulated precipitation and departure from normal in Canada (Prairies) during the 2018 growing season (June 3<sup>rd</sup> to August 31<sup>st</sup> and April 1<sup>st</sup> to August 31<sup>st</sup>, 2018).**



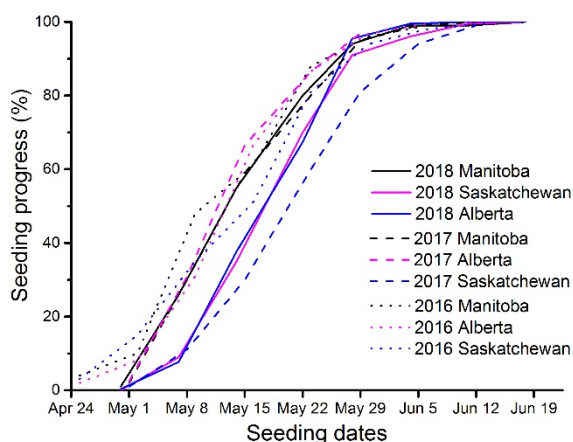
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**Growing season** Warmer than normal temperatures (average 2 to 3°C higher) persisted in June for most of the three provinces, however precipitations were not uniform throughout the provinces (Figure 2b). The lack of precipitation associated with warmer than normal temperatures started to be an issue in some areas of the southern Alberta and the southwest Saskatchewan (Figure 2b). Northwest Alberta and the Peace River area received over 150% of their June rainfall (Figure 2b) resulting in a spotty seed emergence as there was either too much or too little moisture in Alberta and Saskatchewan. The same precipitation pattern followed in July, where the northern prairies received more than average precipitations whereas the southern Alberta and Saskatchewan was in dire need of rain. There was little to no precipitation in August, leading to drought like conditions in most of the prairies (Figure 2c). During the growing season, a significant percent of canola field damages were generally due to lack of moisture associated with high temperatures, high winds and hail. However, in some localized areas, too much moisture was also an issue (Figure 2a). These contrasting growing conditions especially in Alberta-Peace River led a crop that was delayed due to cold and precipitations in the north-west areas and a crop that matured quickly in the south of the province.

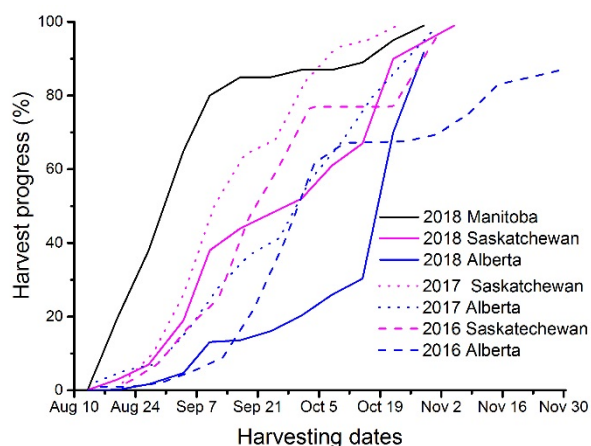
**Figure 2c – Maps – Canadian drought conditions as of May 31<sup>st</sup>, 2018 and August 31<sup>st</sup>, 2018**



**Figure 3 – Seeding and harvest progress in Saskatchewan and Alberta for the 2016, 2017 and 2018 growing seasons**



Seeding progress: 2016, 2017 and 2018



Harvest progress: 2016, 2017 and 2018

**Harvesting conditions:** Harvest started mid-August as crops were drying fast due to the hot and dry weather conditions (Figure 3). By the September long weekend about 65% of the canola was harvested in Manitoba versus 19% in Saskatchewan and only 4% in Alberta-Peace River. In Alberta-Peace River, the southern area was the most advanced with 15% of the canola crop in the bin versus 33 and 37% in the southeast and southwest areas of Saskatchewan. Weather conditions changed drastically after the September long weekend, with frost reported on September 4 and 5 in the three provinces. Cold Arctic weather conditions brought a first snow fall mid-September in Alberta-Peace

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River and a second one at the end of September halting all harvest progress. Harvest was almost at a standstill from mid-September to mid-October, progressing extremely slowly due to the cold and wet conditions that predominated over that period (Figure 3). During that period the harvest progress was even slower in Alberta-Peace River and Saskatchewan than for the 2016 harvest progress when the longest harvest in history as it finished the following spring. Dry weather returned the second half of October allowing producers to complete their harvest. However, about 2% of the canola crop was not harvested in Alberta and British Columbia (Table 2). This split harvest resulted in two types of canola quality, a first crop grown under hot and dry conditions harvested at maturity and the second crop grown under cold and wet conditions leading the harvest of immature seeds.

## Production

In 2018, canola producers seeded 9,191.6 thousand hectares of canola, about 1% less than in 2017 (9,273.3 thousand hectares), but about 8% more than the 5-year average (Table 2). This year, 111.5 thousand hectares were not harvested compared to 39.6 thousand hectares in 2017. Statistics Canada reported that the 2018 western Canada average yield was 2,231 kg/hectare, lower than what was observed in 2017 (2,300 kg/hectare) slightly lower than the 5-year yield average of 2,240 kg/hectare. In 2018, the highest yield average was observed in Manitoba at 2,427 kg/hectare (2,500 kg/hectare in 2017), followed by Saskatchewan at 2,205 kg/hectare (2,200 kg/hectare in 2017), British Columbia (2,281 kg/hectare in 2018 versus 2,000 kg/hectare in 2017) and Alberta (2,172 kg/hectare in 2018 versus 2,400 kg/hectare in 2017). As of January 2019, Statistics Canada reported that the 2018 Canadian production was 20.342 million metric tonnes about one million metric tonne less than last year record production of 21.231 million metric tonnes but well above the 5-year average production (18,852,960 tonnes). In 2018, the provincial production for Manitoba, Saskatchewan, Alberta and British Columbia accounted for 16.3, 53.7, 28.9 and 0.4% (14.8, 52.4, 32.0 and 0.4% in 2017) of the total canola production in Canada, respectively (Table 2).

**Table 2 - Seeded area and production for western Canadian canola**

	Seeded area			Harvested area			Production <sup>1</sup>		
	thousand hectares			thousand hectares			thousand tonnes		
	2018	2017	2013-17	2018	2017	2013-17	2018	2017	2013-17
Manitoba	1,382.4	1,278.8	1,295.0	1,367.5	1,276.8	1,280.4	3,318.4	3,147.9	2,830.0
Saskatchewan	4,997.9	5,151.6	4,575.4	4,955.0	5,131.4	4,549.1	10,927.1	11,181.1	9,710.1
Alberta	2,755.9	2,804.5	2,630.5	2,703.0	2,788.3	2,605.0	5,870.6	6,826.6	6,160.2
British Columbia	55.4	45.3	40.62	54.3	44.5	39.7	123.9	90.5	80.7
<b>Western Canada</b>	<b>9,191.6</b>	<b>9,280.2</b>	<b>8,541.48</b>	<b>9,079.8</b>	<b>9,241.0</b>	<b>8,474.12</b>	<b>20,240.0</b>	<b>21,246.1</b>	<b>18,780.96</b>
<b>Canada</b>	<b>9,232.2</b>	<b>9,313.4</b>	<b>8,573.52</b>	<b>9,119.7</b>	<b>9,273.1</b>	<b>8,505.32</b>	<b>20,342.5</b>	<b>21,313.2</b>	<b>18,852.96</b>

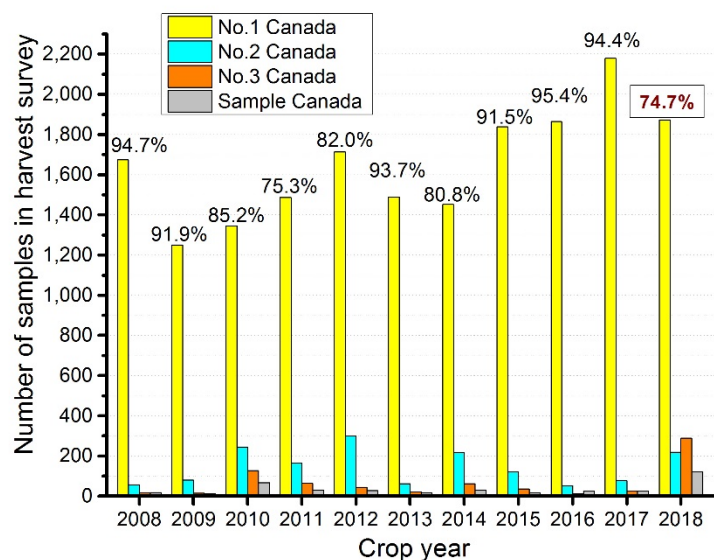
<sup>1</sup> For all production data please consult Statistics Canada. [Table 32-10-0359-01 Estimated areas, yield, production, average farm price and total farm value of principal field crops, in metric and imperial units at:](http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0010010&tabMode=dataTable&srchLan=-1&p1=-1&p2=9)  
<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 2018 harvest is based on analyses of 2,505 individual canola samples. Composites of Canola, No.1 Canada from each crop districts from each province were made using these samples. Specialty oil samples, such as high oleic acid, low linolenic acid, and high erucic acid, were excluded from this report. In 2018, we received close to 200 more samples than in 2017 and over 500 more samples than the 5-year average (Table 1). Crop district composites of Canola, No.1 Canada samples were prepared using 1,796 samples.

Exports of commercially cleaned canola exports (from August 2018 to December 2018) contained on average 1.76% dockage, ranging from 0.70 to 2.5%, 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 usually have even greater reductions in measured quality components. The composition of samples received in 2017 and 2018 was compared and 5-year average data are presented in the report (Table 1). Comparison with the quality of Canadian canola export shipments is provided in Table 6.

**Figure 4 – Canola samples received in harvest sample program and the historical grade distribution, 2008-18**



In 2018, only 74.7% of the samples were graded Canola, No. 1 Canada, compared to 94.4% in 2017 and 91.2% for the 5-year average (Figure 4). Since 2008, this is the lowest percent of samples graded Canola, No. 1 Canada, the second worse was 75.3% in 2011. The grade distribution of the 2018 canola



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crop varied greatly between provinces and between crop districts within a province. The lowest percent of samples graded Canola, No. 1 Canada were found in Alberta-Peace River where only 52.1% of the samples were graded Canola, No. 1 Canada, versus 88.2% in Saskatchewan and 96.7% in Manitoba. The area with the most damaged canola samples was the north-west part of Alberta-Peace River, only 14.5% of the samples from crop district 7 from Alberta-Peace River were graded Canola, No. 1 Canada. The main damage was distinctly green seed count (DGR), as immaturity was prevalent due to an early September killer-frost. DGR were 0.36% (0.41% in 2017) in Canola, No. 1 Canada, 4.04% (3.29% in 2017) in Canola, No. 2 Canada, 12.01% (8.51% in 2017) in Canola, No. 3 Canada and 32.95% (7.17% in 2017) in Sample.

## Quality of western Canadian canola 2018

Tables 3 to 5 show detailed information on the quality of western Canadian canola harvested in 2018 whereas Table 6 compares the quality of 2018 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 a 5-year average production (Statistics Canada production estimate) combined with an estimate of grade distribution per crop district.

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 content of the oil-free meal is presented at 12% moisture whereas the glucosinolate content of the oil-free meal is reported on dry basis 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 2018 mean oil content (44.1%) is significantly lower than the 2017 average (45.0%) (Table 1) and the 5-year average (2013-2017) of 44.5% (Table 1, Figure 5). The 2018 average is also lower than the 10-year average (44.4%).

This year again the Alberta-Peace River oil content mean (43.2%) for samples graded Canola No. 1, Canada is lower than the one observed in Manitoba (44.1%) and Saskatchewan (44.4%) (Table 3). The oil content of individual Canola, No.1 Canada samples harvested in 2018 by producers across western



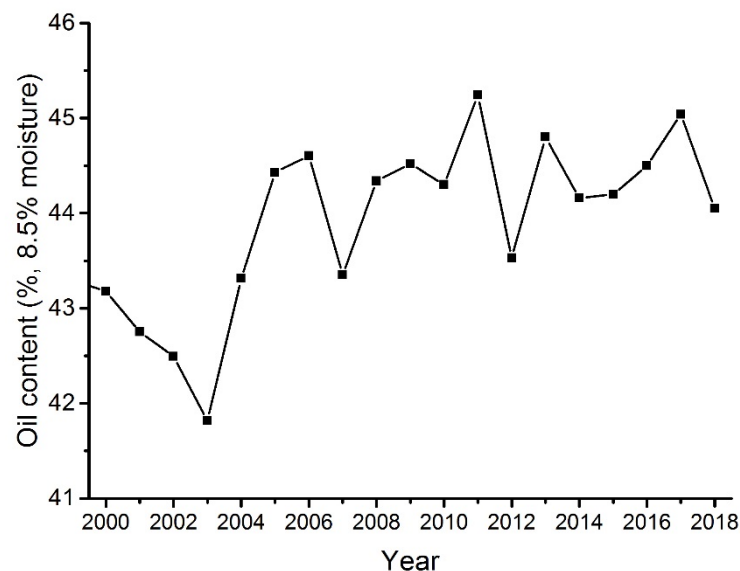
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Canada ranged from 39.5% to 51.2% in Manitoba, 37.8% to 50.4% in Saskatchewan and 37.9% to 50.1% in Alberta-Peace River (Table 3).

Oil content for Canola, No. 2 Canada (44.7%) is higher than for Canola, No. 1 Canada (44.1%). Oil content for Canola, No. 2 Canada samples from western Canada ranged from 37.2% to 50.1% (Table 3). This year the oil content averages for Canola, No. 3 Canada and samples are 44.7% and 44.1%, respectively.

Oil content is influenced by both genetics and environment. For any known canola variety, hot and dry growing conditions will give canola seed with lower oil content when compared to cool growing conditions. The very dry and hot conditions observed during the 2018 growing seasons in the southern part of Alberta-Peace River were responsible for the noticeable lower oil contents observed in the samples from crop districts 1,2 and 3 compared to samples from crop districts 4,5,6 and 7, when samples graded Canola, No.1 Canada were assessed. Most if not all Alberta-Peace River samples graded Canola No.1 Canada were harvested prior the first snow fall (mid-September), suggesting hot and dry growing conditions for these samples. Samples from northern Alberta were grown in much cooler conditions and were immature when the snow and the first killer frost hit the province, resulting in canola samples with higher oil content unfortunately associated with very high green seed counts and high chlorophyll contents.

**Figure 5 – Canola, No. 1 Canada - harvest samples, 2000–2018**  
**Oil content of the seed (% at 8.5% moisture)**



The oil content mean of commercially clean canola exports of Canola, No.1 Canada was 43.3% as of December 18. They averaged 43.2% for the August-November 2018 exports (Table 6). The oil content for last year's shipping season for commercially clean cargoes of canola averaged 44.1%.

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 from the dockage. Harvest samples are completely cleaned (0.00% dockage) whereas the dockage averages for the Commercially Clean August-to-November 2018 exports and December 2018 exports were 1.76 and 1.66% respectively. Last shipping season, dockage for the non-commercially clean exports averaged 2.81% (Table 6).

It is expected that the mean oil content of Canadian exports for the 2018-19 shipping season will be lower than for last shipping season, in the 43.0% range.

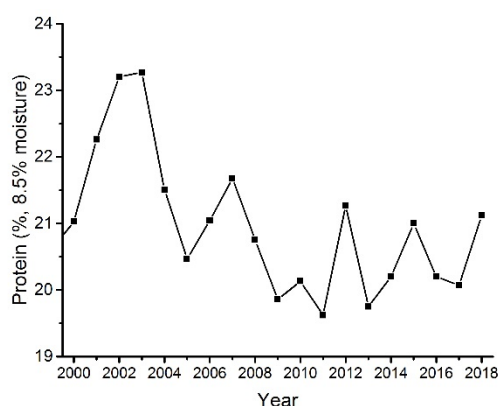
## Protein content

Crude protein content averages were 21.1% for Canola, No.1 Canada, 20.8% for Canola, No. 2 Canada and 20.0% for Canola, No. 3 Canada. Average protein seed content observed for Canola, No.1 Canada in 2018 was higher than the one observed in 2017 (20.1%). This is higher than the 5-year average (20.2%) (Table 1, Figure 6). Protein content of individual producer samples ranged from 14.9 to 28.9% for Canola, No. 1 Canada samples and from 14.1 to 25.6% for Canola, No. 2 Canada samples (Table 3). The protein contents of samples graded Canola, No. 3 Canada and Canola, Sample Canada ranged from 16.00 to 24.1% and 17.7 to 23.1% (average 21.0%), respectively.

Seed protein averages of Canola, No. 1 Canada commercially clean exports were 21.1% in December 2017 and 21.0% in the August-November 2018 exports (Table 6). Protein content averages for the actual shipping season are higher than what was observed for last shipping season (20.4% for August-July 2018).

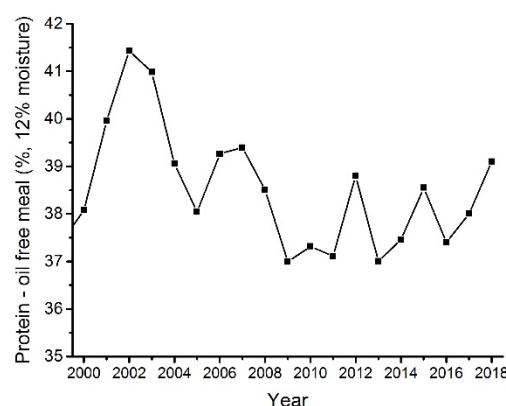
**Figure 6 – Canola, No. 1 Canada - harvest samples, 2000–2018**

**Protein content of the seed (% , at 8.5% moisture)**



**Figure 7 – Canola, No. 1 Canada - harvest samples, 2000–2018**

**Protein content of the meal (% , at 12% moisture)**



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The 2018 protein content calculated to an oil-free meal at 12% moisture basis is 39.1%, which is significantly higher than what was observed in 2017 (38.0%) and for the 5-year average (37.8%) (Table 1, Figure 7). The calculated protein content of the oil-free meal (100% defatted at 12% moisture) was much higher in Alberta-Peace River (40.1%) than in Saskatchewan (38.8%) and in Manitoba (38.9%). 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, the Canadian Grain Commission is reporting the protein of oil-free meal at 12% moisture (Table 1, Figure 7) instead of the 8.5% moisture used for the seeds. It is to be understood that the reported value 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.

Commercially clean exports of Canola, No. 1 Canada, had a calculated meal protein content average for the oil-free meal of 38.3 (12.0% moisture) in December 2018. The meal protein content average for the August-November 2018 exports was 38.2% (12% moisture). These results are higher than what was observed during last shipping season, the average being 37.9% (12% moisture) for commercially clean exports of Canola, No. 1 from August 2017 to July 2018 (Table 6).

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

## Chlorophyll content

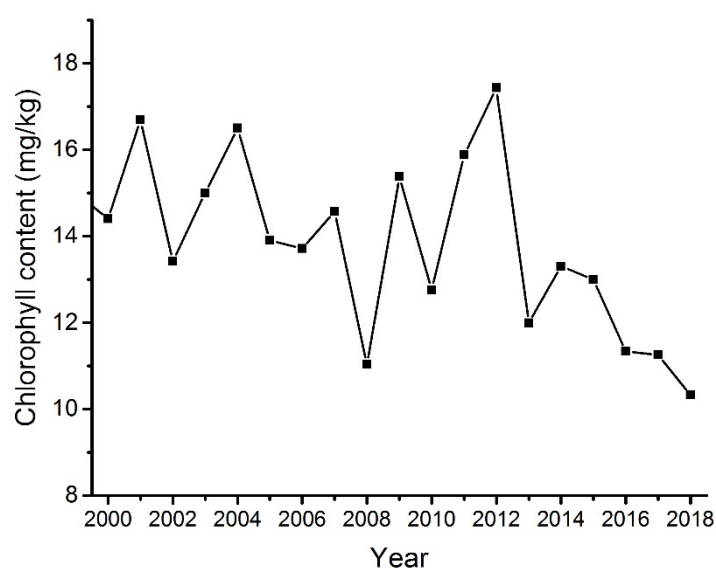
Chlorophyll content averages of producer samples graded Canola, No. 1 Canada were 7, 10 and 13 mg/kg in Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 3). The overall average for Canola, No. 1 Canada was 10 mg/kg, very similar to what was observed for the 2017 harvest (11 mg/kg) (Figure 8). This is slightly lower than the calculated 5-year average (13 mg/Kg). However, individual producer samples of Canola, No. 1 Canada showed important variations due to the very variable growing conditions. Chlorophyll contents of samples graded Canola, No. 1 Canada from Manitoba ranged 4 to 53 mg/kg whereas the ones from Saskatchewan and Alberta ranged from 4.0 to 40 mg/kg and 4.0 to 56 mg/kg, respectively (Table 3). Chlorophyll content means vary greatly from year to year (Figure 8) due to environmental conditions. Once again, this year, location had an important effect on chlorophyll contents measured in the canola samples. Samples graded Canola, No. 1 Canada from crop districts 4, 5, 6 and 7 from Alberta-Peace River had chlorophyll content averages significantly higher than samples from Saskatchewan and Manitoba and other crop districts from Alberta-Peace River.

Chlorophyll levels (Table 3) for Canola, No. 2 Canada samples averaged 43 mg/Kg which is much higher than what was observed for the 2017 harvest (34 mg/kg). Samples graded Canola, No. 3 Canada and Sample had an average chlorophyll content of 101 and 201 mg/kg. The downgraded

canola samples, from Canola, No. 2 Canada to Sample, exhibited extremely high levels of chlorophyll contents – levels not seen since 2004 when a killer frost hit the prairies mid of August.

To be graded Canola, No. 1 Canada, samples must contain no more than 2.00% distinctly green seeds. Distinctly green seed averages were 0.31 (0.26 in 2017), 0.32 (0.38% in 2017) and 0.48 % (0.52% in 2017) in Manitoba, Saskatchewan and Alberta-Peace River, respectively for samples graded Canola, No. 1 Canada.

**Figure 8 – Canola, No. 1 Canada - harvest samples, 2000–2018**  
**Chlorophyll content of the seed (mg/Kg, as is moisture content)**



The chlorophyll content of Canadian canola exports is affected by distinctly green seeds and dockage content (1.66 and 1.76% for December and August-November 2018 exports, respectively, no more than 2.5% for commercially clean exports). In August 2018, the DGR counts averaged 0.54% for individual commercially clean cargoes of Canola, No. 1 Canada ranging from 0.4 to 0.8%, whereas chlorophyll contents averaged 13 mg/kg ranging from 10 to 19 mg/kg. The monthly DGR averages increased as the shipping season proceeded. So far, the maximum chlorophyll content average was obtained for the December exports, 24 mg/kg, corresponding to a DGR count average of 1.76%. August-December individual export ranged from 0.2 to 2.0% DGR count and from 7 to 33 mg/kg for chlorophyll content. These chlorophyll content variations reflected the distinctly green seed variations within the exports (0.2 to 2.0%) and between harvest DGR averages and export DGR averages (0.36 versus > 1.0%); the higher distinctly green seeds content and the higher chlorophyll content in exports (Table 6).

It is expected that chlorophyll data for the 2018-19 exports will be higher than what was observed in for the 2017-18 shipping season due to (1) higher chlorophyll content in the individual Canola, No. 1

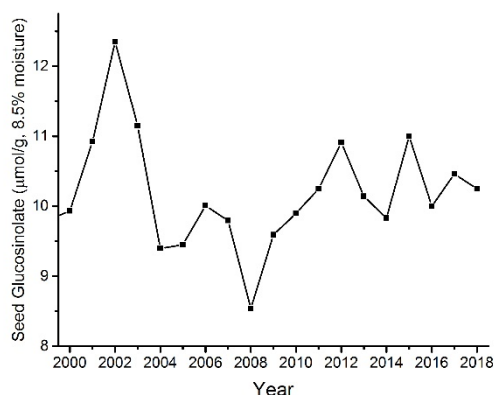
Canada samples compared to last year crop and (2) the high percent of samples of lower grades that have to be commercialized and will likely be blended with top grade samples, the blended samples still fitting Canola, No. 1 Canada specifications (no more than 2.0% green seeds, 0.1% heated seeds) as defined by the Official Grain Grading Guide (<https://grainscanada.gc.ca/oggg-gocg/10/oggg-gocg-10d-eng.htm>).

## Glucosinolate content

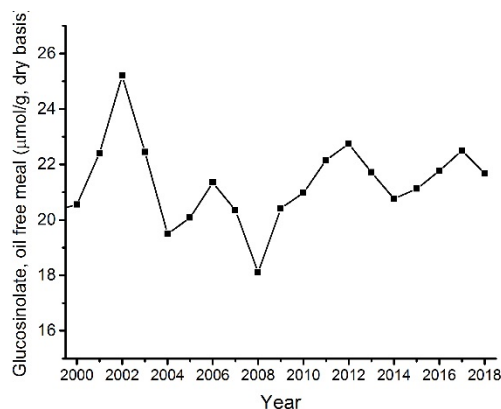
The 2018 total glucosinolate content of the seeds (Figure 9) averaged 10  $\mu\text{mol/g}$ , identical to what was observed in 2017 and 2016 (10  $\mu\text{mol/g}$ ). Since 2009, total glucosinolate content averages remained in the 10  $\mu\text{moles/gram}$  range (Table 1, Figure 9). There was no 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 for the December 2018 commercially clean canola exports was 11  $\mu\text{mol/g}$  of seed, similar to what was observed in the 2018 harvest survey (Table 6). Glucosinolate contents of canola exports for the 2018-19 shipping season will remain similar to the averages observed during the 2017-18 shipping season (Table 6).

**Figure 9 – Canola, No. 1 Canada - harvest samples, 2000–18**  
**Total glucosinolate content of the seed**  
**( $\mu\text{mol/g}$  seed, at 8.5% moisture)**



**Figure 10 – Canola, No. 1 Canada - harvest samples, 2000–18**  
**Total glucosinolate content of oil-free meal**  
**( $\mu\text{mol/g}$  seed, dry basis)**



In 2018, 10  $\mu\text{moles/gram}$  of total glucosinolates in the seed corresponded to 22  $\mu\text{moles/gram}$  in oil-free meal on dry basis, very similar to the 5-year average (21  $\mu\text{mol/g}$  dry basis) and the 2017 harvest average (23  $\mu\text{mol/g}$  dry basis) (Figure 10). The total glucosinolate of the Canadian canola meal obtained from conventional crushing plants (expeller press followed by solvent extraction) is much

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lower than this calculated value. The calculated values assumes that 100% of the oil is recovered from the seed during crushing and that no glucosinolate is destroyed during processing, which is never the case.

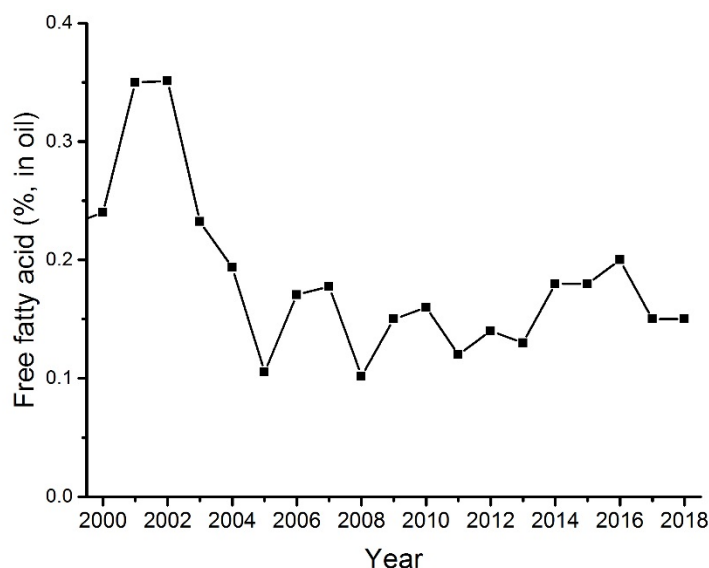
## Free fatty acids content

The average free fatty acids (FFA) content of the oil for the 2018 canola is 0.15%, identical to what was observed in 2017 and calculated for the 5-year average (Tables 1 and 4, Figure 11). FFA averages for Canola, No. 1 Canada samples from Alberta-Peace River (0.17%) and Manitoba (0.17%) were slightly higher than what was observed in the samples from Saskatchewan (0.13%) (Table 4). Canola, No. 1 Canada samples from Manitoba crop districts 4, 5, 6, 9+10 and 12 and crop districts 5 and 7 from Alberta-Peace River had FFA averages higher than 0.2%.

Samples graded Canola, No. 2 Canada presented FFA levels much higher than samples graded Canola No. 1, Canada, 0.26% versus 0.15% (Table 4). There was no significant difference between Saskatchewan and Alberta-Peace River averages regarding the FFA averages. However, FFA averages for the Manitoba samples were higher for all grades than the Saskatchewan and Alberta-Peace River averages (Table 4). Growing conditions varied in the prairies, this year, the main damage was green seed counts linked to seed immaturity mainly in the northwestern part of Alberta-Peace River. It is likely that seeds were quite mature in Manitoba when the September rains obliged the producers to pause their canola harvest in some areas; moisture on mature grains usually leads to germination which could results in higher FFA in some canola samples.



**Figure 11 – Canola, No. 1 Canada - harvest samples, 2000–18**  
**Free fatty acid content (in % as oleic acid )**



In December (2018), FFA level of commercially clean Canola, No.1 Canada exports averaged 0.22% (0.23% for the 2018 August to November exports). The FFA level of individual commercially clean Canola, No.1 Canada exports ranged from 0.12 to 0.53% (Table 6).

Over the year, it has also been noticed that FFA levels can increase during the shipping season as storage condition can affect the activation of the seed hydrolytic enzymes leading to FFA production. We also observed that FFA in canola seed can be high due to field heat stress (high temperatures during the growing season) or to high seed moisture and sprouting due to precipitations at harvest and they could vary from load to load. This year, we experienced both, very hot and dry growing conditions in the south of Alberta-Peace River follow by a high moisture harvest (rain and snow in September) throughout the whole prairies.

## Fatty acid composition

The average level of erucic acid in the 2018 crop was 0.00% (below limit of quantification), which is very similar to what was observed for the last 5 years (0.01%) (Tables 1, 5, Figure 12). Similar to the 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  $\alpha$ -linolenic acid (C18:3) was 8.7%, which is almost one point lower than 2017 (9.5%) and the 5-year (9.4%) averages (Table 1, Figure 13). This year, samples from Manitoba and Saskatchewan had  $\alpha$ -linolenic acid averages much lower than the samples from

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Alberta-Peace River - 8.6, 8.5 and 9.0%, respectively (Table 5). The total content of poly-unsaturated fatty acids or PUFA were 27.1 (28.4% in 2017), 26.8 (28.4% in 2017) and 27.5% (28.5% in 2017) in Manitoba, Saskatchewan and Alberta-Peace River, respectively, for a western Canada average of 27.3% (28.5% in 2017). For canola, the PUFA contents are directly related to the contents  $\alpha$ -linolenic acid (C18:3) and linoleic acid (C18:2). This year, the ratio omega-6/omega-3 (linoleic acid/ $\alpha$ -linolenic acid) was 2.12 significantly higher than the 1.94 observed in 2017.

For Canola, No.1 Canada samples, the oleic acid (C18:1) content average of the 2018 crop is 64.3%, significantly higher than what was observed in 2017 (62.9%) and calculated for the 5-year average (62.9%) (Table 1, Figure 14). Oleic acid contents were similar in Manitoba (64.2%) and Saskatchewan (64.5%) and lower than what was observed in Alberta-Peace River (63.7%) (Table 5). The total content of mono-unsaturated fatty acids (MUFA) was 65.8 (64.5% in 2017), 66.0 (64.6% in 2017) and 65.3% (64.5% in 2017) in Manitoba, Saskatchewan and Alberta-Peace River, for a western Canada average of 65.8% (64.6% in 2018).

The fatty acid composition (oleic acid, linoleic acid and  $\alpha$ -linolenic acid) of the 2018 crop presented a very different composition when compared to the 2017 fatty acid composition (+1.3%, +0.5% and - 0.9% for oleic, linoleic and linolenic fatty acid contents). As a result, the iodine value which is a representation of the total unsaturation on the oil is very different in 2018 when compare to 2017. The 2018 iodine value averaged 111.0 units, 2.1 points lower than the 2017 iodine value average (113.1 units) and 1.6 units lower than the 5-year average (112.6 units) (Table 1, Figure 16). For Canola, No. 1 Canada, the iodine value averages were 110.9 (112.8 units in 2017), 110.6 (113.1 units in 2017) and 111.7 units (113.3 units in 2017) for Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 5). This year, iodine value of individual samples of Canola, No.1 Canada samples ranged from 103.2 to 122.0 units.

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

Average of saturated fatty acid content was 6.7% in 2018, slightly higher than the 2017 average (6.5%) and identical to the 5-year average (6.7%) (Tables 1 and 5). Since 2009, the saturated fatty acid content averages varied from 6.6 - 6.9% (Table 1, Figure 17). In 2018, the saturated fatty acid content averages were similar for the 3 provinces, (6.6, 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.

As all quality parameters, the fatty acid composition is greatly affected by variety and/or environment, however over the last couples of years, a lot of effort has been made to control the total saturates content of the oil in order to produce a healthy oil - the oil with the lowest total saturates content compared to all other vegetable oils. As a result, total saturates content has been very stable since 2009 but all other fatty acid contents – except erucic acid – can move around. This year, for individual samples of Canola, No.1 Canada, oleic acid, linoleic acid and  $\alpha$ -linolenic acid ranged from 55.2 to 69.4%, 14.6 to 23.7% and 5.4 to 12.5%, respectively. Samples from southern Alberta-Peace River (crop districts 1, 2, and 3) had a very different fatty acid composition than samples from the north of Alberta

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- Peace River (crop districts 5, 6 and 7), the hot and dry conditions in the south led to samples with less total unsaturation (more MUFA and less PUFA) when compared to samples grown in the north (more PUFA and less MUFA).

Environment alone is not responsible for the 2018 different fatty acid composition when compared to 2017 averages, variety (genetic) also played an effect. The varieties distribution in the 2018 survey was compared to the 2018 variety insured acreages reported by the Statistics Unit of the Canadian Grain Commission (<https://www.grainscanada.gc.ca/statistics-statistiques/variety-variete/varieties-en.htm>). The main varieties in our harvest survey were L233P at 17.3% (24.0% of insured acres), L252 at 11.8% (13% of insured acres) and L230 at 5.3% (6% insured acres), whereas last year the main three varieties were L252 (13% in the 2017 harvest, 16.1% 2017 insured acres), L140P (10.8% in the 2017 harvest, 12.9% 2017 insured acres) and L233P (4.2% in the 2017 harvest, 5.4% 2017 insured acres). The variety L233P showed the lowest  $\alpha$ -linolenic acid contents (8.1% in Manitoba, 7.8% in Saskatchewan & 8.0% in Alberta) and the highest oleic acid contents (65.4% in Manitoba, 66.2% in Saskatchewan and 65.9% in Alberta) when compared to L252 (9.1 & 62.6% in Manitoba, 9.2 & 62.9% in Saskatchewan and 9.6 & 62.6% in Alberta, for  $\alpha$ -linolenic acid and oleic acid, respectively) and L230P (9.3 & 63.0% in Manitoba, 9.3 & 62.9% in Saskatchewan and 10.1 & 62.3% in Alberta, for  $\alpha$ -linolenic acid and oleic acid, respectively).

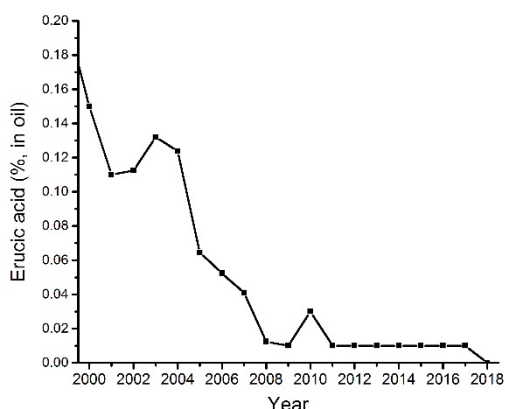
Long-term averages, as presented in Figures 15, 16 and 17 (2000-2018), also showed an important continuous change in the fatty acid composition of Canadian Canola. These long-term changes are a direct result from breeding targets. To fulfill the definition of a low saturated oil, canola oil needs to contain less than 7% total saturated fatty acid. This means that companies need to select seeds that have total saturated lower than 7.0% over different climates and geographic locations. This selection pressure has an effect on the other fatty acid contents, as the only method to maintain low total saturates is to increase unsaturation. In canola oil there are two types of unsaturation, the monounsaturated fatty acids (MUFA) and the polyunsaturated fatty acids (PUFA), since there is no breeding pressure on the MUFA or PUFA contents, they can vary greatly from one variety to the other. However, unsaturation for *Brassica napus*, the canola species grown right now in Canada means more oleic acid, a MUFA than PUFAs being  $\alpha$ -linolenic acid (omega 3, PUFA) or linoleic acid (omega-6, PUFA), leading to the trends seen in Figures 15, 16 and 17.

The different fatty acid composition of the 2018 harvest was reflected with the different fatty acid composition of the first 5 months exports of the 2018-19 shipping season (Table 6). Oleic acid and  $\alpha$ -linolenic acid averages, as well as the resulting iodine value averages, of commercially clean exports were different at the beginning of the shipping season compared to the 2018 December exports and last year shipping season. September and October export averages were 8.6 and 8.4%, and 64.3 and 64.7% for  $\alpha$ -linolenic acid and oleic acid averages (iodine value averages were 110.8 and 110.3 units) as exports were mainly constituted of early harvest canola from the southern part of Alberta. November and December exports averages increased for  $\alpha$ -linolenic acid and decreased for oleic acid as more canola crop from the northern part of Alberta-Peace River was incorporated to the exports.

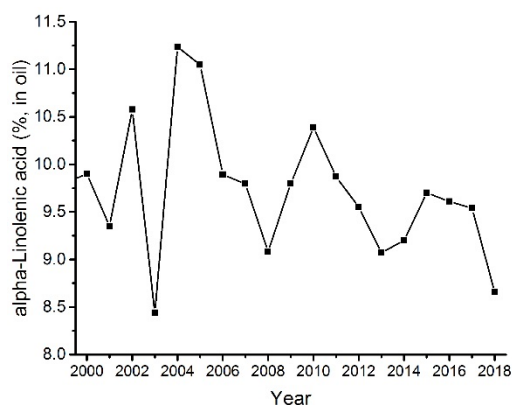
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The level of saturated fatty acids until December 2018 canola (6.6%) exports remained very similar to 2017-18 means (6.6%). It is expected that levels of erucic acid will remain very low for the new shipping season (below 0.1%) since erucic acid contents were very low in the 2018 harvest.

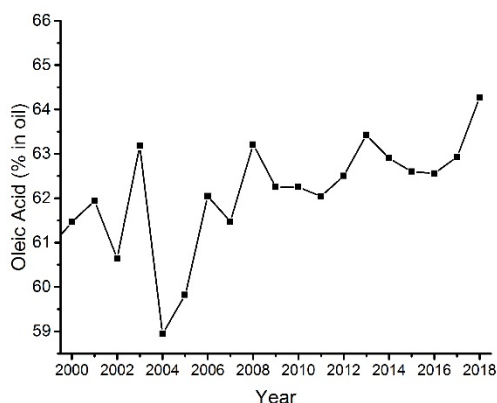
**Figure 12 – Canola, No. 1 Canada, erucic acid content of harvest samples, 2000-18**



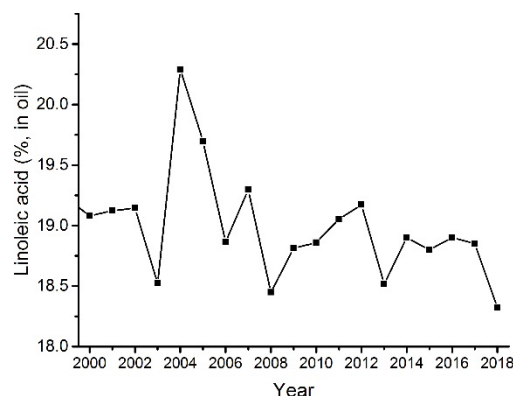
**Figure 13 – Canola, No. 1 Canada,  $\alpha$ -linolenic acid content of harvest samples, 2000-18**



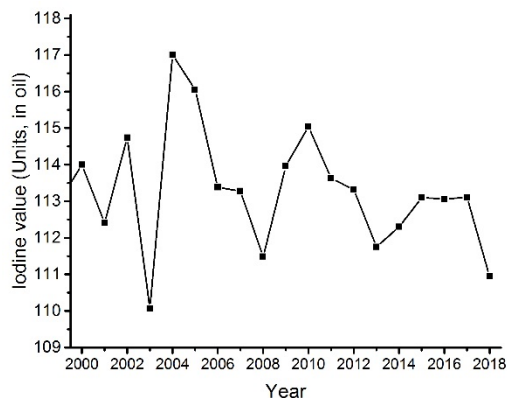
**Figure 14 – Canola, No. 1 Canada, oleic acid content of harvest samples, 2000-18**



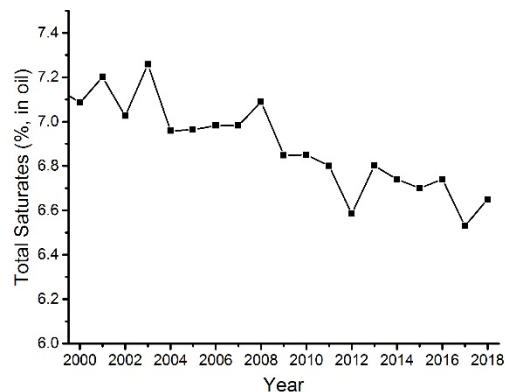
**Figure 15 – Canola, No. 1 Canada, linoleic acid content of harvest samples, 2000-18**



**Figure 16 – Canola, No. 1 Canada, iodine value of harvest samples, 2000-18**



**Figure 17 – Canola, No. 1 Canada, total Saturated fatty acid content of harvest samples, 2000-18**



**Table 3 – 2018 Harvest sample program**  
**Canola quality data by grade and province – oil, protein and chlorophyll contents**

	Number of samples	Oil content <sup>1</sup>			Protein content <sup>2</sup>			Chlorophyll content <sup>5</sup>		
		%			%			mg/kg		
		mean	min.	max.	mean	min.	max.	mean	min.	max.
<b>Canola, No. 1 Canada</b>										
Manitoba	439	44.1	39.5	51.2	21.0	15.1	26.1	7	4	53
Saskatchewan	854	44.4	37.8	50.4	20.8	14.9	27.6	10	4	40
Alberta-Peace River <sup>3</sup>	503	43.2	37.9	50.1	22.1	15.9	28.9	13	4	56
<b>Western Canada<sup>4</sup></b>	<b>1796</b>	<b>44.1</b>	<b>37.8</b>	<b>50.4</b>	<b>21.1</b>	<b>14.9</b>	<b>28.9</b>	<b>10</b>	<b>4</b>	<b>56</b>
<b>Canola, No. 2 Canada</b>										
Manitoba	5	44.1	43.9	46.0	20.3	18.1	22.5	47	28	72
Saskatchewan	49	44.9	39.5	50.1	21.5	14.1	23.7	49	4	81
Alberta-Peace River <sup>3</sup>	118	44.6	37.2	49.1	20.3	16.8	25.6	38	21	91
<b>Western Canada<sup>4</sup></b>	<b>172</b>	<b>44.7</b>	<b>37.2</b>	<b>50.1</b>	<b>20.8</b>	<b>14.1</b>	<b>25.6</b>	<b>43</b>	<b>4</b>	<b>91</b>
<b>Canola, No. 3 Canada</b>										
Manitoba	6	44.6	43.5	46.5	20.1	18.9	22.2	91	4	125
Saskatchewan	28	43.9	38.3	49.1	19.9	16.2	22.8	97	4	161
Alberta-Peace River <sup>3</sup>	181	44.9	40.3	49.9	20.1	16.0	24.1	102	24	171
<b>Western Canada<sup>4</sup></b>	<b>215</b>	<b>44.7</b>	<b>38.3</b>	<b>49.9</b>	<b>20.0</b>	<b>16.0</b>	<b>24.1</b>	<b>101</b>	<b>4</b>	<b>171</b>
<b>Canola, Sample Canada</b>										
Manitoba	4	40.7	40.8	42.4	21.5	20.6	22.4	140	23	219
Saskatchewan	12	44.6	39.9	47.5	19.4	18.0	21.3	229	89	204
Alberta-Peace River <sup>3</sup>	77	44.1	38.4	49.3	21.5	16.8	23.1	194	16	259
<b>Western Canada<sup>4</sup></b>	<b>93</b>	<b>44.1</b>	<b>38.4</b>	<b>49.3</b>	<b>21.0</b>	<b>16.8</b>	<b>23.1</b>	<b>201</b>	<b>16</b>	<b>259</b>

<sup>1</sup> 8.5% moisture basis

<sup>2</sup> N x 6.25; 8.5% moisture basis

<sup>3</sup> Includes part of the Peace River area that is in British Columbia

<sup>4</sup> Values are weighted averages based on production by province as estimated by Statistics Canada

<sup>5</sup> Individual canola samples are analyzed by Near-Infrared Spectroscopy, the accurate limit of quantification for chlorophyll is 4 mg/kg



**Table 4 – 2018 Harvest sample program**  
**Canola quality data by grade and province – glucosinolate and free fatty acid contents**

	Number of samples	Glucosinolates <sup>1</sup> μmol/g			Free fatty acids (%)
		mean	min.	max.	mean
Canola, No. 1 Canada					
Manitoba	439	10	5	19	0.17
Saskatchewan	854	10	5	17	0.13
Alberta –Peace River <sup>2</sup>	503	11	6	24	0.17
Western Canada <sup>3</sup>	1796	10	5	24	0.15
Canola, No. 2 Canada					
Manitoba	5	13	9	14	0.34
Saskatchewan	49	10	5	16	0.25
Alberta-Peace River <sup>2</sup>	118	11	6	16	0.27
Western Canada <sup>3</sup>	172	11	5	16	0.26
Canola, No. 3 Canada					
Manitoba	6	11	11	13	0.48
Saskatchewan	28	10	6	16	0.34
Alberta-Peace River <sup>2</sup>	181	12	5	19	0.35
Western Canada <sup>3</sup>	215	11	5	19	0.35
Canola, Sample Canada					
Manitoba	4	15	14	17	1.09
Saskatchewan	12	12	8	16	0.69
Alberta-Peace River <sup>2</sup>	77	13	6	23	0.83
Western Canada <sup>3</sup>	93	12	6	23	0.80

<sup>1</sup> 8.5% moisture basis

<sup>2</sup> Includes part of the Peace River area that is in British Columbia

<sup>3</sup> Values are weighted averages based on production by province as estimated by Statistics Canada

**Table 5 – 2018 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 <sup>3</sup>	Iodine value <sup>4</sup>
	C18:0	C18:1	C18:2	C18:3	C22:1	(%)	(Units)
<b><u>Canola, No. 1 Canada</u></b>							
Manitoba	1.8	64.2	18.5	8.6	0.00	6.6	110.9
Saskatchewan	1.7	64.5	18.2	8.5	0.00	6.7	110.7
Alberta-Peace River <sup>1</sup>	1.7	63.7	18.4	9.0	0.00	6.6	111.7
<b>Western Canada<sup>2</sup></b>	<b>1.7</b>	<b>64.3</b>	<b>18.3</b>	<b>8.7</b>	<b>0.00</b>	<b>6.7</b>	<b>111.0</b>
<b><u>Canola, No. 2 Canada</u></b>							
Manitoba	1.7	62.2	19.0	9.5	0.02	6.7	112.7
Saskatchewan	1.6	61.1	19.3	10.7	0.00	6.6	115.3
Alberta-Peace River <sup>1</sup>	1.5	61.2	19.4	10.6	0.00	6.5	115.3
<b>Western Canada<sup>2</sup></b>	<b>1.5</b>	<b>61.2</b>	<b>19.3</b>	<b>10.6</b>	<b>0.00</b>	<b>6.6</b>	<b>115.2</b>
<b><u>Canola, No. 3 Canada</u></b>							
<b>Manitoba</b>	1.6	60.5	19.6	10.6	0.02	6.8	115.1
<b>Saskatchewan</b>	1.5	59.7	19.8	11.2	0.02	6.7	116.4
<b>Alberta-Peace River<sup>1</sup></b>	1.5	59.7	20.1	11.1	0.00	6.6	116.6
<b>Western Canada<sup>2</sup></b>	<b>1.5</b>	<b>59.7</b>	<b>20.0</b>	<b>11.1</b>	<b>0.01</b>	<b>6.6</b>	<b>116.5</b>
<b><u>Canola, Sample Canada</u></b>							
<b>Manitoba</b>	1.8	60.0	20.0	9.7	0.00	7.1	113.0
<b>Saskatchewan</b>	1.4	67.7	20.8	11.4	0.23	6.9	117.2
<b>Alberta-Peace River<sup>1</sup></b>	1.5	58.4	20.6	10.9	0.04	6.9	116.3
<b>Western Canada<sup>2</sup></b>	<b>1.6</b>	<b>58.9</b>	<b>20.4</b>	<b>10.5</b>	<b>0.06</b>	<b>7.0</b>	<b>115.2</b>

<sup>1</sup> Includes part of the Peace River area that is in British Columbia

<sup>2</sup> Values are weighted averages based on production by province as estimated by Statistics Canada

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

<sup>4</sup> Calculated from fatty acid composition

**Table 6 – Canola, No. 1 Canada**  
**Comparison of the quality data of 2018 harvest sample averages with export shipment average**

Canola, No. 1 Canada - only	2018 Harvest program	Export			
		Commercially Clean			Non Commercially Clean
		December 2018	August to November 2018	Previous shipping season 2017-18	
Quality parameter					
Oil content <sup>1</sup> (%)	44.1	43.3	43.2	44.1	44.0
Protein content <sup>1,2</sup> (%)	21.1	21.0	21.0	20.4	20.3
Oil-free protein content <sup>2</sup> (%) at 12% moisture (%)	39.1	38.3	38.3	37.7	37.8
Chlorophyll (mg/kg seed)	10	24	15	15	14
Total glucosinolates <sup>1</sup> of the seed (µmol/g seed)	10	11	11	11	11
Free fatty acids, %	0.15	0.22	0.23	0.31	0.62
Erucic acid (% in oil)	0.00	0.02	0.02	0.02	0.03
Oleic acid (% in oil)	64.3	63.5	64.0	62.9	62.7
α-Linolenic acid (% in oil)	8.7	9.2	8.8	9.6	9.6
Total saturated fatty acids <sup>3</sup> (% in oil)	6.7	6.6	6.7	6.6	6.6
Iodine value	111.0	112.1	111.3	113.1	113.2
MUFA	65.8	65.2	65.6	64.5	64.4
PUFA	27.0	27.7	27.3	28.5	28.6
Distinctly green seed (DGR, %)	0.36	1.76	0.79	0.67	0.57
Dockage (%)	0.00	1.66	1.76	1.83	2.81
Loading moisture (%)	NA	8.7	8.5	7.7	7.8
Number of export samples	NA	19	75	236	20
Tonnage (tonnes)	NA	681,516	3,099,514	8,927,455	781,221

<sup>1</sup> 8.5% moisture basis

<sup>2</sup> Calculated using N x 6.25

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

<sup>4</sup> CC = Commercially Clean

<sup>5</sup> NCC = Not commercially clean

NA = Non-applicable