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# Quality of western Canadian canola 2020

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**Canada**

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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. We also recognize the assistance of the Industry Services Division of the Canadian Grain Commission in grading producer samples. Furthermore, we would like to extend our thanks to the Oilseeds staff for technical assistance as well as to Multimedia services for their assistance in the publication of this document.

**Note:** Canola samples for the Canadian Grain Commission's 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. Canadian Grain Commission grain inspectors assigned grade level based on Chapter 10 of the [Official Grain Grading Guide](#) for canola and rapeseed.

Individual harvest samples were analyzed for oil, protein, chlorophyll and total glucosinolates using a near-infrared (NIR) spectrometer. This report is based on the analyses, by reference methods, of composite samples made of the same grade canola by crop district and province. Composites were prepared by combining Canola, No. 1 Canada samples by provincial crop district; Canola, No. 2 and Canola, No. 3 Canada by province and Canola Sample Canada samples prepared for western Canada.

Seed content of oil, protein and total glucosinolates are reported on an 8.5% moisture basis. Meal protein content is reported at 12% moisture, whereas meal total glucosinolates content is reported at 8.5% moisture.

Crop district canola quality data for Manitoba and Alberta and census area quality data for Saskatchewan can be acquired through the Canadian Grain Commission. [Canola variety data](#) is also published yearly.

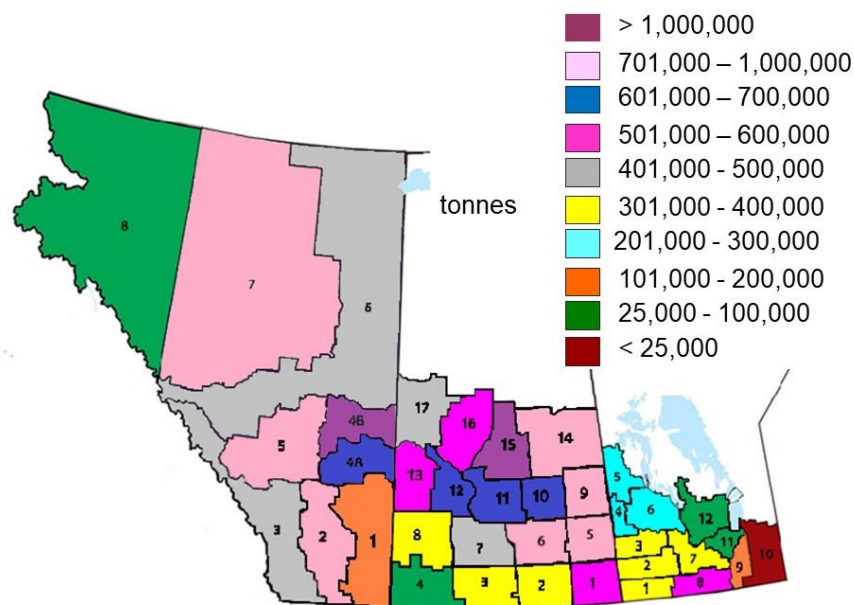
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## Introduction

This report presents quality data and information based on the Canadian Grain Commission's 2020 Harvest Sample Program results of western Canadian canola. The data presented here are from canola samples submitted throughout the harvest period by producers, grain companies and oilseed crushing companies. The quality parameters for canola consisted of oil, protein, chlorophyll, total glucosinolates, free fatty acids and the fatty acid composition.

The map in Figure 1 shows 2019 data for canola production in western Canada per crop district (Manitoba and Alberta) and agriculture census regions (Saskatchewan). Prior to 2018, all historic production reporting in the Prairie provinces was based on Small Area Data (SAD) that corresponded to crop districts. However, in 2018, Statistics Canada began using census agricultural regions (CARs) to describe production areas in Saskatchewan instead of SAD. The new CARs approach did not correspond well with the crop districts in Saskatchewan, affecting the historic quality comparisons. 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.

**Figure 1 – Map of western Canada showing 2019 canola production per crop districts (Manitoba and Alberta-Peace River) and agricultural census regions (Saskatchewan)**



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## Summary

The 2020 harvest showed a higher percentage of samples graded Canola, No. 1 Canada (90.5%) than the 2019 harvest (85.1%) and the 5-year average (88.3%; Table 1). Saskatchewan showed the lowest percent of samples graded Canola, No. 1 Canada with 89.4% (88.2% in 2019), followed by Alberta-Peace River area with 90.8% (75.6% in 2019) and Manitoba with 92.2% (97.0% in 2019). The census agricultural regions 16 (69.6%) and 17 (78.6%) of Saskatchewan, in the northwest area of the province, showed the lowest percent of samples graded Canola, No. 1 Canada.

The 2020 western Canola, No.1 Canada crop was characterized by an average oil content lower than what was observed in the 2019 crop (44.1% in 2020 vs. 44.6% in 2019) with a slightly higher average protein content (20.8% in 2020 vs. 20.4% in 2019; Table 1). The chlorophyll content average for Canola, No. 1 Canada samples was lower in 2020 than in 2019 (10 vs.12 mg/kg; Table 1). In 2020 and 2019, the total seed glucosinolate averages were 9  $\mu\text{mol/g}$  of seeds, which was slightly lower than the 5-year average (10  $\mu\text{mol/g}$  of seeds).

The fatty acid composition of the 2020 and 2019 crop is presented in Table 1. The 2020 average oleic acid content is much higher than what was observed in 2019 (63.9% vs. 62.4%) and the 5 year-average (63.0%). This was accompanied with a sharp decrease in  $\alpha$ -linolenic acid content (8.9% in 2020 vs. 10.0% in 2019) and a slight decrease in linoleic acid content (18.3% in 2020 vs. 18.7% in 2019). Total saturated fatty acid content for the 2020 canola crop was slightly higher than what was observed in 2019 (6.8% vs. 6.6%). This resulted in a very different iodine value for the 2020 canola crop when compared to 2019 (111.2 vs. 113.7 units).

Mean free fatty acids content in 2020 Canola, No.1 Canada seed (0.15%) was similar to what was observed in 2019 (0.16%; Table 1) with some Manitoba crop district averages higher than 0.3% .

**Table 1 – Canola, No. 1 Canada: quality data for 2020 and 2019 harvests plus the 5-year means**

Quality parameter	2020	2019	2015-19 mean
Number of received samples	2430	2320	2211
Number of Canola, No. 1 Canada samples	2199	1936	1939
Percent of samples graded Canola, No. 1 Canada	90.5	83.4	87.7
Oil content (% , 8.5% moisture)	44.1	44.6	44.4
Protein content <sup>1</sup> (% , 8.5% moisture)	20.8	20.4	20.5
Oil-free protein of the meal (% , 12% moisture) <sup>2</sup>	38.6	38.3	38.3
Chlorophyll content (mg/kg in seed)	10	12	11
Total seed glucosinolates (µmol/g, 8.5% moisture)	9	9	10
Oil-free total glucosinolates of the meal (µmol/g, 8.5% moisture)	18	17	18
Free fatty acids (%)	0.15	0.16	0.17
Oleic acid (% in oil)	63.9	62.4	63.0
Linoleic acid (% in oil)	18.3	18.7	18.7
α-Linolenic acid (% in oil)	8.9	10.0	9.5
Erucic acid (% in oil)	0.01	0.00	0.00
Total saturated fatty acids <sup>3</sup> (% in oil)	6.8	6.6	6.6
Iodine value	111.2	113.7	112.8
Total monounsaturated fatty acids (MUFA) <sup>4</sup> (% in oil)	65.4	64.0	64.6
Total polyunsaturated fatty acids (PUFA) <sup>5</sup> (% in oil)	27.3	28.8	28.3

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

<sup>2</sup> Trading rules for the North American sale of canola meal requires that calculations for protein claims must be reported on a 12% moisture basis with N x 6.25.

<sup>3</sup> Total saturated fatty acids are the sum of lauric (C12:0), myristic (C14:0), palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0) and lignoceric (C24:0).

<sup>4</sup> Total monounsaturated fatty acids are the sum of palmitoleic (C16:1), oleic (C18:1), eicosenoic (C20:1), erucic (C22:1) and nervonic (C24:1) acids.

<sup>5</sup> Total polyunsaturated fatty acids are the sum of linoleic (C18:2), linolenic (C18:3) and eicosadienoic (C20:2) acids.

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# Weather and production review

## Weather review - effects on seeding and harvest

[The weather review and weather maps](#) (Figures 2 to 5) were obtained from Agriculture and Agri-Food Canada.

Seeding and harvest progress graphs for each province (Figures 6a & 6b) were made using data reported by the provincial reports for [Manitoba](#), for [Saskatchewan](#) and for [Alberta](#).

[Seeded area \(Figure 7a\) and production data \(Figure 7b\)](#) were obtained from Statistic Canada.

**Seeding conditions:** Due to a wet and snowy fall in 2019, some crops within the three Prairie provinces remained unharvested and were left over the winter. This 2019 crop had to be harvested prior to the start of any 2020 seeding activity. This added field work plus having April-May temperatures below normal (Figure 2) lead to a slight delay in 2020 seeding compared to last year (Figure 6a). However, dry conditions in May (Figure 3) allowed seeding to proceed to near completion and/or completion by the first week of June for the three provinces. Although average precipitation was lower (Figure 3), canola seeds were able to emerge and develop due to adequate soil moisture as a result of the wet 2019 autumn (Figure 4).

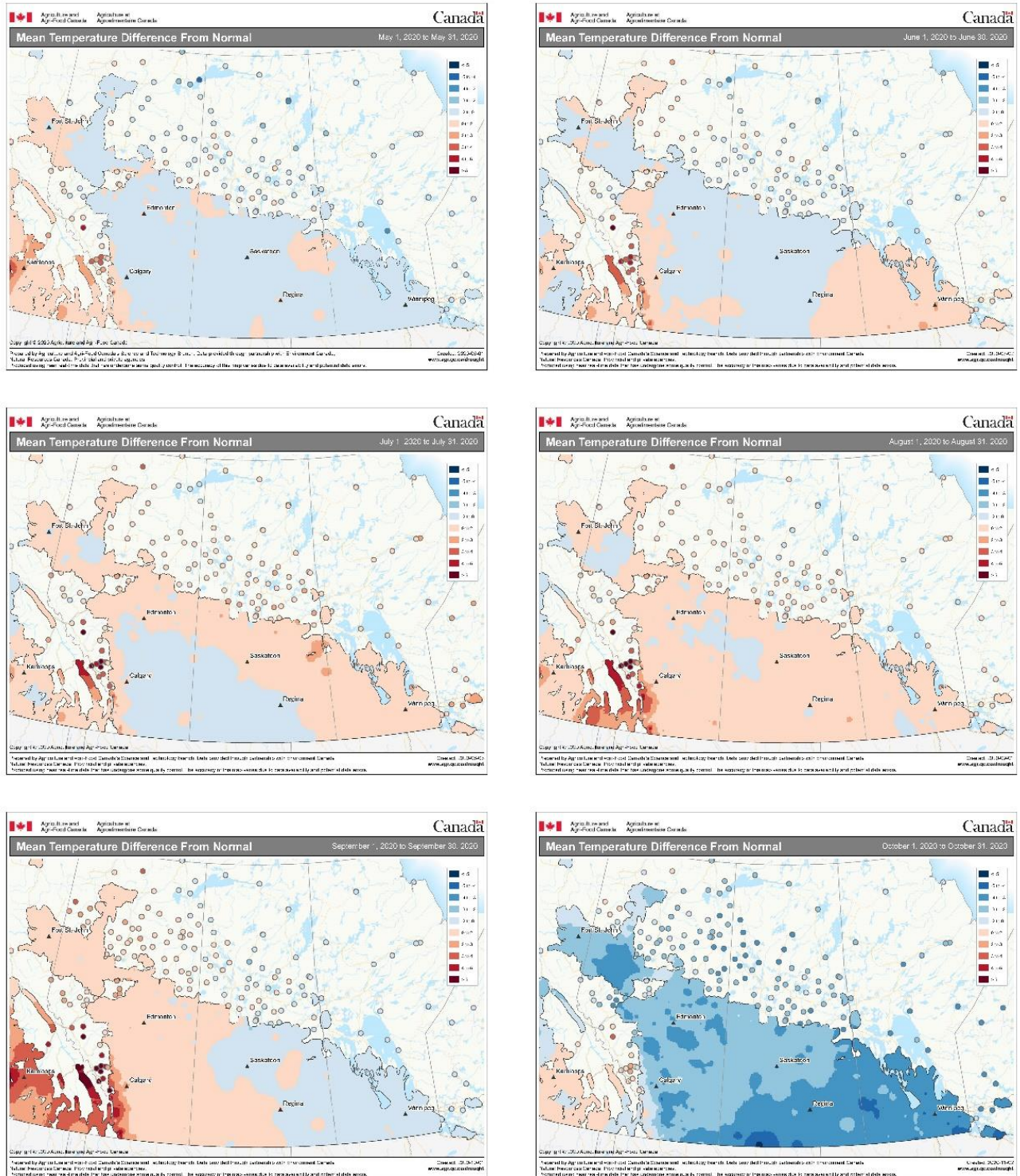
**Growing season:** Figure 2 shows cooler than normal temperatures in July in some parts of Alberta-Peace River and Saskatchewan, whereas the other parts of the Prairies showed warmer than average temperatures. In August, the three Prairie provinces showed overall warmer than normal temperatures. During July and August, there were significant differences in the number of days above 30°C between the southern and northern parts of the Prairies (Figure 5). It has been reported that heat can affect canola yield and canola quality (after flowering). [Agriculture and Agri-Food Canada agro-climate maps](#) show the lowest temperatures, likely at night, ranging from 1°C to over 17°C. Overall, the night temperatures were warmer than last year as departure from normal showed a temperature increase (Figure 2). Night temperatures seemed to be one of the factors affecting oil content and fatty acid composition for canola seeds. Warmer temperatures lowered the oil content and the total unsaturation of the oil.

Precipitation was also an issue during the growing season. It was found to be adequate in some areas and too much or too little in other areas as shown in Figure 3.

**Harvesting conditions:** In 2020, harvest started mid-August in Manitoba and Saskatchewan (Figure 6b). The first week of September, the 2020 harvest was well ahead of the 2019 harvest. The harvest was able to progress at a steady pace thanks to mostly dry weather conditions in September and October (Figure 3). By the third week of October, the 2020 canola harvest was considered complete for the three Prairie provinces (Figure 6b).

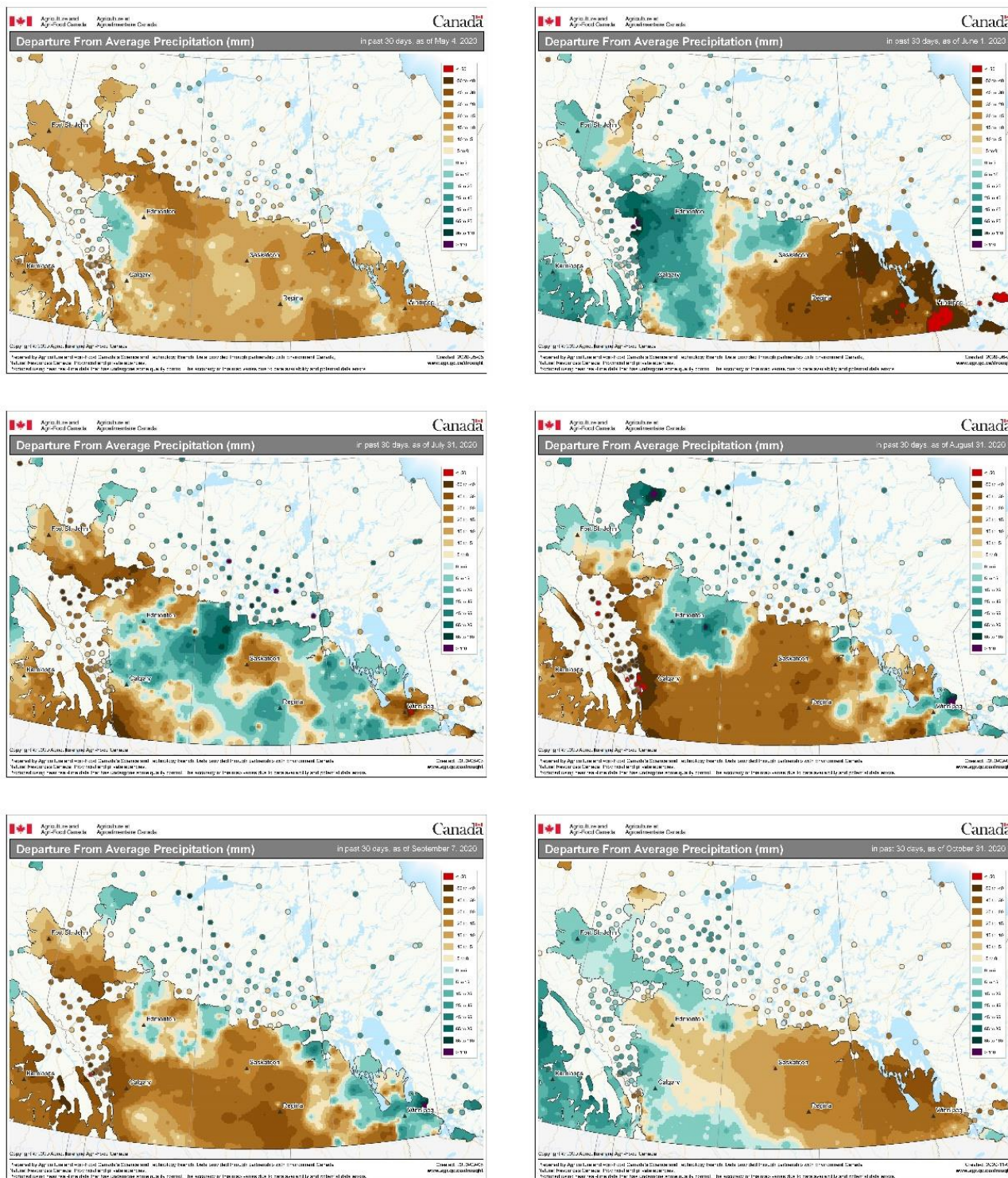


**Figure 2 –Monthly mean temperature difference from normal in Canada (Prairies) during the 2020 growing season (May to October 2020).**



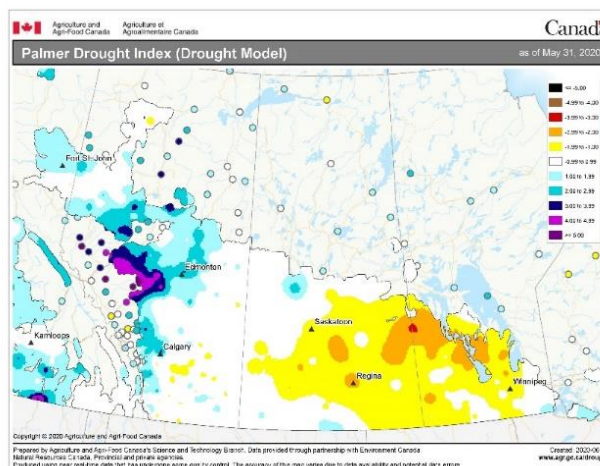


**Figure 3 – Departure from average precipitation in Canada (Prairies) during the 2020 growing season (May to October 2020).**

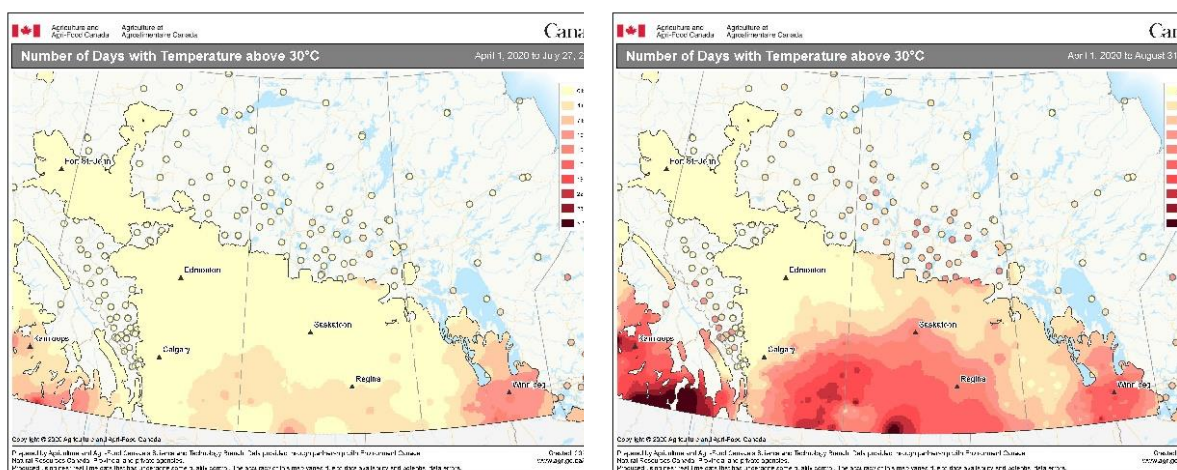


Source: <http://www4.agr.gc.ca/DW-GS/historical-historiques.jsp?lang=eng&jsEnabled=true>

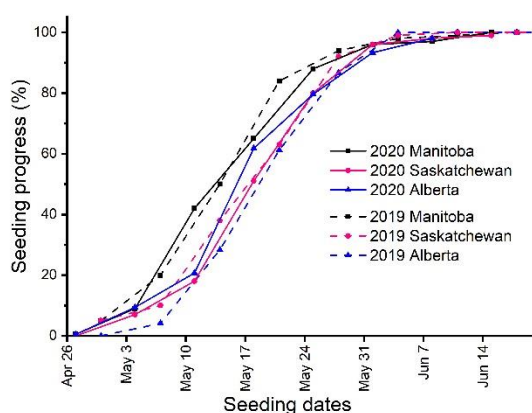
### Figure 4 – Palmer Drought Index in Canada (Prairies) as of May 31<sup>st</sup>, 2020



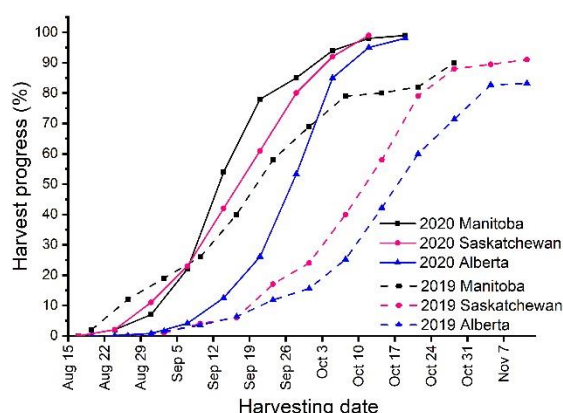
**Figure 5 – Number of days with temperatures above 30°C in Canada (Prairies) from April 1 to July 27 and April 1 to August 31, 2020**



**Figure 6a – Seeding progress in Manitoba, Saskatchewan and Alberta for the 2019 and 2020 growing seasons**



**Figure 6b – Harvest progress in Manitoba, Saskatchewan and Alberta for the 2019 and 2020 growing seasons**



## Production

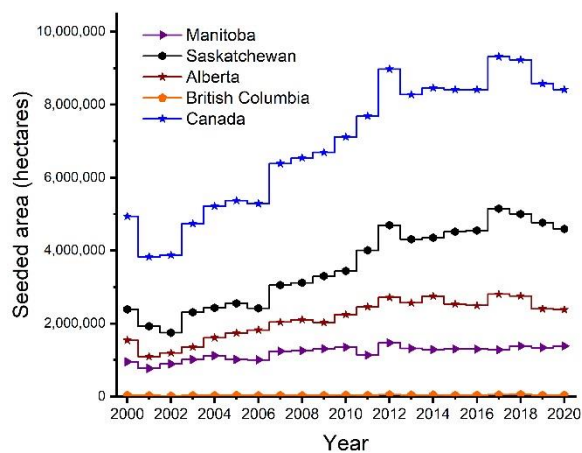
The number of hectares (ha) of canola seeded in Canada since 2000 is presented in Figure 7a. In 2020, it was estimated that canola producers seeded about 161.7 thousand-hectares less when compare to 2019 (8,410.0 vs. 8,571.7 thousand-hectares), about 4.3% less than the 5-year average (8,787.9 thousand-hectares). This is about 903.4 thousand-hectares less than the 2017 record year when 9,313.4 thousand-hectares of canola were seeded (Figure 7a).

Statistics Canada reported that the 2020 western Canada average yield was estimated at 2,250 kg/ha, slightly lower than what was observed in 2019 (2,319 kg/ha) and for the 5-year yield average (2,298 kg/ha). In 2020, the highest average yield was observed in Manitoba at 2,321 kg/ha (2,354 kg/ha in 2019), followed by Alberta (2,253 kg/ha in 2020 vs. 2,259 kg/ha in 2019) and Saskatchewan at 2,231 kg/ha (2,339 kg/ha in 2019). There was a noticeable yield decrease in British Columbia in 2020 when compared to 2019 (1,681 kg/ha in 2020 vs. 2,331 kg/ha in 2019).

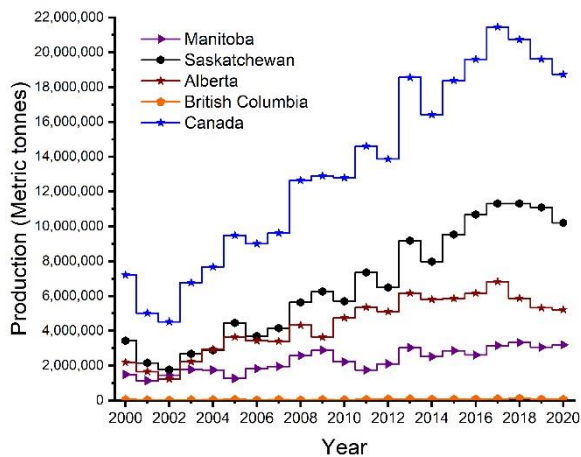
Over the last 4 years, Canadian canola production (Figure 7b) showed a decrease resulting from lower seeded hectares, especially in Saskatchewan, and with less than favourable growing and harvesting conditions (especially in 2019, Figure 6b). As of January 2021, Statistics Canada reported an estimated Canadian canola production of 18,719,700 metric tonnes (MT), about 0.887 million MT less than last year's production (19.607 MT) and about 1.2 MT less than the 5-year average (19.607 MT). This represents about 2.7 MT less than the recorded production of 21.328 MT reported in 2017 (Figure 7). In 2020, Saskatchewan grew 54.5% of the Canadian canola, compared to 56.6 in 2019. Alberta, Manitoba and British-Columbia grew 27.8, 17.0 and 0.3% of the Canadian canola, respectively. The main production areas in 2019 (2020 data not yet available) were in the north-west parts of the Prairie provinces (Figure 1).



**Figure 7a– 2000-2020 Canola seeded area in western Canada (hectares)**



**Figure 7b – 2000-2020 Canola production (metric tonnes)**

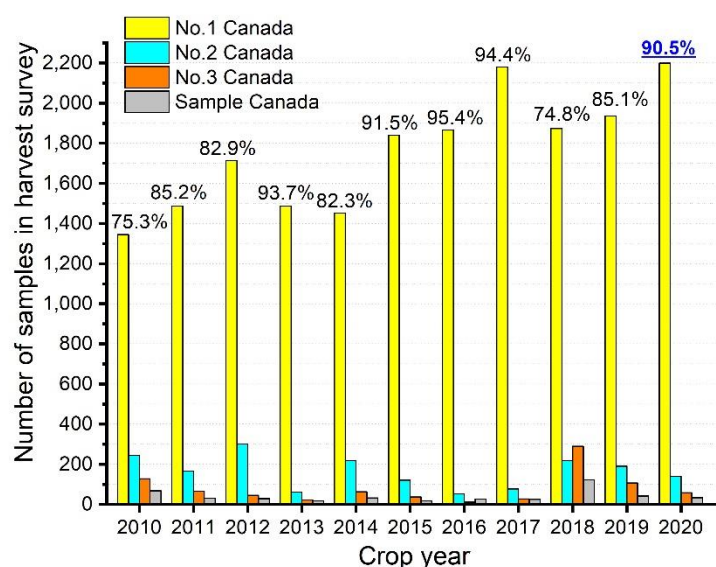


## Harvest Sample Program samples and grade distribution

This report of quality data for the 2020 harvest is based on the analyses of 2,430 individual canola samples. Composites of Canola, No.1 Canada from each crop district and 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 2020, we received 110 more samples than in 2019 and about 219 more samples than the 5-year average (Table 1). Crop district composites of Canola, No.1 Canada samples were prepared using 2,383 samples.

[Exports of commercially cleaned canola](#) (from August 2020 to December 2020) contained on average 1.69% dockage, ranging from 0.60 to 2.5%, which affects quality factors such as oil content, chlorophyll and free fatty acid. Canola exports containing over 2.5% dockage are considered not commercially clean (NCC) and usually have even greater reductions in measured quality components.

**Figure 8 – Canola samples received in Harvest Sample Program and the historical grade distribution, 2010-2020**



In 2020, 90.5% of the samples were graded Canola, No. 1 Canada, compared to 85.1% in 2019 and 88.3% for the 5-year average (Figure 8). The grade distribution of the 2020 canola crop varied greatly between provinces and between crop districts within a province. The main damage was distinctly green seed count (DGR) and admixture. In 2020, overall, DGR was 0.44% (0.39% in 2019) for Canola, No. 1 Canada; 3.2% (3.1% in 2019) in Canola, No. 2 Canada; 9.4% (10.2% in 2019) in Canola, No. 3 Canada and 6.0% (8.5% in 2019) in Sample.

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## Quality of western Canadian canola 2020

Tables 2 & 3 show detailed information on the quality of western Canadian canola harvested in 2020, whereas Table 4 compares the quality of the harvest to recent canola exports. It is important to note 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 grade. Provincial and western Canadian averages were calculated using the quality results for each crop district/agricultural census area weighted with the production data (5-year average) and the grade percentile per crop district/agricultural census area.

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).

### Oil content

For Canola, No.1 Canada, the 2020 oil content was 44.1%, which was lower than the 2019 average (44.6%) and the 5-year average of 44.4% (Table 1). The 2020 average canola oil content was on par with 2018 (44.1%), the second lowest oil content average observed over the last 10 years (Figure 9).

Canola, No. 1 Canada samples from Alberta-Peace River showed the highest oil content average at 44.9% when compared to the oil content averages of samples of the same grade from Manitoba and Saskatchewan: 43.3 and 43.8%, respectively (Table 2). The oil content of individual Canola, No.1 Canada samples harvested in 2020 ranged from 38.6% to 49.8% in Manitoba, 34.0% to 50.2% in Saskatchewan and 37.0% to 50.5% in Alberta-Peace River (Table 2).

Oil content for Canola, No. 2 Canada (44.3%) was slightly higher than Canola, No. 1 Canada (44.1%). Oil content for Canola, No. 2 Canada samples from western Canada ranged from 34.4% to 48.0% (Table 2). This year, the oil content averages for Canola, No. 3 Canada and Sample grade are 44.6% and 43.7%, respectively.

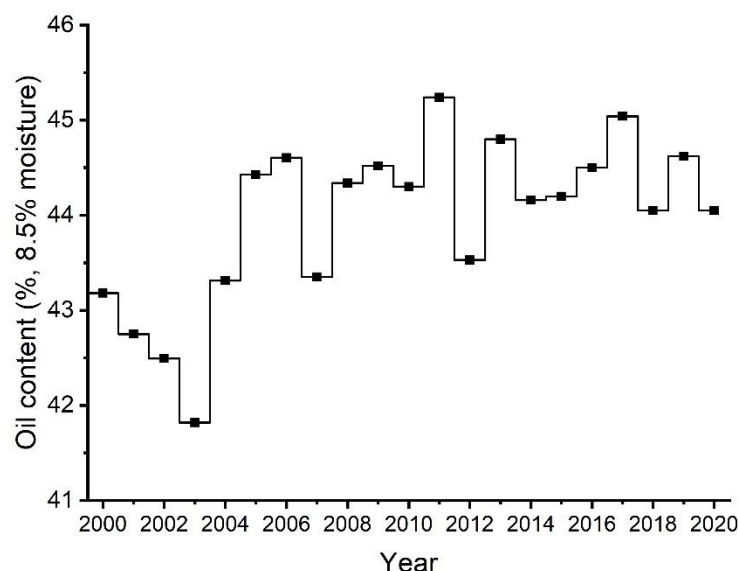
Oil content is influenced by both genetic and environmental factors. For any known canola variety, hot and dry growing conditions, as opposed to cool conditions, will result in canola seeds with lower oil content. The high numbers of days with temperatures over 30°C (Figure 5), especially after flowering, and the variability in precipitation (too much in July and not enough in August; Figure 3) would explain the geographic differences in reference to seed oil content.

The mean oil content of commercially clean (CC) canola exports of Canola, No.1 Canada was 43.3% for the December 2020 exports and 43.3% for the August-November 2020 exports (Table 4). The 2020 exports were observed to have similar average oil content in comparison to last year's shipping season for the CC canola cargoes (43.3%). When compared to oil content from the harvest samples, the CC and the non-commercially clean (NCC) exports of Canola, No.1 Canada had lower oil content averages, due to the dilution from dockage. Harvest samples are completely cleaned (i.e. 0.00% dockage), whereas dockage average for the CC December 2020 exports was 1.59% and 1.71% for the August-November

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exports (1.75% for last year shipping season; Table 4). Non-Commercially Clean (NCC) exports averaged 3.29% (August to December 2020; Table 4).

**Figure 9 – Canola, No. 1 Canada**  
**Oil content of the seed (% , 8.5% moisture)**



## Protein content

The historic protein content average of canola seeds (% , 8.5% moisture) are observed in Figure 10a, whereas the calculated historic protein content of meal (12% moisture) after removing the oil are presented in Figure 10b. Crude protein content averages were 20.8% and 20.7% for Canola, No.1 Canada and No. 2, respectively, and 20.4% for Canola, No. 3 Canada (Table 2). Average protein seed content observed for Canola, No.1 Canada in 2020 was higher than what was observed in 2019 (20.4%) and very similar to the 5-year average (20.5%; Table 1, Figure 10a). Protein content of individual producer samples ranged from 15.1% to 29.7% for Canola, No. 1 Canada samples and from 16.0% to 27.3% for Canola, No. 2 Canada samples. The protein content of Canola, No. 3 Canada and Canola, Sample Canada samples ranged from 15.3% to 25.0% and 15.5% to 24.1%, and averaged 20.4% and 19.6%, respectively (Table 2).

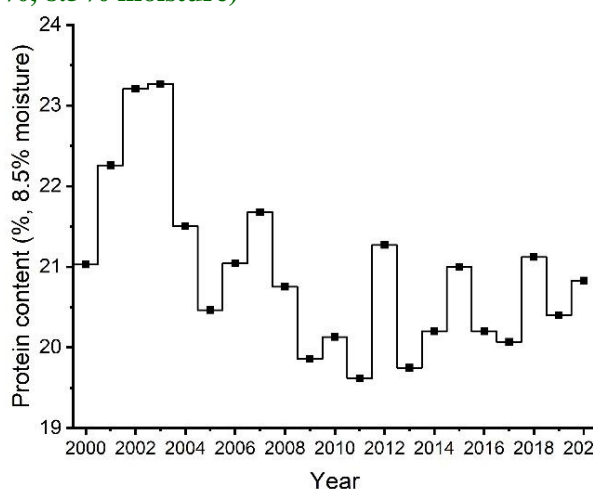
Seed protein averages of Canola, No. 1 Canada commercially clean exports were 20.9% in December 2020 and August-November 2020 exports (Table 5). Protein content averages for this shipping season (August to December 2020) are higher than what was observed for last shipping season (20.5%; August 2019 to July 2020), reflecting the 2020 harvest canola protein content (Table 4).

The calculated meal protein content on an oil-free basis is the maximum protein content of a theoretical meal that could be obtained if a crushing plant was able to extract 100% of the oil from the seeds. The

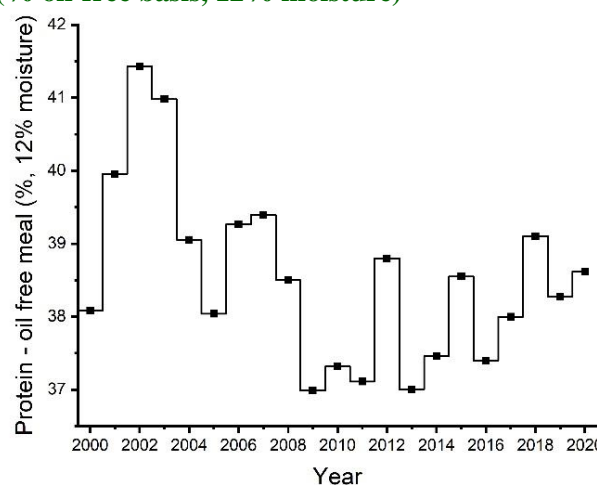


protein content calculated to an oil-free meal at 12% moisture was 38.6% in 2020, which is significantly higher than what was observed in 2019 (37.9%) and slightly higher than the 5-year average (38.3%; Table 1 and Figure 10b). The calculated protein content of the oil-free meal (100% defatted, 12% moisture) was much higher for samples from Saskatchewan (38.9%) than either Manitoba (38.5%) or Alberta-Peace River (38.3%).

**Figure 10a – Canola, No. 1 Canada  
Protein content of the seed  
(%, 8.5% moisture)**



**Figure 10b – Canola, No. 1 Canada  
Protein content of the meal  
(% oil-free basis, 12% moisture)**



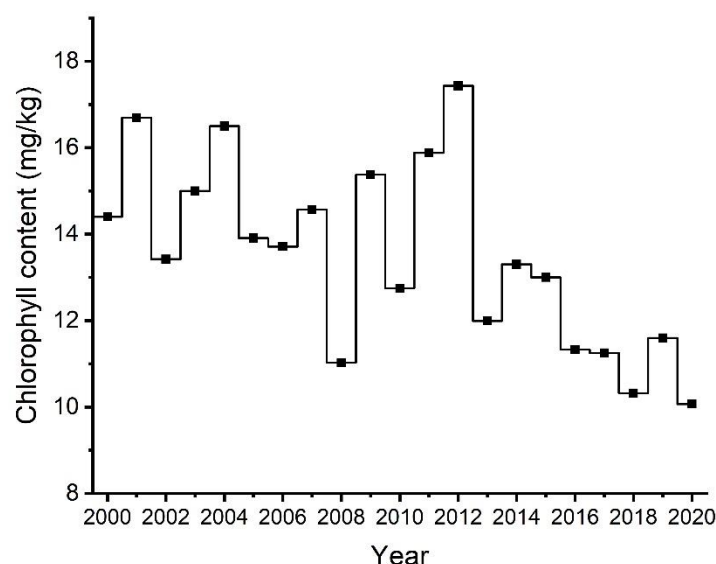
Commercially clean exports of Canola, No. 1 Canada had a calculated average meal protein content (oil-free) of 38.2% (12.0% moisture) in August-November 2020 and December 2020. These results are higher than what was observed during the last shipping season, with the calculated average meal protein content being 37.8% (12% moisture) for CC exports of Canola, No. 1 from August 2019 to July 2020 (Table 4).

## Chlorophyll content

Chlorophyll content averages of Canola, No. 1 Canada producer samples were 9, 10, and 11 mg/kg in Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 2). The overall average for Canola, No. 1 Canada was 10 mg/kg, which was lower than what was observed for the 2019 harvest (12 mg/kg) and calculated 5-year average (11 mg/kg; Table 1). In fact, this is the lowest chlorophyll average observed in the last 10 years (Figure 11). However, individual producer samples of Canola, No. 1 Canada still showed variations in chlorophyll content due to variable growing conditions. Chlorophyll content of Canola, No. 1. Canada samples from Manitoba ranged from 4 to 31 mg/kg, Saskatchewan from 4 to 45 mg/kg and Alberta from 4 to 39 mg/kg (Table 2). Historical chlorophyll content means are observed to vary greatly from year to year (Figure 11) due to the variability in seasonal growing conditions. This year, as opposed to the last couple of years, samples of Canola, No.1 Canada from Saskatchewan agrifur

census areas 10 and 14, both had high average chlorophyll content values at 15 mg/kg, whereas crop district 7 from Alberta-Peace River had an average of 14 mg/kg.

**Figure 11 – Canola, No. 1 Canada**  
**Chlorophyll content of the seed (mg/kg, as is moisture)**



Chlorophyll levels (Table 2) for Canola, No. 2 Canada samples averaged 30 mg/kg, which is much lower than what was observed for the 2019 harvest (38 mg/kg). Samples graded Canola, No. 3 Canada and Sample had an average chlorophyll content of 60 and 43 mg/kg, which is much lower than what was observed in 2019 (76 and 63 mg/kg).

To be graded Canola, No. 1 Canada, samples must contain no more than 2.00% distinctly green seeds (DGR). DGR averages in Canola, No. 1 Canada samples were 0.48% (0.28% in 2019), 0.41% (0.35% in 2019) and 0.57% (0.48% in 2019) for Manitoba, Saskatchewan and Alberta-Peace River, respectively.

The chlorophyll content of Canadian canola exports is affected by DGR and dockage content. DGR averages were 0.76%, 0.85% and 1.48% for December 2020, August-November 2020 CC canola exports, and August-December 2020 non-commercially clean (NCC) canola exports, respectively (Table 4). Chlorophyll content averages were higher for the NCC exports at higher DGR and dockage than the CC exports and the harvest samples (Table 4).

## Glucosinolate content

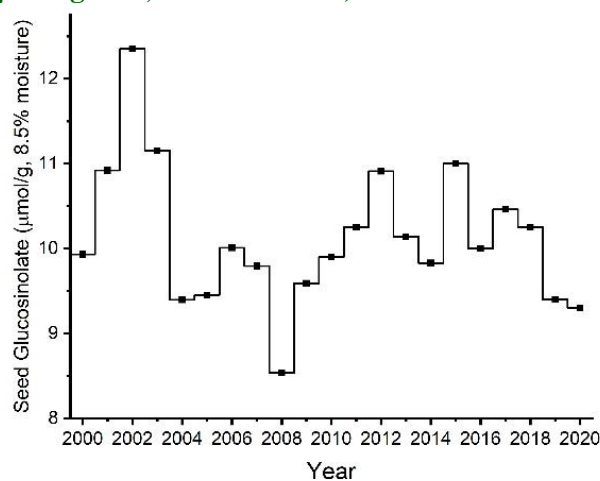
The historic averages of total glucosinolates content of canola seeds is presented in Figure 12a and the calculated historic averages of total glucosinolates content of canola meal after oil removal is presented in Figure 12b. Both are reported at 8.5% moisture. The 2020 total glucosinolate content of the Canola, No. 1

Canada seeds (Table 2) averaged 9  $\mu\text{mol/g}$ , similar to what was observed in 2019 and 2018 (10  $\mu\text{mol/g}$ ). Since 2009, total glucosinolate content averages remained in the 10  $\mu\text{moles/gram}$  range (Figure 12a). 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.

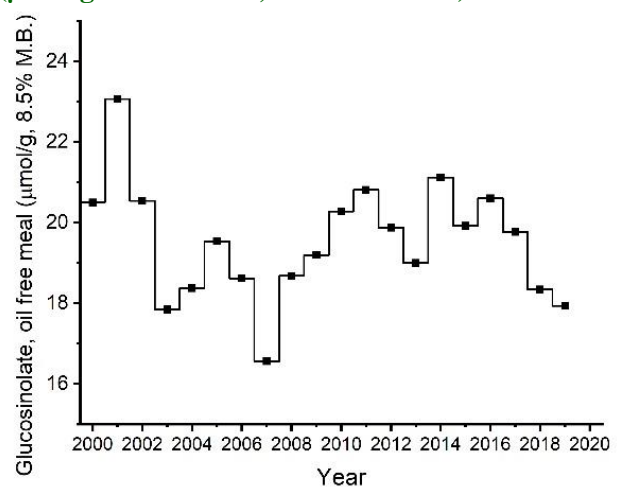
The average level of total seed glucosinolates for the August-December 2020 CC canola exports was 10  $\mu\text{mol/g}$  of seed, similar to what was observed in last year's shipping season (Table 4).

In 2020, 9  $\mu\text{mol/g}$  of total glucosinolates in the seed corresponded to 18  $\mu\text{mol/g}$  in oil-free meal on a 8.5% moisture basis. This is quite similar to both the 5-year average (18  $\mu\text{mol/g}$ , 8.5% moisture basis) and the 2019 harvest average (17  $\mu\text{mol/g}$ , 8.5% moisture basis; Figure 12b; Table 1). The total glucosinolates of the Canadian canola meal obtained from conventional crushing plants (expeller press followed by solvent extraction) is much lower than this calculated value. The calculated values assume 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.

**Figure 12a – Canola, No. 1 Canada  
Total glucosinolate content of the seed  
( $\mu\text{mol/g}$  seed, 8.5% moisture)**



**Figure 12b – Canola, No. 1 Canada  
Total glucosinolate content of the meal  
( $\mu\text{mol/g}$  oil-free meal, 8.5% moisture)**



## Free fatty acids content

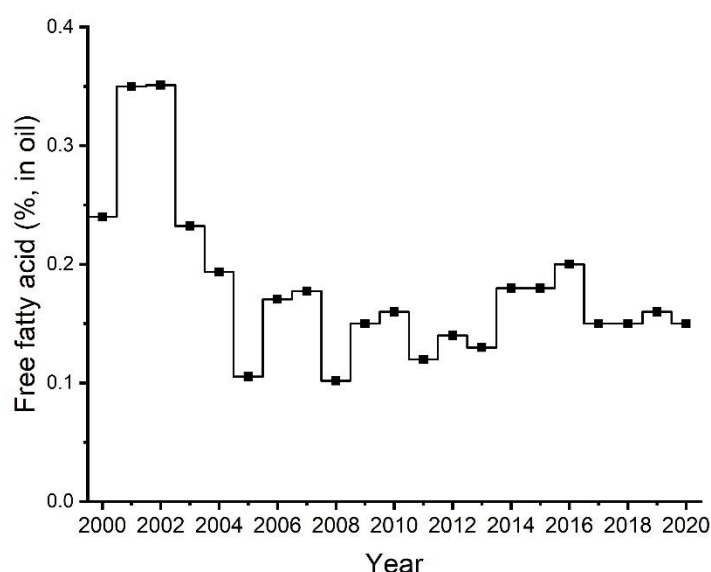
The average free fatty acids (FFA) content of oil for 2020 Canola, No. 1 Canada was 0.15%, similar to what was observed in 2019 (0.16%) and slightly lower than the calculated 5-year average (0.17%; Tables 1 and Figure 13). FFA averages for Canola, No. 1 Canada samples from Manitoba (0.24%) were higher than what was observed in the samples from Saskatchewan (0.13%) and Alberta-Peace River (0.14%;

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Table 2). Canola, No. 1 Canada samples from Manitoba crop districts 6 and 11 had FFA averages of 0.41% and 0.43%, respectively, which was much higher than the 0.13% average.

Overall, samples graded Canola, No. 2 Canada presented a higher FFA average than the Canadian average observed for samples graded Canola No. 1, Canada (0.24% vs. 0.15%; Table 2).

**Figure 13 – Canola, No. 1 Canada**  
**Free fatty acid content of the oil (% as oleic acid )**



For December 2020, FFA level of CC Canola, No.1 Canada exports averaged 0.21% (0.34% for the August-November 2020 exports; Table 5) with individual CC Canola, No.1 Canada exports ranging from 0.08% to 0.96% (Table 4).

Over the years, it has been observed 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 seeds can be quite high due to either field heat stress (high temperatures during the growing season) or high seed moisture and sprouting (precipitations at harvest), and therefore, FFA contents could vary greatly from each load.

## Fatty acid composition

The average level of erucic acid (C22:1) in the 2020 canola crop was 0.01%. Over the last several years, Canadian canola samples graded Canola, No.1 Canada ranged from below limit of detection to 0.01% (Tables 1 and 3, Figure 14a). Similar to the total glucosinolate content, these low values are a direct result of breeding efforts by the Canadian canola industry.

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The  $\alpha$ -linolenic acid (C18:3) content of Canola, No.1 Canada sample averaged 8.9%, which is more than one percentage lower than the 2019 average (10.0%) and similar to what was observed in 2018 (8.7%) when similar hot growing conditions were observed during August (Figure 14b). This average is about 0.6% lower than the 5-year average of 9.5% (Table 1, Figure 14b). This year, samples from Saskatchewan had the lowest average compared to samples from Manitoba and Alberta-Peace River: 8.0%, 8.4% and 9.9%, respectively (Table 3). Since 2010, this year's average was the lowest after 2018 (8.7%; Figure 14b).

For Canola, No.1 Canada samples, the average oleic acid (C18:1) content of the 2020 crop was 63.9%, which was higher than what was observed in 2019 (62.4%) and the calculated 5-year average (63.0%; Table 1, Figure 14c). The lowest average oleic acid content was observed for samples from Alberta-Peace River (62.7%), whereas the highest average was obtained from Saskatchewan (65.1%; Table 3).

The total content of monounsaturated fatty acids (MUFA) was 65.8% (64.8% in 2019) in Manitoba, 66.7% (64.5% in 2019) in Saskatchewan and 64.3% (63.1% in 2019) in Alberta-Peace River, resulting in an average of 65.4% for western Canada (64.0% in 2019; Table 3).

Linoleic acid (C18:2; Figure 14d) content follows a similar pattern as  $\alpha$ -linolenic acid (Figure 14b) in regards to environmental conditions. Hot and dry growing conditions can also reduce the linoleic acid content of canola seeds. This year's average is one of the lowest averages in the last 10 years (Figure 14d).

Total average content of polyunsaturated fatty acids (PUFA) were 26.8% (27.9% in 2019) in Manitoba, 26.0% (28.4% in 2019) in Saskatchewan and 28.5% (29.8% in 2019) in Alberta-Peace River, resulting in an overall average of 27.3% for western Canada (28.8% in 2019; Table 1, Table 3). For canola, PUFA content are directly related to the  $\alpha$ -linolenic acid (C18:3) and linoleic acid (C18:2) content. The hot temperatures in August (Figure 5), after flowering, were directly responsible for the low total unsaturation of oil content in the 2020 canola seeds, and thus, lead to a PUFA content decrease compared to last year. The north and the south parts of the Prairies were affected differently by the hot temperatures, leading the observed geographical range in PUFA content.

The fatty acid composition (oleic acid, linoleic acid and  $\alpha$ -linolenic acid) of the 2020 crop presented a very different composition when compared to the 2019 fatty acid composition (+1.5%, -0.4% and -1.1% for oleic, linoleic and linolenic acid). As a result, the iodine value, which is a representation of the total unsaturation of oil, was very different in 2020 when compare to 2019. It was the lowest iodine values observed over the last 10 years (Figure 14e). The 2020 iodine value averaged 111.2 units, 2.4 points lower than the 2019 iodine value average (113.7 units) and 1.6 units lower than the 5-year average (112.8 units; Tables 1). For Canola, No. 1 Canada, the iodine value averages were 110.3 (112.1 units in 2019), 109.2 (113.4 units in 2019) and 113.3 units (115.1 units in 2019) for Manitoba, Saskatchewan and Alberta-Peace River, respectively (Table 3). This year, the iodine value of individual Canola, No.1 Canada samples ranged from 103.6 to 121.5 units (105.2 to 121.5 units in 2019). Samples graded Canola, No. 2 Canada showed higher iodine value averages with higher linoleic and  $\alpha$ -linolenic acid contents, and lower oleic acid contents than the Canola, No. 1 Canada samples (Table 3).

The average saturated fatty acid content was 6.8% in 2020, which was slightly higher than the 2019 average (6.6%) and the 5-year average (6.6%; Tables 1 and 3). Since 2009, the saturated fatty acid content averages varied from 6.6% to 6.9% (Figure 14f). In 2020, the saturated fatty acid content averages

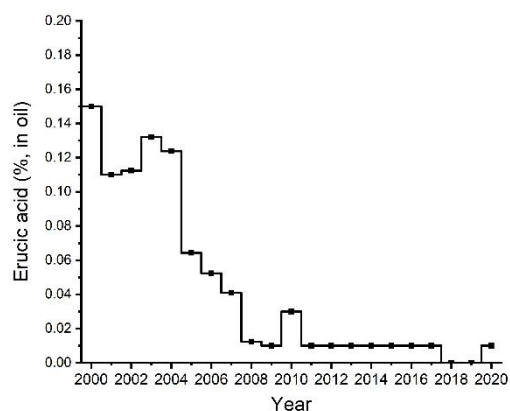
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for Manitoba (6.9%) and Saskatchewan (6.9%) were higher than the average observed for samples from Alberta-Peace River (6.7%).

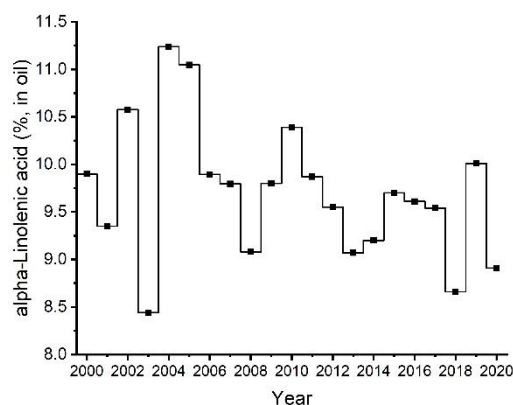
Total saturates fatty acid content (controlled by breeding efforts) has been very stable, lower than 7.0%, ranging from 6.6 to 6.9%, since 2009 (Figure 14f). However, other fatty acids (except erucic acid) are greatly affected by genetic variety and environmental factors. This year, individual samples of Canola, No.1 Canada, had oleic acid, linoleic acid and  $\alpha$ -linolenic acid that ranged from 56.1% to 68.8%, 13.8% to 24.2% and 5.1% to 14.0%, 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-Peace River (crop districts 4, 5, 6 and 7). Samples from the northern areas, especially from Alberta-Peace River, had higher unsaturation than samples from the southern areas. The hot growing conditions this year compared to last year helped to decrease the average unsaturation.

The fatty acid composition of the 2020 harvest reflected well with the fatty acid composition from the August to December 2020 exports compared to last year (Table 4). Average oleic acid,  $\alpha$ -linolenic acid and iodine value of CC canola exports were different at the beginning of the shipping season (August to November) compared to the 2020 December exports and last year's shipping season (August 2019 to July 2020). The level of saturated fatty acids of canola exports up to December 2020 (6.8%) were higher than the last shipping season (6.6%), greatly reflecting the 2020 harvest results. It is expected that levels of erucic acid will remain very low for the new shipping season (below 0.1%) since 2020 harvest erucic acid contents were very low.

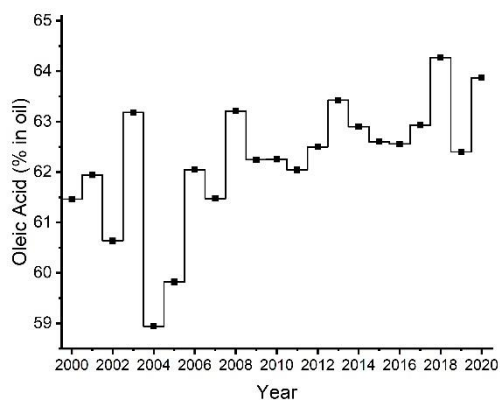
**Figure 14a – Canola, No. 1 Canada**  
**Erucic acid content of the oil (%)**



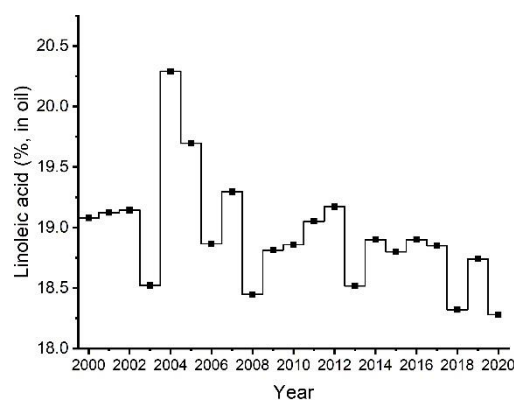
**Figure 14b – Canola, No. 1 Canada**  
 **$\alpha$ -Linolenic acid content of the oil (%)**



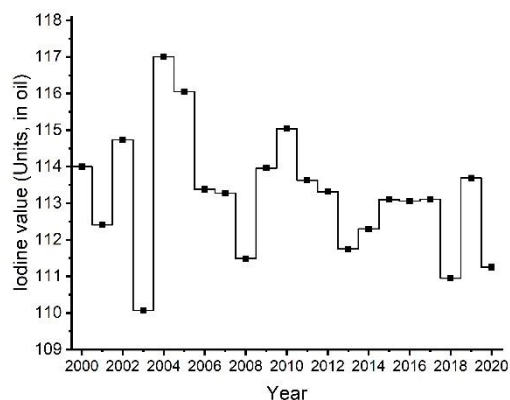
**Figure 14c – Canola, No. 1 Canada**  
**Oleic acid content of the oil (%)**



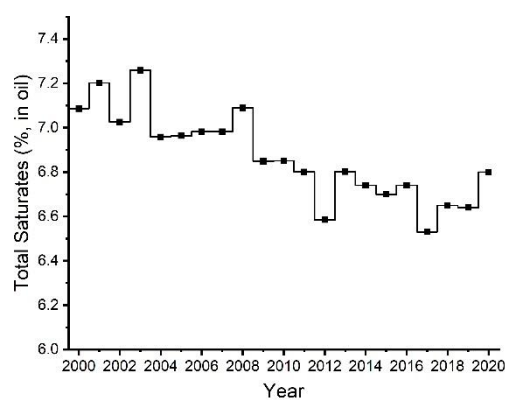
**Figure 14d – Canola, No. 1 Canada**  
**Linoleic acid content of the oil (%)**



**Figure 14e – Canola, No. 1 Canada**  
**Iodine value of the oil (units)**



**Figure 14f – Canola, No. 1 Canada**  
**Total saturates fatty acid content of the oil (%)**



**Table 2 – 2020 canola harvest - quality data by grade and province**

**Oil, protein, chlorophyll, total glucosinolate content of the seeds and free fatty acid content of the oil**

	Number of samples	Oil content <sup>3</sup> %			Protein content <sup>4</sup> %			Chlorophyll content <sup>5</sup> mg/kg			Glucosinolates <sup>3</sup> μmol/g			Free fatty acids (%)
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
<b><u>Canola, No. 1 Canada</u></b>														
Manitoba	473	43.3	38.6	49.8	21.1	16.0	24.6	9	4	31	9	5	21	0.24
Saskatchewan	852	43.8	34.0	50.2	21.0	16.2	29.7	10	4	45	9	4	20	0.13
Alberta-Peace River <sup>1</sup>	838	44.9	37.0	50.5	20.3	15.1	28.5	11	4	39	9	2	20	0.14
<b>Western Canada<sup>2</sup></b>	<b>2163</b>	<b>44.1</b>	<b>34.0</b>	<b>50.5</b>	<b>20.8</b>	<b>15.1</b>	<b>29.7</b>	<b>10</b>	<b>4</b>	<b>45</b>	<b>9</b>	<b>2</b>	<b>21</b>	<b>0.15</b>
<b><u>Canola, No. 2 Canada</u></b>														
Manitoba	27	43.5	40.3	47.2	20.9	18.5	24.9	24	7	43	11	7	18	0.39
Saskatchewan	56	44.7	38.5	47.7	20.7	17.8	24.4	33	4	59	11	6	18	0.20
Alberta-Peace River <sup>1</sup>	52	44.0	34.4	48.0	20.5	16.0	27.3	28	4	64	11	6	16	0.23
<b>Western Canada<sup>2</sup></b>	<b>135</b>	<b>44.3</b>	<b>34.4</b>	<b>48.0</b>	<b>20.7</b>	<b>16.0</b>	<b>27.3</b>	<b>30</b>	<b>4</b>	<b>64</b>	<b>11</b>	<b>6</b>	<b>18</b>	<b>0.24</b>
<b><u>Canola, No. 3 Canada</u></b>														
Manitoba	11	43.4	41.2	46.2	20.8	19.4	22.5	72	11	97	12	8	15	0.37
Saskatchewan	28	44.9	41.3	49.7	20.4	15.3	25.0	66	4	98	13	6	18	0.42
Alberta-Peace River <sup>1</sup>	14	44.2	39.5	49.3	20.2	17.2	23.4	32	4	68	10	7	14	0.29
<b>Western Canada<sup>2</sup></b>	<b>53</b>	<b>44.6</b>	<b>39.5</b>	<b>49.7</b>	<b>20.4</b>	<b>15.3</b>	<b>25.0</b>	<b>60</b>	<b>4</b>	<b>98</b>	<b>12</b>	<b>6</b>	<b>18</b>	<b>0.39</b>
<b><u>Canola, Sample Canada</u></b>														
<b>Western Canada<sup>2</sup></b>	<b>32</b>	<b>43.7</b>	<b>38.3</b>	<b>49.2</b>	<b>19.6</b>	<b>15.5</b>	<b>24.1</b>	<b>43</b>	<b>4</b>	<b>124</b>	<b>32</b>	<b>10</b>	<b>6</b>	<b>16</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> 8.5% moisture basis

<sup>4</sup> Protein content calculated from nitrogen content using N x 6.25, 8.5% moisture basis.

<sup>5</sup> as is, tel-quel moisture basis



**Table 3 – 2020 canola harvest - quality data by grade and province**  
**Main fatty acid composition, total saturates, MUFA and PUFA contents and iodine value of the oil**

	Relative fatty acid composition of the oil (%)										C22:1	Total saturates <sup>3</sup> (%)	PUFA <sup>4</sup>	MUFA <sup>5</sup>	Iodine value <sup>6</sup> (Units)		
	C18:1			C18:2			C18:3			Mean					Min	Max	
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max								
<b>Canola, No. 1 Canada</b>																	
Manitoba	64.3	59.6	67.1	18.3	15.6	22.2	8.4	6.3	11.1	0.00	6.9	65.8	26.8	110.3	105.6	116.0	
Saskatchewan	65.1	58.0	69.0	17.9	14.8	22.8	8.0	5.4	12.5	0.02	6.9	66.7	26.0	109.2	104.3	118.6	
Alberta-Peace River <sup>1</sup>	62.7	55.5	69.0	18.6	14.5	23.5	9.9	5.2	13.8	0.00	6.7	64.3	28.5	113.3	102.7	122.5	
<b>Western Canada<sup>2</sup></b>	<b>63.9</b>	<b>55.5</b>	<b>69.0</b>	<b>18.3</b>	<b>14.5</b>	<b>23.5</b>	<b>8.9</b>	<b>5.2</b>	<b>13.8</b>	<b>0.01</b>	<b>6.8</b>	<b>65.4</b>	<b>27.3</b>	<b>111.3</b>	<b>102.7</b>	<b>122.5</b>	
<b>Canola, No. 2 Canada</b>																	
Manitoba	61.8	58.2	66.1	19.2	16.8	21.3	9.6	7.4	11.5	0.07	7.0	63.5	28.3	112.8	108.6	117.9	
Saskatchewan	62.5	58.4	66.2	18.6	15.8	21.8	9.8	5.7	13.0	0.06	6.7	64.1	28.6	113.1	106.9	119.3	
Alberta-Peace River <sup>1</sup>	60.5	57.7	70.2	19.5	17.4	23.7	10.8	7.2	14.0	0.07	6.8	62.3	30.4	115.6	107.0	120.5	
<b>Western Canada<sup>2</sup></b>	<b>61.8</b>	<b>57.7</b>	<b>70.2</b>	<b>19.0</b>	<b>15.8</b>	<b>23.7</b>	<b>10.1</b>	<b>5.7</b>	<b>14.0</b>	<b>0.07</b>	<b>6.8</b>	<b>63.4</b>	<b>29.2</b>	<b>114.4</b>	<b>106.9</b>	<b>120.5</b>	
<b>Canola, No. 3 Canada</b>																	
Manitoba	60.8	57.3	64.5	19.5	17.3	21.2	10.2	6.5	12.9	0.07	7.0	62.5	29.8	114.2	107.7	120.3	
Saskatchewan	61.0	57.7	70.3	19.3	16.0	21.1	10.3	5.6	13.3	0.07	6.8	62.7	29.6	114.1	102.7	120.5	
Alberta-Peace River <sup>1</sup>	60.5	59.4	63.6	19.6	18.1	21.2	10.8	9.9	14.2	0.07	6.7	62.2	30.5	115.6	113.2	121.0	
<b>Western Canada<sup>2</sup></b>	<b>60.9</b>	<b>57.3</b>	<b>70.3</b>	<b>19.4</b>	<b>16.0</b>	<b>21.2</b>	<b>10.3</b>	<b>5.6</b>	<b>14.2</b>	<b>0.07</b>	<b>6.8</b>	<b>62.6</b>	<b>29.8</b>	<b>114.4</b>	<b>102.7</b>	<b>121.0</b>	
<b>Canola, Sample Canada</b>																	
<b>Western Canada<sup>2</sup></b>	<b>60.7</b>	<b>57.7</b>	<b>68.8</b>	<b>19.5</b>	<b>18.3</b>	<b>24.6</b>	<b>10.6</b>	<b>8.3</b>	<b>13.4</b>	<b>0.07</b>	<b>6.7</b>	<b>62.4</b>	<b>30.2</b>	<b>115.3</b>	<b>108.5</b>	<b>121.1</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 lauric (C12:0), myristic (C14:0), palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0) and lignoceric (C24:0) acids.

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

<sup>5</sup> Total monounsaturated fatty acids are the sum of palmitoleic (C16:1), oleic (C18:1), eicosenoic (C20:1), erucic (C22:1) and nervonic (C24:1) acids.

<sup>6</sup> Calculated from fatty acid composition.

**Table 4 – Canola, No. 1 Canada**  
**Comparison of the quality data of 2020 harvest with recent export shipment data**

Quality parameter	2020 Harvest Sample Program	Export			
		Commercially Clean			Non Commercially Clean
		December 2020	August to November 2020	Previous shipping season 2019-2020	August to December 2020
Oil content <sup>1</sup> (%)	44.1	43.3	43.3	44.0	43.3
Protein content <sup>2</sup> (%)	20.8	20.9	20.9	20.4	20.5
Oil-free protein content <sup>3</sup> (%)	38.6	38.2	38.2	37.8	37.4
Chlorophyll <sup>4</sup> (mg/kg seed)	10	13	13	23	16
Total glucosinolates <sup>1</sup> of the seed (µmol/g seed)	9	10	10	10	11
Free fatty acids (% in oil, as oleic acid)	0.15	0.21	0.34	0.30	0.57
Erucic acid (% in oil)	0.01	0.02	0.02	0.01	0.04
Oleic acid (% in oil)	63.9	63.7	63.5	62.0	62.9
α-Linolenic acid (% in oil)	8.9	9.1	9.1	10.2	9.3
Total saturates <sup>5</sup> (% in oil)	6.8	6.8	6.8	6.6	6.8
Iodine value <sup>6</sup> (units in oil)	111.2	111.5	111.7	114.2	112.3
MUFA <sup>7</sup> (% in oil)	65.4	65.6	65.1	63.7	64.6
PUFA <sup>8</sup> (% in oil)	27.3	27.4	27.6	29.2	28.1
Distinctly green seed (DGR, %)	0.44	0.76	0.85	1.48	1.08
Dockage (%)	0.00	1.59	1.71	1.75	3.29
Loading moisture (%)	NA	7.9	8.0	8.6	8.0
Number of export samples	NA	20	86	231	41
Tonnage (tonnes)	NA	779,036.2	2,956,480.7	7,305,480.0	1,165,171.8

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

<sup>2</sup> Calculated using N x 6.25, 8.5% moisture basis

<sup>3</sup> Calculated using N x 6.25, 12% moisture basis.

<sup>4</sup> as is, tel-quel moisture basis

<sup>5</sup> Total saturated fatty acids are the sum of lauric (C12:0), myristic (C14:0), palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0) and lignoceric (C24:0) acids.

<sup>6</sup> Calculated from fatty acid composition.

<sup>7</sup> Total monounsaturated fatty acids are the sum of palmitoleic (C16:1), oleic (C18:1), eicosenoic (C20:1), erucic (C22:1) and nervonic (C24:1) acids.

<sup>8</sup> Total polyunsaturated fatty acids are the sum of linoleic (C18:2), linolenic (C18:3) and eicosadienoic (C20:2) acids.

NA = Non-applicable