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# Quality of western Canadian mustard seed 2024

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# Summary

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In 2024, No. 1 oriental, brown and yellow mustard seed each had a mean oil content (34.2%, 32.1% and 24.1%, respectively) lower than the 2023 means for oil (36.9%, 33.4% and 26.3%, respectively) and 10-year means for oil (39.6%, 35.3% and 27.7%, respectively) (Figure 6, Figure 7 and Figure 8). In contrast, the mean protein content values for No. 1 oriental, brown and yellow mustard seed (31.1%, 32.0% and 36.5%, respectively) were higher than the 2023 means for protein (29.4%, 31.2% and 35.2%, respectively) and the 10-year means for protein (27.9%, 29.5% and 33.6%, respectively). The total glucosinolate content for No. 1 oriental mustard seed was 148 micromoles per gram ( $\mu\text{mol/g}$ ) of seeds, 150  $\mu\text{mol/g}$  of seeds for No. 1 brown mustard seed and 164  $\mu\text{mol/g}$  of seed for No. 1 yellow mustard seed. These values are higher than the 10-year means of 134  $\mu\text{mol/g}$  seed for oriental mustard and 115  $\mu\text{mol/g}$  of seeds for brown mustard (Figure 9). The 10-year mean for total glucosinolate content for yellow mustard seed is not available since reporting started in 2020. However, the 2024 total glucosinolate content for yellow mustard seed was higher than the 2020-2023 mean (146  $\mu\text{mol/g}$  of seeds). Oil, protein, and total glucosinolate content are reported on a dry matter basis in this report.

# Introduction

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This report presents harvest quality data for oriental mustard seed (*Brassica juncea*), brown mustard seed (*Brassica juncea*), and yellow mustard seed (*Sinapis alba*) grown in western Canada in 2024 (Figure 1). Mustard seed samples were submitted to the Canadian Grain Commission's Harvest Sample Program by producers and grain processing companies. Quality data is compiled from the results of [analytical tests](#) performed by the Grain Research Laboratory.

Figure 1 Mustard seed grown in western Canada



Oriental mustard (*Brassica juncea*)



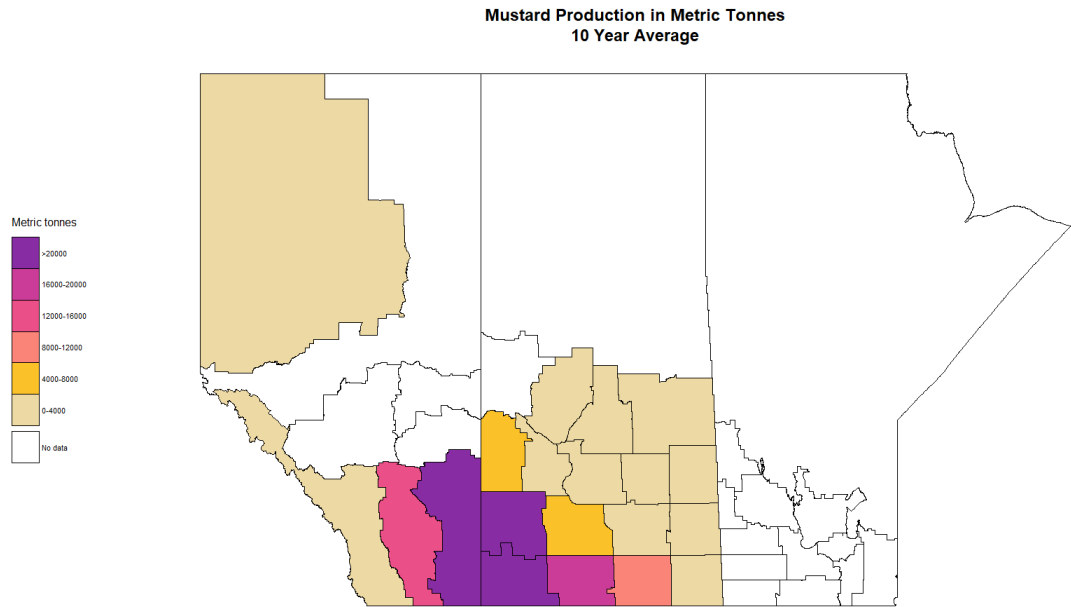
Brown mustard (*Brassica juncea*)



Yellow mustard (*Sinapis alba*)

The map in Figure 2 shows the estimated 10-year-average mustard seed production in metric tonnes (MT) by Small Area Data Regions from [Statistics Canada](#). It also shows that the main mustard seed growing areas are southeastern Alberta and southwestern Saskatchewan.

Figure 2 10-year average (2014 to 2023) of the estimated mustard seed production by Small Area Data Regions



Source: [Statistics Canada](#)

# Weather and production review

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## Seeding and growing conditions

Above normal temperatures in April were followed by below normal temperatures in May and June. April and May had above normal precipitation, whereas the precipitation in June was below average in some mustard seed growing areas (Figure 3). In Saskatchewan, spring seeding was delayed because of an April snowstorm and high levels of precipitation in May. Only 77% of the crop was planted by the end of May, compared to 89% in 2023, and 91% for the 5-year average for late May. By mid-June, seeding was considered completed in Saskatchewan, about a week later than last year. In Alberta, even in early May, seeding progress was ahead of the 5-year average. On May 7, 2024, 35.4% of the mustard crop was seeded in southern Alberta, compared to only 4.4% on May 2, 2023. However, rain slowed down seeding in June, especially in southern Alberta. By June 4, only 93.7% of mustard was seeded in southern Alberta compared to 100% in the central region. In Alberta, the 2024 seeding was considered completed about a week later than last year.

In July, precipitation came in the form of localized thundershowers and there was also a non-negligible number of days with temperatures above 30°C, including some above 32°C, in southern Saskatchewan and southeastern Alberta. The hot and dry weather conditions in July (Figure 3) accelerated crop development and caused crop stress. The 2024 mustard harvest started before mid-August and was considered completed by the end of September in Saskatchewan (Figure 5). Alberta's mustard harvest was considered completed in the first week of October. Harvest progress in both provinces was slowed down and even stopped at times because of rain in September.

More detailed information can be found in the following online reports:

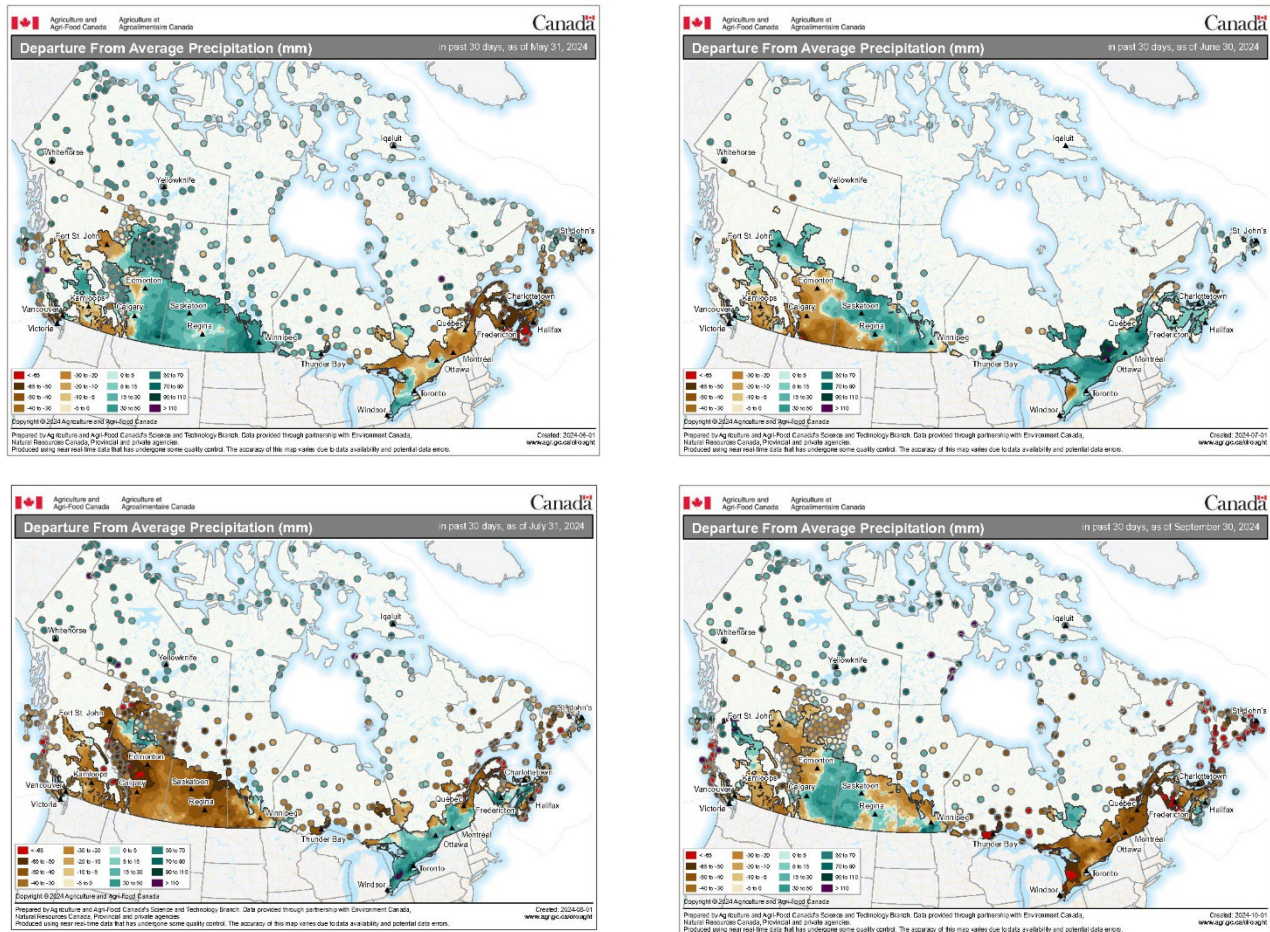
[Saskatchewan crop reports](#)

[Alberta crop report \(2024\)](#)

[Walter Dyck's reports](#)

Information on the temperature and precipitation patterns from the 2024 growing season in western Canada can be obtained from [Agriculture and Agri-Food Canada](#).

Figure 3 Departure from average precipitation between May 1 and September 30, 2024



Source: [Agriculture and Agri-Food Canada](#)

## Production and grade distribution

In 2024, the estimated production of mustard seed in western Canada was 192,297 metric tonnes (MT), higher than the 2023 production of 170,710 MT, the 5-year mean (2019 to 2023) of 125,525 MT and the 10-year mean (2014 to 2023) of 147,982 MT (Figure 4). The increase in production in 2024 was not due to an increase in hectares (ha) seeded with mustard seed (245,400 ha in 2024 versus 257,800 ha in 2023), but to a significant increase in yield (Figure 4). The estimated yield in western Canada in 2024 was 792 kilograms per hectare (kg/ha) versus 681 kg/ha in 2023. The 2024 yield was slightly higher than the 5-year mean (765 kg/ha), but much lower than the 10-year mean (866 kg/ha) and well below the record yield in 2016 (1,210 kg/ha). The estimated yield was 829 kg/ha (708 kg/ha in 2023) in Saskatchewan and 710 kg/ha (592 kg/ha in 2023) in Alberta.

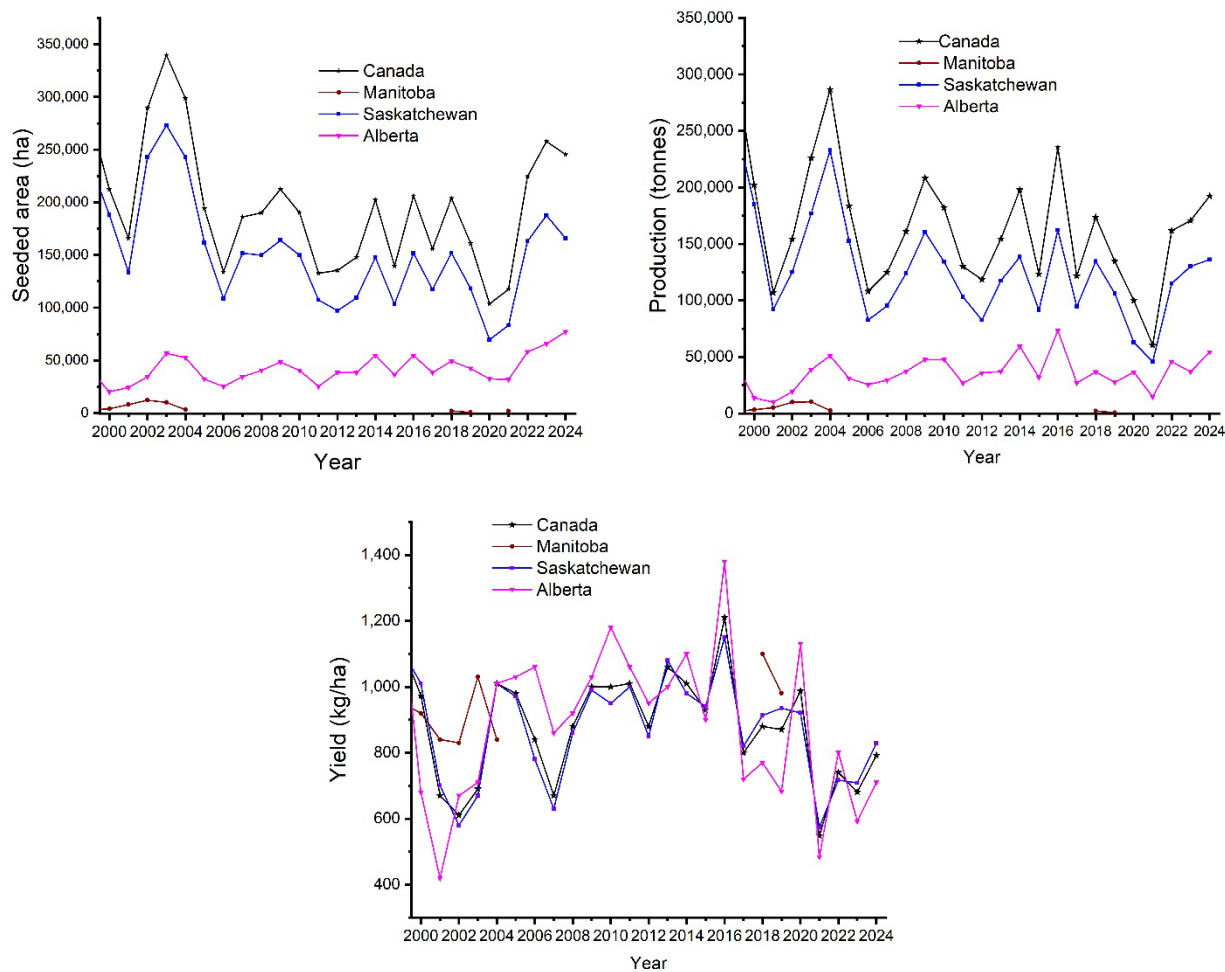
Saskatchewan accounted for 67.6% (73.1% in 2023) of western Canada's total area seeded with mustard and 70.8% (73.0% in 2023) of western Canada's mustard seed production. Most of the remaining seeded area and

production were in Alberta (Figure 4). Some mustard seed is grown in Manitoba, but it represents less than 1% of the hectares seeded in western Canada. All production data are available from [Statistics Canada](#).

In 2024, 73.2% of all mustard seed samples received by the Harvest Sample Program were graded Domestic Mustard Seed No. 1, Canada. This is higher than what was recorded in 2023 (66.4%) and higher than the 5-year mean (61.6%) and the 10-year mean (62.2%). Oriental mustard seed had the highest percentage of samples graded No. 1 (75.0% in 2024 versus 69.4% in 2023), followed by yellow mustard seed (68.7% in 2024 versus 56.6% in 2023). Samples of brown mustard seed had the most damage, with only 66.4% graded as No. 1 in 2024 (70.9% in 2023).

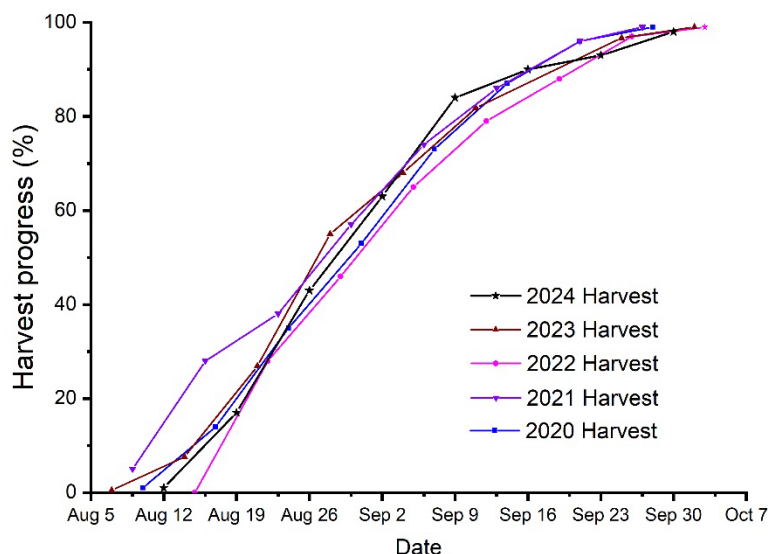
In 2024, the main downgrading factors were conspicuous admixture (28.3% of the samples contained inseparable seeds), green seeds (18.0% of the samples contained distinctly green seeds), sprouting (11.7% of the samples contained seeds with a ruptured seed coat and a sprout or showed distinct swelling of the seed) and inconspicuous admixture (10.0% of the samples contained seeds that were difficult to distinguish from mustard seeds). Sprout damage was mainly observed in the brown mustard seed samples. However, one oriental mustard seed sample showed some sprout damage, which was likely due to moisture at harvest. Among the brown mustard seed samples, 51.9% showed sprouting (59.8% in 2023) but only 10.8% of samples (12.6% in 2023) were downgraded due to severe sprouting.

Figure 4 Seeded area, production and yield for mustard seed in western Canada from 2000 to 2024<sup>1</sup>



<sup>1</sup> <sup>1</sup> Data from 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](#)

Figure 5 Progress of mustard seed harvest in Saskatchewan from 2020 to 2024



## Harvest samples

In 2024, the Harvest Sample Program received 239 mustard seed samples from producers and grain companies. This was lower than the 2023 number (295) and the 10-year mean (280), but higher than the 5-year mean (234). We analyzed 131 samples of yellow mustard seed (123 in 2023), 64 samples of brown mustard seed (83 in 2023) and 44 samples of oriental mustard seed (58 in 2023). Most of the samples (84.9%) came from Saskatchewan (74.6% in 2023), while 11.7% came from Alberta (22.7% in 2023) and 3.4% came from Manitoba (2.7% in 2023). Individual samples were cleaned to remove dockage and were graded by grain inspectors according to Chapter 12 of the [Official Grain Grading Guide](#).

We used a FOSS NIRSTM DS2500 spectrophotometer, calibrated to and verified against the appropriate listed reference methods, to determine the oil and protein content of all individual whole-seed samples. The total glucosinolate content was determined on individual mustard seed samples using NIR spectroscopy and all composite samples were analyzed using the high-performance liquid chromatography reference method. All [oilseed methods and test procedures](#) are detailed on our website.

Composite samples of No. 1 mustard seed were prepared for Canada and for each province by combining samples of each type of mustard seed. Composite samples of lower grade mustard seed (No. 2, No. 3, No. 4, and Sample) were prepared by combining samples of each type for western Canada. Composites of mustard seed varieties were also prepared by combining only samples of the most common varieties graded No. 1. Composites were analyzed for oil, protein, total glucosinolates and chlorophyll, as well as fatty acid composition.

# Quality of the 2024 mustard seed crop

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The mustard seed crop grown in western Canada in 2024 had the general characteristics of a well matured crop but showed some stress due to warm and dry growing conditions. Historical data from the Harvest Sample Program indicates that warm and dry growing conditions tend to produce oilseed crops with higher protein and lower oil content. Scientific literature also suggests that total glucosinolate levels increase in rapeseed when crops are exposed to dry conditions after flowering.

## Oil, protein and total glucosinolate content

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Table 1 contains a summary of the 2024 data for oil, protein and total glucosinolate content in oriental, brown, and yellow mustard seed samples according to grade. Comparisons of the quality of oriental, brown, and yellow mustard seed from previous years can be found in Figure 6, Figure 7 and Figure 8.

Oriental mustard seed graded No. 1 had a mean oil content of 34.2% in 2024, much lower than the 2023 mean (36.9%), the 5-year mean (37.7%) and the 10-year mean (39.6%). The mean protein content in 2024 (31.1%) was higher than the 2023 mean (29.4%), the 5-year mean (29.1%) and the 10-year mean (27.9%) (Figure 6). The oil content ranged from 30.8% to 38.7% (32.5% to 43.7% in 2023) and the protein content ranged from 28.0% to 32.7% (24.4% to 32.8% in 2023) (Table 1).

In 2024, brown mustard seed graded No. 1 also had a mean oil content (32.1%) that was lower than the 2023 mean (33.4%), the 5-year mean (34.0%) and the 10-year mean (35.3%). The mean protein content in 2024 (32.0%) was higher than the 2023 mean (30.6%), the 5-year mean (30.5%) and the 10-year mean (29.5%) (Figure 7). The oil content ranged from 27.8% to 39.0% (29.9% to 39.2% in 2023) and the protein content ranged from 27.3% to 35.3% (26.6% to 34.2% in 2023) (Table 1).

Yellow mustard seed is characteristically lower in oil and higher in protein content than oriental and brown mustard seed (Table 1). The mean oil content of yellow mustard seed graded No. 1 in 2024 (24.1%) was lower than the 2023 mean (26.3%), the 5-year mean (26.4%) and the 10-year mean (27.7%). The mean protein content in 2024 (36.5%) was similar to the 2023 mean (35.2%) and significantly higher than the 5-year mean (34.7%) and the 10-year mean (33.6%) (Figure 8). The oil content ranged from 21.3% to 30.2% (22.8% to 28.5% in 2023) and the protein content ranged from 28.9% to 39.8% (28.6% to 40.0% in 2023) (Table 1).

The mean total glucosinolate content of oriental mustard seed graded No. 1 was 148  $\mu\text{mol/g}$  of seeds, higher than the 2023 mean (135  $\mu\text{mol/g}$  of seeds), the 5-year mean (131  $\mu\text{mol/g}$  of seeds) and the 10-year mean (124  $\mu\text{mol/g}$  of seeds). The mean total glucosinolate content of No. 1 brown mustard seed in 2024 was 150  $\mu\text{mol/g}$  of seeds, higher than the 2023 mean (131  $\mu\text{mol/g}$ ) and significantly higher than the 5-year mean (123  $\mu\text{mol/g}$  of seeds) and the 10-year mean (115  $\mu\text{mol/g}$  of seeds). The mean total glucosinolate content of

yellow mustard seed graded No. 1 was 165  $\mu\text{mol/g}$  of seeds, much higher than the 2023 mean (147  $\mu\text{mol/g}$  of seeds) and the 2020-2023 mean (146  $\mu\text{mol/g}$  of seeds).

In comparison to 2023, the mean protein content increased in 2024 for oriental mustard seed (plus 1.7%), brown mustard seed (plus 0.8%) and yellow mustard seed (plus 1.3%). The protein content for each type of No. 1 mustard seed in 2024 was higher than its 5-year mean and 10-year mean. The opposite was observed for oil content, with each of the 2024 means being lower than in 2023. The difference in mean oil content was minus 2.7% for oriental mustard seed, minus 1.3% for brown mustard seed and minus 2.2% for yellow mustard seed, resulting in mean oil content values lower than the 5-year mean and 10-year mean for each type of mustard seed.

The number of days over 30°C between April 1 and July 31 was higher in 2024 than in 2023 (13 to 16 days in 2024 versus 9 to 12 days in 2023). An important difference between the 2024 and 2023 growing seasons was that no night temperatures in the single digits occurred in 2024, as was recorded in July 2023 in most of the Prairies. Low night temperatures are known to help the oilseed crop to recover from the heat of the day, leading to an increase in oil content.

Data on the chlorophyll content for samples of oriental mustard seed, brown mustard seed and yellow mustard seed from 2024 are given in Table 2. The chlorophyll content for No. 1 oriental mustard seed was 0.5 milligrams per kilogram (mg/kg) (1.0 mg/kg in 2023) and was 1.3 mg/kg (2.4 mg/kg in 2023) for No. 1 brown mustard seed (Figure 10). The chlorophyll content for No. 1 yellow mustard seed was similar to that observed in 2023 (0.5 mg/kg in 2024 versus 0.7 mg/kg in 2023) (Figure 10 and Table 2).

## Fatty acid composition

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Table 2 contains the fatty acid composition data for samples of brown mustard seed, oriental mustard seed and yellow mustard seed received in 2024.

Yellow mustard seed oil had more oleic acid (C18:1) and erucic acid (C22:1) than brown mustard seed oil and oriental mustard seed oil. Concurrently, the amount of linoleic acid (C18:2) and  $\alpha$ -linolenic acid (C18:3) was higher in brown mustard seed oil and oriental mustard seed oil than in yellow mustard seed oil. The mean erucic acid content for yellow mustard seed oil was 30.8% (32.1% in 2023), while the mean erucic acid content was 22.7% (22.3% in 2023) for brown mustard seed oil and 22.0% (21.6% in 2023) for oriental mustard seed oil. This resulted in a lower iodine value for oriental mustard seed oil (115.1 units in 2024 versus 116.1 units in 2023), a similar iodine value for brown mustard seed oil (117.5 units in 2024 versus 117.7 units in 2023) and the same iodine value for yellow mustard seed oil (102.0 units in 2024 and 2023). The percentage of total saturated fatty acids was 5.5% for yellow mustard seed oil, 7.0% for oriental mustard seed oil and 6.6% for brown mustard seed oil.

In 2024, Cutlass was the main variety of oriental mustard seed, Centennial Brown was the main variety of brown mustard seed, and Andante and AAC Yellow 80 were the two main varieties of yellow mustard seed. Compared to AAC Yellow 80 seed oil, Andante seed oil contained more erucic acid (33.1% versus 28.4%), similar  $\alpha$ -linolenic acid (9.5% versus 9.4%), and less oleic acid (26.6% versus 30.9%) and linoleic acid (10.9% versus 11.4%) (Table 2).

Free fatty acid (FFA) content is an indicator of seed stress and oil degradation. In 2024, the mean FFA content of No. 1 mustard seed was low (0.05% to 0.08%), similar to what was observed in 2023 (0.05% to 0.14%). Samples of No. 1 brown mustard seed showed sprouting damage, but the mean FFA content was not statistically different from No. 1 oriental mustard seed. Since FFA content was lower than 0.1%, it was not an issue for mustard seed quality this year.

Table 1 Oil, protein and total glucosinolate content of 2024 western Canadian mustard seed

| Grade                                   | Location       | Number of samples | Oil content <sup>1</sup><br>% |                  |                  | Protein content <sup>2</sup><br>% |      |      | Glucosinolate content<br>μmol/g <sup>3</sup> |                  |     |
|-----------------------------------------|----------------|-------------------|-------------------------------|------------------|------------------|-----------------------------------|------|------|----------------------------------------------|------------------|-----|
|                                         |                |                   | Mean                          | Min <sup>4</sup> | Max <sup>5</sup> | Mean                              | Min  | Max  | Mean                                         | Min              | Max |
| Domestic Mustard Seed, Oriental, Canada |                |                   |                               |                  |                  |                                   |      |      |                                              |                  |     |
| No. 1                                   | Western Canada | 33                | 34.2                          | 30.8             | 38.7             | 31.1                              | 28.0 | 32.7 | 148                                          | 131              | 175 |
|                                         | Saskatchewan   | 29                | 34.3                          | 30.8             | 38.7             | 31.2                              | 29.1 | 32.7 | 147                                          | 131              | 175 |
|                                         | Alberta        | 4                 | 34.2                          | 33.6             | 37.3             | 30.7                              | 28.0 | 31.6 | 154                                          | 144              | 167 |
| Cutlass, No. 1                          | Western Canada | 20                | 34.6                          | 34.0             | 38.7             | 31.2                              | 29.2 | 32.7 | 145                                          | 131              | 154 |
| Domestic Mustard Seed, Brown, Canada    |                |                   |                               |                  |                  |                                   |      |      |                                              |                  |     |
| No. 1                                   | Western Canada | 52                | 32.1                          | 27.8             | 39.0             | 32.0                              | 27.3 | 35.3 | 150                                          | 119              | 155 |
|                                         | Saskatchewan   | 50                | 32.1                          | 27.8             | 39.0             | 32.0                              | 27.3 | 35.3 | 150                                          | 119              | 155 |
| No. 2                                   | Western Canada | 8                 | 33.1                          | 31.4             | 36.6             | 32.1                              | 29.2 | 34.9 | 145                                          | 137              | 161 |
| Centennial Brown, No. 1                 | Western Canada | 11                | 32.3                          | 28.8             | 37.8             | 32.0                              | 27.3 | 34.3 | 143                                          | 122              | 155 |
| Domestic Mustard Seed, Yellow, Canada   |                |                   |                               |                  |                  |                                   |      |      |                                              |                  |     |
| No. 1                                   | Western Canada | 90                | 24.1                          | 21.3             | 30.2             | 36.5                              | 28.9 | 39.8 | 165                                          | n/a <sup>6</sup> | n/a |
|                                         | Saskatchewan   | 73                | 23.9                          | 21.3             | 29.7             | 36.8                              | 31.3 | 39.8 | 165                                          | n/a              | n/a |
|                                         | Alberta        | 14                | 24.9                          | 23.1             | 28.2             | 35.3                              | 32.2 | 38.7 | 164                                          | n/a              | n/a |
| No. 2                                   | Western Canada | 15                | 25.3                          | 21.1             | 29.0             | 36.3                              | 31.0 | 41.9 | 167                                          | n/a              | n/a |
| No. 3                                   | Western Canada | 10                | 24.2                          | 21.1             | 28.4             | 37.2                              | 32.6 | 39.2 | 168                                          | n/a              | n/a |
| No. 4                                   | Western Canada | 10                | 27.0                          | 24.5             | 31.2             | 33.3                              | 29.0 | 35.5 | 163                                          | n/a              | n/a |
| Sample                                  | Western Canada | 6                 | 25.8                          | 22.6             | 27.9             | 35.9                              | 33.5 | 37.7 | 162                                          | n/a              | n/a |
| Andante, No. 1                          | Western Canada | 27                | 23.8                          | 21.6             | 29.1             | 36.4                              | 32.2 | 39.8 | 168                                          | n/a              | n/a |
|                                         | Saskatchewan   | 21                | 23.4                          | 21.6             | 29.1             | 37.0                              | 33.9 | 39.8 | 168                                          | n/a              | n/a |
|                                         | Alberta        | 6                 | 25.3                          | 23.1             | 28.2             | 34.4                              | 32.2 | 36.9 | 167                                          | n/a              | n/a |
| AAC Yellow 80, No. 1                    | Western Canada | 15                | 24.8                          | 21.6             | 28.4             | 36.4                              | 32.5 | 39.7 | 169                                          | n/a              | n/a |
|                                         | Saskatchewan   | 8                 | 24.7                          | 21.6             | 28.4             | 37.0                              | 32.5 | 39.7 | 167                                          | n/a              | n/a |
|                                         | Alberta        | 7                 | 24.9                          | 23.2             | 26.7             | 35.8                              | 34.0 | 38.7 | 171                                          | n/a              | n/a |

<sup>1</sup> Determined on a dry matter basis.

<sup>2</sup> Protein content calculated from nitrogen (N) content using N x 6.25 on a dry matter basis.

<sup>3</sup> μmol/g = micromoles per gram; total glucosinolate content calculated on a dry matter basis.

<sup>4</sup> Min = minimum obtained from the NIR predictions.

<sup>5</sup> Max = maximum obtained from the NIR predictions.

<sup>6</sup> n/a = not applicable

Table 2 Relative fatty acid composition of the oil, chlorophyll content and free fatty acid content of 2024 western Canadian mustard seed

|                                         |                   | Relative fatty acid composition (%) <sup>1</sup> |       |       |       |                        | Iodine<br>value<br>(units) | Chlorophyll<br>content<br>(mg/kg <sup>2</sup> ) | FFA <sup>3</sup><br>(%) |
|-----------------------------------------|-------------------|--------------------------------------------------|-------|-------|-------|------------------------|----------------------------|-------------------------------------------------|-------------------------|
| Grade                                   | Location          | C18:1                                            | C18:2 | C18:3 | C22:1 | Total SFA <sup>4</sup> |                            |                                                 |                         |
| Domestic Mustard Seed, Oriental, Canada |                   |                                                  |       |       |       |                        |                            |                                                 |                         |
| No. 1                                   | Western<br>Canada | 21.6                                             | 24.0  | 10.1  | 22.0  | 7.0                    | 115.1                      | 0.50                                            | 0.08                    |
|                                         | Saskatchewan      | 21.3                                             | 23.7  | 10.2  | 22.4  | 7.0                    | 115.0                      | 0.50                                            | 0.08                    |
|                                         | Alberta           | 24.1                                             | 25.8  | 9.3   | 19.2  | 7.1                    | 115.7                      | 0.20                                            | 0.09                    |
| Cutlass, No. 1                          | Western<br>Canada | 20.5                                             | 23.2  | 10.2  | 23.4  | 7.0                    | 114.4                      | 0.50                                            | 0.09                    |
| Domestic Mustard Seed, Brown, Canada    |                   |                                                  |       |       |       |                        |                            |                                                 |                         |
| No. 1                                   | Western<br>Canada | 20.6                                             | 22.0  | 12.3  | 22.7  | 6.6                    | 117.5                      | 1.3                                             | 0.05                    |
|                                         | Saskatchewan      | 20.6                                             | 22.0  | 12.3  | 22.7  | 6.6                    | 117.5                      | 1.3                                             | 0.08                    |
| No. 2                                   | Western<br>Canada | 23.3                                             | 22.4  | 13.0  | 19.7  | 6.7                    | 119.4                      | 1.5                                             | 0.07                    |
| Centennial Brown,<br>No. 1              | Western<br>Canada | 19.7                                             | 21.6  | 12.2  | 23.9  | 6.5                    | 116.9                      | 1.1                                             | 0.06                    |
| Domestic Mustard Seed, Yellow, Canada   |                   |                                                  |       |       |       |                        |                            |                                                 |                         |
| No. 1                                   | Western<br>Canada | 28.7                                             | 11.1  | 9.5   | 30.8  | 5.5                    | 102.0                      | 0.5                                             | 0.05                    |
|                                         | Saskatchewan      | 29.0                                             | 11.1  | 9.5   | 30.5  | 5.6                    | 102.1                      | 0.5                                             | 0.05                    |
|                                         | Alberta           | 27.1                                             | 11.0  | 9.4   | 32.6  | 5.5                    | 101.8                      | 0.4                                             | 0.03                    |
| No. 2                                   | Western<br>Canada | 26.0                                             | 10.4  | 10.4  | 33.5  | 5.3                    | 103.1                      | 1.2                                             | 0.06                    |
| No. 3                                   | Western<br>Canada | 26.2                                             | 10.4  | 10.0  | 33.8  | 5.3                    | 102.1                      | 1.4                                             | 0.07                    |
| No. 4                                   | Western<br>Canada | 26.0                                             | 10.2  | 10.2  | 33.7  | 5.3                    | 102.2                      | 2.2                                             | 0.10                    |
| Sample                                  | Western<br>Canada | 25.9                                             | 10.2  | 10.6  | 33.6  | 5.3                    | 103.1                      | 2.1                                             | 0.06                    |
| Andante, No. 1                          | Western<br>Canada | 26.6                                             | 10.9  | 9.5   | 33.1  | 5.5                    | 101.7                      | 0.6                                             | 0.06                    |
|                                         | Saskatchewan      | 27.3                                             | 11.0  | 9.5   | 32.3  | 5.5                    | 101.9                      | 0.6                                             | 0.07                    |
|                                         | Alberta           | 24.3                                             | 10.7  | 9.4   | 35.8  | 5.4                    | 101.0                      | 0.7                                             | 0.02                    |
| AAC Yellow 80,<br>No. 1                 | Western<br>Canada | 30.9                                             | 11.4  | 9.4   | 28.4  | 5.7                    | 102.4                      | 0.4                                             | 0.06                    |
|                                         | Saskatchewan      | 31.7                                             | 11.4  | 9.4   | 27.5  | 5.7                    | 102.6                      | 0.2                                             | 0.07                    |
|                                         | Alberta           | 29.9                                             | 11.3  | 9.4   | 29.4  | 5.6                    | 102.3                      | 0.6                                             | 0.04                    |

<sup>1</sup> Total fatty acids include oleic (C18:1), linoleic (C18:2), α-linolenic (C18:3) and erucic (C22:1).

<sup>2</sup> mg/kg = milligrams per kilogram.

<sup>3</sup> FFA = free fatty acids.

<sup>4</sup> Total saturated fatty acids (SFA) is the sum of palmitic (C16:0), stearic (C18:0), arachidic (C20:0), behenic (C22:0) and lignoceric (C24:0).

Figure 6 Oil and protein content of oriental Domestic Mustard Seed, No. 1 Canada from 2014 to 2024 harvest samples

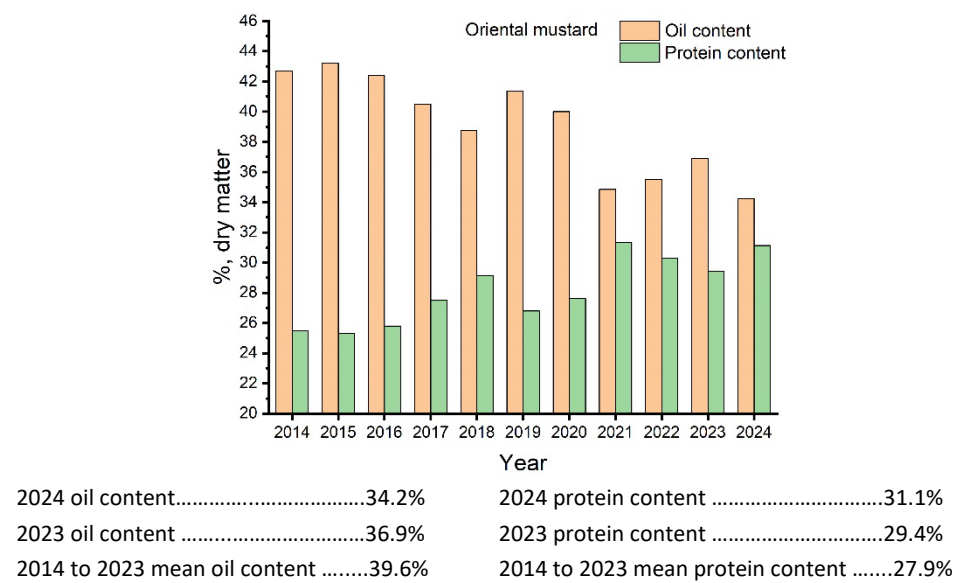


Figure 7 Oil and protein content of brown Domestic Mustard Seed, No. 1 Canada from 2014 to 2024 harvest samples

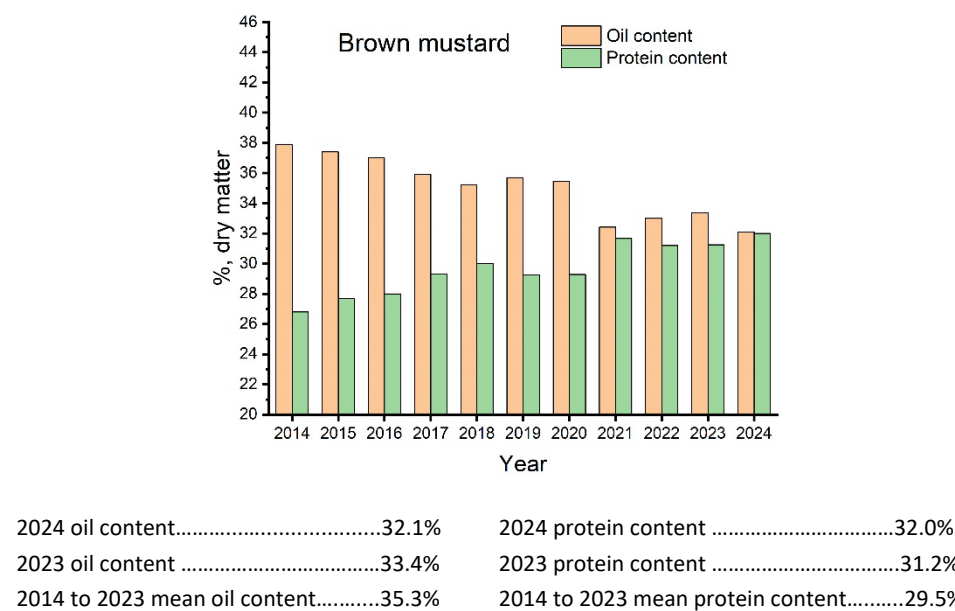
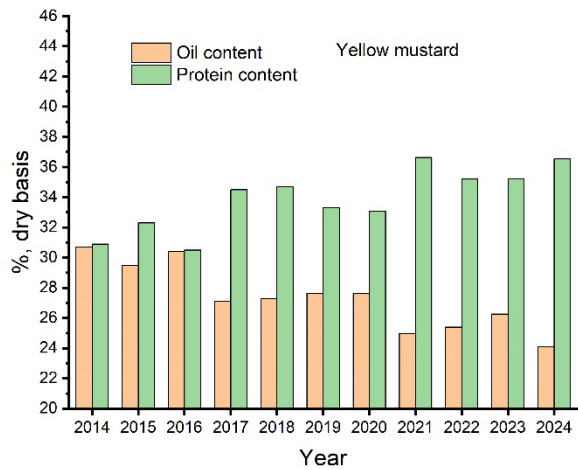
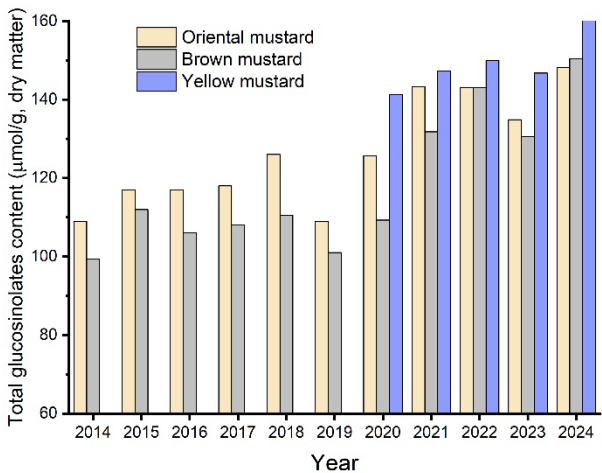


Figure 8 Oil and protein content of yellow Domestic Mustard Seed, No. 1 Canada from 2014 to 2024 harvest samples



|                                    |       |                                        |       |
|------------------------------------|-------|----------------------------------------|-------|
| 2024 oil content.....              | 24.1% | 2024 protein content .....             | 36.5% |
| 2023 oil content .....             | 26.3% | 2023 protein content .....             | 35.3% |
| 2014 to 2023 mean oil content..... | 27.7% | 2014 to 2023 mean protein content..... | 33.6% |

Figure 9 Total glucosinolate content of oriental, brown and yellow<sup>1</sup> Domestic Mustard Seed, No. 1 Canada from 2014 to 2024 harvest samples



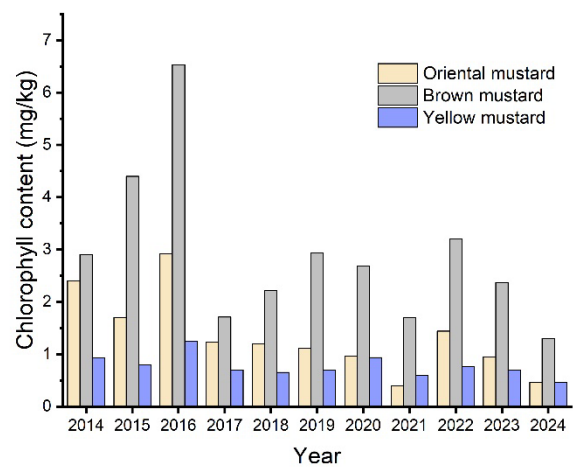
2024 total glucosinolate content of oriental mustard seed ..... 148 µmol/g  
 2023 total glucosinolate content of oriental mustard seed ..... 135 µmol/g  
 2014 to 2023 mean total glucosinolate content of oriental mustard seed ..... 124 µmol/g

2024 total glucosinolate content of brown mustard seed ..... 150 µmol/g  
 2023 total glucosinolate content of brown mustard seed ..... 131 µmol/g  
 2014 to 2023 mean total glucosinolate content of brown mustard seed ..... 115 µmol/g

2024 total glucosinolate content of yellow mustard seed ..... 164 µmol/g  
 2023 total glucosinolate content of yellow mustard seed ..... 147 µmol/g  
 2020 to 2023 mean total glucosinolate content of yellow mustard seed ..... 146 µmol/g

<sup>1</sup> data from 2020 to 2024

Figure 10 Chlorophyll content of oriental, brown and yellow Domestic Mustard Seed, No. 1 Canada from 2014 to 2024 harvest samples



|                                                         |           |                                                                      |           |
|---------------------------------------------------------|-----------|----------------------------------------------------------------------|-----------|
| 2024 chlorophyll content of oriental mustard seed ..... | 0.5 mg/kg | 2014 to 2023 mean chlorophyll content of oriental mustard seed ..... | 1.4 mg/kg |
| 2024 chlorophyll content of brown mustard seed .....    | 1.2 mg/kg | 2014 to 2023 mean chlorophyll content of brown mustard seed .....    | 3.1 mg/kg |
| 2024 chlorophyll content of yellow mustard seed .....   | 0.5 mg/kg | 2014 to 2023 mean chlorophyll content of yellow mustard seed .....   | 0.8 mg/kg |

# Acknowledgements

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