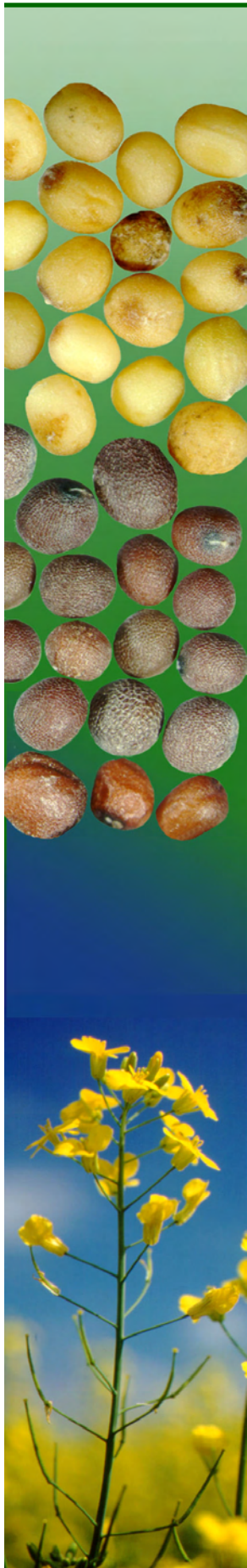




Canadian Grain
Commission

Commission canadien
des grains

ISSN 1498-9905



Quality of western Canadian mustard 2006

Douglas R. DeClercq
Program Manager, Oilseeds Services

Contact: Douglas R. DeClercq
Program Manager, Oilseeds Services
Tel: 204 983-3354
Email: ddeclercq@grainscanada.gc.ca
Fax: 204 983-0724

Grain Research Laboratory
Canadian Grain Commission
1404-303 Main Street
Winnipeg MB R3C 3G8
www.grainscanada.gc.ca

Canada

Quality

Innovation

Service

Table of contents

| | |
|---|---|
| Introduction..... | 3 |
| Summary | 3 |
| Weather and production review..... | 3 |
| Harvest survey samples | 6 |
| Quality of western Canadian mustard –2006..... | 7 |
| Quality of Domestic Mustard Seed, Canada Oriental and Domestic Mustard Seed, Canada, Brown | 7 |
| Quality of Domestic Mustard Seed, Canada, Yellow | 8 |

Tables

| | |
|--|----|
| Table 1 – Seeded area and production for western Canadian mustard..... | 5 |
| Table 2 – Quality of 2006 western Canadian mustard | 9 |
| Table 3a – Fatty acid composition of 2006 western Canadian mustard | 10 |
| Table 3b – Fatty acid composition of 2006 western Canadian mustard | 11 |
| Table 4 – Quality of western Canadian mustard from CGC surveys..... | 12 |

Acknowledgements

The CGC acknowledges the cooperation of mustard producers, grain handling offices, and seed handling plants in western Canada for supplying the samples of mustard harvested in 2006, and the Weather and Crop Surveillance department of the Canadian Wheat Board for providing the review of the 2006 growing season. The CGC recognizes Industry Services grain inspectors for grading the mustard harvest survey samples and GRL staff for conducting the analyses and preparing the report.

Introduction

This report presents information on the oil, protein and glucosinolate contents and the fatty acid composition of oriental (*Brassica juncea*), brown (*Brassica juncea*) and yellow (*Sinapis alba*) mustard grown in western Canada in 2006. The data were obtained from analyses of harvest survey samples collected by the Canadian Grain Commission (CGC).

Summary

Compared to the ten-year means, all three types of mustard seed were similar to the average fixed oil content and crude protein content. However, both the oriental and brown mustard 2006 survey samples had lower average fixed oils and slightly higher protein contents compared to the 2005 values. Top grade oriental mustard had a fixed oil content of 41.8%, a decrease of 0.9% from the 2005 value of 42.7%. Top grade brown mustard samples had a fixed oil content of 40.2%, a 0.4% decrease from the 2005 value of 40.6%. Oriental mustard samples had similar a protein content of 26.2% while brown mustard increased 0.3% to 26.0% in 2006. Compared to 2005 values, the average glucosinolate content of the 2006 oriental mustard samples increased slightly while the 2006 brown mustard samples contained similar levels of glucosinolates. Compared to 2005, the yellow mustard survey samples were 0.3% lower in fixed oil at 30.5% and 0.4% higher in protein content at 31.8%.

Weather and production review

Weather review

Temperature and precipitation patterns for the 2006 western Canadian growing season can be found on the PFRA web site (http://www.agr.gc.ca/pfra/drought/drmaps_e.htm). The prairie provinces experienced adequate to excessive moisture to start the 2006 growing year. However, Saskatchewan and the prairies experienced a warmer, drier growing season in 2006 compared to the cooler, moister conditions during the past two years. The drier and warmer than normal growing period eventually stressed many crops, but also allowed for quicker crop maturity and an earlier than normal harvest. The Weather and Crop Surveillance department of the Canadian Wheat Board provided the majority of the detailed weather review for the 2006 crop year.

Seeding

The soil moisture supply in western Canada was good to excellent in most regions for seeding of the 2006 crop, although excess moisture caused delays in northern Saskatchewan. The source of the excess moisture was precipitation received during the 2005 harvest season, as the winter precipitation was generally below normal. Seeding began in the southern areas of the Prairies at the end of April, with slow progress

reported until the second week of May. Progress rapidly accelerated during the middle of May and reached 75% completion by May 22. Planting progress slowed during the next few weeks as heavy rains fell in the northern growing areas of Saskatchewan. Seeding continued in northern Saskatchewan into the third week of June. Approximately 800 000 hectares were left fallow due to the wet conditions in northeastern Saskatchewan. Temperatures were mostly above normal during seeding, which resulted in rapid germination and emergence of the crop. Crops in the southern and central Prairies were about one week ahead of normal development by the end of June.

Growing conditions

The above-normal temperatures experienced during the spring continued through the months of July and August. Average monthly temperatures were generally one to four degrees above normal across the Prairies. The largest deviations were seen in the eastern growing areas, but relatively cool evening temperatures helped crops survive the hot weather. Precipitation amounts were well below normal in all areas of the Prairies during July and August. Southern and central areas received between 25 and 50% of normal precipitation, while northern growing areas received between 50 and 75%. The combination of hot temperatures and a lack of moisture stressed crops and lowered yield potential. The dry conditions minimized disease pressure in the crop and advanced crop development such that it was two to three weeks ahead of normal in most growing areas. The northeastern areas of Saskatchewan were an exception to this trend, as crop development was close to normal due to the late planting during the spring.

Harvest conditions

The early start to the harvest was a sharp contrast to the delayed harvests of the previous two growing seasons. The hot, mostly dry conditions experienced during August resulted in rapid crop ripening. The dry, warm conditions continued into September, which allowed 93% of the Saskatchewan mustard crop to be harvested by the mid-month, compared to only 53% at that time in 2005. Cooler, wet conditions prevailed in the last half of September, which slowed the harvest and prevented completion of the entire mustard harvest until October.

Production and grade information

As shown in Table 1, mustard seed production for 2006 decreased by 42% to 116.1 thousand metric tonnes as a result of lower seeded area and lower yields. About 45% of western Canadian mustard production was estimated to be the yellow type, followed by 30% brown and 25% oriental mustard. Saskatchewan accounted for 83% and 78% respectively of western Canada's total seeded acreage and production of mustard. According to Saskatchewan Agriculture and Food, the 2006 Saskatchewan yield of 799 lb/acre (362 kg/acre) was slightly above the ten-year (1996-2005) average of 778 lb/acre (352 kg/acre) but 7% below the 2005 yield of 863 lb/acre (383 kg/acre). Detailed information on production factors and yields for Saskatchewan crop districts can be found at: http://www.agr.gov.sk.ca/DOCS/crops/special_crops/production_information/specialtycroprpt.asp

Saskatchewan Agriculture and Food estimated 84% of the 2006 Saskatchewan mustard crop graded No.1 Canada, compared to 77% in 2005 and 74% for the 1996–2005 period. The good harvest conditions, particularly in southern Saskatchewan and Alberta, produced a mustard crop with less visible damage than in 2005 and 2004. Compared to 2004, a frost year, there were significantly fewer yellow mustard samples in the lower grades.

Table 1 – Seeded area and production for western Canadian mustard

| Region | Seeded area ¹ | Seeded area ² | Production ¹ | Production ² | Mean production ² |
|-----------------------|--------------------------|--------------------------|-------------------------|-------------------------|------------------------------|
| | 2006 | 2005 | 2006 | 2005 | 1996-2005 |
| | thousand hectares | | thousand tonnes | | thousand tonnes |
| Manitoba | n/a | n/a | n/a | n/a | 4.6 |
| Saskatchewan | 119.4 | 180.1 | 90.5 | 170.3 | 183.4 |
| Alberta | 24.2 | 32.3 | 25.6 | 31.1 | 33.5 |
| Western Canada | 143.6 | 212.4 | 116.1 | 201.4 | 221.5 |

¹ *Field Crop Reporting Series No. 8*, December 7, 2006; Statistics Canada

² *Field Crop Reporting Series No. 8*, revised estimates for 1996-2005

Harvest survey samples

The 340 samples for the 2006 mustard survey included 163 yellow mustard, 82 brown mustard and 95 oriental mustard. Over 75% of the 2006 harvest survey samples came from Saskatchewan.

Producers, grain companies and elevators that routinely handle mustard seed submitted samples of mustard grown in 2006 to the CGC. The individual samples were cleaned to remove dockage and graded by the CGC's Industry Services Division.

The oil, protein, and glucosinolate contents were determined on all individual whole seed samples using a NIRSystems 6500 scanning near infra-red spectrometer calibrated to and verified against the appropriate listed reference methods. The glucosinolate contents of oriental and brown mustard are expressed as μ moles/g of allyl glucosinolate and mg/g of allyl isothiocyanate on a whole-seed, dry moisture basis. A molar mass of 99.16 g/mole for allyl isothiocyanate is used to convert μ moles of allyl glucosinolate (sinigrin) to mg/g of allyl isothiocyanate. Composite samples were tested for fatty acid composition.

Quality of western Canadian mustard 2006

The three mustard crops grown in western Canada in 2006 showed the general characteristics of a crop grown under generally good, but drier and warmer than normal conditions. Some of the southern regions of the mustard growing area received very hot, dry weather in July which contributed to much lower fixed oils, higher crude proteins and higher glucosinolate levels in those regions. The Grain Research Laboratory (GRL) long-term harvest survey results show that hot, dry growing conditions tend to produce an oilseed crop with lower oil contents and iodine values, but higher protein contents. Research also shows that glucosinolate levels may increase when Brassica crops are grown under hot, dry conditions. Because mustard processors generally prefer lower fixed oils, the quality of the 2006 mustard crop should be very good for end-users.

The oil, protein, and glucosinolate contents for yellow, brown and oriental mustard are summarized by grade in Table 2. The fatty acid compositions of the mustard oils are detailed in Table 3. A comparison of the 2006 quality data with the previous years' surveys is provided in Table 4. The means and standard deviations of the 2006 analytical data by grade and province can be found at:

<http://www.grainscanada.gc.ca/Quality/Mustard/mustardmenu-e.htm>

Quality of Domestic Mustard Seed, Canada, Oriental and Domestic Mustard Seed, Canada, Brown

In 2006, the average fixed oil content of the Oriental Mustard, No.1 Canada samples decreased 0.9% to 41.8% while the average crude protein content remained at 26.2%. The fixed oil contents of Oriental Mustard, No. 1 Canada samples from producers in western Canada ranged from 37.1% to 47.1%. The protein content of Oriental Mustard, No. 1 Canada samples from producers in western Canada ranged from 22.2% to 30.3%.

In 2006, the average fixed oil content of Brown Mustard, No. 1 Canada samples decreased 0.4% to 40.2% while the average crude protein content increased by 0.3% to 26.0%. The fixed oil content of Brown Mustard, No. 1 Canada samples from producers in western Canada ranged from 35.8% to 43.7%. The protein content of Brown Mustard, No. 1 Canada samples from producers in western Canada ranged from 21.8% to 31.2%.

In 2006, the average glucosinolate contents for Oriental Mustard, No.1 Canada samples increased by 1 $\mu\text{mol/g}$ to 131 $\mu\text{mol/g}$ while Brown Mustard, No.1 Canada samples remained at 108 $\mu\text{mol/g}$. The glucosinolate contents of Oriental Mustard, No. 1 Canada samples from producers in western Canada ranged from 111 to 152 $\mu\text{mol/g}$. The glucosinolate contents of Brown Mustard, No. 1 Canada samples from producers in western Canada ranged from 91 to 130 $\mu\text{mol/g}$. The provincial and grade differences are detailed in the statistical tables for oriental and brown mustard: <http://www.grainscanada.gc.ca/Quality/Mustard/mustardmenu-e.htm>

Fatty acid compositions for the oriental and brown mustard composites are provided in Table 3. The 2006 average erucic acid level decreased by 0.7% for Oriental Mustard, No.1 Canada samples while Brown Mustard, No.1 Canada samples remained the

same. The average 2006 erucic acid values of 20.5% and 22.7% for oriental and brown mustards are typical of *Brassica juncea* condiment mustards. The oriental mustard variety Forge showed some differences in oleic (C18:1), linoleic (C18:2), and erucic acid (C22:1) content compared to the variety Cutlass.

The total saturated fatty acids for the Oriental and Brown, No.1 Canada composites were 6.2% and 6.0% respectively; similar to last year's values. The 2006 mustard composites had decreased levels of linolenic acid and increased levels of oleic acid. As a result, the iodine value, an indicator of oil unsaturation, will be slightly lower in 2006 mustard samples.

The growing season temperatures for the 2004 season were among the coolest reported in over 100 years. This caused the oilseed plants to increase the amount of unsaturation in the oil. The plant's objective in making the oil unsaturated is to give a more liquid (i.e. unsaturated) oil at lower temperatures. To do this, the plants have evolved mechanisms in the form of enzyme systems that are more active in making the oil unsaturated when the weather is cool and less active when it is hot. A return to very warm temperatures in 2006 resulted in further shifts from the 2005 fatty acid profiles.

Quality of Domestic Mustard Seed, Canada, Yellow

The yellow mustard had the characteristically lower oil content and higher protein content than oriental and brown mustards. For Yellow Mustard, No. 1 Canada samples, the average fixed oil content decreased 0.3% to 30.5% while average crude protein content increased 0.4% to 31.8% (Table 4). The fixed oil contents of Yellow Mustard, No. 1 Canada samples from producers in western Canada ranged from 23.4% to 35.0%. The crude protein content of Yellow Mustard, No. 1 Canada samples from producers in western Canada ranged from 26.5% to 39.1%. Regional and grade differences in seed quality are detailed at:

<http://www.grainscanada.gc.ca/Quality/Mustard/mustardmenu-e.htm>

Fixed oil in yellow mustard contained higher amounts of oleic (C18:1) and erucic acid (C22:1) but lower amounts of linoleic (C18:2) and linolenic (C18:3) acid compared to the oriental and brown mustard oils. The oil from the 2006 Yellow Mustard, No.1 Canada seed had a mean erucic acid content of 36.2% compared to the 35.5% in 2005. Total saturated fatty acids, at 5.0%, were slightly lower than the 5.2% in 2005.

Table 2 – Quality of 2006 western Canadian mustard

| Grade | Number of samples | Oil content ¹ | Protein content ² | Glucosinolate content ³ | |
|--|-------------------|--------------------------|------------------------------|------------------------------------|------|
| | | % | % | µmol/g | mg/g |
| Domestic Mustard Seed, Canada, Oriental | | | | | |
| No. 1 Canada | 84 | 41.8 | 26.2 | 131 | 13.0 |
| No. 2 Canada | 6 | 43.5 | 24.6 | 127 | 12.6 |
| No. 3 Canada | 0 | — | — | — | — |
| No. 4 Canada | 2 | 40.7 | 26.3 | 139 | 13.8 |
| Sample Canada | 3 | 41.8 | 26.5 | 133 | 13.1 |
| Domestic Mustard Seed, Canada, Brown | | | | | |
| No. 1 Canada | 71 | 40.2 | 26.0 | 108 | 10.7 |
| No. 2 Canada | 3 | 39.9 | 26.2 | 111 | 11.0 |
| No. 3 Canada | 1 | 42.1 | 23.2 | 100 | 9.9 |
| No. 4 Canada | 2 | 39.3 | 26.4 | 115 | 11.4 |
| Sample Canada | 5 | 40.7 | 25.1 | 104 | 10.3 |
| Domestic Mustard Seed, Canada, Yellow | | | | | |
| No. 1 Canada | 108 | 30.5 | 31.8 | — | — |
| No. 2 Canada | 22 | 30.8 | 31.6 | — | — |
| No. 3 Canada | 10 | 31.1 | 32.3 | — | — |
| No. 4 Canada | 14 | 31.5 | 30.7 | — | — |
| Sample Canada | 9 | 32.0 | 30.6 | — | — |

¹ Dry matter basis

² % N x 6.25; dry matter basis

³ Allyl glucosinolate (µmoles/g) and allyl isothiocyanate (mg/g); dry matter basis

Table 3a – Fatty acid composition of 2006 western Canadian mustard

| Category | Number of samples | Fatty acid composition(%) ¹ | | | | | | | | |
|--|-------------------|--|------------|------------|------------|------------|------------|------------|------------|------------|
| | | C16:0 % | C16:1 % | C18:0 % | C18:1 % | C18:2 % | C18:3 % | C20:0 % | C20:1 % | C20:2 % |
| Domestic Mustard Seed, Canada, Oriental | | | | | | | | | | |
| No. 1 Canada | | | | | | | | | | |
| Saskatchewan | 64 | 3.0 | 0.2 | 1.5 | 23.9 | 22.4 | 11.2 | 0.9 | 12.6 | 1.0 |
| Alberta | 18 | 2.9 | 0.2 | 1.5 | 23.0 | 22.3 | 11.5 | 0.9 | 12.8 | 1.0 |
| No. 2 | 6 | 2.9 | 0.2 | 1.5 | 22.0 | 21.7 | 11.8 | 0.9 | 13.1 | 1.1 |
| No. 4 | 1 | 3.1 | 0.2 | 1.5 | 25.2 | 23.6 | 11.2 | 0.8 | 12.3 | 1.0 |
| Sample Canada | 3 | 3.0 | 0.2 | 1.5 | 23.8 | 22.7 | 11.3 | 0.9 | 12.7 | 1.0 |
| Cutlass | 31 | 2.9 | 0.2 | 1.5 | 21.4 | 21.3 | 11.6 | 0.9 | 13.4 | 1.1 |
| Forge | 52 | 3.1 | 0.2 | 1.6 | 24.5 | 23.3 | 11.1 | 0.9 | 12.4 | 1.0 |
| Domestic Mustard Seed, Canada, Brown | | | | | | | | | | |
| No. 1 Canada | | | | | | | | | | |
| Manitoba | 3 | 3.0 | 0.2 | 1.5 | 21.9 | 20.8 | 12.7 | 0.9 | 13.0 | 1.0 |
| Saskatchewan | 60 | 3.0 | 0.2 | 1.4 | 21.3 | 21.0 | 12.7 | 0.9 | 12.8 | 1.0 |
| Alberta | 8 | 2.9 | 0.2 | 1.4 | 21.5 | 20.6 | 13.0 | 0.9 | 12.8 | 1.0 |
| No. 2 | 3 | 3.0 | 0.2 | 1.4 | 21.7 | 21.0 | 12.6 | 0.9 | 12.9 | 1.0 |
| No. 3 | 1 | 3.1 | 0.2 | 1.5 | 22.5 | 20.8 | 12.2 | 0.9 | 13.3 | 0.9 |
| No. 4 | 1 | 3.1 | 0.2 | 1.4 | 21.5 | 21.5 | 12.2 | 0.9 | 12.5 | 1.0 |
| Sample Canada | 5 | 3.1 | 0.2 | 1.5 | 24.0 | 20.9 | 12.7 | 0.9 | 12.2 | 0.9 |
| Common | 8 | 3.0 | 0.2 | 1.4 | 21.6 | 20.8 | 12.6 | 0.9 | 13.1 | 1.0 |
| Duchess | 37 | 3.0 | 0.2 | 1.4 | 21.6 | 20.9 | 12.7 | 0.9 | 12.8 | 1.0 |
| Domestic Mustard Seed, Canada, Yellow | | | | | | | | | | |
| No. 1 Canada | | | | | | | | | | |
| Manitoba | 2 | 2.6 | 0.2 | 1.0 | 25.6 | 9.1 | 10.7 | 0.6 | 11.3 | 0.3 |
| Saskatchewan | 72 | 2.7 | 0.2 | 1.0 | 24.6 | 9.3 | 10.0 | 0.6 | 11.3 | 0.3 |
| Alberta | 35 | 2.6 | 0.2 | 1.0 | 24.8 | 9.1 | 10.4 | 0.6 | 11.4 | 0.3 |
| No. 2 | 20 | 2.6 | 0.2 | 1.0 | 24.3 | 9.3 | 10.3 | 0.6 | 11.0 | 0.3 |
| No. 3 | 9 | 2.7 | 0.2 | 1.0 | 24.0 | 9.3 | 10.7 | 0.6 | 11.1 | 0.3 |
| No. 4 | 13 | 2.7 | 0.2 | 1.0 | 24.8 | 9.0 | 10.9 | 0.6 | 11.3 | 0.3 |
| Sample Canada | 9 | 2.7 | 0.2 | 1.1 | 26.6 | 9.8 | 10.9 | 0.6 | 11.0 | 0.3 |
| AC Pennant | 19 | 2.6 | 0.2 | 1.0 | 25.0 | 9.2 | 10.0 | 0.6 | 11.4 | 0.3 |
| Ace | 8 | 2.6 | 0.2 | 1.0 | 23.2 | 9.0 | 10.4 | 0.6 | 11.0 | 0.3 |
| Andante | 40 | 2.6 | 0.2 | 1.0 | 24.7 | 9.1 | 10.3 | 0.6 | 11.3 | 0.3 |

¹ Percentage of total fatty acids including: palmitic (C16:0), palmitoleic (C16:1), stearic (C18:0), oleic (C18:1), linoleic (C18:2), linolenic (C18:3), arachidic (C20:0), eicosenoic (C20:1), eicosadienoic (C20:2), behenic (C22:0), erucic (C22:1), docosadienoic (C22:2), lignoceric (C24:0), and nervonic (C24:1)

² Saturated fatty acids are defined as the sum of C16:0, C18:0, C20:0, C22:0, and C24:0.

Table 3b – Fatty acid composition of 2006 western Canadian mustard

| Category | Number of samples | Fatty acid composition(%) ¹ | | | | | Saturated fatty acids ² | Iodine value |
|--|-------------------|--|-------|-------|-------|-------|------------------------------------|--------------|
| | | C22:0 | C22:1 | C22:2 | C24:0 | C24:1 | | |
| | | % | % | % | % | % | | |
| Domestic Mustard Seed, Oriental | | | | | | | | |
| No. 1 Canada | | | | | | | | |
| Saskatchewan | 64 | 0.4 | 20.4 | 0.5 | 0.3 | 1.3 | 6.2 | 117 |
| Alberta | 18 | 0.4 | 20.8 | 0.5 | 0.3 | 1.3 | 6.1 | 117 |
| No. 2 | 6 | 0.4 | 21.9 | 0.5 | 0.3 | 1.4 | 5.9 | 117 |
| No. 4 | 1 | 0.4 | 18.4 | 0.4 | 0.3 | 1.2 | 6.1 | 118 |
| Sample Canada | 3 | 0.4 | 20.2 | 0.4 | 0.3 | 1.3 | 6.0 | 117 |
| Domestic Mustard Seed, Canada, Brown | | | | | | | | |
| No. 1 Canada | | | | | | | | |
| Manitoba | 3 | 0.4 | 22.4 | 0.4 | 0.3 | 1.2 | 6.0 | 117 |
| Saskatchewan | 60 | 0.5 | 22.7 | 0.4 | 0.3 | 1.2 | 6.0 | 118 |
| Alberta | 8 | 0.4 | 22.7 | 0.4 | 0.3 | 1.2 | 5.9 | 118 |
| No. 2 | 3 | 0.4 | 22.5 | 0.4 | 0.3 | 1.2 | 5.9 | 117 |
| No. 3 | 1 | 0.4 | 21.8 | 0.4 | 0.3 | 1.1 | 6.2 | 116 |
| No. 4 | 1 | 0.4 | 22.8 | 0.4 | 0.3 | 1.2 | 6.0 | 117 |
| Sample Canada | 5 | 0.4 | 21.0 | 0.3 | 0.2 | 1.1 | 6.1 | 118 |
| Common | 8 | 0.4 | 22.5 | 0.5 | 0.3 | 1.2 | 6.0 | 117 |
| Duchess | 37 | 0.4 | 22.6 | 0.4 | 0.2 | 1.2 | 6.0 | 118 |
| Domestic Mustard Seed, Canada, Yellow | | | | | | | | |
| No. 1 Canada | | | | | | | | |
| Manitoba | 2 | 0.5 | 35.1 | 0.3 | 0.2 | 2.1 | 5.0 | 102 |
| Saskatchewan | 72 | 0.5 | 36.3 | 0.3 | 0.3 | 2.2 | 5.0 | 101 |
| Alberta | 35 | 0.5 | 35.9 | 0.3 | 0.3 | 2.2 | 5.0 | 102 |
| No. 2 | 20 | 0.5 | 36.6 | 0.3 | 0.3 | 2.3 | 5.0 | 102 |
| No. 3 | 9 | 0.5 | 36.4 | 0.3 | 0.3 | 2.2 | 2.0 | 102 |
| No. 4 | 13 | 0.5 | 35.6 | 0.3 | 0.3 | 2.2 | 4.9 | 103 |
| Sample Canada | 9 | 0.4 | 33.4 | 0.3 | 0.2 | 2.1 | 5.0 | 104 |
| AC Pennant | 19 | 0.5 | 36.1 | 0.3 | 0.3 | 2.2 | 5.0 | 101 |
| Ace | 8 | 0.5 | 38.1 | 0.4 | 0.3 | 2.3 | 4.9 | 101 |
| Andante | 40 | 0.5 | 36.1 | 0.3 | 0.3 | 2.2 | 4.9 | 102 |

¹ Percentage of total fatty acids including: palmitic (C16:0), palmitoleic (C16:1), stearic (C18:0), oleic (C18:1), linoleic (C18:2), linolenic (C18:3), arachidic (C20:0), eicosenoic (C20:1), eicosadienoic (C20:2), behenic (C22:0), erucic (C22:1), docosadienoic (C22:2), lignoceric (C24:0), and nervonic (C24:1)

² Saturated fatty acids are defined as the sum of C16:0, C18:0, C20:0, C22:0, and C24:0.

Table 4 – Quality of western Canadian mustard from CGC surveys

| Year | No. of samples | Oil content ¹ | Protein content ² | Glucosinolate content ³ | |
|--|----------------|--------------------------|------------------------------|------------------------------------|------|
| | | % | % | µmol/g | mg/g |
| Domestic Mustard Seed, No. 1 Canada, Oriental | | | | | |
| 2006 | 84 | 41.8 | 26.2 | 131 | 13.0 |
| 2005 | 90 | 42.7 | 26.2 | 130 | 12.9 |
| 1996-05 | 640 | 42.0 | 26.5 | 129 | 12.8 |
| Domestic Mustard Seed, No. 2 Canada, Oriental | | | | | |
| 2006 | 6 | 43.5 | 24.6 | 127 | 12.6 |
| 2005 | 8 | 43.2 | 26.8 | 131 | 12.9 |
| 1996-05 | 78 | 42.3 | 26.8 | 128 | 12.7 |
| Domestic Mustard Seed, No. 3 Canada, Oriental | | | | | |
| 2006 | 0 | — | — | — | — |
| 2005 | 6 | 40.9 | 28.3 | 135 | 13.3 |
| 1996-05 | 34 | 42.7 | 25.9 | 126 | 12.5 |
| Domestic Mustard Seed, No. 1 Canada, Brown | | | | | |
| 2006 | 71 | 40.2 | 26.0 | 108 | 10.7 |
| 2005 | 91 | 40.6 | 25.7 | 108 | 10.7 |
| 1996-05 | 616 | 40.0 | 26.0 | 107 | 10.6 |
| Domestic Mustard Seed, No. 2 Canada, Brown | | | | | |
| 2006 | 3 | 39.9 | 26.2 | 111 | 11.0 |
| 2005 | 7 | 40.0 | 26.8 | 111 | 11.0 |
| 1996-05 | 36 | 38.3 | 27.5 | 111 | 11.0 |
| Domestic Mustard Seed, No. 3 Canada, Brown | | | | | |
| 2006 | 1 | 42.1 | 23.2 | 100 | 9.9 |
| 2005 | 4 | 41.9 | 23.6 | 106 | 10.6 |
| 1996-05 | 39 | 38.8 | 26.6 | 109 | 10.8 |
| Domestic Mustard Seed, No. 1 Canada, Yellow | | | | | |
| 2006 | 108 | 30.5 | 31.8 | — | — |
| 2005 | 94 | 30.8 | 31.4 | — | — |
| 1996-05 | 654 | 30.5 | 31.9 | — | — |
| Domestic Mustard Seed, No. 2 Canada, Yellow | | | | | |
| 2006 | 22 | 30.8 | 31.6 | — | — |
| 2005 | 16 | 33.0 | 29.6 | — | — |
| 1996-05 | 160 | 30.8 | 31.8 | — | — |
| Domestic Mustard Seed, No. 3 Canada, Yellow | | | | | |
| 2006 | 10 | 31.1 | 32.3 | — | — |
| 2005 | 10 | 32.6 | 30.0 | — | — |
| 1999-05 | 66 | 31.2 | 31.4 | — | — |

¹ Dry matter basis² % N x 6.25; dry matter basis³ Allyl glucosinolate (µmoles/g) and allyl isothiocyanate (mg/g); dry matter, seed basis