

Report Title

**Analysis of Tannins in Canola Seed Collected from MON 88302 Grown in the
United States and Canada during the 2009 Growing Season**

Authors



Study Completed On

October 7, 2011

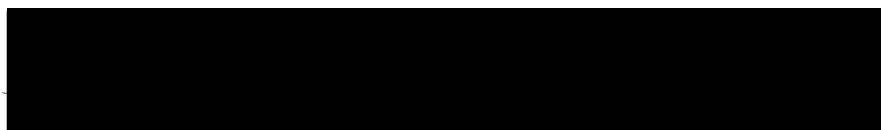
Sponsor

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Project ID

Monsanto Study No. RAR-2011-0237

Approval



Author

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PROPRIETARY INFORMATION OF MONSANTO COMPANY

1.0 Summary

Monsanto Company has developed a second generation herbicide-tolerant canola product, MON 88302 that allows a glyphosate application from emergence to first flowering at a rate up to 1800 g a.e. (grams acid equivalents) per hectare. With an increased window of application and higher spray rates, MON 88302 will provide superior weed control compared to the commercial first generation Roundup Ready® (RR) canola product RT73 (also referred to as GT73). MON 88302 produces the 5-enolpyruvylshikimate-3-phosphate synthase protein via incorporation of the *cp4 epsps* coding sequence from *Agrobacterium sp.* strain CP4. Expression of the gene product (CP4 EPSPS) renders the plant tolerant to glyphosate, the active ingredient in the Roundup® family of agricultural herbicides.

This report compares the level of total tannins (defined as the sum of soluble and insoluble tannin fractions) in seed of MON 88302 to the level in the conventional control Ebony. Seven untreated conventional commercial canola varieties were included as references to provide data for the development of a 99% tolerance interval. Analyses were conducted on seed collected from MON 88302, the conventional control, and the commercial reference varieties grown in the U.S. and Canada during 2009. MON 88302 plants were grown both in the absence and presence of glyphosate treatment. The conventional control and the commercial reference varieties were grown in the absence of glyphosate treatment. MON 88302, the conventional control, and the commercial reference varieties were grown concurrently in replicated plots at two U.S. sites [Wilkin County, MN (MNCA) and McHenry County, North Dakota (NDVA)] and three Canadian sites [Portage la Prairie, Manitoba (MBPL); Newton, Manitoba (MBNW); and Saskatoon, Saskatchewan (SKSA)]. A total of 122 whole seed samples were analyzed by EPL-Bio-Analytical Services (BAS), Inc. for levels of total tannins.

Six sets of statistical comparisons were conducted between MON 88302 and the conventional control for total tannins. One comparison was based on data from a combination of all five field sites (referred to as the combined-site analysis), and five comparisons were based on data from each individual field site. The level of significant difference was predetermined to be 5% ($\alpha = 0.05$).

Significant differences ($p < 0.05$) were not observed for total tannins in any of the six statistical comparisons conducted between MON 88302, both treated with glyphosate and not treated, and the conventional control. Tannin levels in glyphosate treated MON 88302 and glyphosate untreated MON 88302 are similar to levels in conventional canola, and there were no meaningful differences from a food and feed safety or nutritional perspective

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2.0 Introduction

Monsanto Company has developed a second generation herbicide-tolerant canola product, MON 88302, that allows a glyphosate application from emergence to first flowering at a rate up to 1800 g a.e. per hectare. With an increased window of application and higher spray rates, MON 88302 will provide superior weed control compared to the commercial first generation Roundup Ready[®] (RR) canola product RT73 (also referred to as GT73). MON 88302 produces the 5-enolpyruvylshikimate-3-phosphate synthase protein via incorporation of the *cp4 epsps* coding sequence from *Agrobacterium sp.* strain CP4. Expression of the gene product (CP4 EPSPS) renders the plant tolerant to glyphosate, the active ingredient in the Roundup family of agricultural herbicides.

3.0 Purpose

The purpose of this study was to evaluate the level of total tannins (soluble and insoluble fractions, referred to as tannins) in seed from MON 88302 canola, both treated with glyphosate and untreated, compared to an untreated conventional control that has a genetic background similar to MON 88302, but does not contain the *cp4 epsps* gene. Seven untreated conventional commercial canola varieties were included as references to provide data for the development of a 99% tolerance interval for each component analyzed. Composition analyses were conducted on seed collected from MON 88302, the conventional control, and the commercial reference varieties grown in the U.S. and Canada during 2009.

4.0 Test, Control, and Reference (T/C/R) Substances

4.1 Test Substance

The test substance was MON 88302, Lot Number 11225246. Seed collected from glyphosate-untreated and glyphosate-treated plants was evaluated in this study.

4.2 Control Substance

The control substance was Ebony, Lot Number 11225244, a conventional canola variety that has a similar genetic background to MON 88302 but does not contain the glyphosate tolerant gene, *cp4 epsps*. Seed collected from the control plants was evaluated in this study.

4.3 Reference Substances

The reference substances were conventional commercial canola varieties. Seven different varieties were grown at a total of five field sites. Seed collected from the reference substances was evaluated in this study.

Material Name	Seed Lot Number	Field Site Codes ¹
Q2	10001931	MBPL, MBNW, SKSA, NDVA, MNCA
Hyola 401	10001850	NDVA, MBPL, SKSA
Croplan 601	10001849	MBPL, SKSA, NDVA
SP Armada	10001932	MBPL, SKSA, NDVA
SValof Sponsor	10002116	MNCA, MBNW
SValof Senator	10002115	MNCA, MBNW
DSV Ability	10002117	MNCA, MBNW

¹Field sites described in Section 5.0.

4.4 T/C/R Substance Characterization

The identities of MON 88302, the conventional control, and commercial reference varieties were confirmed by verifying the chain of custody documentation prior to analysis. To further confirm the identities of MON 88302, the conventional control, and commercial reference varieties, event-specific polymerase chain reaction (PCR) analyses were conducted on the harvested seed from each site, as described in MSL0022806 (Lundry, 2011). The PCR analyses and the resulting Verification of Identity (VOI) documents were archived in the Monsanto Regulatory Archive under the starting seed lot numbers.

5.0 Field Trial Description

Seed of MON 88302, the conventional control and the commercial reference varieties was collected from replicated plots at each of two U.S. sites [Wilkin County, MN (MNCA); and McHenry County, North Dakota (NDVA)] and three Canadian sites [Portage la Prairie, Manitoba (MBPL); Newton, Manitoba (MBNW); and Saskatoon, Saskatchewan (SKSA)]. Seeds were planted in a randomized complete block design with four replicate blocks for each material. All materials were grown under standard agronomic field conditions for their respective geographic regions. MON 88302 plants were grown both in the presence and absence of glyphosate treatment. The conventional control and commercial reference varieties were grown in the absence of glyphosate treatment.

Seed samples were harvested from all plots and shipped at ambient temperature to Monsanto Company, St. Louis, MO. A sub-sample for composition analysis was obtained from each sample collected. These sub-samples were then ground and stored in a freezer set to maintain a temperature of -20 °C until their shipment on dry ice to EPL-BAS (Niantic, Illinois) for analysis.

6.0 Analytical Methods

A total of 122 whole seed samples were analyzed by EPL-Bio-Analytical Services (BAS), Inc. for levels of total tannins. The soluble and insoluble tannin fractions were quantified individually, summed, and reported as total tannins. The analytical data generated by EPL-BAS, including a summary of the method used, EPL-BAS SOP or method mnemonics, literature references, limit of quantitation, and the reference standards used can be found in the analytical sub-report for EPL-BAS study 115G154 (see Appendix 1).

7.0 Control of Bias

Samples were analyzed in the order specified by a computer-generated randomized list. The Study Director generated the randomized sample list and forwarded it to EPL-BAS prior to analysis.

8.0 Statistical Analysis and Methods

After composition analyses were completed at EPL-BAS, data spreadsheets were forwarded to Monsanto Company. The data were reviewed, formatted, and sent to Certus International, Inc. for statistical analyses. Six sets of statistical comparisons between MON 88302 and the conventional control were conducted for total tannins in seed using a mixed-model analysis of variance. One comparison, termed the combined-site analysis, was based on data combined across all field sites, and five comparisons were conducted separately on data from each individual field sites. Statistical differences were declared at $\alpha = 0.05$. Data from the reference substances were combined across all sites and used to calculate a 99% tolerance interval for tannins. A statistical subreport was generated by Certus International, Inc. The subreport includes details of the statistical models used, formulas for re-expression of component units, and the results of outlier testing (see Appendix 2).

9.0 Results and Discussion

The level of total tannins in seed from MON 88302, both treated with glyphosate and untreated, was analyzed and statistically compared to the untreated conventional control, Ebony, that has a genetic background similar to the MON 88302, but does not contain the *cp4 epsps* gene. Least square means, standard errors, and the range of observed values for MON 88302 and the conventional control are presented in Appendix 2. A summary of the statistical analyses between MON 88302 not treated with glyphosate and the untreated control can be found in Table 1. A summary of the statistical analyses between MON 88302 treated with glyphosate and the untreated control can be found in Table 2. The ranges of values for total tannins in conventional canola seed obtained from published scientific literature are presented in Table 3.

9.1 Results and Discussion of Glyphosate-Untreated MON 88302

Statistical analyses of the combined-site total tannins data resulted in no significant differences ($p>0.05$) between MON 88302 not treated with glyphosate and the conventional control (Table 1). Likewise, statistical analysis of the individual site data resulted in no significant differences ($p>0.05$) between MON 88302 not treated with glyphosate and the conventional control. Tannin levels in MON 88302 not treated with glyphosate are similar to levels in conventional canola.

9.2 Results and Discussion of Glyphosate-Treated MON 88302

Statistical analyses of the combined-site total tannins data resulted in no significant differences ($p>0.05$) between glyphosate treated MON 88302 and the conventional control in the combined site analysis (Table 2). Likewise, statistical analysis of the individual site data resulted in no significant differences ($p>0.05$) between glyphosate treated MON 88302 and the conventional control. Tannin levels in glyphosate treated MON 88302 are similar to levels in conventional canola.

10.0 Conclusions

Canola was analyzed for levels of total tannins in seed from MON 88302 and the near-isogenic conventional control Ebony, produced at five sites in the U.S. and Canada during 2009. The comparison of total tannins in seed from MON 88302, both treated with glyphosate and untreated, and the untreated conventional control confirmed that there are no meaningful differences from a food and feed safety or nutritional perspective.

11.0 References

Lundry, D.R., S. Riordan, B. Potts, and R. Sorbet. 2011. Compositional analyses of canola seed collected from MON 88302 grown in the United States and Canada during the 2009 growing season. Monsanto Technical Report MSL0022806. St. Louis, MO.

Naczek, M., R. Amarowicz, A. Sullivan, and F. Shahidi. 1998. Current research developments on polyphenolics of rapeseed/canola: a review. Food Chem, 62:489-502.

OECD. 2001. Consensus document on key nutrients and key toxicants in low erucic acid rapeseed (canola). Organization for Economic Co-operation and Development, 15th Meeting of the Task Force for the Safety of Novel Foods and Feeds. Paris, France. ENV/JM/MONO(2001)13.

SAS Software Release 9.2 (TS1M0). Copyright (c) 2002-2008 by SAS Institute Inc., Cary, NC, USA.

Table 1. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Untreated Test) vs. Ebony (Control)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Combined-Site						
Anti-nutrient (% dw)						
Total Tannins	0.74 (0.11) (0.23 - 1.47)	0.69 (0.11) (0.31 - 1.11)	0.044 (0.083) (-0.54 - 0.82)	-0.15, 0.24	0.609	0, 1.37 (0.14 - 1.18)
Site MBNW						
Anti-nutrient (% dw)						
Total Tannins	0.44 (0.10) (0.23 - 0.68)	0.60 (0.087) (0.54 - 0.68)	-0.15 (0.11) (-0.31 - 0.059)	-0.49, 0.19	0.249	0, 1.37 (0.14 - 1.18)
Site MBPL						
Anti-nutrient (% dw)						
Total Tannins	0.82 (0.17) (0.60 - 1.09)	0.90 (0.20) (0.86 - 0.94)	-0.085 (0.26) (-0.26 - -0.18)	-0.92, 0.75	0.769	0, 1.37 (0.14 - 1.18)
Site MNCA						
Anti-nutrient (% dw)						
Total Tannins	0.85 (0.16) (0.46 - 1.47)	0.55 (0.16) (0.38 - 0.70)	0.29 (0.20) (-0.062 - 0.82)	-0.23, 0.82	0.209	0, 1.37 (0.14 - 1.18)

Table 1. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Untreated Test) vs. Ebony (Control) (cont.)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Site NDVA						
Anti-nutrient (% dw)						
Total Tannins	0.55 (0.059) (0.37 - 0.70)	0.43 (0.068) (0.31 - 0.51)	0.12 (0.090) (0.0099 - 0.40)	-0.16, 0.41	0.268	0, 1.37 (0.14 - 1.18)
Site SKSA						
Anti-nutrient (% dw)						
Total Tannins	0.89 (0.13) (0.53 - 1.19)	1.01 (0.11) (0.87 - 1.11)	-0.12 (0.16) (-0.54 - 0.10)	-0.55, 0.32	0.498	0, 1.37 (0.14 - 1.18)

¹dw = dry weight.

²Test refers to MON 88302 (Untreated). These plants were not sprayed with herbicide, but received another conventional treatment as was done for the conventional control.

³Mean (S.E.) = least-square mean (standard error).

⁴Control refers to the non-biotechnology derived, conventional control (Ebony).

⁵With 95% confidence, interval contains 99% of the values expressed in the population of commercial substances. Negative limits set to zero.

Table 2. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Herbicide-Treated Test) vs. Ebony (Control)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Combined-Site						
Anti-nutrient (% dw)						
Total Tannins	0.70 (0.11) (0.20 - 1.32)	0.69 (0.11) (0.31 - 1.11)	0.0036 (0.084) (-0.49 - 0.45)	-0.19, 0.20	0.966	0, 1.37 (0.14 - 1.18)
Site MBNW						
Anti-nutrient (% dw)						
Total Tannins	0.58 (0.077) (0.48 - 0.76)	0.60 (0.087) (0.54 - 0.68)	-0.013 (0.089) (-0.10 - 0.14)	-0.30, 0.27	0.893	0, 1.37 (0.14 - 1.18)
Site MBPL						
Anti-nutrient (% dw)						
Total Tannins	0.82 (0.14) (0.49 - 1.19)	0.90 (0.20) (0.86 - 0.94)	-0.084 (0.25) (-0.32 - 0.24)	-0.88, 0.71	0.759	0, 1.37 (0.14 - 1.18)
Site MNCA						
Anti-nutrient (% dw)						
Total Tannins	0.48 (0.18) (0.20 - 0.70)	0.55 (0.16) (0.38 - 0.70)	-0.074 (0.22) (-0.49 - 0.31)	-0.65, 0.50	0.751	0, 1.37 (0.14 - 1.18)

Table 2. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Herbicide-Treated) vs. Ebony (cont.)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Site NDVA						
Anti-nutrient (% dw)						
Total Tannins	0.48 (0.083) (0.46 - 0.50)	0.43 (0.068) (0.31 - 0.51)	0.055 (0.11) (0.044 - 0.15)	-0.29, 0.40	0.643	0, 1.37 (0.14 - 1.18)
Site SKSA						
Anti-nutrient (% dw)						
Total Tannins	1.12 (0.13) (0.89 - 1.32)	1.01 (0.11) (0.87 - 1.11)	0.11 (0.16) (-0.18 - 0.45)	-0.32, 0.55	0.510	0, 1.37 (0.14 - 1.18)

¹dw = dry weight.

²Test refers to MON 88302 (Herbicide-Treated).

³Mean (S.E.) = least-square mean (standard error).

⁴Control refers to the non-biotechnology derived, conventional control (Ebony).

⁵With 95% confidence, interval contains 99% of the values expressed in the population of commercial substances. Negative limits set to zero.

Table 3 Literature Range for Total Tannins in Canola

Component ¹	Literature Range ²
Antinutrients	
Tannins (% dw)	1.5 – 3.0 ^a ; 0.68 – 0.77 ^b

¹dw=dry weight

²Literature Range= Values published for canola (low erucic acid rapeseed).

^aOECD, 2001; ^bNaczek, *et al*,1998.

Appendix 1. EPL-BAS Analytical Sub-Report

**Analysis of Tannins in Canola Seed Collected from MON 88302 Grown in the
United States and Canada during the 2009 Growing Season**

The following 25 pages are the analytical sub-report
Pages 14-38

Sponsor

Monsanto Company
800 North Lindbergh Blvd.
St. Louis, MO 63167

ANALYTICAL SUB-REPORT

Sub-report Title

Analysis of Tannins in Canola Seed Collected from MON 88302 Grown
in the United States and Canada during the 2009 Growing Season

Author

[REDACTED]

Sub-report Completion Date

September 20, 2011

Compositional Analysis Testing Facility

EPL Bio Analytical Services (EPL BAS)
9095 W. Harristown Blvd.
Niantic, IL 62551

EPL BAS Study Identification

115G154

Monsanto Study Number

RAR-2011-0237

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STUDY IDENTIFICATION

Test Substance:	MON 88302
Sponsor Study No.:	RAR-2011-0237
Sponsor Study Title:	Analysis of Tannins in Canola Seed Collected from MON 88302 Grown in the United States and Canada during the 2009 Growing Season
Sponsor:	Monsanto Company 800 North Lindbergh Blvd. St. Louis, MO 63167
Study Director:	<div></div> Monsanto Company – C1NA Product Safety Center 800 North Lindbergh Blvd. St. Louis, MO 63167 Phone: <div></div> Fax: (314) 694-6733 e-mail: <div></div>
Compositional Analysis Testing Facility:	EPL Bio Analytical Services (EPL BAS) 9095 W. Harristown Blvd. Niantic, IL 62551
Compositional Analysis Principal Investigator:	<div></div> EPL Bio Analytical Services (EPL BAS) Phone: <div></div>
Study Timetable	
Study Initiation Date:	June 6, 2011
Sub-report Completion Date:	September 20, 2011

EPL BAS KEY PERSONNEL

[REDACTED]

Principal Investigator
Chief Executive Officer/Testing Facility
Management

[REDACTED]

Quality and Compliance
Vice President of Analytical Services
Co-Team Lead, Anti-Nutrient Non Spec
Vitamins

[REDACTED]

Co-Team Lead, Anti-Nutrient Non Spec
Vitamins

[REDACTED]

Team Lead, Proximates

INTRODUCTION

The purpose of this study was to compare the levels of tannins in glyphosate-treated MON 88302 (test substance) and glyphosate untreated MON 88302 to a conventional control, Ebony (control substance), which had a genetic background similar to the test substance. Seven conventional canola varieties were included as reference substances. Tannins analyses were conducted on seed of all test, control and reference (T/C/R) substances. The T/C/R substances were harvested from canola grown at a total of five replicated field sites across the United States (PPN-08-462) and Canada (PPN-08-586) during the 2009 growing season.

COMPLIANCE

This study was conducted in compliance with EPL BAS standard operating procedures (SOPs). The sample handling and data quality procedures support the re-constructability of all study events.

TEST, CONTROL, AND REFERENCE SUBSTANCES

Identification

Test Substance

The test substance was MON 88302. Seed collected from glyphosate-treated and glyphosate-untreated plots were evaluated in this study. The test substance was described as:

Material Name	Seed Lot Number	Treatment ¹	Field Site
MON 88302	11225246	Yes	All
MON 88302	11225246	No	All

¹Post-emergence glyphosate application

Control Substance

The control substance, Ebony, was a conventional canola variety with a genetic background similar to MON 88302. Seed collected from plots not treated with glyphosate were evaluated in this study. The control substance was described as:

Material Name	Seed Lot Number	Field Site
Ebony	11225244	All

Reference Substances

The reference substances were conventional canola varieties. Seven different canola varieties grown at a total of five field sites, and collected from plots not treated with glyphosate were evaluated in this study. The reference substances were described as:

Material Name	Seed Lot Number	Field Site
Q2	10001931	MBPL, MBNW, SKSA, NDVA, MNCA
Hyola 401	10001850	NDVA, MBPL, SKSA
SP Armada	10001932	MBPL, SKSA, NDVA
Croplan 601	10001849	MBPL, SKSA, NDVA
SValof Sponsor	10002116	MNCA, MBNW
SValof Senator	10002115	MNCA, MBNW
DSV Ability	10002117	MNCA, MBNW

Characterization

Characterization of the test, control, and reference canola seed samples was the responsibility of the sponsor.

Storage/Retention

The samples were received frozen on June 9, 2011. The samples were received ground and were further processed and homogenized using a coffee grinder until the entire sample passed through a number 20-mesh screen. Samples were stored at approximately -20°C when not needed for laboratory analysis. A freezer log was kept to monitor movement of samples in and out of the freezer. After analysis, all excess tissues will be retained by EPL BAS until notified of final disposition by the Sponsor.

Safety Precautions

Safety precautions were taken as required by EPL BAS SOP's and the Safety Manual.

SAMPLE RECEIPT AND HANDLING

The samples were entered into an EXCEL spreadsheet with unique EPL BAS sample ID's. Printed reports were generated which provided correlation between the EPL BAS sample ID's and the Sponsor sample identifiers.

PROCEDURES

This study was conducted in accordance with the study plan (Monsanto Study No. RAR-2011-0237). Appendix A of this sub-report contains summaries of the analytical methods used in this study and the SOP number for each analytical method. Analyses for moisture and tannins were conducted for each canola seed sample.

The samples were analyzed in a random order to minimize assay bias. Monsanto provided the analysis order. Quality control samples were analyzed to judge the acceptability of each set of canola seed samples. Fortified quality control samples were also analyzed with each canola seed set for tannins. The recovery values for the fortified samples were used to judge the acceptability of each set of samples. Acceptance criteria for each analytical method were approved by the Principal Investigator.

STATISTICAL METHODS

No statistical analysis of the data was performed at EPL BAS.

MAINTENANCE OF RAW DATA AND RECORDS

A final analytical sub-report, including a compositional analyses summary spreadsheet accepted by the EPL BAS Quality Assurance Unit, was sent to the Study Director. All data relating to or generated by the project, including (if applicable) a copy of the study plan, a copy of the final analytical sub-report, results, rejected data, laboratory data packets, applicable SOP lists and any other information or records relating to the project were retained in the archives of EPL BAS. At the completion of the study, the Sponsor will be contacted for approval to transfer all data and records for permanent retention in

the Monsanto archives. The certificates of analysis for any reference substances used in this study are archived by EPL BAS. The supporting records retained at EPL BAS, but not archived with the study data, include the following items:

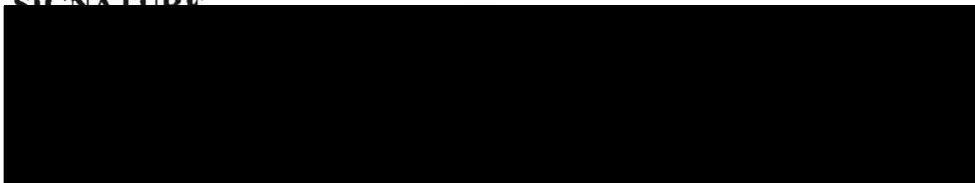
- Study personnel- training records
- Storage temperature records
- Instrument calibration and maintenance records
- Durable media records
- Standard Operating Procedures
- Standard Logbooks

RESULTS

The results for all canola seed test substance analyses are presented in Table 1. The results for all canola seed control substance analyses are presented in Table 2. The results for all canola seed reference substance analyses are presented in Table 3.

The results are reported on a fresh weight basis.

SIGNATURE

A large black rectangular box redacting the signature of the Principal Investigator.

Principal Investigator
EPL Bio Analytical Services

Table 1. Compositional Analyses of Canola Seed Test Substance

Material Name	MON 88302	MON 88302	MON 88302	MON 88302
Field Site	MBNW	MBNW	MBNW	MBNW
Entry	8	8	8	8
Sample ID	11254116	11254127	11254137	11254151
EPL BAS Sample ID	154-K020	154-K083	154-K002	154-K045

Proximates

Moisture (%)	5.07	6.05	5.08	4.92
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Anti-Nutrients

Total Tannins (% FW)	0.552	0.448	0.493	0.719
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Material Name	MON 88302	MON 88302	MON 88302	MON 88302
Field Site	MBPL	MBPL	MBPL	MBPL
Entry	8	8	8	8
Sample ID	11248699	11248709	11248725	11248733
EPL BAS Sample ID	154-K012	154-K005	154-K025	154-K118

Proximates

Moisture (%)	5.61	5.84	5.60	5.99
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Anti-Nutrients

Total Tannins (% FW)	1.12	0.465	0.511	0.989
----------------------	------	-------	-------	-------

Material Name	MON 88302	MON 88302	MON 88302
Field Site	MNCA	MNCA	MNCA
Entry	8	8	8
Sample ID	11248612	11248621	11248631
EPL BAS Sample ID	154-K097	154-K056	154-K093

Proximates

Moisture (%)	5.84	5.39	5.99
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Anti-Nutrients

Total Tannins (% FW)	0.415	0.193	0.657
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Table 1. Compositional Analyses of Canola Seed Test Substance (Continued)

Material Name	MON 88302	MON 88302
Field Site	NDVA	NDVA
Entry	8	8
Sample ID	11248650	11248666
EPL BAS Sample ID	154-K001	154-K099

Proximates

Moisture (%)	5.94	6.01
--------------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.475	0.432
----------------------	-------	-------

Material Name	MON 88302	MON 88302	MON 88302
Field Site	SKSA	SKSA	SKSA
Entry	8	8	8
Sample ID	11254160	11254168	11254191
EPL BAS Sample ID	154-K016	154-K050	154-K036

Proximates

Moisture (%)	5.63	4.81	5.03
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Anti-Nutrients

Total Tannins (% FW)	1.25	0.850	1.04
----------------------	------	-------	------

Material Name	MON 88302	MON 88302
Field Site	MBNW	MBNW
Entry	9	9
Sample ID	11254129	11254140
EPL BAS Sample ID	154-K078	154-K100

Proximates

Moisture (%)	6.57	7.71
--------------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.219	0.625
----------------------	-------	-------

Table 1. Compositional Analyses of Canola Seed Test Substance (Continued)

Material Name	MON 88302	MON 88302	MON 88302
Field Site	MBPL	MBPL	MBPL
Entry	9	9	9
Sample ID	11248713	11248716	11248736
EPL BAS Sample ID	154-K051	154-K074	154-K014

Proximates

Moisture (%)	7.31	6.81	7.30
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Anti-Nutrients

Total Tannins (% FW)	0.709	0.558	1.01
----------------------	-------	-------	------

Material Name	MON 88302	MON 88302	MON 88302	MON 88302
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	9	9	9	9
Sample ID	11248623	11248624	11248634	11248644
EPL BAS Sample ID	154-K030	154-K105	154-K062	154-K013

Proximates

Moisture (%)	5.95	6.96	5.70	6.56
--------------	------	------	------	------

Anti-Nutrients

Total Tannins (% FW)	1.38	0.590	0.434	0.767
----------------------	------	-------	-------	-------

Material Name	MON 88302	MON 88302	MON 88302	MON 88302
Field Site	NDVA	NDVA	NDVA	NDVA
Entry	9	9	9	9
Sample ID	11248652	11248663	11248676	11248689
EPL BAS Sample ID	154-K065	154-K007	154-K107	154-K101

Proximates

Moisture (%)	6.93	7.74	7.39	7.16
--------------	------	------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.345	0.649	0.485	0.555
----------------------	-------	-------	-------	-------

Table 1. Compositional Analyses of Canola Seed Test Substance (Continued)

Material Name	MON 88302	MON 88302	MON 88302
Field Site	SKSA	SKSA	SKSA
Entry	9	9	9
Sample ID	11254156	11254166	11254180
EPL BAS Sample ID	154-K040	154-K029	154-K080
Proximates			
Moisture (%)	7.25	6.94	6.97
Anti-Nutrients			
Total Tannins (% FW)	1.10	0.496	0.902

Table 2. Compositional Analyses of Canola Seed Control Substance

Material Name	Ebony	Ebony	Ebony
Field Site	MBNW	MBNW	MBNW
Entry	1	1	1
Sample ID	11254125	11254138	11254149
EPL BAS Sample ID	154-K088	154-K026	154-K009

Proximates

Moisture (%)	7.68	6.92	7.10
--------------	------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.498	0.575	0.633
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Material Name	Ebony	Ebony
Field Site	MBPL	MBPL
Entry	1	1
Sample ID	11248710	11248723
EPL BAS Sample ID	154-K094	154-K023

Proximates

Moisture (%)	7.58	7.34
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Anti-Nutrients

Total Tannins (% FW)	0.873	0.797
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Material Name	Ebony	Ebony	Ebony	Ebony
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	1	1	1	1
Sample ID	11248614	11248626	11248629	11248648
EPL BAS Sample ID	154-K042	154-K037	154-K063	154-K121

Proximates

Moisture (%)	6.77	6.71	6.46	7.60
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Anti-Nutrients

Total Tannins (% FW)	0.443	0.649	0.360	0.602
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Table 2. Compositional Analyses of Canola Seed Control Substance (Continued)

Material Name	Ebony	Ebony	Ebony	
Field Site	NDVA	NDVA	NDVA	
Entry	1	1	1	
Sample ID	11248669	11248674	11248692	
EPL BAS Sample ID	154-K079	154-K064	154-K047	
Proximates				
Moisture (%)	6.58	6.71	6.86	
Anti-Nutrients				
Total Tannins (% FW)	0.480	0.287	0.429	
Material Name	Ebony	Ebony	Ebony	Ebony
Field Site	SKSA	SKSA	SKSA	SKSA
Entry	1	1	1	1
Sample ID	11254154	11254173	11254183	11254195
EPL BAS Sample ID	154-K033	154-K032	154-K108	154-K022
Proximates				
Moisture (%)	6.27	6.01	6.70	6.78
Anti-Nutrients				
Total Tannins (% FW)	0.920	1.01	1.04	0.811

Table 3. Compositional Analyses of Canola Seed Reference Substances

Material Name	Croplan 601	Croplan 601	Croplan 601	Croplan 601
Field Site	MBPL	MBPL	MBPL	MBPL
Entry	3	3	3	3
Sample ID	11248704	11248717	11248728	11248732
EPL BAS Sample ID	154-K046	154-K070	154-K091	154-K120

Proximates

Moisture (%)	7.08	6.93	7.31	7.75
--------------	------	------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.401	0.575	0.752	0.783
----------------------	-------	-------	-------	-------

Material Name	Croplan 601	Croplan 601	Croplan 601	Croplan 601
Field Site	NDVA	NDVA	NDVA	NDVA
Entry	5	5	5	5
Sample ID	11248659	11248662	11248672	11248682
EPL BAS Sample ID	154-K096	154-K071	154-K028	154-K019

Proximates

Moisture (%)	7.37	6.51	7.28	7.13
--------------	------	------	------	------

Anti-Nutrients

Total Tannins (% FW)	0.521	0.467	0.322	0.570
----------------------	-------	-------	-------	-------

Material Name	Croplan 601	Croplan 601	Croplan 601	Croplan 601
Field Site	SKSA	SKSA	SKSA	SKSA
Entry	3	3	3	3
Sample ID	11254159	11254161	11254185	11254193
EPL BAS Sample ID	154-K098	154-K010	154-K109	154-K041

Proximates

Moisture (%)	7.65	7.92	7.21	6.76
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Anti-Nutrients

Total Tannins (% FW)	0.654	1.09	0.798	0.841
----------------------	-------	------	-------	-------

Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	DSV Ability	DSV Ability	DSV Ability
Field Site	MBNW	MBNW	MBNW
Entry	5	5	5
Sample ID	11254128	11254132	11254152
EPL BAS Sample ID	154-K059	154-K090	154-K077

Proximates

Moisture (%)	6.66	7.15	6.70
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Anti-Nutrients

Total Tannins (% FW)	0.359	0.360	0.589
----------------------	-------	-------	-------

Material Name	DSV Ability	DSV Ability	DSV Ability	DSV Ability
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	5	5	5	5
Sample ID	11248607	11248616	11248632	11248642
EPL BAS Sample ID	154-K087	154-K027	154-K052	154-K076

Proximates

Moisture (%)	7.22	6.87	6.63	6.42
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Anti-Nutrients

Total Tannins (% FW)	0.332	0.309	0.416	0.240
----------------------	-------	-------	-------	-------

Material Name	Hyola 401	Hyola 401	Hyola 401
Field Site	MBPL	MBPL	MBPL
Entry	5	5	5
Sample ID	11248702	11248714	11248724
EPL BAS Sample ID	154-K021	154-K106	154-K092

Proximates

Moisture (%)	7.05	7.69	7.72
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Anti-Nutrients

Total Tannins (% FW)	0.384	0.567	0.642
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Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	Hyola 401	Hyola 401	Hyola 401	Hyola 401
Field Site	NDVA	NDVA	NDVA	NDVA
Entry	3	3	3	3
Sample ID	11248664	11248667	11248678	11248688
EPL BAS Sample ID	154-K048	154-K102	154-K082	154-K122

Proximates

Moisture (%)	7.10	7.47	7.60	7.86
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Anti-Nutrients

Total Tannins (% FW)	0.346	0.437	0.445	0.425
----------------------	-------	-------	-------	-------

Material Name	Hyola 401	Hyola 401	Hyola 401	Hyola 401
Field Site	SKSA	SKSA	SKSA	SKSA
Entry	5	5	5	5
Sample ID	11254155	11254171	11254178	11254188
EPL BAS Sample ID	154-K054	154-K103	154-K035	154-K067

Proximates

Moisture (%)	7.12	7.53	7.37	6.35
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Anti-Nutrients

Total Tannins (% FW)	0.724	0.794	0.745	1.00
----------------------	-------	-------	-------	------

Material Name	Q2	Q2	Q2	Q2
Field Site	MBNW	MBNW	MBNW	MBNW
Entry	2	2	2	2
Sample ID	11254114	11254122	11254134	11254146
EPL BAS Sample ID	154-K113	154-K115	154-K024	154-K039

Proximates

Moisture (%)	6.89	7.60	6.75	7.13
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Anti-Nutrients

Total Tannins (% FW)	0.287	0.282	0.240	0.265
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Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	Q2	Q2	Q2
Field Site	MBPL	MBPL	MBPL
Entry	2	2	2
Sample ID	11248694	11248707	11248720
EPL BAS Sample ID	154-K044	154-K018	154-K038

Proximates

Moisture (%)	6.98	7.00	7.11
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Anti-Nutrients

Total Tannins (% FW)	0.191	0.353	0.356
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Material Name	Q2	Q2	Q2	Q2
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	2	2	2	2
Sample ID	11248610	11248622	11248639	11248645
EPL BAS Sample ID	154-K110	154-K075	154-K004	154-K068

Proximates

Moisture (%)	7.14	6.24	8.26	6.33
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Anti-Nutrients

Total Tannins (% FW)	0.299	0.550	0.312	0.287
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Material Name	Q2	Q2	Q2
Field Site	NDVA	NDVA	NDVA
Entry	2	2	2
Sample ID	11248653	11248661	11248677
EPL BAS Sample ID	154-K084	154-K112	154-K031

Proximates

Moisture (%)	7.52	6.96	6.39
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Anti-Nutrients

Total Tannins (% FW)	0.128	0.251	0.254
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Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	Q2	Q2	Q2	Q2
Field Site	SKSA	SKSA	SKSA	SKSA
Entry	2	2	2	2
Sample ID	11254162	11254169	11254179	11254192
EPL BAS Sample ID	154-K066	154-K072	154-K119	154-K116
Proximates				
Moisture (%)	6.51	6.32	7.58	7.34
Anti-Nutrients				
Total Tannins (% FW)	0.403	0.445	0.666	0.515
Material Name	SP Armada	SP Armada	SP Armada	SP Armada
Field Site	MBPL	MBPL	MBPL	MBPL
Entry	4	4	4	4
Sample ID	11248700	11248712	11248721	11248735
EPL BAS Sample ID	154-K017	154-K104	154-K114	154-K117
Proximates				
Moisture (%)	6.78	7.64	7.68	7.50
Anti-Nutrients				
Total Tannins (% FW)	0.308	0.322	0.340	0.310
Material Name	SP Armada	SP Armada		
Field Site	NDVA	NDVA		
Entry	4	4		
Sample ID	11248671	11248691		
EPL BAS Sample ID	154-K073	154-K055		
Proximates				
Moisture (%)	7.24	6.86		
Anti-Nutrients				
Total Tannins (% FW)	0.392	0.279		

Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	SP Armada	SP Armada	SP Armada	SP Armada
Field Site	SKSA	SKSA	SKSA	SKSA
Entry	4	4	4	4
Sample ID	11254158	11254174	11254182	11254190
EPL BAS Sample ID	154-K058	154-K008	154-K061	154-K085
Proximates				
Moisture (%)	7.51	8.01	6.72	7.77
Anti-Nutrients				
Total Tannins (% FW)	0.344	0.481	0.240	0.455
Material Name	SValof Senator	SValof Senator	SValof Senator	SValof Senator
Field Site	MBNW	MBNW	MBNW	MBNW
Entry	4	4	4	4
Sample ID	11254115	11254126	11254141	11254150
EPL BAS Sample ID	154-K081	154-K057	154-K015	154-K043
Proximates				
Moisture (%)	7.58	7.03	7.06	7.08
Anti-Nutrients				
Total Tannins (% FW)	0.592	0.345	0.550	0.420
Material Name	SValof Senator	SValof Senator	SValof Senator	SValof Senator
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	4	4	4	4
Sample ID	11248605	11248606	11248618	11248637
EPL BAS Sample ID	154-K006	154-K089	154-K034	154-K086
Proximates				
Moisture (%)	7.08	7.40	7.51	7.06
Anti-Nutrients				
Total Tannins (% FW)	0.914	0.424	0.527	0.461

Table 3. Compositional Analyses of Canola Seed Reference Substances (Continued)

Material Name	SValof Sponsor	SValof Sponsor	SValof Sponsor	SValof Sponsor
Field Site	MBNW	MBNW	MBNW	MBNW
Entry	3	3	3	3
Sample ID	11254111	11254131	11254139	11254143
EPL BAS Sample ID	154-K049	154-K011	154-K095	154-K003

Proximates

Moisture (%)	6.94	7.22	7.41	7.54
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Anti-Nutrients

Total Tannins (% FW)	0.500	0.799	0.581	0.697
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Material Name	SValof Sponsor	SValof Sponsor	SValof Sponsor	SValof Sponsor
Field Site	MNCA	MNCA	MNCA	MNCA
Entry	3	3	3	3
Sample ID	11248613	11248625	11248635	11248647
EPL BAS Sample ID	154-K060	154-K111	154-K069	154-K053

Proximates

Moisture (%)	6.31	6.63	6.68	6.43
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Anti-Nutrients

Total Tannins (% FW)	0.476	0.771	0.724	0.825
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APPENDIX A
Canola Seed Analytical Method Summaries

CANOLA SEED ANALYTICAL METHOD SUMMARIES

Moisture (NC-4)

Moisture content was determined gravimetrically. Subsamples of ground canola seed were dried to a constant weight in a vacuum oven at 100°C and 25 inches of mercury pressure for 15 hours. There was no analytical reference substance for this analysis. Moisture results were reported on a percent of fresh weight basis and percent dry matter.

Reference:

AOAC International Method 925.09 (2011). In Official Methods of Analysis of AOAC International, 18th Edition. Association of Official Analytical Chemists International, Gaithersburg, MD.

Tannins (NC-280)

Soluble condensed tannins (SCT) were extracted from defatted ground canola seed with 70:30 – acetone: DI water, employing the stabilizing agent, sodium metabisulfite. The insoluble condensed tannins (ICT) remained in the pellet after extraction. Both SCT and ICT were hydrolyzed with 95:5 – butanol:concentrated HCl in the presence of an iron catalyst. The hydrolysates were analyzed by UV-VIS spectrophotometer, and reported as Procyanidin B2 equivalents. The results were reported on a percent fresh weight basis of the original canola seed weighed. Procyanidin B2 was the analytical reference substance used to verify the method and spectrophotometer. The analytical reference substance was purchased from Indofine Chemical Company, Inc. and had a purity of >90%. The lot number was 11021646. The Reporting Limit was 0.00938% for SCT and 0.00156% for ICT. Tannins were reported on a percent fresh weight basis.

References:

Lawrence J. Porter, Liana N. Hrstich, And Bock G. Chan, The Conversion of Procyanidins And Prodelphinidins To Cyanidin And Delphinidin. *Phytochemistry*, 1986, 25, 223-230.

Hee-Dong Bae, Tim A. Mcallister, Alister D. Muir, and Kuo-Joan Cheng, Selection of a Method of Condensed Tannin Analysis for Studies with Rumen Bacteria. *J. Agric. Food Chem.*, 1993, 41, 1256-1260.

Marian Naczk, Tom Nichols, David Pink, And Frank Sosulski, Condensed Tannins in Canola Hulls. *J. Agric. Food Chem.*, 1994, 42, 2196-2200.

Scott A. Dalzell and Graham L. Kerven, A rapid Method for The Measurement of Leucaena spp Proanthocyanidins By the Proanthocyanidin (Butanol/HCl) Assay. *J. Sci. Food Agric.*, 1998, 78, 405-416.

M. Naczk, R. Amarowicz, P. Pink, And F. Shahidi, Insoluble Condensed Tannins of Canola/rapeseed. *J. Agric. Food Chem.*, 2000, 48, 1758-1762.

Celestino Santos-Buelga, And Augustin Scalbert, Review-Proanthocyanidins and Tannins-like Compounds-Nature, Occurance, Dietary Intake and Effects On Nutrition and Health. *J. Sci. Food Agric.*, 2000, 80, 1094-1117.

Appendix 2. Certus Statistical Sub-Report

**Analysis of Tannins in Canola Seed Collected from MON 88302 Grown in the
United States and Canada during the 2009 Growing Season**

The following 9 pages are the statistical sub-report
Pages 40-48

STATISTICAL REPORT

Analysis of Tannins in Canola Seed Collected from MON 88302 Grown in the United States and Canada during the 2009 Growing Season

STUDY NUMBER: RAR-2011-0237

SPONSOR: Monsanto Company
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Manager, Biostatistics and Data Management

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2. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Herbicide-Treated) vs. Ebony	8

1. Data Description

A SAS[®] dataset (DATARAR11237.sas7bdat, created 7/27/2011) containing canola seed moisture and total tannins compositional analysis data was received from Monsanto. Data were from test substance MON 88302 (untreated and herbicide-treated), conventional control substance Ebony, and seven commercial reference substances.

Canola seed of the test, control, and reference substances were collected from replicated plots at two United States and three Canadian sites during the 2009 growing season. The following table summarizes the distribution of replicates excluded from analyses due to excessive presence of unintended traits:

Country	Site	Excluded Samples ¹
U.S.	MNCA	1 rep MON 88302 (S)
U.S.	NDVA	2 reps MON 88302 (S), 1 rep Ebony, 1 rep Q2, 2 reps SP Armada
Canada	MBPL	1 rep MON 88302 (NS), 2 rep Ebony, 1 rep Hyola 401, 1 rep Q2
Canada	MBNW	2 reps MON 88302 (NS), 1 rep Ebony, 1 rep DSV Ability
Canada	SKSA	1 rep MON 88302 (S), 1 rep MON 88302 (NS)
¹ (S) = herbicide-treated; (NS) = untreated.		

Reference substances were distributed as follows across sites:

Site MBNW	Site MBPL	Site MNCA	Site NDVA	Site SKSA
DSV Ability	Croplan 601	DSV Ability	Croplan 601	Croplan 601
Q2	Hyola 401	Q2	Hyola 401	Hyola 401
SValof Senator	Q2	SValof Senator	Q2	Q2
SValof Sponsor	SP Armada	SValof Sponsor	SP Armada	SP Armada

The following formula was used for re-expression of canola seed total tannins data for statistical analysis:

Component	From (X)	To	Formula ¹
Total Tannins	% fw	% dw	X/d
¹ 'X' is the individual sample value; 'd' is the fraction of the sample that is dry matter.			

2. Statistical Methods

The purpose of this study was to compare the total tannins composition of test substance MON 88302, either untreated or herbicide-treated, to a conventional control, Ebony, which has a genetic background representative of the test substances.

[®] SAS is a registered trademark of SAS Institute Inc.

The SAS¹ GLM procedure was applied to all data (test, control and reference) to detect potential outliers in the dataset by screening studentized PRESS residuals. Substance, site, and replication effects were included in the model.

A PRESS residual² is the difference between any value and its predicted value from a statistical model that excludes the data point. The studentized version scales these residuals so that the values tend to have a standard normal distribution when outliers are absent. Thus, most values are expected to be between ± 3 . Extreme data points that are also outside of the ± 6 studentized PRESS residual range are considered for exclusion, as outliers, from the final analyses. For this study, no observations had PRESS residual values outside of the ± 6 range.

Canola seed total tannins were statistically analyzed using a mixed model analysis of variance with the SAS MIXED procedure. The five replicated sites were analyzed both separately and combined. Individual replicated site analyses used model (1).

$$(1) Y_{ij} = U + T_i + B_j + e_{ij},$$

where Y_{ij} = unique individual observation, U = overall mean, T_i = substance effect, B_j = random block effect, and e_{ij} = residual error.

Combined site analyses used model (2).

$$(2) Y_{ijk} = U + T_i + L_j + B(L)_{jk} + LT_{ij} + e_{ijk},$$

where Y_{ijk} = unique individual observation, U = overall mean, T_i = substance effect, L_j = random site effect, $B(L)_{jk}$ = random block within site effect, LT_{ij} = random site by substance interaction effect, and e_{ijk} = residual error.

A tolerance interval is an interval that one can claim, with a specified degree of confidence, contains at least a specified proportion, p , of an entire sampled population for the parameter measured.

For each compositional component, 99% tolerance intervals were calculated that are expected to contain, with 95% confidence, 99% of the quantities expressed in the population of commercial conventional substances. Each estimate was based upon the average of observations per unique reference substance. Because negative quantities are not possible, negative calculated lower tolerance bounds were set to zero.

3. Statistical Results

SAS software was used to generate all summary statistics and perform all analyses. Report tables present p-values from SAS as either <0.001 or the actual value truncated to three decimal places.

Test vs. control statistical results are summarized in Tables 1 and 2. For total tannins, least-square means, standard errors (S.E.), and the range of observed values are presented for each substance. Mean differences, standard errors of the differences, the range of observed differences, 95% confidence intervals for the mean differences and the significance probability are presented for each comparison. In addition, the range of the observed reference values and 99% tolerance intervals are presented.

No test vs. control comparisons were found to be statistically significant ($p < 0.05$).

4. References

1. SAS Software Release 9.2 (TS2M3). Copyright (c) 2002-2008 by SAS Institute Inc., Cary, NC, USA.
2. Belsley, D. A., Kuh, E., Welsch, R. E. 1980. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity. John Wiley & Sons, New York.

Table 1. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Untreated) vs. Ebony

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Combined-Site						
Anti-nutrient (% dw)						
Total Tannins	0.74 (0.11) (0.23 - 1.47)	0.69 (0.11) (0.31 - 1.11)	0.044 (0.083) (-0.54 - 0.82)	-0.15, 0.24	0.609	0, 1.37 (0.14 - 1.18)
Site MBNW						
Anti-nutrient (% dw)						
Total Tannins	0.44 (0.10) (0.23 - 0.68)	0.60 (0.087) (0.54 - 0.68)	-0.15 (0.11) (-0.31 - 0.059)	-0.49, 0.19	0.249	0, 1.37 (0.14 - 1.18)
Site MBPL						
Anti-nutrient (% dw)						
Total Tannins	0.82 (0.17) (0.60 - 1.09)	0.90 (0.20) (0.86 - 0.94)	-0.085 (0.26) (-0.26 - -0.18)	-0.92, 0.75	0.769	0, 1.37 (0.14 - 1.18)
Site MNCA						
Anti-nutrient (% dw)						
Total Tannins	0.85 (0.16) (0.46 - 1.47)	0.55 (0.16) (0.38 - 0.70)	0.29 (0.20) (-0.062 - 0.82)	-0.23, 0.82	0.209	0, 1.37 (0.14 - 1.18)

Table 1. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Untreated) vs. Ebony (cont.)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Site NDVA						
Anti-nutrient (% dw)						
Total Tannins	0.55 (0.059) (0.37 - 0.70)	0.43 (0.068) (0.31 - 0.51)	0.12 (0.090) (0.0099 - 0.40)	-0.16, 0.41	0.268	0, 1.37 (0.14 - 1.18)
Site SKSA						
Anti-nutrient (% dw)						
Total Tannins	0.89 (0.13) (0.53 - 1.19)	1.01 (0.11) (0.87 - 1.11)	-0.12 (0.16) (-0.54 - 0.10)	-0.55, 0.32	0.498	0, 1.37 (0.14 - 1.18)

¹dw = dry weight.

²Test refers to MON 88302 (Untreated). These plants were not sprayed with herbicide, but received another conventional treatment as was done for the conventional control.

³Mean (S.E.) = least-square mean (standard error).

⁴Control refers to the non-biotechnology derived, conventional control (Ebony).

⁵With 95% confidence, interval contains 99% of the values expressed in the population of commercial substances. Negative limits set to zero.

Table 2. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Herbicide-Treated) vs. Ebony

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Combined-Site						
Anti-nutrient (% dw)						
Total Tannins	0.70 (0.11) (0.20 - 1.32)	0.69 (0.11) (0.31 - 1.11)	0.0036 (0.084) (-0.49 - 0.45)	-0.19, 0.20	0.966	0, 1.37 (0.14 - 1.18)
Site MBNW						
Anti-nutrient (% dw)						
Total Tannins	0.58 (0.077) (0.48 - 0.76)	0.60 (0.087) (0.54 - 0.68)	-0.013 (0.089) (-0.10 - 0.14)	-0.30, 0.27	0.893	0, 1.37 (0.14 - 1.18)
Site MBPL						
Anti-nutrient (% dw)						
Total Tannins	0.82 (0.14) (0.49 - 1.19)	0.90 (0.20) (0.86 - 0.94)	-0.084 (0.25) (-0.32 - 0.24)	-0.88, 0.71	0.759	0, 1.37 (0.14 - 1.18)
Site MNCA						
Anti-nutrient (% dw)						
Total Tannins	0.48 (0.18) (0.20 - 0.70)	0.55 (0.16) (0.38 - 0.70)	-0.074 (0.22) (-0.49 - 0.31)	-0.65, 0.50	0.751	0, 1.37 (0.14 - 1.18)

Table 2. Statistical Summary of Canola Seed Total Tannins Content for MON 88302 (Herbicide-Treated) vs. Ebony (cont.)

Analytical Component (Units) ¹	Test ² Mean (S.E.) ³ (Range)	Control ⁴ Mean (S.E.) (Range)	Difference (Test minus Control)			Commercial Tolerance Interval ⁵ (Range)
			Mean (S.E.) (Range)	95% Confidence Interval	Significance (p-Value)	
Site NDVA						
Anti-nutrient (% dw)						
Total Tannins	0.48 (0.083) (0.46 - 0.50)	0.43 (0.068) (0.31 - 0.51)	0.055 (0.11) (0.044 - 0.15)	-0.29, 0.40	0.643	0, 1.37 (0.14 - 1.18)
Site SKSA						
Anti-nutrient (% dw)						
Total Tannins	1.12 (0.13) (0.89 - 1.32)	1.01 (0.11) (0.87 - 1.11)	0.11 (0.16) (-0.18 - 0.45)	-0.32, 0.55	0.510	0, 1.37 (0.14 - 1.18)

¹dw = dry weight.²Test refers to MON 88302 (Herbicide-Treated).³Mean (S.E.) = least-square mean (standard error).⁴Control refers to the non-biotechnology derived, conventional control (Ebony).⁵With 95% confidence, interval contains 99% of the values expressed in the population of commercial substances. Negative limits set to zero.