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MINNESOTA CANOLA PRODUCTION CENTRE RESULTS

I ACKNOWLEDGEMENTS

Minnesota Canola Production Centre

The Minnesota Canola Production Centre is a public-private international partnership between the Minnesota Canola Council, the University of Minnesota and the Canola Council of Canada.

Many thanks to all of our local and regional sponsors for their donations of cash, products and services. Their continued generous support has made the Minnesota Canola Production Centre a reality.

Thank you all!

II LOCAL AND REGIONAL SPONSORS

MINNESOTA - Dave LeGare, Scientist - University of Minnesota

Location: Roseau - 80 acres

Land: Steve and Diane Dahl

Seed and Seed Treatment:
Bayer CropScience - InVigor 2663 (2 bags)
Interstate Seed - Hyola 401, Hyola 357 (4 bags)
Gustafson - Fungicide seed treatment
Syngenta - Tribune seed treatment

Fertilizer:
Agriliance (65 acres)
Farmer's Union Oil Co. - West Plant (15 acres)

Pesticides:
BASF - Ronilan (80 acres), Beyond (8 acres)
Bayer CropScience - Liberty (19 acres)
Monsanto - Roundup Ultra Max (70 acres)
Zeneca - Warrior (80 acres)

Equipment and Labor:
Dave Severson - cement mixer
Steve Dahl - MF 760 and MF 8560 combines, combine operator, equipment storage, grain trucks and shop use
Farmer's Union Oil Co., West Plant - fertilizer application, soil testing, soil analysis, fungicide application (18 acres), insecticide application (80 acres), weigh wagon
Slater Spraying Service - fungicide application (2 acres)

Photocopying & Faxing: Roseau County Extension Office

Field Day:

AGSCO	Farmers Union Oil – Roseau
BASF	FMC
Bayer CropScience	Gustafson, LLC
Border State Bank – Ros.	Interstate Seed Company
Brett -Young Seeds Ltd.	Monsanto
CanAmera Foods	Northwest Grain
CerexAgri	Pioneer Hi-Bred Int'l Inc.
Citizens State Bank – Ros.	Proseed Inc.
Croplan Genetics	Roseau Cnty Co-op, Greenbush
DuPont Crop Protection	Roseau Farm Service
Farm Credit Services	Syngenta Crop Protection

Comments: I would like to thank **Brent Arndt, Lisa Voth**, **Tony Lorentz** and **Karen Andol** for all of their hard work and dedication throughout the growing season. Thanks to **Wayne Brateng** and the crew at **West Plant** for their assistance. Thanks to the staff of the **Minnesota Canola Council** for organizing the field day. Many thanks to **Steve Dahl** for his help combining the plots. I would also like to thank **Derwyn Hammond** of the Canola Council of Canada for his ideas and assistance with seeding and reviewing this report. I would especially like to thank my family (**Sue, Laura** and **Katie**) for their patience with me during the growing season.

III INTRODUCTION

The Canola Council of Canada initiated Canola Production Centres to address the ongoing need for canola production technology transfer as identified during the Grow with Canola program (1985-1990). The Canola Production Centres were a joint effort between producer groups, industry representatives, and government and extension personnel. Field scale agronomic trials utilizing commercial farm equipment were conducted at the sites, and the information generated utilized for extension activities throughout the year.

Following tours of the Canola Production Centre near Carman, MB in 1996 and 1997 the Minnesota Canola Council sought funding for a joint project between the Minnesota Canola Council, University of Minnesota and Canola Council of Canada. The purpose of the project was to establish a Canola Production Centre site in Minnesota, and the role of the Canola Council of Canada was to provide expertise and supervisory support. This would help ensure that activities at this site would be consistent with activities at the Canadian CPCs. This allowed the information from all sites to be easily shared. Funding for the project was approved in April 1998, and the Minnesota Canola Production Centre program was born.

During the first two years of the project, the Minnesota Canola Production Centre was located near Roseau, MN. In 2000, the site was moved to Thief River Falls, MN where it stayed through 2002. In 2003, the CPC returned to the Roseau area. The field day tour was held on July 2 and included a barbeque lunch, tour of the site and a golf tournament after the lunch. All trials were signed and copies of site plans were available at the entrances to allow for self-guided tours at any time other than scheduled tour dates.

Information obtained from the Canola Production Centre included many agronomic factors such as yield and quality data, early season plant counts, lodging indices and harvestability ratings on varieties.

Canada did not have Production Centres in 2003. In the fall of 2002 the Canola Council of Canada (CCC) initiated some strategic planning, and the Canadian canola industry identified a goal of achieving a sustained production and market demand base of seven million tonnes of canola by 2007. For the crop production area of CCC this has meant a shift from the Canola Production Centre program of field scale agronomy trials to a new extension focused program called Canola Advantage. This new program is focused on providing producers with production information targeted at improving profitability, in order to make canola one of their best cropping options. Activities within the new program fall into one of five key areas including just-in-time information, skill development, optimizing production practices, production solutions, and research.

It should be noted that the material contained in this report is a collection of agronomic information from a specific location and only from one site year. Therefore, it should be observed and understood accordingly.

IV DEFINITIONS

Brassica napus varieties: Argentine varieties

Co-efficient of variation (CV): The standard deviation expressed as a percentage of the mean.

Contribution margin: The amount of total revenue less variable costs that directly relate to the business operation available to contribute to fixed costs and return on investment, labour and management.

Contribution margin per acre: The amount of revenue remaining per acre after variable costs have been serviced, allowing the producer to manage other financial commitments, such as fixed costs.

DAP: Days after planting

Days to maturity: Actual calendar days from the date of seeding to approximately 30% seed colour change on the main stem.

Fixed costs: Costs that remain relatively unchanged regardless of the volume of production (e.g. land taxes, mortgage interest and machinery depreciation).

Height: The average plant height in inches at swathing time.

Growing degree-days (GDD): Heat accumulated above canola's base temperature. The heat accumulated each day is determined by adding the maximum and minimum temperatures and dividing the total by two to obtain a daily average. The base temperature for canola of 0°C is subtracted from the average to arrive at the number of growing degree-days. The total growing degree-days required for Argentine canola on average is 1432 to 1557 growing degree-days.

Least significant difference (LSD): The difference required for one treatment to be statistically different from another at the **95%** confidence level, expressed in identical units. For example, if Variety A yielded 1900 lb/ac and Variety B yielded 2050 bu/ac and the LSD for that trial was 112.5, then Variety A is statistically different from Variety B because 2050 - 1900 = 150, which is greater than 112.5. If the difference were less than 112.5, then the varieties would not be statistically different from each other.

Lodging ratio/rating: A measure of the lodging resistance of a particular variety.

Opportunity costs: The opportunity cost of a resource is the return the resource can earn when put to its best alternative.

Variable costs: Costs that vary directly with the volume of production or activity (e.g. seed, fertilizer, fuel and repairs).

V ECONOMIC ANALYSIS

A. *Canola Pricing System (Based on price at harvest, in U.S. dollars)*

Green Seed (%)	$/100 lb At Elevator	Plus $/100 lb LDP*	Final $/100 lb	Final $/bu
0 - 2.0	9.16	0.34	9.50	4.75

Note 1: *The green seed was determined by using 2-100 seed crush strip tests done on each sample from every treatment within a particular project trial.*

Note 2: ** LDP = Loan Deficiency Program*

B. *Cost Calculations & Assumptions*

The following costs were used in calculating economic returns for the various trials and treatments, and are expressed in **U.S. dollars**. Fertilizer and crop protection product prices were obtained from the local dealer for summer 2003.

Equipment costs were obtained from the University of Minnesota Extension Service and are estimated equipment variable costs for Minnesota. There has been no value allocated for capital and fixed costs.

CANOLA VARIETY SEED COSTS					
B. napus	**$/lb**	**Distributor**	***B. napus***	**$/lb**	**Distributor**
45H21	4.72	Pioneer Hi-Bred	Hyola 505 RR	4.86*	Interstate Seed
46A76	3.45	Pioneer Hi-Bred	InVigor 2663	5.36	Bayer CropScience
DKL223	5.43	DeKalb/Monsanto	InVigor 2733	5.50	Bayer CropScience
DKL34-55	3.95	DeKalb/Monsanto	RideR	4.35	DeKalb/Monsanto
DKL35-85	3.95	DeKalb/Monsanto	RR Hyb 2013	5.47	Proseed
Hyola 357 Magnum	5.44	Interstate Seed	SW Marksman RR	4.86*	Interstate Seed
Hyola 401	4.06	Interstate Seed	SW Patriot RR	4.46*	Interstate Seed

Note: Seed cost may vary. Prices reflect the Minnesota suggested retail for Spring 2003 with Helix Xtra seed treatment.

* These varieties were not sold in the USA in 2003, so 2004 prices are listed with permission of the distributor.

PRODUCT INFORMATION			
Product	**Active Ingredient**	**Manufacturer/ Distributor**	**$/Unit Cost**
Assure II	quizalofop-p-ethyl	DuPont Agriculture Prod.	126.00/gal
Ammonium Sulfate	ammonium sulfate	Agriliance	0.60/lb
Beyond	imazamox	BASF	510.00/gal
Canola Fungicide Package	carboxin + thiram + metalaxyl	Gustafson	0.08/lb seed
Capture	bifenthrin	FMC Corporation	413.00/gal
Endura *	boscalid	BASF	Not available
Helix Lite	fludioxonil + mefenoxam + difenoconazole + thiamethoxam	Syngenta	0.82/lb seed
Helix XTra	fludioxonil + mefenoxam + difenoconazole + thiamethoxam	Syngenta	1.46/lb seed
L1286-A1 *	Not available	Gustafson	Not available
Muster	ethametsulfuron	DuPont Agriculture Prod.	31.00/oz
Liberty	glufosinate ammonium	Bayer CropScience	62.50/gal
Poast	sethoxydim	BASF	66.80/gal
Preference	non-ionic surfactant	Agriliance	18.90/gal
Prime Oil	crop oil concentrate	Agriliance	7.00/gal
Prosper 200	carboxin + thiram + metalaxyl + clothianidin	Gustafson	0.82/lb seed
Prosper 400	carboxin + thiram + metalaxyl + clothianidin	Gustafson	1.47/lb seed
Ronilan	vinclozolin	BASF	20.82/lb
Roundup Ultra Max **	glyphosate	Monsanto	51.30/gal
Stinger	clopyralid	Dow AgroSciences	490.00/gal
Topsin M	thiophanate-methyl	Elf Atochem	17.70/lb
Tribune	fludioxonil + mefenoxam + difenoconazole	Syngenta	0.20/lb seed

*Note: Endura is a registered product on canola, but pricing had not been established at press time. L1286-A1 is a non-registered product and pricing is not available.

**Note: $15/ac CUA (Canola Use Agreement) includes first 13 oz/ac of Roundup Ultra Max.

Numerous references to pesticide applications will be found in this report. We advise everyone to consult with recommendations and product labels for complete instructions.

CANOLA FERTILIZER COSTS			
Fertilizer	**Analysis**	**$/Ton**	**$/lb of Nutrient**
Ammonium Sulfate	21-0-0-24	165.00	0.27 (of N)
Ammonium Sulfate	21-0-0-24	165.00	0.11 (of S)
Phosphate	18-46-0	250.00	0.17
Urea	46-0-0	250.00	0.27

Machinery Cost:

- Conventional tillage: $ 27.66/ac
- Extra spray pass: add $ 0.55/ac

Additional Machinery Costs: (Custom Application)

- Aerial $ 5.00/ac
- Ground (fungicide) $ 4.00/ac
- Fertilizer application $ 4.50/ac
- Air-assist Ground (fungicide) $ 4.50/ac

Note: Machinery costs were obtained from the University of Minnesota Extension Service and are estimated operating costs (such as fuel, lubrication and repairs) for Minnesota.

Minnesota State Check-off:

$0.06 per 100 pounds of canola.

Interest/Opportunity Cost:

This cost calculation demonstrates the cost of money borrowed and charged on crop inputs and machinery-operating costs. In 2003, 6.5% per annum over six months was used.

C. Economic Results Report (example)

Site: Roseau, MN

Variety and System Comparison Trial: Hyola 401

CALCULATION OF VALUE OF PRODUCTION				
Yield (lb/ac)	**X**	**Price ($/cwt)**	**=**	**Value of Production**
2238		9.50		212.61

CALCULATION OF VARIABLE COSTS ($/ac)	
Seed	20.30
Fertilizer	25.78
Herbicides	42.20
Fungicides	22.02
Insecticides	12.46
Machinery	27.68
Insurance	0.00
Check-off	1.34
Interest/opportunity	4.89
Total Variable Costs	156.67

CALCULATION OF CONTRIBUTION MARGIN				
Value of Production ($/ac)	**-**	**Variable Costs ($/ac)**	**=**	**Contribution Margin ($/ac)**
212.61		156.67		55.94

Contribution Margin ($/ac)	/	Yield (bu/ac)	=	Contribution Margin ($/bu)
55.94		44.8		1.25

This example was developed and prepared with assistance from Royal Bank of Canada agrologists.

VI SITE INFORMATION

THIS IS GENERAL SITE INFORMATION THAT MAY CHANGE FOR SPECIFIC TRIALS.

Location:	**Roseau, MN**

Co-operator: Steve and Diane Dahl

Previous crop: Wheat (flooded)

Soil test results: (AGVISE Laboratories)

Organic matter content: 3.8 %

Macronutrient Levels: (0-6", 6-24")

Nitrogen -	46, 66 lb/ac
Phosphorus -	30 lb/ac
Potassium -	354 lb/ac
Sulfur -	20, 52 lb/ac

Micronutrient Levels: (0-6")

Boron -	1.6 lb/ac
Copper -	0.9 lb/ac
Iron -	32.6 lb/ac
Zinc -	0.8 lb/ac
Chlorine -	308 lb/ac (0-24")
Manganese -	9.8 lb/ac

Recommended Fertilizer Applications - (lb/ac of actual nutrient):

Target Yield (lb/ac)	Probability of Precip. (%)	Precip. Required (inches)	Nitrogen	Phosphate	Potash	Sulphur
2200	N/A	N/A	40	44	0	20

Target yield: 2200 lb/ac

Fertilizer applied: Spring: N - 30 lb/ac P - 30 lb/ac K - 0 lb/ac S - 15 lb/ac
Seed placed: N - 3 lb/ac P - 15 lb/ac K - 0 lb/ac S - 0 lb/ac

Soil association/zone: Beardon Fargo Glyndon

Soil texture: Silty clay loam

Soil pH: 7.9

Salinity: 0.49, 0.31 mmho (0-6", 0-24") (slightly saline)

Tillage operations: The field was chisel plowed in the fall of 2002. The field was cultivated and harrow packed after a spring application of fertilizer.

Seeding method: The field was seeded with a John Deere 9350 double disc press drill

Dates: April 28 thru 30, 2003
Depth: ½ to 1 inch deep
Rate: 5.0 lb/ac with the following exceptions:
4.0 lb/ac - InVigor 2663 and InVigor 2733
4.5 lb/ac - InVigor 2663 in the Fungicide trial

Herbicides applied:

A) Conventional variety in the systems trial - Assure II (10 oz/ac), crop oil concentrate (10 oz/ac), Stinger (5 oz/ac), Muster (0.40 oz/ac)
B) Liberty Link varieties in the systems trial - Liberty (34 oz/ac), ammonium sulfate (3.0 lb/ac)
C) Clearfield varieties - Beyond (4 oz/ac), non-ionic surfactant (3.5 oz/ac), ammonium sulfate (2.5 lb/ac)
D) Roundup Ready varieties in the systems, seed treatment, and nitrogen trials - Roundup Ultra Max (13 oz/ac), ammonium sulfate (1.0 lb/ac)
E) The fungicide trial - Liberty (34 oz/ac), ammonium sulfate (3.0 lb/ac) plus a sequential of Liberty (28 oz/ac), ammonium sulfate (3.0 lb/ac)

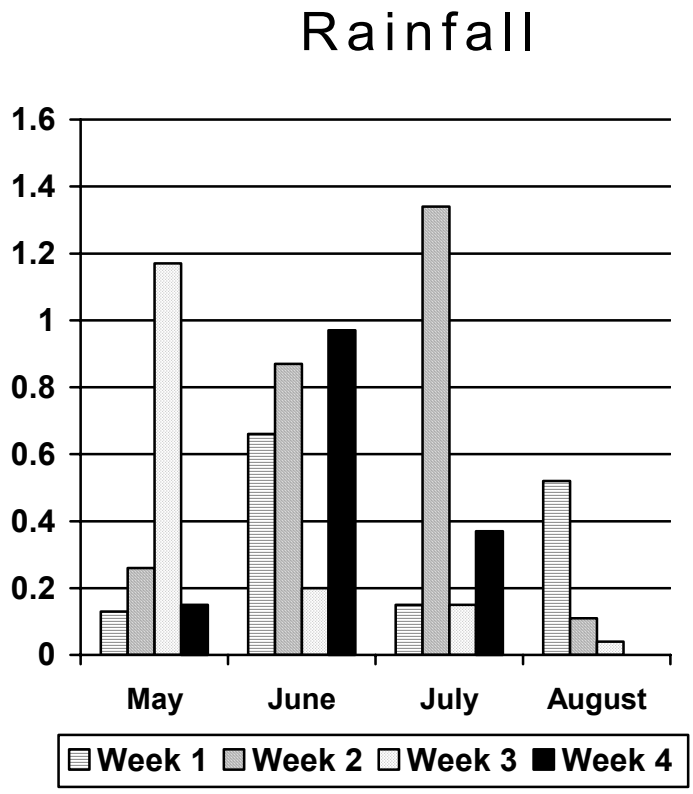
Fungicides applied: Ronilan (12 oz/ac) + Tactic (3.2 oz/ac) on June 27 at 15 to 50% bloom

Swathing: Started: August 1 Finished: August 11

Combining: Started: August 21 Finished: August 23

Comments:

There was fair to good moisture throughout the summer. Good moisture was present at seeding and emergence was uniform. Flea beetles started feeding around May 14, and by May 21 the entire Production Center was reaching action threshold for flea beetle damage. The whole field was sprayed with Warrior (3.8 oz/ac) on May 22 because the beetles were still feeding heavily and the forecast was for hot and dry conditions for the next several days. Frequent light rains produced good yields with little sclerotinia pressure. There was very little lodging, and swathing was easy in spite of the heavy crop. Conditions after swathing were ideal for good seed color change. Differences in yield from one trial to another indicated variability across the site, possibly due to differences in residual fertility levels.



Total accumulated moisture = 7.09 inches (180.1 mm)

VII VARIETY AND SYSTEMS COMPARISON TRIAL

Objective: To establish agronomic criteria for choosing among varieties and herbicide options.

Background: The availability of canola with innovative traits (herbicide tolerance, specialty oils) has given producers many options for variety selection. Yield, crop quality, lodging resistance, harvestability and disease resistance are important variety traits to consider in the selection process. The greatest economic return will occur by choosing the most appropriate combination of suitable varieties and appropriate herbicides for each field. Factors to consider beyond the performance of the variety include specialty oil premiums, weed spectrum, tillage system and herbicide rotation.

Methodology: All varieties were seeded at 5 lb/ac with the exception of the InVigor varieties, which were seeded at 4 lb/ac. The trial was laid out as a modified RCB design with four replicates. Roundup Ready varieties were grouped together to facilitate timely herbicide spraying and reduce drift damage to non-Roundup Ready plots, which were also grouped together. All varieties were treated with Helix Xtra seed treatment and had the same tillage, fertilizer and post-emergent fungicide treatments. The check variety for this trial was Hyola 401, treated with conventional herbicides. All the herbicide tolerant varieties were sprayed with their respective herbicides (see *Site Information – Herbicides applied*). Swathing commenced when seed colour change was 30 to 40 % on the main stem, and harvest was completed when suitable conditions existed.

Observations: The trial was seeded on April 30 into good soil moisture. A few light rain showers the week after seeding provided good conditions for a quick and uniform emergence. Heavy flea beetle pressure resulted in damage reaching the action threshold of 25% defoliation on most of the varieties by May 20. Hot and dry conditions were forecasted for the next several days, so the site was sprayed with Warrior (3.8 oz/ac) on May 21. Weed pressure was very high with the primary weeds being green smartweed, wild buckwheat, wild oats and some volunteer wheat. Weed control was good in all but the Liberty plots, where smartweed re-growth was apparent. The reduced efficacy was likely due to inadequate coverage for the contact herbicide, as a result of the extremely thick growth of smartweed.

Note that SW Marksman was SW F5229 RR and SW Patriot was SW F5191 RR on the CPC site maps that were available during the season.

Results:

VARIETY AND SYSTEMS COMPARISON TRIAL Roseau, MN							
Treatment / System	**Yield (%)**	**Yield (lb/ac)**	**Contrib. Margin ($/ac)**	**Canopy Closure DAP**	**Oil (%)**	**Growing Degree Days**	**Days To Mature**
Conventional (Check)							
Hyola 401	100	2238	55.94	40	45.6	1497	96
Liberty Link							
InVigor 2663	94	2093	65.66	41	46.4	1536	98
InVigor 2733	91	2031	59.19	42	45.8	1441	93
Clearfield							
Pioneer 46A76	89	1995	61.15	41	47.4	1624	102
Roundup Ready							
Pioneer 45H21	99	2211	77.81	41	48.2	1580	100
Hyola 357 Magnum	97	2163	69.54	42	46.0	1536	98
DKL223	92	2068	60.63	44	44.3	1459	94
RR Hyb 2013	92	2050	58.78	43	48.0	1580	100
SW Marksman RR	91	2034	60.31 *	40	48.2	1580	100
DKL35-85	88	1972	59.23	42	46.7	1580	100
RideR	87	1947	54.77	41	46.3	1536	98
DKL34-55	86	1930	55.24	41	47.3	1536	98
SW Patriot RR	86	1927	52.36 *	40	47.0	1516	97
Hyola 505 RR	81	1820	40.11 *	43	48.8	1602	101
LSD (0.05) CV%		108.7 3.7		0.9 1.6	0.85 1.3		1.5 1.1

* Note: 2003 seed prices were not available for SW Marksman RR, SW Patriot RR and Hyola 505 RR, so the 2004 seed prices were used for calculating contribution margins (with Interstate's permission).

Discussion: Hyola 401, 45H21 and Hyola 357 Magnum yielded significantly higher than the other varieties, with the exception of InVigor 2663. Pioneer 45H21 had the highest contribution margin. Even with the highest yield, the high cost of the conventional herbicide treatments ($42.20/ac) resulted in a contribution margin for Hyola 401 that was lower than all but four varieties. Contribution margins reflect differences in seed costs, yield and herbicide costs. Hyola 505 RR had the highest oil content and DKL223 had the lowest. Relatively mild temperatures during swathing allowed the maturity differences among varieties to be expressed.

VIII HARVESTABILITY TRIAL

Objective: To compare the harvestability of varieties entered in the variety and systems comparison trial.

Background: A number of varieties have very similar yield and quality traits. In choosing a variety a grower needs to consider additional traits like lodging and harvestability. Harvestability is the measurement of swathing and combining ease. Currently, there is no meaningful scientific measurement for harvestability. Therefore, a standardized criterion for a subjective measurement was used.

Methodology: The entries in the variety and systems comparison trial were all scored for height, lodging and harvestability. Crop **height** was the average height (in inches) of randomly selected plants. The **lodging score** was a visual score in which 1 = erect and 9 = flat. Varieties that were standing well and had a 'high yield tip' were given a score of two or three. Varieties that had severe uneven lodging with patches standing upright and patches laying flat were given a seven or eight, depending on the severity. **Lodging ratio** was obtained by dividing the average height of the canopy by the average height of randomly selected plants. **Harvestability** was evaluated as swathing and combining were completed. Swathing and combining were each evaluated on a scale of one to five, compared to the check (Hyola 401), which was given a number two to match the ratings of previous years at the Canola Production Centres in Canada and Minnesota. The following criteria were considered; lodging, height, straw stiffness, straw strength, stand uniformity, swath fluffiness (pod dispersion), tendency to clump, flowability, feeding and speed of operation.

The following ratings were subjective. The machine operator, crop conditions, weather and time of day can affect the harvestability of a variety.

Ratings:
1 = much better than average
2 = better than average (check)
3 = equal to average
4 = worse than average
5 = much worse average

Observations: There was very little lodging this year. The plots were swathed with an 18 foot Versatile swather equipped with a pick-up reel and side cutter bar. They were harvested with a Massey Fergusson 8560 combine.

Results:

HARVESTABILITY TRIAL Variety and Systems Comparison Trial Roseau, MN					
Treatment	**Height (inches)**	**Lodging ratio**	**Lodging score**	**Swathing Rating**	**Combining Rating**
DKL223	37	0.79	2.3	3.0	1.8
DKL34-55	42	0.93	2.5	2.5	1.8
DKL35-85	45	0.93	3.5	3.1	2.3
Hyola 357 Magnum	37	0.87	2.0	2.4	2.1
Hyola 401	35	0.86	1.8	2.0	2.0
Hyola 505 RR	57	0.91	3.3	3.6	3.5
InVigor 2663	52	0.92	2.0	2.9	2.3
InVigor 2733	43	0.83	2.0	1.9	1.8
Pioneer 45H21	47	0.88	2.5	2.8	2.6
Pioneer 46A76	54	0.98	3.5	3.4	3.8
RideR	49	0.92	3.0	3.1	2.7
RR Hyb 2013	50	0.98	2.5	2.9	3.2
SW Marksman RR	45	0.97	3.0	3.0	2.6
SW Patriot RR	47	0.87	3.5	3.8	2.5
LSD (0.05)	3.9	0.094	0.80	0.55	0.50
C.V.	5.9	7.3	21.1	13.4	12.6

Discussion: DKL223 had very low pod placement and required swathing very low to the ground so that little or no stubble was left to anchor the swath. Hyola 401 and InVigor 2733 were the easiest to swath. SW Patriot RR was somewhat challenging to swath due to uneven lodging. The height of Hyola 505 and 46A76 created the challenge of getting the swath to flow through the throat of the swather and resulted in clumpy swaths, which made them more difficult to combine.

IX FUNGICIDE TRIAL

Objective: To evaluate the effectiveness of different fungicides at controlling sclerotinia in canola and how they influence yield, quality and economic return.

Background: Sclerotinia stem rot is caused by the fungus *Sclerotinia sclerotiorum* that occurs in most canola growing areas. The disease is usually most severe in wetter areas of the growing region. Severity of stem rot varies from year to year, and even from field to field within a region. With the right combination of thick crop density and wet weather conditions before and during flowering, heavy infections can develop almost anywhere. In some cases half the potential yield of a crop may be lost to sclerotinia. Quadris, Ronilan EG, Endura, and Topsin 70WP are currently labeled for sclerotinia control on canola in the United States.

Methodology: The trial was seeded with the variety InVigor 2663 at a seeding rate of 4.5 lb/ac. Spraying was done using a ground sprayer equipped with twinjet nozzles at 75 psi and 20 gal/ac spray solution. Fungicides were applied at 30 to 40 % bloom and at the rates suggested by the label or industry representative. Treatments included:

1. Check - no fungicide applied
2. Endura 70WG (5.8 oz/ac)
3. Ronilan EG (12 oz/ac)
4. Topsin 4.5 FL (20 oz/ac)
5. Topsin 70 WP (16 oz/ac)
6. Topsin 70 WP + COC (16 oz/ac + 1% v/v crop oil concentrate)

Disease levels were recorded by rating 50 unswathed plants at three random locations within each plot along the edge of the swathed area. Infection ratings for each plant were assessed on a scale of 1 to 5 (1 = small branch infected, 5 = the whole plant is dead with substantial yield loss). Percent infection was calculated by dividing the number of infected plants by the number of plants evaluated.

Observations: This trial was seeded on April 28 into good moisture. A rain event a few hours after the first Liberty application required a second Liberty application (28 oz/ac) to control some escaped weeds. The fungicides were applied early in the morning of June 27 when the canola was at 30 to 40 % bloom. A petal test taken later that day showed 55 % petal infection. Despite this high infection level and frequent light rains during bloom, the infection levels of the trial were low.

Results:

FUNGICIDE EVALUATION TRIAL Roseau, MN						
Treatment	**Yield (%)**	**Yield (lb/ac)**	**Oil (%)**	**Plants Infected (%)**	**Infect. Rating (1-5)**	**Contrib. Margin ($/ac)**
Check (No Fung.)	100	2192	47.1	14	3.3	94.95
Endura 70 WG	103	2258	46.7	5	1.8	NA*
Ronilan EG	101	2209	46.9	5	2.4	74.55
Topsin 4.5 FL	100	2203	47.1	5	2.2	67.20
Topsin 70 WP	101	2226	47.4	5	2.3	69.28
Topsin 70 WP + COC	102	2202	47.6	4	2.0	65.62
LSD (0.05) CV%		42.7 1.3	0.53 0.7	2.46 25.9	1.04 29.4	

Note: Endura is a newly registered fungicide on canola and a price was not established at press time.

Discussion: There were no yield differences among the treatments due to the low infection levels. All the fungicides provided equally good protection from sclerotinia compared to the check. With the low infection levels and lack of yield differences, the check had the greatest contribution margin due to the lack of fungicide cost. Contribution margins reflect differences in yield and fungicide application costs. Endura and Ronilan treatments had significantly lower oil contents than the Topsin 70 WP and Topsin + COC treatments, respectively.

X AERIAL VS. GROUND APPLICATION TRIAL

Objective: To compare the effectiveness of fungicide application with an airplane, standard Rogator, and an Air-assist ground applicator.

Background: Sclerotinia control in canola requires a timely application of fungicide to be effective. The two main methods of application are aerial and ground application. Aerial application has the benefits of not leaving wheel tracks and being able to apply the fungicide after heavy rains. Ground application uses more water which should improve coverage, and is frequently cheaper per acre. A third method of application is using an air-assist ground applicator. Air-assist applicators use a stream of air near the nozzles to push the fungicide down into the canopy, potentially providing better coverage.

Methodology: This trial was laid out in the cooperators field near the Canola Production Centre. The field had the same soil test analysis as the rest of the Production Centre. However, it was fertilized with 50-30-30-10 (N-P-K-S). The field was seeded to InVigor 2733 (5 lb/ac) on May 4. The plots were laid out in an RCB design with four replicates. Plots were 372 ft X 95 ft. A 100 ft buffer was used on each side of the aerial treatment to reduce risk of drift into neighboring plots. The treatments and cooperators that applied them are listed below.

1. Check - no fungicide applied
2. Aerial - Gary Slater using a Thrush spray plane (5 gal/ac)
3. Rogator - West Plant using a Rogator (20 gal/ac)
4. Air-assist - Oslo Farmers Union Oil using a Willmar Airtrack (20 gal/ac)

All fungicide treatments were sprayed with Ronilan (12 oz/ac) and Tactic (3.2 oz/ac). At swathing time, two 18 ft swaths were taken from each plot. In the Rogator and Air-assist plots, one wheel track was included in the swath to be taken for yield.

Disease levels were recorded by rating 50 unswathed plants at three random locations within each plot along the edge of the swathed area. Disease levels for each plant were assessed on a scale of 1 to 5 (1 = small branch infected, 5 = the whole plant is dead with substantial yield loss). Percent infection was calculated by dividing the number of infected plants by the number of plants evaluated.

Observations: Treatments were applied on June 27 when the weather was cool, clear and calm. Even though the site was frequented with light showers during bloom, little sclerotinia developed in the crop. Swathing the Rogator and Air-assist plots was more difficult (harvestability score of 4) due to the wheel tracks, compared to the check and aerial plots (harvestability score of 3). Plots were laid out and swathed perpendicular to the direction of seeding in order to have room for all the treatments.

Results:

AERIAL VS. GROUND APPLICATION TRIAL Roseau, MN						
System	**Yield (%)**	**Yield (lb/ac)**	**Contrib. Margin ($/ac)**	**Oil (%)**	**Plants Infected (%)**	**Infect. Rating (1-5)**
No Fungicide (Check)	100	2295	114.12	45.6	18	3.5
Aerial	104	2383	100.41	46.1	2	1.4
Rogator	99	2275	91.31	45.8	3	2.0
Air-assist	100	2303	93.42	46.1	2	1.3
LSD (0.05) CV%		153.8 4.1		0.48 0.6	1.6 16.2	0.64 19.5

Discussion: Methods of fungicide application showed no difference in yield or percent infection. The application of Ronilan did significantly reduce the percent infection and the severity of the infection. However, the disease levels were not severe enough to affect yields, resulting in much lower contribution margins in the fungicide treated plots. Contribution margins reflect differences in yield and fungicide application costs. The aerial and air-assist application methods had higher oil content than the check.

XI MICROESSENTIALS TRIAL

Objective: To evaluate the effects of seed-placed MicroEssentials S15 (13-33-0-15) on stand establishment, maturity and yield, as compared to MAP (11-52-0).

Background: Growers that have high levels of residual nitrogen but are lacking sulfur could use another option to apply that sulfur with the seed at seeding time. Using a mixture of ammonium sulfate (21-0-0-24) and MAP (11-52-0) can result in hot spots and skips in the field, if blending is not uniform or segregation occurs in the applicator. MicroEssentials S15 is a product that has an analysis of 13-33-0-15 (N-P-K-S) for each prill. This eliminates uneven distribution during seeding and should allow for greater safety to the emerging seedling. Half of the sulfur in MicroEssentials S15 is in the sulfate form for immediate use and half is in the elemental form for possible use later in the season.

Methodology: This trial was integrated into the Nitrogen Top Dress Trial. Fall soil tests for the field indicated 46 and 112 lb N/ac at 0-6" and 0-24" depths, respectively. Spring soil tests prior to seeding indicated 533 and 196 lb N/ac at 0-6" and 0-24" depths, respectively. These results were suspiciously high, so they were not used to calculate fertility levels. The canola variety Hyola 357 Magnum was seeded at a rate of 5 lb/ac on April 30. The trial was laid out in a randomized complete block (RCB) design with four replicates. Treatment 1 received no fertilizer. Treatment 2 received a pre-plant application of 15 lbs S/ac as SulfaMag (0-0-22-22-10; N-P-K-S-Mg). Soil tests showed potassium (K) and magnesium (Mg) levels as being high for the site (150 and 785 ppm, respectfully) so the addition of the SulfaMag as a sulfur source should not have affected the levels of K and Mg.

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The trial consisted of the following treatments:

Trtmt	lb/ac	Fertilizer Source	Analysis applied (N-P-K-S-Mg)
1.	0	(Check) no Fertilizer added	NA
2.	64 68	Monoammonium Phosphate (MAP) SulfaMag (preplant incorporated)	(7-33-0 -0 -0) (0 -0 -15-15-7)
3.	100	MicroEssentials S15	(13-33-0-15-0)
4.	150	MicroEssentials S15	(20-50-0-23-0)

Stand counts were taken in multiple 2 foot X 2 foot areas and marked with a flag. Counts were taken at the exact same locations in the plots on four dates (12, 15, 21, and 29 DAP).

Observations: This trial was seeded on April 30 into good moisture conditions. Just prior to seeding, the entire trial was cultivated to incorporate the SulfaMag. The No Fertilizer treatment started blooming around June 19 and the 150 lb/ac MicroEssentials treatment started blooming around June 21. The other two treatments started blooming June 20. Fertilizer costs for the treatments were as follows: MAP + SulfaMag ($15.14/ac), 100 lb/ac MicroEssentials ($12.75/ac), and 150 lb/ac MicroEssentials ($19.13/ac).

Results:

MICROESSENTIALS TRIAL
Roseau, MN

Treatment	Stand counts - plants/ft^2			
	12 DAP	15 DAP	21 DAP	29 DAP
No Fertilizer Applied (Check)	1.9	3.8	4.6	4.8
64 lb/ac MAP + 68 lb/ac SulfaMag	1.2	2.9	3.5	4.6
100 lb/ac MicroEssentials S15	0.8	2.8	3.9	4.4
150 lb/ac MicroEssentials S15	0.8	2.1	3.3	4.3
LSD (0.05)	0.8	0.57	1.00	1.10
CV%	43.9	12.2	16.7	15.4

MICROESSENTIALS TRIAL
Roseau, MN

Treatment	Yield (%)	Yield (lb/ac)	Oil (%)	Contrib. Margin ($/ac)	Days To Mature
No Fertilizer Applied (Check)	100	2129	46.1	92.94	96
64 lb/ac MAP + 68 lb/ac SulfaMag	105	2245	46.3	88.26	98
100 lb/ac MicroEssentials S15	107	2288	46.0	94.76	99
150 lb/ac MicroEssentials S15	108	2300	45.7	89.36	99
LSD (0.05)		55.2	0.51		
CV%		1.5	0.7		

Discussion: Both MicroEssentials treatments and the MAP+SulfaMag combination appeared to slightly delay canola emergence, as evidenced by lower stand counts. With the exception of 100 lb/ac MicroEssentials, this trend continued until 29 DAP when there was no difference in stand counts among treatments.

All the fertilized treatments yielded significantly higher than the check. There were no significant yield differences among the MicroEssentials treatments and the MAP+SulfaMag treatment. There was little difference in contribution margins among the treatments. Although the SulfaMag was spread prior to seeding in this trial, the extra cost of the application was not included in the contribution margin because most growers would have blended the MAP and SulfaMag and applied the blend with the drill. Contribution margins reflect differences in yield and fertilizer costs. The check matured sooner than the other treatments.

XII NITROGEN TOP DRESSING TRIAL

Objective: To evaluate the potential yield benefit of top dressing nitrogen compared to pre-plant incorporation (PPI).

Background: A recent study indicated that nitrogen (N) accumulation in canola increases from about 20 lb/ac to 100 lb/ac in a 30 day period beginning twenty days after emergence, with the most N accumulation (about 110 lb/ac) occurring 55 days after emergence (Phil Thomas, 2000). Rainfall prior to and during this period of rapid nitrogen accumulation could result in N losses due to denitrification or leaching of soil N beyond the canola-rooting zone. A split application of N, with a portion applied preplant and the remainder applied at pre-bolt, may be more efficiently utilized by the plants. A split application of N could also provide growers an additional month to evaluate their canola crop prior to purchasing and applying the additional N.

A 2001 study conducted at two locations in North Dakota showed a yield increase of up to 30% when split applications of N were used (Bob Henson, personal communications). The trial was repeated in 2002 with an average yield increase of 9% across four site-years when all or part of the N was applied at the 3 to 5-leaf stage (Eric Eriksmoen, personal communications).

In 2003 an extensive nitrogen application trial, including 7 nitrogen levels PPI and 4 nitrogen levels top dressed, was conducted at 7 locations in North Dakota. Results from this trial showed significant yield increases from top dressing at one location (John Lukach, personal communications), and significant yield reductions in some cases.

Methodology: Fall soil tests for the field indicated 46 and 112 lb N/ac at 0-6” and 0-24” depths, respectively. Spring soil tests prior to seeding indicated 533 and 196 lb N/ac at 0-6” and 0-24” depths, respectively. These results were suspiciously high, so they were not used to calculate fertility levels. The canola variety Hyola 357 Magnum was seeded at a rate of 5 lb/ac on April 30. The trial was laid out in a randomized complete block (RCB) design with four replicates. Treatment 1 received no fertilizer. All other treatments received a pre-plant application of 15 lbs S/ac as SulfaMag (0-0-22-22-10; N-P-K-S-Mg). Soil tests showed potassium and magnesium levels as being high for the site (150 and 785 ppm, respectfully) so the added potassium and magnesium from the SulfaMag should not have affected any treatments. All treatments, but treatment 1, received 64 lb/ac MAP (7-33-0-0) with the seed. All top dress treatments were applied on June 3 at the 4 to 5-leaf stage of the canola.

The trial consisted of the following treatments:

Trt	PPI	Top dress at 4 to 6 leaf stage	N source
	-Applied lbs N/ac -		
1.	0	0	no Fertilizer added
2.	0	0	Only MAP and SulfaMag
3.	30	0	(46-0-0) Urea (Check)
4.	60	0	(46-0-0) Urea (Check)
5.	0	30	(46-0-0) Urea
6.	0	60	(46-0-0) Urea
7.	0	30	(28-0-0) liquid (applied with Nitro-bars)
8.	0	60	(28-0-0) liquid (applied with Nitro-bars)
9.	0	30	(34-0-0) Ammonium Nitrate
10.	0	60	(34-0-0) Ammonium Nitrate

The liquid nitrogen was applied with a 30 foot sprayer equipped with Nitro-Bars (Concord Environmental Equipment, Hawley, MN (218) 937-5100). Dry fertilizer was applied with a 12 foot drop spreader.

Observations: This trial was seeded on April 30 into good moisture conditions. Just prior to seeding, the whole trial was cultivated to incorporate the preplant incorporated (PPI) treatments of nitrogen and SulfaMag. Emergence was quick and uniform. The top dress treatments were applied the evening of June 3. The dry urea and ammonium nitrate treatments were top dressed using a 12-foot wide drop spreader, which was pulled by driving the tractor on the edge of the plots to minimize wheel tracks in the portion of the plots sampled for yield. The liquid nitrogen treatment was applied with a 30-foot sprayer and the tractor was driven down the middle of the plots. The only problem observed with the top dress treatments was breakage of some of the Nitro-Bars due to the rough field conditions. A rain event totaling 0.37 inches of rain started about 50 hours after the application of the top dress treatments. Between the application on the 3rd and the rain on the 5th, the temperature averaged 60^{o} F and reached highs of 70^{o} F and 75^{o} F on the 4th and 5th, respectively. Very little leaf burning was observed after the top dress treatments. There was very little difference among treatments for canopy closure and bloom dates. Treatments 1 and 2 bloomed about 1 day earlier than the other treatments.

Results:

NITROGEN APPLICATION TRIAL Roseau, MN							
Seeding Date	**Yield (%)**	**Yield (lb/ac)**	**Oil (%)**	**Contrib. Margin ($/ac)**	**Fert. Cost ($/ac)**	**Height (in)**	**Days To Mature**
No Added Nitrogen							
No Fertilizer	100	2129	46.1	92.94	0.00	36	96
MAP* + 0 lb N	105	2245	46.3	88.26	15.14	41	97
Urea (46-0-0) - Preplant incorporated							
MAP* + 30 lb N	114	2427	44.7	92.39	27.77	42	99
MAP* + 60 lb N	114	2436	44.6	84.84	35.89	43	99
Urea (46-0-0) - Top dress							
MAP* + 30 lb N	119	2524	44.8	101.55	27.77	39	99
MAP* + 60 lb N	115	2457	44.4	86.85	35.89	41	99
Liquid (28-0-0) - Top dress							
MAP* + 30 lb N	113	2407	44.8	87.85	30.35	39	99
MAP* + 60 lb N	118	2507	44.2	86.22	41.06	42	99
Ammonium Nitrate (34-0-0) - Top dress							
MAP* + 30 lb N	114	2425	45.4	85.92	33.82	41	99
MAP* + 60 lb N	118	2506	44.8	78.98	47.99	43	99
LSD (0.05)		79.4	0.44			3.4	
CV%		2.3	0.7			5.8	

* 64 lb/ac MAP plus 68 lb/ac SulfaMag

Discussion: A significant yield increase of 116 lb/ac was observed with even the small amount of fertilizer provided by the MAP + SulfaMag treatment when compared to no fertilizer. The only significant yield increase obtained from top dressing the fertilizer occurred with the urea 30 lb/ac top dress treatment compared to the 30 lb/ac N PPI treatment. The other top dressed treatments were as effective as the similar rate pre-plant incorporated, but did not improve yield significantly. Even though the MAP + SulfaMag treatment yielded higher than the no fertilizer treatment, the contribution margin was lower due to the extra fertilizer costs. Contribution margins reflect differences in yield and fertilizer costs. Although the SulfaMag was spread prior to seeding in this trial, the extra cost of the application was not included in the contribution margin because most growers would have blended the MAP and SulfaMag and applied the blend with the drill. An application cost of $4.50/ac was included in the fertilizer costs for each of the preplant incorporated and top dress treatments.

Oil content was significantly higher on the treatments that had little or no additional nitrogen added. This was expected because higher nitrogen levels usually lead to higher protein levels at the expense of oil production. The no fertilizer treatment was slightly shorter and earlier in maturing than the other treatments.

XIII SEED TREATMENT TRIAL

Objective: To evaluate the impact of new seed treatments on seedling diseases and insect control for canola as it relates to yield, quality and contribution margins.

Background: Some of the most wide spread problems of canola production are stand establishment and flea beetle control. Poor stand establishment may be caused by a seedling disease complex including pathogens such as *Rhizoctonia solani*, along with *Fusarium* and *Pythium* species. Seed treatment fungicides are used extensively in canola production as a first line of defense to control seedling diseases. In addition, some new products are being evaluated to look at extended flea beetle control.

Methodology: The seed treatment trial was laid out as an RCB with four replications. The trial included the following treatments on the same seed lot of Hyola 357 Magnum:

1. Canola Fungicide Package (Gustafson Check) (fungicide only)
2. Prosper 200 (Gustafson)
3. Prosper 400 (Gustafson)
4. L1286-A1 (Coded Gustafson product)
5. Tribune (Syngenta Check) (fungicide only)
6. Helix Lite (Syngenta)
7. Helix Xtra (Syngenta)
8. Tribune + Capture (1.3 oz/ac) (FMC)

All other agronomic practices remained the same. The Capture treatment was applied at 16 days after planting (DAP). Flea beetle ratings and stand counts were taken at the exact same locations in the plots on four dates (13, 16, 22 and 30 DAP).

A flea beetle damage guide was used to estimate the percentage of shot hole damage to leaf area using the following scale:

0 = No leaf damage
1 = Approximately 10 % leaf damage
2 = Approximately 20 % leaf damage
3 = Approximately 30 % leaf damage
(4, 5, 6, etc.)
9 = Approximately 90 to 100 % leaf damage

Observations: The trial was seeded on April 29 into good moisture conditions. No seedling diseases were observed in the trial. A heavy infestation of flea beetles moved into the field around May 14. The Capture treatment was sprayed on May 15 (16 DAP) when those plots reached action threshold (see Results). By May 21 the entire Production Center was reaching action threshold for flea beetle damage. The entire trial was sprayed with Warrior (3.8 oz/ac) on May 22 because the beetles were still feeding heavily and the forecast was for hot and dry conditions for the next several days. Growth stages of the plots were as follows; early cotyledon at 13 DAP, cotyledon at 16 DAP, late cotyledon to first leaf at 22 DAP, and three leaf stage at 30 DAP. Lygus counts were taken weekly during bloom. Average counts ranged from 0 to 4 lygus per 10 sweeps with little consistency within treatments. Average green seed counts were slightly higher on the check treatments (1.5 %) than the insecticide treatments (0.5 to 1.0 %).

Results:

SEED TREATMENT TRIAL
Roseau, MN

Treatment	Plant stand per ft^2				Flea Beetle Injury (0-9)			
	13 DAP	16 DAP	22 DAP	30 * DAP	13 DAP	16 DAP	22 DAP	30 DAP
Gustafson								
Canola Fungicide	2.4	2.9	3.4	3.3	0.3	5.5	6.2	0.3
Prosper 200	1.6	2.6	3.3	3.2	0.1	0.7	3.8	0.2
Prosper 400	2.8	3.9	4.6	4.5	0.0	0.7	3.2	0.0
L1286-A1	2.5	3.6	4.5	4.0	0.1	1.6	2.3	0.3
Syngenta								
Tribune	2.3	2.5	2.7	2.9	0.2	4.9	6.6	0.3
Helix Lite	2.3	3.0	4.3	3.6	0.0	1.8	4.6	0.5
Helix Xtra	2.8	3.6	4.4	3.9	0.0	0.8	3.5	0.1
Tribune + Capture	2.6	3.0	4.2	4.0	0.3	4.7	4.7	0.0
LSD (0.05)	1.05	1.16	1.29	1.01	0.34	2.43	2.55	0.44
CV%	29.7	25.1	22.5	18.7	225.6	64.6	40.0	159.4

*Note: Reduced stand counts at 30 DAP are primarily due to Rogator tracks through the areas that were used to take stand counts.

SEED TREATMENT TRIAL Roseau, MN								
Treatment	**Yield (%)**	**Yield (lb/ac)**	**Contr. Margin ($/ac)**	**Oil (%)**	**Seed Cost ($/ac)**	**Canopy Close DAP**	**Begin Bloom DAP**	**Mature DAP**
Gustafson								
Canola Fung.	100	2076	67.92	45.3	20.80	46	52	102
Prosper 200	99	2053	61.90	45.5	24.50	43	51	100
Prosper 400	97	2018	55.29	44.7	27.75	42	51	96
L1286-A1	100	2085	NA *	45.0	NA*	42	50	98
Syngenta								
Tribune	100	1959	56.31	45.4	21.40	46	52	100
Helix Lite	103	2025	59.34	44.8	24.50	42	50	97
Helix Xtra	105	2057	59.07	45.2	27.70	41	49	96
Tribune + Capture	104	2044	59.35	45.0	26.24**	42	50	97
LSD (0.05) CV%		88.6 2.9		0.59 0.9		2.3 3.5	0.9 1.2	2.4 1.7

* Note: L1286-A1 is a coded product of Gustafson that is in the testing phase and does not have a price established.
** Note: Seed cost for the Tribune + Capture includes the cost of Tribune treated seed and the costs of the Capture application.

Discussion: All the insecticide seed treatments provided good protection from the flea beetles with significantly less injury at 16 DAP. By 22 DAP the Prosper 200 and Helix Lite were loosing strength and no longer providing significantly better protection then the checks. Flea beetle damage was almost gone by 30 DAP because the crop outgrew the damage very aggressively after the Warrior overspray.

Helix Xtra was the only Syngenta seed treatment that produced a significantly higher yield than the check (Tribune). All the Gustafson products provided similar yields to the Gustafson check (Canola Fung.). The Warrior overspray likely suppressed the yield losses that would have been expected from the severe damage that was done to the fungicide check treatments. Even though stand counts and injury ratings of the two checks were similar, the Canola Fungicide Package yielded significantly higher then the Tribune treatment. Canopy closure, begin bloom, and maturity dates were all significantly delayed as a result of the level of flea beetle damage on the checks. Contribution margins reflect differences in yield, seed treatment and foliar insecticide costs.

XIV SUMMARY

The sixth year of the Minnesota Canola Production Centre (CPC) program was another success. The trials at the Roseau site were chosen to demonstrate basic canola production principles as well as investigate new technologies and techniques. While many of the trends in the trials reflected past results from the CPC program, other trial results differed. All of the results will provide good focal points for discussions at extension meetings throughout the winter. This joint project has provided a unique opportunity to share information between Canadian and American growers. Since the initial grant that was used to fund the Minnesota CPC has come to an end, a proposal has been written to seek funding to support a smaller CPC in 2004. If you have any questions, ideas or comments about the Minnesota CPC program please feel free to contact Dave who is listed in the following Staff Information section.

XV STAFF INFORMATION

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