APPENDIX - Minnesota Canola Production Centre Results

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.

II SITE DESCRIPTION

The Program was supported locally by the following organizations that have donated products and/or services to the Canola Production Centre:

MINNESOTA - Dave LeGare, Agronomist

Location: Thief River Falls - 95 acres

Land:

Ken and Connie Mehrkens (co-operators)

Gold Level Sponsors ($400 or more)
Northern State Bank

Silver Level Sponsors ($200 - $399)
Anderson Power & Equipment

Bronze Level Sponsors (Less than $200)
Cenex Farmers Union
Evergreen Implement
Farmer's Co-op Grain and Seed Association
First National Bank
Northern Motors
West Side Motors
Thune Insurance

Seed and Seed Treatment:

Croplan Genetics - CL2078
Gustafson - Gaucho and Benlate
Interstate Seed - Hyola 357 (three bags), Hylite 201, Hyola 401, Quantum
Pioneer Hi-Bred - 44A89 (two bags), 45A51 (three bags)

Fertilizer:

Agriliance (78 acres)
Northwest Grain (17 acres)

Herbicides and Fungicides:

Agriliance - Class Trust (60 acres), Class COC 17% (7.5 gal), Ammonium Sulfate (102 lb)
Aventis CropScience USA - Liberty (38 acres)
BASF - Ronilan (89 acres), Poast (35 acres), Raptor (16 acres)
Dow AgroSciences - Stinger (64 acres)
DuPont Agricultural Products - Assure II (51 acres)
Monsanto - Roundup Ultra (80 acres)

Equipment and Labor:

Ken and Connie Mehrkens - John Deere pick-up header, equipment storage, grain truck, shop use
Evergreen Implement - John Deere 24 ft straight cut header
Nelson Equipment - John Deere 8820 combine
Northwest Grain - five soil tests, fertilizer spreading, preplant herbicide application
Pioneer Hi-Bred - weigh wagon

Photocopying & Faxing:	Pennington County Extension Office
Tours:	Dale Nelson KKAQ Radio of Thief River Falls Land O' Lakes Northern State Bank Pennington County Extension Office Seeds 2000 (Howard Hoven family) Smiley 4-H Club
Comments:	A special thank you to **Andy Hedlund**, **Karen Andol, Nycole Erickson** and **Ryan Casavan** for their dedication and technical assistance. Thanks also to the staff of the Minnesota Canola Council for assisting with field day.

III INTRODUCTION

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

Following tours of the Canola Production Centre (CPC) 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 CPC's. This allows 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.

In 2000, the field day tour was held on June 26 and included a barbeque lunch and tour of the site. 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 includes many agronomic factors such as yield and quality data, early season plant counts, lodging indices and harvestability ratings on varieties.

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

Please refer to the Definitions (Page 15) section of the report for the Canadian CPC's for clarification of any terms you are not familiar with.

V ECONOMIC ANALYSIS

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

Green Seed (%)	$/100 lb At Elevator	Plus $/100 lb LDP*	Final $/100 lb	Final $/bu
0 - 2.0	6.17	3.65	9.82	4.91

Note 1: *The green seed was determined by using one 500 seed crush strip test 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 various dealers throughout the region. Prices reflect a northwestern Minnesota average for summer 2000.

Equipment costs were obtained from the Border State Bank of Badger, MN and are estimated equipment variable costs for northwestern Minnesota. There has been no value allocated for capital and fixed costs.

CANOLA ARGENTINE VARIETY SEED COSTS					
B. napus	**$/lb**	**Distributor**	***B. napus***	**$/lb**	**Distributor**
44A89	3.30	Pioneer Hi-Bred	InVigor 2663	5.14	Aventis CropScience
45A51	4.00	Pioneer Hi-Bred	KC-701	4.70	Kaystar Seed
46A65	3.30	Pioneer Hi-Bred	LG3235	4.09	Agri-Tel Grain
46A76	3.70	Pioneer Hi-Bred	LG3311	3.65	Agri-Tel Grain
Canterra 1492	4.78	Proseed	LG3345	4.20	Cargill Seeds
CL2078	4.32	Croplan Genetics	LiBred 280	3.30	Vandaele Seeds
Golden Ready RR	4.20	Seeds 2000	Minot	3.40	Croplan Genetics
Hylite 201	2.70	Interstate Seed	Phoenix	3.00	Aventis CropScience
Hyola 357	5.10	Interstate Seed	Q2	2.70	Interstate Seed
Hyola 401	4.50	Interstate Seed	Quantum	2.70	Interstate Seed
Hyper 5001	4.56	Integra Seed	RideR	4.20	Monsanto
InVigor 2573	5.14	Aventis CropScience			

Note: Seed cost may vary from location to location. Prices reflect the Minnesota average for spring 2000 and include the cost of seed treatments (Benlate and Gaucho). Gaucho ($60 per 50/lb bag of seed) is the U.S. product for flea beetle control.

PRODUCT INFORMATION			
Product	**Active Ingredient**	**Manufacturer/ Distributor**	**$/Unit Cost**
Assure II	quizalofop-p-ethyl	DuPont Agriculture Products	119.36/gal
Ammonium Sulphate	ammonium sulphate	Agriliance	0.37/lb
Benlate	benomyl	DuPont Agriculture Products	16.38/lb
Class COC	crop oil concentrate - 17%	Agriliance	5.28/gal
Class Trust	trifluralin	Agriliance	22.67/gal
Gaucho 600	imidacloprid	Gustafson	1.32/lb seed
Helix XTra	fludioxonil + mefenoxam + difenoconazole + thiamethoxam	Syngenta	1.44/lb seed
M. A. D.	fludioxonil+mefenoxam difenoconazole	Syngenta	N/A
Muster	ethametsulfuron	DuPont Agriculture Products	27.02/oz
Liberty	glufosinate ammonium	Aventis CropScience	96.37/gal
Quadris	azoxystrobin	Syngenta	284.98/gal
Raptor	imazamox	BASF	461.89/gal
Ronilan	vinclozolin	BASF	21.00/lb
Roundup Ultra *	glyphosate	Monsanto	40.61/gal
Rovral flo	iprodione	Aventis CropScience	137.78/gal
Stinger	clopyralid	Dow AgroSciences	477.67/gal

*Note: $15/ac TUA includes first pint of Roundup Ultra. Second application includes a $4/gal rebate.

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 Sulphate	21-0-0-24	155.00	0.18 (of N)
Ammonium Sulphate	21-0-0-24	155.00	0.17 (of S)
Phosphate	18-46-0	174.96	0.19 (of P_2O_5)
Urea	46-0-0	170.00	0.18

Machinery Cost:

- Conventional tillage: $15.00/acre
- Extra spray pass: add $0.32/acre
- Straight combining: subtract $0.71/acre

Additional Machinery Costs: (Custom Application)

- Aerial $4.00/acre
- Ground (fungicide) $4.25/acre
- Top dress fertilizer $3.50/acre

Note: Machinery costs were obtained from the Border State Bank of Badger, MN and are estimated operating costs (such as fuel, lubrication and repairs) for northwestern Minnesota.

Minnesota State Check-off:

$0.05 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 2000, 11.0% per annum over six months was used.

Site: *Thief River Falls, MN*

B. napus Variety Trial: *Hyola 401*

CALCULATION OF VALUE OF PRODUCTION				
Yield (bu/ac)	X	Price ($/bu)	=	Value of Production
49.9		4.91		245.01

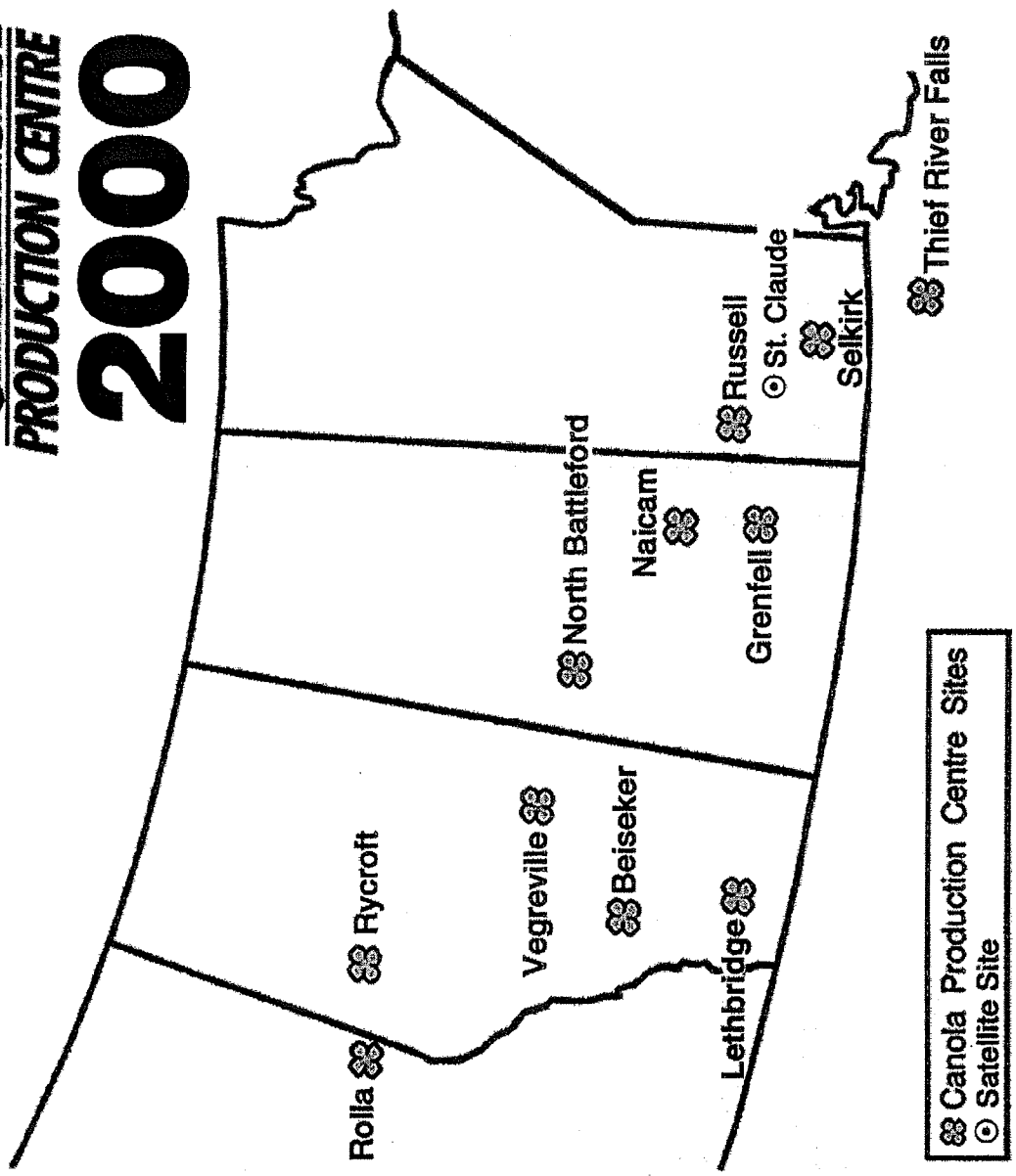
CALCULATION OF VARIABLE COSTS ($/ac)	
Seed	23.40
Fertilizer	10.83
Herbicides	31.30
Fungicides	18.90
Insecticides	0.00
Machinery	19.00
Insurance	0.00
Check-off	1.25
Interest/opportunity	5.69
Total Variable Costs	110.37

CALCULATION OF CONTRIBUTION MARGIN				
Value of Production ($/ac)	-	Variable Costs ($/ac)	=	Contribution Margin ($/ac)
245.01		110.37		134.64

Contribution Margin ($/ac)	/	Yield (bu/ac)	=	Contribution Margin ($/bu)
134.64		49.9		2.70

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

VI SITE LOCATION MAP



VII SITE INFORMATION

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

Location:	**Thief River Falls, MN**

Co-operator: Ken and Connie Mehrkens

		West Stubble	West Fallow	East Fallow
Previous crop:		Wheat	Fallow	Fallow
Soil test results: (AgriSource Laboratories)				
Organic matter content:		N/A	3.2%	4.7%
Macronutrient Levels: (0-6", 6-24")				
Nitrogen -	0-6 inches	6 lb/ac	128 lb/ac	65 lb/ac
	0-24 inches	12 lb/ac	200 lb/ac	140 lb/ac
Phosphorus -	0-6 inches	42 lb/ac	26 lb/ac	30 lb/ac
Potassium -	0-6 inches	518 lb/ac	360 lb/ac	594 lb/ac
Sulphur -	0-6 inches	28 lb/ac	40 lb/ac	68 lb/ac
	0-24 inches	24 lb/ac	98 lb/ac	120 lb/ac
Micronutrient Levels: (0-6")				
Calcium -		N/A	3300 ppm	3200 ppm
Magnesium -		N/A	680 ppm	1120 ppm
Boron -		N/A	0.7 ppm	0.8 ppm
Zinc -		N/A	0.5 ppm	0.8 ppm
Manganese -		N/A	1.5 ppm	2.4 ppm
Copper -		N/A	0.5 ppm	0.6 ppm
Iron -		N/A	13.3 ppm	37.2 ppm
Target yield:		2200 lb/ac	2400 lb/ac	2200 lb/ac
Fertilizer applied:				
Nitrogen -		143 lb/ac	12* lb/ac	23 lb/ac
Phosphorous -		25 lb/ac	40 lb/ac	40 lb/ac
Potassium -		0 lb/ac	0 lb/ac	0 lb/ac
Sulfur -		10 lb/ac	10 lb/ac	10 lb/ac

* **Note:** Additional nitrogen (10 lb/ac) was applied to the *Fall-seeding trial* on the west fallow.

Soil association/zone:		Clearwater loam	Hilaire very fine sandy loam	Clearwater clay loam
Soil texture:		Loam	Sandy loam	Clay loam
Soil pH:		7.8	7.6	7.0
Salinity:	(slightly saline)	0.3 mmho	0.6 mmho	0.5 mmho

Tillage operations: The stubble field was cultivated lightly in the fall to maintain residue and incorporate fertilizer. The fallow fields were cultivated once in the fall to incorporate fertilizer and control weeds. The west fallow field was cultivated and coil packed once in the spring prior to seeding. The east fallow field was cultivated twice to incorporate trifluralin, the second time also using a coil packer. Spring-seeded plots on the fall dormancy trial were cultivated once prior to seeding.

Seeding method: Seeded with a John Deere 9350 double disk press drill

Date: October 15 and November 16, 1999; April 29 to May 2, 2000

Depth: ½" - ¾"

Rate: 5.2 lb/ac - *B. napus* for most of the site
6.0 lb/ac - Fall-seeded plots and fungicide trial
4.3 lb/ac - InVigor 2573 in swathing trial

Herbicides applied:

A) Conventional varieties in system trial - Assure II (10 oz/ac), crop oil concentrate (1.5 pt/ac), Stinger (4 oz/ac), Muster (0.28 oz/ac).
B) Sclerotinia and conventional variety trial - Stinger (4 oz/ac), Muster (0.3 oz/ac), non-ionic surfactant (0.25 % v/v), ammonium sulfate (3/4 lb/ac)
C) Fungicide trial - Stinger (4 oz/ac), Muster (0.28 oz/ac), crop oil concentrate (1.5 pt/ac)
D) Liberty Link varieties - Liberty (34 oz/ac), ammonium sulfate (3.0 lb/ac)
E) Clearfield varieties - Raptor (4 oz/ac), non-ionic surfactant (0.25% v/v), ammonium sulfate (2.5 lb/ac)
F) Roundup Ready varieties - Roundup Ultra (1 pt/ac), ammonium sulfate (1.0 lb/ac)

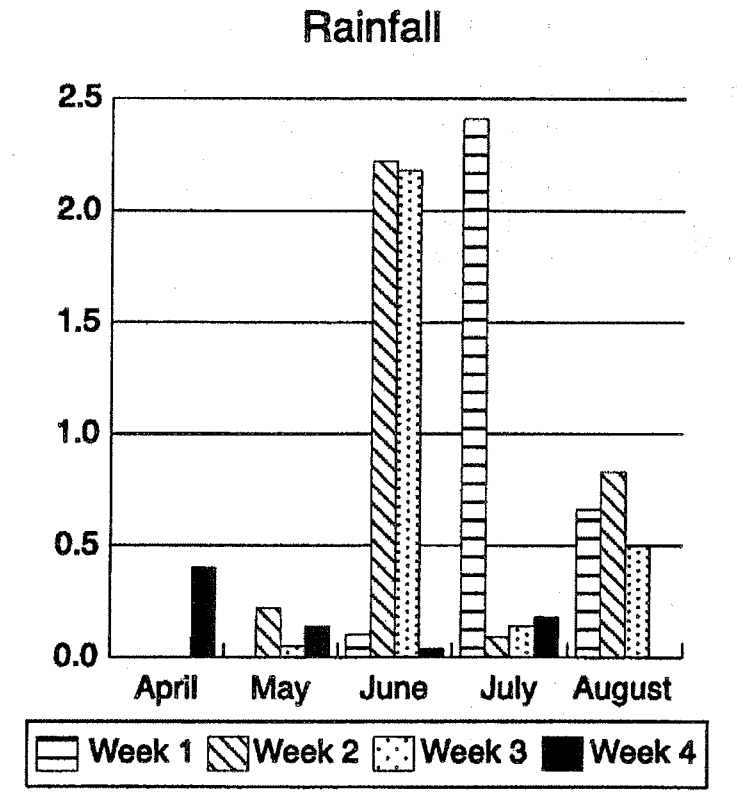
Fungicides applied: Ronilan (14.5 oz/ac) at about 20-40% bloom.

Swathing: Started: July 26 Finished: August 7

Combining: Started: August 24 Finished: August 29

Comments: The east and west fallow fields were not seeded in 1999 due to excess moisture. The west fallow field had 100 lb N/ac of anhydrous ammonia applied in the spring of 1999 in anticipation of seeding wheat. No value was assigned in the contribution margins toward the anhydrous ammonia application due to the extended period between the anhydrous ammonia application and this year's crop. Note the high levels of residual nitrogen in the soil test results. Flea beetles were present on the fall-seeded canola but not on the spring-seeded. The growing season was ideal with good moisture before and after seeding, followed by a dryer period up to flowering. This was ideal for the fallow fields because there was plenty of moisture available to sustain the crop and it encouraged deep root development. Frequent rains occurred during flowering providing ideal conditions for sclerotinia development. A severe thunderstorm pelted the site on

July 7 causing severe lodging on the west fallow field. The high nitrogen levels on that field also contributed to the severe lodging. Conditions during swathing were warm and dry, which hastened seed colour change. A two-week period of wet cool weather after swathing allowed for slow curing of the swaths and minimal green seed in the harvested canola.



Total accumulated moisture = 10.2 inches (259 mm)

VIII CONVENTIONAL VARIETY TRIAL - *B. NAPUS*

Objective: To evaluate agronomic differences between newly registered and recommended varieties in a given area as submitted by the seed trade.

Background: The increased number of new varieties available over the past several years has made the task of choosing a variety for a specific farm challenging. Yield, crop quality and disease resistance are important variety traits to consider in the selection process. However, other agronomic factors such as lodging resistance and harvestability are also important factors. Varieties in the trial are selected and submitted by the seed trade and compared against the check (Hyola 401) and Quantum.

Methodology: The variety trial was made up of four replicates in a randomized complete block design. Identical agronomic practices were used for the entire trial. This included the same tillage, fertilizer, weed control and post-emergent fungicide treatments. Swathing commenced when seed colour change was 30-40%, and harvest was completed when suitable conditions existed.

Observations: The trial was located on the east fallow field and seeded on May 2 into good moisture. Growing conditions were ideal throughout the summer. The back half of the fourth replicate was lodged and later maturing than the rest of the trial. Conditions at swathing were dry and warm. To prevent shattering in the lodged plots, swathing was done when the average of the plot was between 30-40% seed colour change.

Results:

B. NAPUS VARIETY TRIAL YIELD, ECONOMIC & QUALITY RESULTS Thief River Falls, MN							
Treatment	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contribution Margin ($/ac)**	**Oil (%)**	**Growing Degree Days**	**Days To Maturity**
Hyola 401	100	2495	49.9	134.64	45.4	1019	92
46A65	87	2172	43.4	109.67	46.9	1019	92
Canterra 1492	84	2107	42.1	101.75	46.2	1032	93
Quantum	82	2043	40.9	100.31	44.2	1032	93
CL2078	81	2019	40.4	89.08	44.7	1032	93
LG3311	80	2007	40.1	91.60	45.0	1004	91
Q2	77	1926	38.5	88.85	44.9	1048	94
LiBred 280	77	1920	38.4	85.03	46.0	1032	93
Hyper 5001	74	1855	37.1	71.77	45.3	1048	94
KC-701	71	1778	35.6	63.50	44.7	1032	93
LSD (0.10) CV%		90.1 3.7	1.80 3.7		1.33 2.4		

Note: Hyola 401 was used as a check in this trial.

Discussion: The check (Hyola 401) yielded significantly higher than the other varieties. 46A65 had higher oil content than all other varieties except Canterra 1492 and LiBred 280. Days to maturity represent the calendar days from the date of seeding until the crop reached 30% seed colour change. The growing degree days, expressed in Celsius, represent the heat accumulation above canola's base temperature of 5°C (41°F). The warm dry conditions at swathing hastened seed colour change and reduced the differences in maturity that are common among varieties.

IX SYSTEMS COMPARISON TRIAL

Objective: To establish agronomic criteria for choosing between varieties and herbicide options of novel trait canola varieties.

Background: The introduction of canola with novel traits for herbicide tolerance has given producers many options for herbicide and variety selection. The greatest return will occur by choosing the most appropriate combination of variety and herbicide for each field. Factors to consider beyond the performance of the variety includes weed population, weed spectrum, tillage system and herbicide rotation. Entries in the systems comparison trial were on a contract basis.

Methodology: Each treatment was replicated four times in a randomized complete block. The canola varieties with novel traits for herbicide tolerance were compared to the conventional varieties Hyola 401 and Quantum in a conventional herbicide program.

Observations: The trial was seeded on the west fallow field on May 1 into good moisture. Weed pressure was light to moderate with patches of quackgrass, dense patches of green smartweed (cotyledon), red root pigweed, large field pennycress and Canada thistle scattered throughout the trial. All applications were done at the 2-leaf stage. Roundup Ready and Clearfield systems were applied after sunset, when the wind was calmer (below 3 mph), to reduce risks of drift onto neighboring plots. Liberty was applied the following morning before the wind increased. High levels of residual nitrogen, along with good growing conditions provided for a tall thick crop, which lodged severely during flowering. Most of the lodging occurred during a thunderstorm on July 7 when the trial was at full bloom. The trial was sprayed with Ronilan EG when most of the plots were at 20-40% bloom. The exceptions were 46A76, InVigor 2573 and InVigor 2663 which were at 5-10% bloom. Sclerotinia levels were taken by scoring 50 random plants in each plot.

Results:

SYSTEMS COMPARISON TRIAL Thief River Falls, MN								
System	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contrib. Margin ($/ac)**	**Sclerotinia (%)**	**Oil (%)**	**Growing Degree Days**	**Days To Maturity**
Conventional								
Hyola 401	100	2772	55.4	160.55	11	43.8	1041	94
Quantum	78	2165	43.3	111.13	19	41.6	1057	95
Clearfield (Raptor Tolerant)								
46A76	77	2137	42.7	120.75	18	43.6	1057	95
Liberty Link								
InVigor 2573	74	2042	40.8	91.93	13	42.7	1057	95
InVigor 2663	70	1932	38.6	81.21	35	43.5	1057	95
Roundup Ready								
Hyola 357	94	2613	52.3	160.09	9	43.6	1041	94
LG3455	84	2333	46.7	137.71	23	44.2	1041	94
LG3235	84	2328	46.6	137.75	29	44.3	1013	92
Minot	82	2263	45.3	135.25	32	43.5	1028	93
RideR	76	2114	42.3	116.27	22	43.7	1041	94
Golden Ready RR	73	2019	40.4	107.01	16	43.8	1041	94
45A51	69	1902	38.0	96.70	22	44.3	1041	94
LSD CV%		85.7 3.2	1.71 3.2		11.6 47.3	1.09 2.1		

Discussion: The check (Hyola 401) and Hyola 357 had significantly higher yields than any other variety. The severe lodging (see *Harvestability*) during flowering likely prevented many of the varieties from reaching their full yield potential. Differences in sclerotinia levels did not directly relate to yield differences. Contribution margins reflect differences in seed cost, yield and chemical weed control costs. Quantum had significantly lower oil than all other varieties. The warm dry conditions at swathing hastened seed colour change and reduced the differences in maturity that are common among varieties.

XI 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: The most wide spread problem of canola production is stand establishment. Poor stand establishment may be caused by seedling disease complex including pathogens such as *Rhizoctonia solani* along with *Fusarium* and *Pythium* species. In addition to fungal pathogens of emerging canola, insects may also cause economic yield loss.

Methodology: The seed treatment trial included the following treatments:

A) Standard seed treatment - Gaucho 600 + Benlate
B) No insecticide check - Benlate
C) Gaucho Platinum - [Gaucho 600 + Allegiance + Vitaflow 280]
D) Helix XTra - [Adage + Maxim + Apron XL + Dividend]
E) M. A. D. - [Maxim + Apron XL + Dividend]

All other agronomic practices remained the same.

Observation: The trial was located near an alfalfa field to enhance the probability of insect pressure throughout the season. The soil was cloddy from being tilled when wet prior to seeding. The trial was seeded on May 2 into marginal moisture. Stand counts and flea beetle pressure ratings were taken in three 0.5 m^2 quadrants per plot. The same quadrants were used each time at 15, 22 and 31 days after seeding. Stand counts declined marginally in all treatments during the first month after seeding. Much of stand loss was due to high winds, which caused plants to twist just below the soil surface and die. Stand counts in the Benlate treatment declined the most from 11.0 plants/ft^2 at 15 days after seeding to 9.6 plants/ft^2 at 31 days after seeding. Plots were checked periodically during the summer for insects with no significant levels detected. Lygus bug levels were highest on July 13 (5-7 lygus per 10 sweeps). However, they were well below the threshold (15 lygus per 10 sweeps).

Results:

SEED TREATMENT TRIAL Thief River Falls, MN							
Treatment	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contribution Margin ($/ac)**	**Oil (%)**	**Seed Cost ($/ac) ***	**Flea Beetle Rating ****	**Plant Stand (Pl/ft^2)**
Benlate	2105	42.1	108.61	45.2	20.28	1.6	9.6
Gaucho + Benlate	2083	41.7	99.89	45.3	26.52	0.8	9.0
Gaucho Platinum	2289	45.8	N/A	43.9	N/A	0.5	9.0
Helix XTra	2149	43.0	105.56	45.2	27.77	0.8	9.9
M. A. D.	2154	43.1	N/A	44.8	N/A	1.3	8.2
LSD	154.6	3.09		1.37		0.29	1.51
CV%	5.7	5.7		2.4		24.0	13.1

Note: Prices for Gaucho Platinum and M. A. D. were not available (N/A) from the company at press time.
* These prices are based on consultation with industry representatives and include the cost of seed and treatment.
** Flea beetle ratings at 22 days after seeding. 0 = no pressure, 9 = leaves completely chewed off.

Discussion: The Gaucho Platinum seed treatment yielded significantly higher than the Benlate and Gaucho + Benlate seed treatments. Even though flea beetle pressure was low, seed treatments with insecticide had significantly less flea beetle damage than the Benlate and M.A.D. treatments, which did not have insecticide. However, the differences in feeding did not influence yield. There was no significant difference in plant stand among any of the treatments at 31 days after planting. Gaucho Platinum had lower oil content than Gaucho + Benlate. Contribution margins reflect differences in yield and seed costs.

XII SCLEROTINIA TRIAL

Objective: To evaluate the effectiveness of an apetalous variety at avoiding sclerotinia compared to two other petalled varieties that are equal and later in maturity.

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. Differences in disease level can be observed among varieties due to timing of flowering or structure of the plant. Since the spores of sclerotinia infect dead flower petals prior to infecting the healthy plant stem, eliminating the petals from the plant should reduce the potential of infection. Hylite 201, an apetalous variety, uses this technique to reduce infection levels of sclerotinia.

Methodology: Spraying was done using twinjet nozzles at 75 psi. Ronilan EG was applied at 0.9 lb/ac in 20 gal of spray solution at the 30-40% bloom stage of each variety. The trial was set up as a randomized complete block in a 3 x 2 factorial design. Treatments included:

A) Hylite 201 (early maturing apetalous) - no fungicide
B) Hylite 201 (early maturing apetalous) - fungicide
C) 44A89 (early maturing petalled) - no fungicide
D) 44A89 (early maturing petalled) - fungicide
E) CL 2078 (late maturing petalled) - no fungicide
F) CL 2078 (late maturing petalled) - fungicide

Infection readings were taken by sampling 100 unswathed plants in three random areas of each plot along the edge of the swathed area.

Observation: The trial was seeded in the east fallow field on May 1 into good moisture. Early season moisture enabled a dense stand. The weather was dry leading up to flowering at this site, but was wet during flowering. Petal tests taken at 30% bloom indicated a 12% infection level.

Results:

SCLEROTINIA STEM ROT CONTROL TRIAL Thief River Falls, MN						
Treatment	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Oil (%)**	**Plants Infected (%)**	**Contribution Margin ($/ac)**
Hylite 201 - no fungicide	100	2031	40.6	43.7	30	123.29
Hylite 201 - fungicide	104	2123	42.5	43.4	13	108.18
44A89 - no fungicide	100	1591	31.8	44.3	63	77.06
44A89 - fungicide	137	2176	43.5	44.8	29	110.01
CL2078 - no fungicide	100	1701	34.0	44.4	45	82.14
CL2078 - fungicide	128	2174	43.5	44.2	3	104.19
LSD (0.10) CV%		107.9 4.4	2.16 4.4	1.10 2.0	10.00 26.2	

Discussion: Fungicide significantly increased yield of 44A89 and CL 2078, but not of Hylite 201. Hylite 201 (no fungicide) had the highest contribution margin. Contribution margins reflect differences in yield, seed and fungicide costs. Without the significant yield boost, the fungicide treatment did not pay for itself with the apetalous line (Hylite 201). The fungicide treatment significantly decreased disease levels and improved contribution margins for the petalled varieties. Oil content was not affected by fungicide treatment.

XII SCLEROTINIA TRIAL

Objective: To evaluate the effectiveness of an apetalous variety at avoiding sclerotinia compared to two other petalled varieties that are equal and later in maturity.

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. Differences in disease level can be observed among varieties due to timing of flowering or structure of the plant. Since the spores of sclerotinia infect dead flower petals prior to infecting the healthy plant stem, eliminating the petals from the plant should reduce the potential of infection. Hylite 201, an apetalous variety, uses this technique to reduce infection levels of sclerotinia.

Methodology: Spraying was done using twinjet nozzles at 75 psi. Ronilan EG was applied at 0.9 lb/ac in 20 gal of spray solution at the 30-40% bloom stage of each variety. The trial was set up as a randomized complete block in a 3 x 2 factorial design. Treatments included:

A) Hylite 201 (early maturing apetalous) - no fungicide
B) Hylite 201 (early maturing apetalous) - fungicide
C) 44A89 (early maturing petalled) - no fungicide
D) 44A89 (early maturing petalled) - fungicide
E) CL 2078 (late maturing petalled) - no fungicide
F) CL 2078 (late maturing petalled) - fungicide

Infection readings were taken by sampling 100 unswathed plants in three random areas of each plot along the edge of the swathed area.

Observation: The trial was seeded in the east fallow field on May 1 into good moisture. Early season moisture enabled a dense stand. The weather was dry leading up to flowering at this site, but was wet during flowering. Petal tests taken at 30% bloom indicated a 12% infection level.

XIII 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 and Ronilan EG are currently labeled for sclerotinia control on canola in the United States.

Methodology: The trial was seeded with 44A89. A higher seeding rate of 6.0 pounds per acre was used to facilitate a microclimate in the canopy to enhance sclerotinia development. Spraying was done using a ground sprayer equipped with twinjet nozzles at 75 psi and 20 gal/ac spray solution. Fungicides were applied at rates and timings suggested by the label or industry representative. Treatments included:

A) Check - no fungicide applied
B) Benlate - 1.0 lb/ac applied at 30% bloom
C) Quadris - 10 oz/ac applied at 10-25% bloom
D) Ronilan EG - 14.4 oz/ac applied at 30-40% bloom
E) Rovral flo - 14.4 oz/ac + 1% crop oil concentrate applied at 20-30% bloom

Infection readings were taken by sampling 100 unswathed plants in three random areas of each plot along the edge of the swathed area.

Observation: The trial was seeded in the east fallow field on April 29 into good moisture. Early moisture enabled a good crop stand. The 6.0 lb/ac seeding rate provided a thick crop canopy, which enhanced disease development. The weather was dry leading up to flowering at this site, but was wet during flowering. Petal tests taken at 30% bloom indicated a 12% infection level. The Quadris treatment was applied on June 19 when the trial was at 5-10% bloom. Winds that day were about 15 mph. It started raining seven hours after application and rained 1.5" by the next morning. It rained another 0.5" on June 21. The soonest the other treatments could be applied was June 24 when the canola was at 35-40% bloom. Wind that day was about 6 mph. There was no rain for the next 10 days.

Results:

FUNGICIDE EVALUATION TRIAL Thief River Falls, MN						
Treatment	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Oil (%)**	**Plants Infected (%)**	**Contribution Margin ($/ac)**
Check (No Fungicide)	100	1341	26.8	44.9	62	50.09
Benlate	162	2168	43.4	45.1	19	109.38
Quadris	102	1369	27.4	44.7	73	25.11
Ronilan	150	2007	40.1	44.2	37	91.07
Rovral flo	138	1857	37.1	45.2	43	79.92
LSD (0.10) CV%		193.1 8.8	3.86 8.8	1.16 2.1	14.4 24.5	

Discussion: Benlate, Ronilan and Rovral flo all provided significantly lower disease levels and higher yields compared to Quadris and the check. Quadris is not rain fast for eight hours and rain occurred seven hours after application. The combination of earlier than recommended application time of Quadris, high winds during application, rain seven hours after application, and high inoculum pressure later in flowering, resulted in Quadris not providing any protection from sclerotinia.

XIV LIBERTY TANK MIX TRIAL

Objective: To demonstrate strategies to improve the efficacy of the contact herbicide Liberty on grassy weeds.

Background: Liberty is a non-selective contact herbicide that is used to control weeds in Liberty Link canola. Previous research has indicated Liberty to be less effective on controlling grasses than other non-selective herbicides. Reducing the rate of Liberty while adding a half rate of a grass herbicide should improve grass control while maintaining control of broadleaf weeds.

Methodology: The Liberty tank mix trial consisted of the following treatments in a randomized block design:

A) Liberty (28 oz/ac) + Assure II (5 oz/ac) + ammonium sulfate (3 lb/ac) applied at the 2-leaf stage.
B) Liberty - full rate (34 oz/ac) + ammonium sulfate (3 lb/ac) applied at the 2-leaf stage.
C) Liberty - split application (20 oz/ac) + ammonium sulfate (3 lb/ac) applied at the 2-leaf stage and (20 oz/ac) + ammonium sulfate (3 lb/ac) applied at the 5-leaf stage.

Observation: This trial was integrated with the Systems Comparison Trial. Weed pressure was light to moderate with patches of quackgrass, dense patches of green smartweed (cotyledon) and red root pigweed, large field pennycress and Canada thistle scattered throughout the trial. Applications at the 2-leaf stage were done at sunrise when the temperature was 40°F. The weather turned warm, sunny and windy the rest of the day.

Results:

LIBERTY TANK MIX TRIAL
Thief River Falls, MN

Treatment	Yield (lb/ac)	Yield (bu/ac)	Contribution Margin ($/ac)	Oil (%)
Liberty + Assure II	2042	40.8	91.93	42.7
Liberty - full rate	2044	40.9	92.33	43.3
Liberty - split application	1956	39.1	77.43	42.5
LSD (0.10)	145.6	2.91		1.23
CV%	5.3	5.3		2.1

Discussion: There were no yield or oil differences among the different tank mix combinations of Liberty. Weed control was good for all treatments. The first 20 oz application of the split treatment gave good weed control. Contribution margins were lower with the split application of Liberty due to slightly lower yield and an additional $5.80 for the extra chemical and second application.

XV TIME OF WEED REMOVAL TRIAL

Objective: To compare the effects of time of weed removal on yield and quality of *B. napus* canola using conventional, Roundup Ready and Clearfield systems.

Background: Weed removal and proper time to remove them has been a constant source of frustration to producers. Producers will often delay post emergent herbicide application in an attempt to avoid late flushes of weeds. The concern is that these late flushes of weeds may add to the bank of weed seeds in the soil or require additional herbicide applications and increased input costs. Work conducted by Harker, et al (Agriculture and Agri-Food Canada) along with Canola Production Centre data has shown there are economic benefits to removing weeds early in crop development.

Methodology: The trial consisted of the following varieties and stages of herbicide application in a split-plot design:

A) Conventional system - Quantum
   - Assure II + Stinger + Muster at the 2-leaf stage of the canola
   - Assure II + Stinger + Muster at the 5-leaf stage of the canola

B) Clearfield system - 46A76
   - Raptor at the 2-leaf stage of the canola
   - Raptor at the 5-leaf stage of the canola

C) Roundup Ready system - RideR
   - Roundup Ultra at the 2-leaf stage of the canola
   - Roundup Ultra at the 5-leaf stage of the canola

See *Site Description* for details on rates of chemicals.

Observations: The trial was seeded on the west fallow field on May 1 as part of the systems trial. Weed pressure was light to moderate with patches of quackgrass, dense patches of green smartweed (cotyledon), red root pigweed, large field pennycress and Canada thistle scattered throughout the trial. All applications were done after sunset when the wind was lower (3 mph), to reduce risks of drift onto neighboring plots.

Results:

TIME OF WEED REMOVAL TRIAL Thief River Falls, MN				
Treatment	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contribution Margin ($/ac)**	**Oil (%)**
Conventional System				
2-leaf	2165	43.3	111.13	41.6
5-leaf	2112	42.2	105.90	42.3
Clearfield System				
2-leaf	2137	42.7	120.75	43.6
5-leaf	2136	42.7	120.65	43.7
Roundup Ready System				
2-leaf	2114	42.3	116.27	43.7
5-leaf	2186	43.7	123.35	43.7
LSD spray time within a variety CV%	55.9 2.0	1.12 2.0		0.97 1.8

Discussion:

Results from this trial are mixed. Yield was slightly higher when sprayed at the 2-leaf stage compared to the 5-leaf stage in the conventional system. Yield was significantly higher when sprayed at the 5-leaf stage compared to the 2-leaf stage in the Roundup Ready system. Time of weed removal had no effect on yield in the Clearfield system. Contribution margins reflect differences in yield, seed costs and chemical weed control costs. These mixed results are likely due to the low weed pressure and the patchiness of the weeds in the trial. With heavy weed pressure, early weed removal is important to reduce early competition for moisture and nutrients. Oil content was not affected by time of weed removal.

XVI TIME OF SWATHING (AVENTIS)

Objective: To compare the effects of various swathing dates on yield and quality of hybrid vs. open pollinated varieties.

Background: Traditionally, the recommended stage of swathing is at 30-40% seed colour change (SCC) on the main stem to maximize yield and quality and minimize green seed and shattering. The introduction of hybrids, with associated lower seeding rates and lower plant densities, can result in extra secondary branching. The secondary branching causes a wider range of seed development and maturation as compared to traditional seeding rates. Therefore, the normal time of swathing (30-40% SCC) may need to be delayed to a later stage to allow for optimum development and pod fill on the secondary side branches.

Methodology: The time of swathing trial consisted of the following treatments, in a split plot design with varieties as the main plot and swath timing as sub-plots.

A) 30-40% SCC ~ InVigor 2573
B) 40-50% SCC ~ InVigor 2573
C) 50-60% SCC ~ InVigor 2573
D) 60-70% SCC ~ InVigor 2573
E) Straight Combine ~ InVigor 2573
F) 30-40% SCC ~ Phoenix
G) 40-50% SCC ~ Phoenix
H) 50-60% SCC ~ Phoenix
I) 60-70% SCC ~ Phoenix
K) Straight Combine ~ Phoenix

InVigor 2573 was seeded at 4.3 lb/ac. Phoenix was seeded at 5.2 lb/ac. Seed colour change was determined on the main stem.

Observation: The trial was seeded in the east fallow field on April 29 into good moisture. Weather at swathing time was very warm and dry. Seed colour change occurred rapidly at a rate of about 10% per day. All swathing was done in the early evening. Average stand counts were 11.6 plants/ft^2 for Phoenix and 9.6 plants/ft^2 for InVigor 2573. Primary branch counts were similar between the Phoenix and InVigor 2573 with 4.6 and 4.8 branches per plant, respectively. Secondary branch counts were also not significantly different between the Phoenix and InVigor 2573 with 0.7 and 0.3 secondary branches per plant respectively. Straight cut treatments were harvested with a 24 ft flex-header with a pick-up reel. Green seed counts were below 0.3% for all treatments due to frequent rains after swathing, which allowed the swaths to dry slowly.

Results:

TIME OF SWATHING TRIAL (AVENTIS) Thief River Falls, MN							
System	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contribution Margin ($/ac)**	**Oil (%)**	**Growing Degree Days**	**Days To Swathing**
Open Pollinated Variety – Phoenix							
30-40% SCC	100	1896	37.9	81.22	49.3	1025	94
40-50% SCC	102	1925	38.5	84.02	49.9	1039	95
50-60% SCC	108	2045	40.9	95.72	48.8	1052	96
60-70% SCC	109	2072	41.4	98.41	49.2	1069	97
Straight Cut	79	1253	25.1	19.11	47.9	1376	119
Hybrid Variety - InVigor 2573							
30-40% SCC	100	2047	40.9	89.12	46.5	1025	94
40-50% SCC	101	2059	41.2	90.29	46.3	1039	95
50-60% SCC	103	2104	42.1	94.63	47.3	1052	96
60-70% SCC	105	2156	43.1	99.78	46.2	1069	97
Straight Cut	91	1863	37.3	71.80	47.2	1376	119
LSD for method within variety CV%		88.2 3.8	1.76 3.8		1.25 2.2		

Discussion: Yield was significantly increased over the standard 30-40% SCC by delaying the time of swathing to 50-60% SCC on the Phoenix and 60-70% SCC on the InVigor 2573. Yield was significantly decreased for both varieties by waiting to straight combine the crop. The crop was very erect and not well knitted together, so the winds that occurred near harvest time likely caused shelling. Wind speeds of 10-25 mph were recorded on three days during the week prior to straight combining. Unlike previous studies conducted by the Canola Production Centres, oil content did not significantly increase with delayed swathing. This is possibly due to the very warm and dry conditions during the week of swathing. Oil content was significantly lower on the straight cut Phoenix compared to three of the swathed treatments.

XVII FALL DORMANT SEEDING

Objective: To compare the effectiveness of seeding canola in spring versus fall (with and without 'Extender' polymer seed coating) on soils with different levels of crop residue.

Background: Fall dormant seeding has become another management tool that growers can use when planting canola to spread out the workload and hopefully capture higher yields. Research in Canada and in the United States has shown mixed results. With good spring stand establishment, fall-seeded canola generally flowers sooner and longer than spring-seeded canola and often produces a better yield by avoiding the hot weather during flowering. Thin and uneven stands can cause problems with weed control and harvest timing due to many late maturing branches. One of the difficulties of fall dormant seeding is judging when to plant it. The soil must be cool enough and/or dry enough to prevent germination in the fall. Early snow or rains late in the season can prevent a grower from seeding fall dormant canola. "Extender", a product from Grow Tec Inc. out of Nisku, AB, Canada provides an extended period in the fall in which the grower can seed the canola up to two weeks before freeze-up. Without Extender the grower needs to plant a day or two before winter freeze-up. The introduction of herbicide tolerant canola has provided a better means of weed control in fall-seeded canola, especially for the winter annual weeds.

Methodology: The fall dormant seeding trial was conducted as two separate trials, side by side, on wheat stubble and on fallow. Different seed treatment combinations and various seeding dates included:

A) October 15 - Extender (Benlate seed treatment)
B) November 16 - Extender (Benlate seed treatment)
C) November 16 - No Extender (Benlate seed treatment)
D) May 2 - (Gaucho + Benlate seed treatment)

October 15 was the date targeted for seeding two weeks prior to the projected freeze-up date. Just prior to freeze-up was seeded November 16. Spring-seeding was on May 2. All fertilizer was broadcast and incorporated prior to seeding with the exception of a seed placed starter fertilizer and 100 lb/ac of 21-0-0-24 (N-P-K-S), which was top-dressed on the fall-seeded plots at bolting. Stand counts on the fall and spring-seeded plots were taken by counting three random 1 m^2 and 0.5 m^2 quadrants, respectively, per plot.

Observation: The Roundup Ready variety 45A51 was used for this study. The trials were seeded in the west fallow and west stubble fields on the dates indicated. Soil conditions at seeding of the fall-seeded treatments were dry and cloddy on the stubble field, and marginal moisture on the fallow field. The soil temperature on November 16 was 41°F at 1" deep and 38°F at 4" deep. The soil froze around November 20. Warm temperatures in early March likely broke dormancy on some of the seed in the trial. Soil temperatures at 1"

deep reached 45-60° F each afternoon from March 3-7 and then dropped to 18°F on March 16.

Flea beetles were present in spring on the fall-seeded plots at near threshold levels. Plots were not sprayed because cool weather allowed the canola to outgrow the damage. Weeds were controlled with a single application of Roundup Ultra (1 pt/ac) for most of the treatments. The October seeding on the stubble field required a second Roundup application (1 pt/ac) at the end of bolting to control a dense late flush of redroot pigweed because the crop would not canopy in time to provide competition. Bloom started in the fall-seeded treatments on May 30 and continued flowering for about 35 days. The spring-seeded treatments started to bloom on June 20 and continued flowering for about 25 days. Both trials were sprayed with Ronilan EG on June 24. The fall-seeded plots were at 70-80% bloom when sprayed, so the fungicide would not have provided much protection from sclerotinia. Therefore, the fungicide cost was not included in the contribution margins of the fall-seeded plots. Very little lodging occurred on the stubble field or the fall-seeded plots on the fallow. However, the spring-seeded plots on the fallow laid down flat during flowering. Swathing was easy for most plots except the severely lodged spring-seeded plots on the fallow, which were very difficult. The October seeded treatments were also difficult to swath due to branches lying on the ground along open areas in the plots. April 20 was the chosen start date for growing degree days (GDD) and days to maturity for the fall-seeded plots because that is when the mean temperature stayed consistently above 5°C, which is the base line temperature for canola. Sixty-eight GDD had accumulated by May 2, which was the spring planting date.

Results:

FALL DORMANT SEEDING - FALLOW Thief River Falls, MN								
Seeding Date	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contrib. Margin ($/ac)**	**Spring Stand (plt/ft^2)**	**Height (in)**	**Growing Degree Days**	**Days To Maturity**
Oct. 15 - Extender	110	2021	40.4	125.56	0.6	46	1107	104
Nov. 16 - Extender	129	2370	47.4	159.65	2.3	43	1008	98
Nov. 16 - No Extender	130	2377	47.5	167.90	1.5	45	1008	98
May 2	100	1835	36.7	90.15	9.1	57	1080	96
LSD (0.10)		95.4	1.91		0.61	3.1		
CV%		3.4	3.4		14.0	5.0		

FALL DORMANT SEEDING - WHEAT STUBBLE Thief River Falls, MN								
Seeding Date	**Yield (%)**	**Yield (lb/ac)**	**Yield (bu/ac)**	**Contrib. Margin ($/ac)**	**Spring Stand (plt/ft^2)**	**Height (in)**	**Growing Degree Days**	**Days To Maturity**
Oct. 15 - Extender	84	1644	32.9	69.93	1.1	41	1041	100
Nov. 16 - Extender	90	1766	35.3	87.02	1.6	43	1008	98
Nov. 16 - No Extender	90	1771	35.4	95.10	2.0	41	1008	98
May 2	100	1959	39.2	88.66	10.4	52	1032	93
LSD (0.10)		112.8	2.26		0.61	3.0		
CV%		4.9	4.9		12.4	5.2		

Discussion:

Fall-seeded yields were significantly lower on the wheat stubble compared to spring-seeded as a result of reduced stands. However, fall-seeded yields on the fallow were significantly higher compared to spring-seeded. This was likely due to reduced lodging in the fall-seeded treatments. The October seeding date provided the lowest yield and plant stand of all the fall-seeded treatments on both stubble and fallow. The October seeding also took longer to mature, especially on the fallow due to the low stands and extensive branching. The late freeze-up in 1999 was beyond the two-week protection window that the Extender seed treatment provides. Some fall germination occurred which resulted in the lower stands compared to the November seeding date. Mixed results with stand counts on the Extender versus no-Extender on the November seeding date are likely due to freeze-up shortly after seeding. Stands of all the fall-seeded treatments were reduced by the warm weather in early March, which likely induced premature germination. Contribution margins reflect differences in yield, seed treatments, fungicide costs for sclerotinia control, fertilizer application costs and weed control. The lower contribution margin of the November 16 - Extender compared to the November 16 - No Extender is mostly due to the extra cost of the Extender seed treatment ($7.02 per acre at the 6.0 lb/ac seeding rate).

XVIII SUMMARY

The third year of the Minnesota Canola Production Centre (CPC) program has been another success. The trials at the Thief River Falls site were chosen to demonstrate basic canola production principles as well as look at new technologies and techniques. While many of the trends in the trials reflected past results from the Canadian CPC program, other trial results differed. Future work will help reveal if these unexpected trends are regionally specific, or if they were just a feature of this year's growing conditions. 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. Planning for next year's program has already begun with the site for 2001 being 1.5 miles south of the John Deere dealership in Thief River Falls, Minnesota. If you have any questions or comments about the Minnesota CPC program please feel free to contact any of the people listed in the following Field Staff Information section.

XIX FIELD STAFF INFORMATION

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