2014 Minnesota Canola Production Center (CPC)

Cooperative Project with the Minnesota Canola Council and the University of Minnesota

2014 Research Summary Report

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Minnesota Canola Production Center

The Minnesota Canola Production Center (CPC) is a public-private partnership between the Minnesota Canola Council and the University of Minnesota. The efforts of many individuals and organizations make it possible to conduct this field research in support of the canola industry. The financial, products & services and information provided by local and regional sponsors are, in large part, responsible for the success of the Canola Production Center. This generous support has made the Minnesota Production Center a research project that benefits, not only canola growers in Minnesota, but canola growers in the entire region.

A special thank you goes to Magnusson Farms Incorporated for land and field preparation for the small plot canola trials, Hugh Hunt for large plot demonstration site and Peter Grafstrom for land, field preparation and harvest assistance with the large on-farm three year canola rotation trial.

SITE INFORMATION – 2014 MN Canola Production Center (CPC)

Location: Approximately, 3 miles NW of Roseau, MN

Cooperator: Magnusson Farms Incorporated

Previous Crop: Wheat

Soil Test Results:

Macronutrient Level:	
Nitrogen – 0-6 inch	13 #/acre
Nitrogen – 6-24 inch	6 #/acre
Phosphorous -	9 ppm
Potassium -	79 ppm
Sulfur -	14#/acre

Target Yield:	2500 #/acre
Fertilizer Applied (#/acre):	N - 140; P - 30; K - 30; S - 30
%Organic Matter:	3.5
Soil pH:	8.1

Tillage Operations: The entire experimental site was tilled with a field cultivator prior to a broadcast fertilizer application. After pre emergent fertilizer applications were made, final seedbed prep was done with an S-tine cultivator with rolling baskets. All plots were cultipacked after planting.

Fertilizer Applied: A base fertility program of 30-30-30-30s was applied to the entire area. The canola variety and fungicide area received 140 units of urea nitrogen (46-0-0) and the fertility trial received various nitrogen sources and timings (PPI and post applications, per trial protocol).

Seeding Method: All small plot trials were seeded with a small plot-seeder and the on-farm location established with commercial equipment.

Herbicides Applied: A) Clearfield hybrids - Beyond @ 4 fl. oz/ac + NIS 0.25% v/v + AMS @ 15 lbs. /100 gal

B) Liberty Link hybrids - Ignite @ 22 fl. oz/ac + AMS @ 3.0 lbs. /ac

C) Roundup Ready hybrids - Roundup PowerMax @ 16 fl. oz/ac + AMS @ 17 lbs. /100 gal

Comments: The spring of 2014 will be remembered as one of the coldest in recent memory. In addition to the lack of heat, saturated soil conditions resulted in a significant number of prevent planted acres in northwest MN. Prevent plant acres in Roseau County was reported to be 21% of the tillable ground. Daily maximum and minimum temperatures were 1 to 8 degrees below normal for each month of the growing season from March-July during the 2014 growing season (Source: NDAWN). Further, accumulated rainfall during the growing season (April-July) was 3.32 inches above normal. The cool weather coupled with the wet soil conditions resulted in crops being planted in less than ideal conditions.

Canola stands were variable depending upon soil moisture level and timely rainfall after planting. Crops (canola, barley, soybeans and wheat) in the area were seeded in mid-May into June. Canola planted on course textured, lighter soils tended to have better stands than canola seeded into fine textured, heavy soils.

In 2014, the crop planting window was mid-May into June. Crop planting proceeded at a rapid pace, in the fields that dried out enough for field operations. Once planted, canola emergence was variable with the lighter textured soil generally had more uniform canola stands than the heavy fine textured soils. Once the canola emerged and was out of the ground, flea beetle populations in many canola fields were above threshold, which required a post emergence insecticide treatment. With flea beetles controlled, subsequent canola growth and development was good to excellent going into summer.

In 2014, white mold infestations were very low in most of the canola production region. Canola had completed the bloom period before white mold spores were released into the environment. In addition, other diseases that impact canola growth and development were also at low levels in the 2014 season. Further, other than early season flea beetle pressure in some areas, other insect pests were at a low level in 2014.

The Minnesota Canola Production Center had six field locations in 2014. The small plot replicated canola research trials were conducted with cooperation of Magnusson Farms near Roseau, MN. The aster leafhopper - Early Alert Project had two locations in Roseau County and one in Kittson County. The three year canola rotation trial was initiated in Roseau County (Spruce Township, Section 13) with cooperation of Peter Grafstrom. The large on-farm plot was in Kittson County in cooperation with Hugh Hunt. All field operations at this on-farm site were performed with commercial farming equipment with the cooperation with Mr. Hunt

The public canola trials conducted at the CPC in 2014 included:

- Small plot canola variety trial
- Small plot fertility nitrogen source, rate and timing trial
- Small plot canola fungicide trial
- Establishment of a three year canola rotation trial
- Development of an Aster Yellows - Early Alert Network in Canola
- Large on-farm strip trial to compare swathed vs. direct harvest canola

Small Plot Variety and Systems Trial

Objective:
To evaluate agronomic characteristics of canola varieties with different herbicide production systems (Roundup Ready, Liberty Link and Clearfield) grown under the climatic conditions of northern Minnesota.

Background:
New and emerging technologies in canola varieties have given canola growers choices in variety selection. Yield, lodging resistance, maturity, and crop quality are important variety traits for growers to consider when making variety selections. Canola seed companies were invited to submit current and pending varieties for entry in the trials to compare against similar varieties in a small plot replicated research trial.

Methods:
All varieties were seeded at 15 PLS/ft.2 (or 5 #/acre if PLS was not listed) on May 29, 2014. The experimental design was a randomized complete block (RCB) with four replications. Individual plot size was 5 x 27 ft. and end-trimmed to a harvest area of 5 x 20 ft. Roundup Ready, Liberty Link, and Clearfield canola varieties were planted in separate blocks to minimize the influence of potential herbicide drift. Roundup was applied on 6/21/14 with Liberty and Beyond applied on 6/25/14. Early canola varieties were swathed on 8/30/14 and harvested on 9/17/14. Late canola varieties were swathed on 9/2/14 and harvested on 9/18/14. Harvested canola was weighted and a sub-sample taken from each plot for test weight, percent oil content and other quality factors. Canola yields are expressed at 8.5% moisture.

Results:
A total of 28 canola varieties were entered in the 2014 CPC (Table 1). A breakdown of the canola varieties: 21 Roundup Ready, 4 Clearfield and 3 Liberty Link canola entries. Canola yields ranged from 2,094 to 3,483 #/acre. The trial average yield was 2,694 #/acre.

The top-yielding canola varieties were: InVigor L130, InVigor L252 and DKLL38-48, InVigor L140p HyClass 969 and Nexera 2012CL. Average canola yield for these 6 varieties were 3,137 #/acre and at $17/cwt would be a gross dollar return of $532/acre.

All varieties exhibited good early season vigor. First flower date ranged from July 6th to July 13th with the end of flowering ranging from July 26th to August 4th. Percent oil, protein, lodging plant height and other agronomic information is summarized in Table1.

Nitrogen Fertility Trial

Objective:
To evaluate canola yield response from various rates of urea applied PPI and post emergence (3-5 leaf canola), with and without the nitrogen stabilizer Agrotain®. Urea was also applied PPI in combinations with a coated urea product ESN (environmentally smart nitrogen).

Background:
Canola requires high levels of nitrogen and usually shows increased yields with increasing levels of nitrogen fertilizer. However, high spring application rates of nitrogen can be subject to environmental losses. One strategy to reduce nitrogen losses into the environment is to delay nitrogen applications and make it available just before peak uptake demand by the canola plant. This delay in nitrogen availability can be accomplished by; 1) a coated urea product like ESN, which is a polymer-coated urea that releases nitrogen based on temperature and moisture, or 2) an early post emergence application of urea with and without the nitrogen stabilizer Agrotain®. This study was initiated to evaluate the canola yield response to various rates, timings and combinations of urea with ESN and urea applied with and without the nitrogen stabilizer, Agrotain® Ultra.

Methods:
The canola variety Star Specialty Seeds '514' was seeded at 13 PLS/ft.2 on 5/29/14. Harvested plot size was 5 x 20 ft. The experimental design was a RCB with four replicates. The entire plot area had a background nitrogen level of 14 #/acre. A broadcast application of 30-30-30-30S was applied to the entire plot area. Nitrogen treatments included PPI urea (46-0-0) applied at 0, 45, 90, 135 and 180 #/acre. A 50/50 blend of urea and ESN (44-0-0) applied at 0, 45, 90, 135 and 180 #/acre. Post emergence urea alone and with Agrotain® Ultra applied at 45, 90 and 135 #/acre with and without a base urea treatment of 45 #N/acre applied PPI. All plots were swathed on 8-30-14 and harvested on 9-17-14. Harvested canola was weighted and a sub-sample taken from each plot for test weight and percent oil content.

Results:
This trial was seeded approximately 1 inch deep on May 29, 2014. Topsoil was slightly dry with good sub-soil moisture. The canola trial average yield was 3,007 #/acre (Table 2). The 50/50 blend of urea and ESN gave similar canola yields, as the nitrogen rate increased to 180# nitrogen/acre. The highest canola yield (3,560 #/acre) in the trial was from 45#N urea PPI + 135#N urea + Agrotain® Ultra. Canola yields from urea applied post emergence averaged 3147#/acre compared to 3181 #/acre from urea +Agrotain® Ultra. In this trial, canola yields tended to be higher from post emergence urea applied with the nitrogen stabilizer Agrotain Ultra, than urea alone especially when 45 #N/acre

Urea was applied PPI. Percent oil and protein were inversely related with nitrogen rate. Percent oil decreased and protein increased as the rate of nitrogen increased, regardless of the method of nitrogen application, with and without nitrogen stabilizers.

A chlorophyll meter, FIELDSCOUT, CM 1000, from Spectrum Technologies, Inc., was used to determine if a light meter could detect nitrogen levels in canola A light meter reading was taken under full sun conditions at 12:30 pm on 7/18/14. Results suggest chlorophyll meter readings generally were higher from the nitrogen treatments compared to the untreated. However, treatment differences were not detected at the single observation date. Additional research is needed to determine the utility of light meter technology in canola. The goal would be to correlate light meter readings with nitrogen status in the plant. This information could be used to predict nitrogen status and develop a predictive model of how much nitrogen should be applied at a given growth stage which will maximize canola yield and minimize environmental concerns.

The canola yield response to early post emergence application of nitrogen with the nitrogen stabilizer, Agrotain® Ultra, may warrant additional research to investigate how to improve the nitrogen use efficiency in canola. Further, the coated urea product, ESN, appeared to enhance nitrogen efficiency, especially at the total nitrogen rate of 135 and 180#/acre.

Canola Fungicide Management Small Plot Trial

Objective:
To evaluate fungicides applied at three timings in canola and determine the influence on canola growth development and yield.

Background:
White mold, caused by the fungal pathogen, *Sclerotinia sclerotiorum*, is the most serious disease in canola. White mold infects the canola plant during flowering and fungicides are an effective management tool used by canola growers. Blackleg, *Leptosphaeria maculans* is another fungal disease that can damage canola. Blackleg is most damaging to canola when infection occurs from the cotyledon to the six-leaf stage. Genetic resistance is the most effective method of control for Blackleg in canola. However, recent disease surveys suggests that Blackleg is now a common disease in canola (Source: NDSU, Plant Disease Bulletin, PP-1367). If fungicides are to be effective in the control of these two canola diseases, two different timing windows will be required to optimize disease control. This multiply fungicide strategy has worked well in spring wheat. In fact, the U of MN has several years of field research which wheat yields were higher from an intensive fungicide regime compared to the standard (Source: MN Varietal Trials, Jan 2013). This fungicide trial in canola will be designed to evaluate canola yield and growth parameters from a standard fungicide program compared to a sequential fungicide application.

Methods:
This small plot trial was conducted on land operated by Magnusson Farms Inc. Experimental design was a RCB with four replications. The canola variety in this trial

was Star '402' and was seeded at 13PLS/ft.2 on 5/29/14. Individual plot size was 5'wide by 27' long, end trimmed to 5 x 20. The treatments and application dates are listed in Table 3. All post emergence fungicides were applied with hand boom sprayer delivering 17 gpa. Plots were swathed on 8/30/14 and harvested on 9/17/14. Harvested canola was weighted and a sub-sample taken from each plot for test weight, percent oil content and other quality factors.

Results:
Canola yields in this small plot fungicide trial ranged from 3,173 to 3,377 #/acre (Table 3). At the 95% confidence level, no differences in canola yields were detected based on treatment or the untreated. The untreated canola yield was 3,242 #/acre which is an indication of limited disease pressure. Field observations in local canola fields also indicate that 2014 season was a year of low disease pressure. Additional research in canola is needed to determine if multiple fungicide applications are advisable.

Aster Leafhopper-Aster Yellows Early Alert System in Canola

Background
Aster yellow is a difficult disease to control and once the plant has the disease, there is no known cure. Canola varieties don't appear to have genetic resistance to AYP. Field observation suggests canola is not the 'first choice' for aster leafhopper feeding. Rather, it appears leafhoppers feed or move into canola from small grain as grass crops begin to bolt. In addition, research from Saskatchewan found that only the adult leafhoppers were found in canola. Adult leafhoppers feed on canola, for a short time and move on to other crops to reproduce. Further, on average, the numbers of aster leafhoppers in small grains are three-to-seven times that of canola. Result of this Canadian research suggests that leafhoppers are not attracted to the canola plant rather will feed as they transition to other crops.

Recently, canola growers have asked about management practices to minimize aster yellows in canola. A common question, can an insecticide spray program be effective in the control of aster leafhoppers? To be successful, the insecticide treatment would have to be timed to the influx of aster leafhoppers as these insects can transmit AYP in less than 8 hours. An economic threshold level has not been established for aster leafhopper in canola. However, greenhouse research conducted by Chrystel Olivier, with Agriculture Canada in Saskatoon, SK., suggest a greenhouse threshold level of three leafhoppers/plant when allowed feed for three hours or more.

Aster yellows can be found in canola almost every year with an infection rate of less than 1%. However, in 2012, aster yellow infections in Minnesota and North Dakota were severe and wide-spread. Many growers reported an AYP infection rate of over 30%. A 10% infection rate of AYP results in 3 to 7% light or missing seed. In 2012, many growers reported of canola yield losses in the 30 to 50% range from aster yellows. Field notes from Ron Beneda, NSDU Extension agent in Cavalier county, ND

found light to moderate outbreaks of aster yellows in canola in 1999, 2001 and 2007. Aster yellows infestations were very high in 2012, but in 2013, Aster yellows in canola were almost non-existent. In the last decade, or so, it appears that Aster yellow outbreaks in canola are more severe with early compared to late planting. An early alert network for Aster leafhoppers has the potential to be used as a management tool to reduce the incidence and severity of AYP in the canola growing regions of Minnesota and North Dakota.

Project Objectives

1. Utilize national weather service data to determine when wind currents are favorable for leafhopper flights into the canola growing regions of MN and ND.
2. Coordinate a leafhopper scouting network to determine the onset and frequency of aster leafhopper flights into the canola growing regions of MN and ND.
3. Determine the percent of AYP in these early flights of aster leafhoppers by sending insect samples to an approved laboratory to determine the infectivity level.
4. Coordinate a communications plan to notify canola growers and industry partners on the movement of aster leafhoppers into the canola growing regions of MN and ND.

Project Partners

Dr. Janet Knodel (PI), Plant Pathology Department, NDSU, Fargo, ND
Dr. Nancy Ehlke, Agronomy Department, U of MN, St. Paul, MN
Leslie Lubenow, Area Extension Agronomist, NDSU, Langdon, ND
Dr. Venkata Chapara, Area Crop Protection Extension Specialist, NDSU, Minot, ND
Dr. Dave Grafstrom, Northland Community and Technical College, Roseau, MN
Dr. Madeleine Smith, Plant Pathologist, U of MN, Crookston, MN
Canola Council of Canada
MN Canola Council
Northern Canola Growers Association
North Dakota State University Extension
U of MN Extension Service

2014 Aster Leafhopper Project

Aster leafhopper were surveyed in the major canola producing counties of North Dakota and Minnesota. Grassy ditches near canola fields and canola fields were surveyed weekly from canola emergence through early pod development (late May through late July). Leafhoppers samples were obtained by taking 20 sweeps with a standard 15-inch sweep net, at 10 sites in grassy ditches or 10 sites in a canola field (a total of 200 sweeps per field). Samples from individual fields were placed in gallon-size Ziploc bags, and the date, time, LAT/LON coordinates, and weather recorded. Samples were sent to the laboratory for species identification and insect species counts. Subsamples of aster leafhoppers were tested for the aster yellows phytoplasma. Results were

posted each week, on the NDSU Pest Newsletter web site from canola emergence to flowering. Dr. Jan Knodel summarized the data from various monitoring sites in Minnesota and North Dakota.

Straight Harvest Trial

Objective:
To compare canola yields from the standard practice of swathing and harvesting compared to straight harvest alone with and without a desiccant.

Background:
Swathing is a common management practice in the production of canola. Swathing prior to harvest has the potential to reduce shattering loss, reduce moisture content, lower green count and may "even up" canola maturity. However, many growers are interested in ways to eliminate swathing in favor of to direct harvest of canola. This study was initiated to determine the effectiveness of straight harvest canola as compared to the standard practice of swathing prior to harvest.

Methods:
The experimental design was a RCB with three replications. The canola variety selected was Star '402' and was seeded to a rate of 5.5 #/ac. Treatments included swathing prior to harvest, direct harvest and direct harvest after an application of a desiccant.

Results:
The canola stand at this location exhibited a high degree of variability. Environmental conditions, at this site, contributed to the in-field variability. Due to this extreme in-field variability, the decision was made to abandon this trial in 2014 with plans to repeat it in 2015.

Impact of Previous Crop on Soybean and Canola Yields

Principal Investigator: Dr. Brian Jenks, NDSU

Co-Principal Investigators:
Dr. Nancy Ehlke, Univ. of MN
Dr. Mike Ostlie, NDSU-Carrington
Dr. Jasper Teboh, NDSU-Carrington
Dr. Pravin Gautam, NDSU-Langdon
Bryan Hanson, NDSU-Langdon
Eric Eriksmoen, NDSU-Minot

Objectives
1: Determine if soybean yield is greater following canola than wheat
2: Determine if canola yield is greater following soybean than wheat

Materials and Methods

This study will be conducted at three NDSU Research Extension Centers (Minot, Carrington, and Langdon) and at the MN Canola Production Center.

The experiment will be conducted as a randomized complete block design with four replications. Individual research plots will be approximately 30 by 120 ft. Crops will be planted in research plots as listed below. The first crop sequence is for 2013-2015 and will be repeated in 2014-2016. Soil will be tested each year for N-P-K-S and plots fertilized for optimum crop growth. Tillage system and production practices will follow local grower practices to achieve optimal yields. Liberty Link canola will be used to more easily control volunteers in the following RR soybean crop. Short residual herbicides will be used in the wheat crop to avoid carryover concerns to following crops. Fungicides will be applied to reduce disease in each crop, in particular sclerotinia in canola and soybean.

Data to be collected includes: yield, test weight, oil, protein, crop density, crop height, flowering date, physiological maturity, and disease evaluations for sclerotinia in canola and soybean. Data will be evaluated using proper statistical procedures.

Crop sequence to evaluate effect of previous crop on soybean and canola yield in 2013 - 2015.			
Treatment	2013	2014	2015
1	Wheat	Wheat	Soybean
2	Wheat	Canola	Soybean
3	Wheat	Wheat	Canola
4	Wheat	Soybean	Canola

Repeat of planned crop sequence in 2014-2016.			
Treatment	2014	2015	2016
1	Wheat	Wheat	Soybean
2	Wheat	Canola	Soybean
3	Wheat	Wheat	Canola
4	Wheat	Soybean	Canola

Duration

This study was initiated in spring of 2014. A report containing results, conclusions, and recommendations will be completed by May 1, 2017.

Table 1.

2014 Canola Variety Trial

Location: Magnusson Farms west of Roseau, MN

	Company	Herbicide tolerance	Variety	Yield[1] #/acre	Yield[1] % of mean	% protein	% oil[2]	% ground cover[3]	ESV[4]	Ht.(in.)	Flowering begin day	Flowering end day	Flowering days
1	Bayer CropScience	LL	InVigor L140p	3038	**113**	21.5	**39.9**	88	7	47	11-Jul	30-Jul	20
2	Bayer CropScience	LL	InVigor L130	3483	**129**	21.5	**38.9**	88	8	48	11-Jul	30-Jul	20
3	Bayer CropScience	LL	InVigor L252	3229	**120**	21.1	**41.5**	94	9	49	12-Jul	31-Jul	19
4	Mycogen	CL	Nexera 2012 CL	2927	**109**	21.7	**39.7**	81	7	44	11-Jul	2-Aug	22
5	Mycogen	CL	CL2537382H	2496	**93**	21.9	**40.1**	90	9	45	12-Jul	3-Aug	22
6	Mycogen	CL	CL2537385H	2822	**105**	24.0	**40.7**	93	9	45	10-Jul	3-Aug	24
7	Mycogen	CL	Nexera 2020 CL	2621	**97**	21.7	**41.3**	83	8	45	11-Jul	3-Aug	23
8	Mycogen	RR	G2537367H	2337	**87**	21.8	**38.5**	90	8	41	13-Jul	4-Aug	22
9	Mycogen	RR	Nexera 1012 RR	2167	**80**	23.0	**40.4**	89	8	45	13-Jul	4-Aug	22
10	Winfield Solutions	RR	HyClass 969	3025	**112**	19.1	**43.1**	97	9	41	9-Jul	29-Jul	21
11	Winfield Solutions	RR	HyClass 930	2565	**95**	20.0	**45.1**	93	9	41	8-Jul	27-Jul	19
12	Winfield Solutions	RR	HyClass 955	2712	**101**	19.9	**44.1**	95	9	41	9-Jul	28-Jul	19
13	DuPont Pioneer	RR	45H31	2578	**96**	22.1	**41.1**	90	9	46	10-Jul	4-Aug	25
14	DuPont Pioneer	RR	45S53	2094	**78**	20.4	**41.6**	85	9	48	11-Jul	4-Aug	23
15	Monsanto	RR	DKL30-03	2517	**93**	20.3	**43.8**	94	9	40	6-Jul	26-Jul	20
16	Monsanto	RR	DKL30-42	2745	**102**	19.5	**42.5**	97	9	38	7-Jul	27-Jul	21
17	Monsanto	RR	DKL38-48	3120	**116**	20.6	**40.7**	94	9	43	8-Jul	30-Jul	22
18	Monsanto	RR	DKL55-55	2638	**98**	19.8	**43.1**	94	9	44	9-Jul	29-Jul	20
19	Monsanto	RR	DKL70-07	2795	**104**	18.8	**43.0**	95	9	43	8-Jul	30-Jul	22
20	Monsanto	RR	74-54RR	2674	**99**	20.2	**41.7**	89	9	45	9-Jul	31-Jul	22
21	Star Specialty Seed	RR	Star 402	2676	**99**	19.1	**44.5**	95	9	42	9-Jul	29-Jul	20
22	Proseed	RR	300 Magnum	2739	**102**	20.1	**42.5**	91	9	46	9-Jul	31-Jul	22
23	Proseed	RR	44 Magnum	2633	**98**	21.3	**41.4**	91	9	42	8-Jul	29-Jul	22
24	Mycogen	RR	Nexera 1016 RR	2346	**87**	22.5	**40.4**	86	8	44	9-Jul	1-Aug	24
25	BrettYoung	RR	6056 CR	2562	**95**	20.7	**41.5**	93	9	46	10-Jul	2-Aug	22
26	BrettYoung	RR	6044 RR	2686	**100**	21.4	**40.0**	90	9	45	11-Jul	4-Aug	25
27	BrettYoung	RR	6070 RR	2767	**103**	19.6	**41.2**	97	9	43	9-Jul	1-Aug	23
28	Wilbur-Ellis	RR	Integra 7150R	2426	**90**	19.7	**42.4**	93	9	41	9-Jul	28-Jul	19
			LSD @ 5% Level	312	**11.6**	1.5	**1.4**	5.4	1	3	2	1	2
			CV	8	8	5	3	4	8	5	12	2	7

[1] Seed Yield corrected to 8.5% moisture

Mean yield = 2694#/acre

[2] All quality on dry matter basis

[3] % ground cover June 22

[4] ESV(early season vigor) on June 22

Planted May 29-2014

Plot size=6' x 27'

Table 2.

2014 Canola Fertility Trial- University of Minnesota

Location: Magnusson Farms west of Roseau, MN

Trt#	N* Rate PPI Urea[1]	Yield as % of Mean[3] 2014	2013	2 Yr. Ave.	% Oil	%Protein	%Ground[4] Cover	Vigor[5] 6/18	7/3	7/18	RCI[6] 7/18	Begin Bloom Date	End Bloom Date	Harvest Height (inches)
1	0	76.1	73.2	74.7	46.0	19.6	69	6.5	6.8	5.5	493	7/8	7/31	38
2	45	91.8	97.0	94.4	45.2	17.6	89	8.0	8.8	7.8	608	7/7	7/31	45
3	90	99.1	96.1	97.6	45.5	19.5	90	8.0	8.8	8.5	617	7/8	7/31	45
4	135	109.7	105.9	107.8	44.3	19.2	91	8.5	9.0	9.0	675	7/9	8/1	47
5	180	106.1	110.6	108.4	43.2	19.9	79	6.5	8.8	8.8	682	7/10	8/2	48
PPI urea only =				102.0										
	Urea/ESN[1]													
6	45	93.5	96.4	95.0	45.7	19.4	86	7.5	8.3	8.0	617	7/8	7/31	42
7	90	94.6	98.2	96.4	44.9	17.8	89	8.0	8.8	8.3	561	7/8	7/31	45
8	135	110.2	109.4	109.8	44.1	20.2	90	8.0	8.8	8.8	644	7/10	8/1	46
9	180	103.9	120.1	112.0	43.7	20.5	80	8.0	8.0	8.8	681	7/10	8/1	45
PPI 50% urea+50% ESN=				103.3										
	Urea[1]													
10	0/45	93.4	101.2	97.3	45.1	18.7	84	7.5	8.3	7.5	659	7/9	8/1	44
11	0/90	102.1	89.8	95.9	44.4	20.0	75	6.5	7.8	8.0	672	7/10	8/1	46
12	0/135	112.1	95.1	103.6	43.8	19.8	76	7.5	8.3	8.3	649	7/10	8/1	46
13	45/45	100.5	111.4	106.0	44.7	18.8	85	7.5	8.5	8.3	593	7/9	8/1	45
14	45/90	103.9	102.0	102.9	44.1	19.4	80	7.5	8.3	8.0	680	7/10	8/2	46
15	45/135	116.0	106.6	111.3	43.3	21.0	90	8.5	8.8	9.0	722	7/10	8/1	47
PPI/Post- urea only =				102.8										
	Urea+Agrotain Ultra[2]													
16	0/45	94.0	94.2	94.1	44.8	18.5	74	6.5	8.0	7.0	703	7/8	8/1	44
17	0/90	105.4	110.3	107.8	43.8	19.8	73	6.5	7.8	7.8	684	7/10	8/2	44
18	0/135	106.4	112.9	109.6	43.5	21.4	75	7.0	7.8	7.8	716	7/11	8/2	45
19	45/45	104.0	95.9	99.9	44.8	19.7	89	8.5	8.8	8.5	670	7/10	8/1	45
20	45/90	106.6	112.4	109.5	43.1	20.7	90	8.0	8.8	9.0	712	7/10	8/1	47
21	45/135	118.4	114.7	116.5	43.6	21.3	90	8.5	8.8	8.8	658	7/10	8/1	47
PPI/Post urea+Agrotain =				106.2										
LSD @5% Level		9.3	15.3	9	1.1	1.9	17	1.7	1.1	1.1	123	1	1	3
CV(%)		7	10		2		14	16	9	10	13	8	2	5
	Trial Mean=	3007	2344											

Experimental design= RCB w/4 replications

Post application urea application means

Urea only=3147 Urea+Agrotain®=3181

[1]N rate-Urea source PPI treatments= all applied at planting time and incorporated with final seedbed prep

PPI urea/ESN= 50%coated Urea(ESN)+ 50% Urea nitrogen source and shallow tilled into soil.

PPI/Post= Urea applied pre-plant incorporate with urea applied postemergence on June 23

[2]Urea+Agrotain Ultra= PPI urea/Post urea+Agrotain

[3] Harvested seed cleaned and corrected to 8.5% moisture

[4]%Ground cover-Visual rating of % of ground covered by plant material

[5] Vigor-1 = poorest; 9 = best

[6]RCI = Relative Chlorophyll Index, higher number = more chlorophyll

Canola variety = Star 514

Plots seeded 5/30/2014

1Pt. Roundup PowerMax+2.5%AMS 6/25/2014

Table 3.

2014 Canola Fungicide Trial - University of Minnesota

Location: Magnusson Farms west of Roseau, MN

Trt.#	Fungicide Treatment/Timing		Product Rate/acre	Yield[1] #/acre	Yield[1] % of mean	% Oil	%Protein	First bloom	End bloom	Harvest Ht.(in.)	ESV[2]
1	No treatment			3242	**99.3**	44.9	18.1	8-Jul	29-Jul	44	9.0
2	Quadris	Early	7 oz.	3240	**99.2**	45.0	19.0	8-Jul	29-Jul	46	9.0
3	Proline	Medium(standard)	5.7oz. Fl	3248	**99.5**	45.2	18.4	8-Jul	29-Jul	44	9.0
4	Priaxor	Late	6oz.	3377	**103.4**	44.0	17.5	8-Jul	29-Jul	45	9.0
5	*Proline-med+ Priaxor late		5.7oz+5.7oz	3250	**99.5**	45.6	19.5	8-Jul	29-Jul	45	9.0
6	*Quadris early+Proline med		7oz.+5.7oz.	3215	**98.5**	45.1	19.2	8-Jul	28-Jul	44	9.0
7	*Quadris early+Proline med+Priaxor late		7oz+5.7oz+5.7oz.	3374	**103.3**	45.7	18.7	8-Jul	29-Jul	45	9.0
8	*Quadris early+Proline med+Priaxor late+Insecticide		7oz+5.7oz+5.7oz.	3173	**97.2**	44.8	18.3	8-Jul	29-Jul	45	9.0
			LSD @5% level	NS	**NS**	1.4	1.5	NS	1	NS	NS
			CV(%)	6	6	2	6	3	3	4	0

0.25% NIS added to all treatments Mean Yield=3265#/acre

Trade name	Common name	Active Ingredient/ac.
Proline 480SC	prothioconazole	4#/gal
Priaxor	fluxapyroxad+pyraclostrobin	1.39#+2.78#/gal
Quadris Flowable	Azoxystrobin	2.08#/gal
Warrior	Lambda-cyhalothrin	1.0 #/gal
Preference	Non-ionic surfactant	90%

[1] Harvested seed cleaned and corrected to 8.5% moisture. Trial mean= 3265 #/acre.

[2] Early Season Vigor 6/22 -1 = poorest; 9 = best

Variety- Star 402 (Star specialty seeds)

Seeding Date=5/29/2014

Plot size- 5' x 27'

Application Timing:

2-early treatment-Quadris 6/18/2014--3 leaf stage

3-standard treatment- Proline 7/15/2014--50%bloom

4-late treatment- Priaxor 7/25/2014--80%-late bloom

5-*Proline + Priaxor

6-*Quadris + Proline

7-*Quadris + Proline + Priaxor

8-*Quadris + Proline + Priaxor (+Warrior 1.5oz. with all treatments)

CO2 backpack sprayer- 18GPA @ 28psi