2012 Minnesota Canola Production Center (CPC)

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

Field Summary and Research Report
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Minnesota Canola Production Center

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SITE INFORMATION – 2012 MN Canola Production Center (CPC)

Location: Approximately, 6 miles NW of Roseau, MN

Cooperator: Rice Farms Incorporated

Previous Crop: Perennial Ryegrass

Soil Test Results:

Macronutrient Level:	
Nitrogen – 0-6 inch	14 #/acre
Nitrogen – 6-24 inch	6 #/acre
Phosphorous -	7 ppm
Potassium -	76 ppm
Sulfur -	21 #/acre

Target Yield:	2000 #/acre
Fertilizer Applied (#/acre):	N – 120; P – 20; K – 20; S – 15
Organic Matter:	3.6%
Soil pH:	7.8

Tillage Operations: The entire field was super coultered (2X) prior to a broadcast fertilizer application. The entire field, except the fertility trial was harrowed and rolled after canola seeding. The fertility trial had the broadcast fertilizer and nitrogen treatments incorporated with an S-tine cultivator with a rolling basket.

Seeding Method: All small plot trials were seeded with a small plot-seeder. The direct harvest trial was broadcast seeded, harrowed and rolled.

Herbicides Applied: A) Clearfield hybrids – Beyond @ 4 fl. oz/ac + NIS 0.25% v/v + AMS @ 15 lbs/100 gal; Select @ 5 fl. oz/ac + OC @1%v/v

B) Liberty Link hybrids – Ignite @ 22 fl. oz/ac + AMS @ 3.0 lbs/ac; Select @ 5 oz/ac + OC 1%v/v

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

Comments: The 2012 growing season will be remembered as one of the warmest and driest in recent memory. The spring started off with several days that reached 70 degrees in March! The warm trend continued and most canola was planted in late April to early May. Daily maximum and minimum temperatures were 3 to 5 degrees above

the five year average for each month during the 2012 growing season. Accumulated rainfall during the growing season (April-September) was 6.74 inches compared to the average of 18.51 (Source: NDAWN - Roseau site). This is a moisture deficit of 11.77 inches! Recorded rainfall was below normal, every month, during the 2012 growing season.

Canola stands were variable depending upon soil moisture level and timely rainfall after planting. All crop stands (canola, barley, wheat) in the area; especially fields seeded in mid-late April and early May were erratic due to the lack of uniform soil moisture at planting. Seeds placed in dry soil didn't emerge until a rainfall event which, often times, was over four weeks after planting. Soil moisture was a critical factor for canola growth and development in the 2012 growing season. Canola planted on course textured, lighter soils tended to have lower yields than heavier ground with a higher moisture holding capacity.

The aster leafhopper, hot dry weather and hail damage were canola production challenges in the 2012 growing season. On the positive side, white mold infestations were limited to not visible in canola due to the hot dry weather.

The public canola trials conducted at the 2012 CPC included:

- Small plot canola variety trial
- Small plot fertility nitrogen source, rate and timing trial
- Small plot date of planting trial
- Large on-farm strip trial to compare swathed vs. direct harvest canola

Limited canola lodging was observed in the 2012 canola growing season. In addition, it appeared that the number of days the canola plant was in full flower was reduced compared to past years. This was especially true on the upper portions of the canola plant. Another observation was bee activity seemed to be not as active as in years past. The hot dry conditions environmental conditions may have been a contributing factor to these general field observations.

Small Plot Variety and Systems Trial

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

Background:
New and emerging technologies in canola varieties have given canola growers several 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 trials.

Methods:
All varieties were seeded at 5 #/acre on May 17, 2012. The experimental design was randomized complete block (RCB) with four replications. Individual plot size was 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. Select was applied on 5/30/12 and Roundup and Beyond were applied on 6/5/12 and Ignite was applied on 6/6/12. All varieties were swathed on 8/10/12, and harvested on 8/30/12. Harvested canola was weighted and a sub-sample taken from each plot for test weight, percent oil content and green count.

Results:
A total of 33 canola varieties were entered in the 2012 CPC. A breakdown of the canola varieties: 24 Roundup Ready, 6 Liberty Link and 2 Clearfield canola entries. Canola yields ranged from 1092 to1943 pounds/acre. The average canola yield over all varieties was 1591 pounds/acre.

The top-yielding canola varieties were Monsanto G13109, Monsanto G08648, Monsanto G08652, DKL70-07, Cropland Genetics HyClass 947 and HyClass 930. Statistical analysis at the 10% level of confidence suggests these 7 canola varieties did not differ significantly in yield.

Percent oil content in this trial was in the mid-to-high 40's. Lodging and green seed counts were low from all varieties which may be an indication of the dry environmental conditions in the 2102 growing season.

Table 1: Relative seed yield, oil content, test weight, and growth characteristics of canola varieties grown in the small plot canola variety trial at Roseau in 2012.

Brand	Entry	Herbicide System[1]	Yield as % of mean[2]	% Oil	Test Weight Lb/Bu.[3]	Early Season Vigor[4]	Begin Bloom Date	End Bloom Date	Maturity[5]	Harvest Height (inches)	Lodging[6]	% Green Seed[7]
Bayer Cro	InVigor L1	LL	76	46.8	52.8	6.5	7/3	7/19	6.3	48	5.3	0.5
Bayer Cro	Exp.159	LL	89	44.5	52.9	6.5	7/3	7/20	6.3	50	2.0	1.4
Bayer Cro	InVigor L1	LL	94	45.8	53.0	8.5	6/30	7/17	5.5	49	2.3	0.6
Bayer Cro	Exp.154	LL	88	46.1	52.7	9.0	7/2	7/18	4.8	47	4.0	0.9
Bayer Cro	Exp.526	LL	69	45.0	52.0	7.0	7/2	7/20	5.8	47	2.3	1.1
Bayer Cro	InVigor L1	LL	83	46.5	52.1	8.0	7/1	7/17	4.8	44	2.3	0.6
Cropland (	HyClass 93	RR	112	49.0	51.9	8.5	6/28	7/13	3.3	44	2.8	0.4
Cropland (	HyClass 94	RR	112	49.2	51.9	9.0	6/29	7/16	4.8	43	3.3	0.5
Cropland (	HyClass 98	RR	98	47.2	51.3	9.0	7/1	7/20	7.0	47	2.0	0.8
Cropland (	HyClass 95	RR	104	48.0	52.0	9.0	6/28	7/14	3.3	39	2.8	0.5
Dow Agro	Nexera 20	CL	92	46.3	52.2	7.0	7/1	7/19	7.5	43	2.5	0.5
Dow Agro	Nexera 20	CL	97	48.0	52.4	9.0	7/1	7/19	7.3	43	2.3	1.1
Dow Agro	Nexera 10	RR	92	46.8	52.8	8.5	7/2	7/16	6.8	44	2.8	0.3
Dow Agro	Nexera 10	RR	103	44.7	52.9	8.5	7/4	7/20	7.3	51	2.0	0.3
Monsanto	DKL30-42	RR	90	46.5	52.2	9.0	6/28	7/14	3.0	38	2.3	1.1
Monsanto	G13109	RR	122	47.9	51.9	8.5	6/30	7/16	4.8	43	4.3	0.5
Monsanto	DKL55-55	RR	110	48.8	51.9	9.0	6/29	7/15	3.8	45	2.8	0.8
Monsanto	G84737	RR	115	48.2	52.3	8.5	7/1	7/16	5.5	41	2.0	0.6
Monsanto	G93765	RR	105	48.6	51.8	8.0	6/30	7/15	5.3	44	2.3	0.6
Monsanto	G08486	RR	100	47.5	52.5	8.5	7/1	7/17	5.5	41	2.5	0.3
Monsanto	DKL30-03	RR	109	48.3	52.0	7.5	6/27	7/13	3.0	40	3.0	0.3
Monsanto	DKL70-07	RR	114	49.4	52.0	9.0	6/30	7/16	4.5	44	2.5	0.9
Monsanto	G08652	RR	117	49.9	51.7	9.0	6/30	7/16	5.0	43	5.0	0.4
Monsanto	G08648	RR	120	49.1	52.3	8.5	6/30	7/15	3.5	43	4.5	0.3
Monsanto	DKL72-55	RR	96	47.8	52.4	7.0	6/29	7/16	5.3	45	3.0	0.4
Monsanto	G95585	RR	109	49.9	51.9	9.0	6/28	7/14	4.0	43	5.0	0.5
Monsanto	G95483	RR	89	48.3	52.2	8.5	6/28	7/14	3.5	41	4.3	0.4
Monsanto	G09149	RR	102	48.1	52.2	8.0	6/29	7/14	4.3	44	2.8	0.3
Pioneer	45 Caliber	RR	93	46.0	51.8	8.5	7/1	7/20	6.5	44	3.0	1
Pioneer	45H31	RR	107	46.9	52.7	8.5	7/2	7/19	7.0	49	1.8	0.4
Pioneer	46S53	RR	97	48.6	52.5	8.5	7/3	7/19	6.5	53	3.8	0.8
Star Specialty Seeds	Star 402	RR	96	49.1	51.9	8.5	6/28	7/16	5.0	46	2.3	1
LSD @ 10% Level			11	0.9	0.2	1.5	1	1	0.9	4	1.1	0.7
CV (%)			9	1.6	0.4	15.7	2	5	14.7	7	32.6	97

[1]RR = Roundup Ready; LL = Liberty Link; CL = Clearfield.

[2]Trial canola seed yields are expressed as a percentage of the trial mean (1591/acre) and corrected to 8.5%moisture

[3]Test weight corrected to 8.5% moisture

[4]Early Plant Vigor 6/9/12: 1 = poorest; 9 = best

[5]Maturity at harvest: 1 = green; 9 = brown

[6]Lodging: 1 = upright; 9 = flat

[7]%Green Seed = Average of 2x100 seed samples per plot

Nitrogen Fertility Trial

Objective:
To evaluate canola yield response to various rates of urea applied at PPI and post emergence (4-5 leaf canola), and in combinations with ESN (environmentally smart nitrogen) applied PPI.

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 to the environment is to have the nitrogen 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, and 2) an early post emergence application of nitrogen. This study was initiated to evaluate the canola yield response to various rates, timings and combinations or urea and ESN.

Methods:
The canola variety DKL-7240 was seeded at 5 #/acre. 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 20 #/acre. A broadcast application of 23-30-40-20 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) was applied at 0, 45, 90, 135 and 180 #/acre. Post emergence urea was 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 8-2-12 and harvested on 8-20-12. Harvested canola was weighted and a sub-sample taken from each plot for test weight, percent oil content and green count.

Results:
The trial was seeded approximately 1 inch deep on May 3, 2012 into warm soils. Topsoil was dry with adequate sub- soil moisture. Limited rainfall was recorded for 4 weeks after planting. A significant amount of the PPI nitrogen was lost as modest increases in canola yields were detected with any PPI nitrogen treatment compared to the untreated. Canola yields for the untreated was in the 703#/acre range compared to in the 900#/acre range for the high rates of nitrogen. The 50/50 blend of urea and ESN gave similar canola yields as the nitrogen rate increased, but top end yields were only in the 900# range. The urea treatments applied post emergence gave the highest canola yields in the trial, especially as the nitrogen rate increased to 135#/acre. Canola yields over 1,600# from nitrogen levels at 45# PPI +135# post. Canola yields were in the high 1300# range from post emergence nitrogen at 135# or 45# PPI + 90 post. The canola yield response to this early post emergence application of nitrogen may warrant further study to improve the nitrogen use efficiency in canola.

Table 2: Seed yield in #/acre and yield as % of mean, oil content, test weight, early season vigor and growth characteristics of DKL 72-40 in the fertility trial at Roseau in 2012.

Trt#	N' Rate PPI Urea[1]	Yield[2] #/acre	Yield as[2] % of mean	% Oil	Test[3] Weight Lb/Bu.	Early[4] Season Vigor	Begin Bloom Date	End Bloom Date	Maturity[5]	Harvest Height (inches)	Lodging[6]	% Green Seed[7]
1	0	789	80	50.4	51.7	6	18-Jun	1-Jul	25-Jul	39	1	0.4
2	45	862	87	50.3	51.8	7.3	19-Jun	2-Jul	27-Jul	42	1	0.1
3	90	715	72	49.7	51.8	6.5	19-Jun	2-Jul	27-Jul	43	1	0.4
4	135	940	95	49.8	52.0	7.3	20-Jun	3-Jul	28-Jul	42	1	0.3
5	180	967	98	48.9	51.9	5	21-Jun	4-Jul	30-Jul	43	1	0.4
	PPI Urea/ESN[1]											
6	0	716	72	50.5	51.8	6.5	18-Jun	1-Jul	25-Jul	40	1	0
7	45	696	70	50.0	51.7	5	18-Jun	1-Jul	26-Jul	42	1	0.3
8	90	815	82	50.3	51.4	6.8	19-Jun	2-Jul	26-Jul	42	1	0.3
9	135	982	99	49.6	52.0	6.8	19-Jun	2-Jul	28-Jul	42	1	0.5
10	180	955	97	49.5	51.9	7	20-Jun	3-Jul	29-Jul	44	1	0.3
	PPI/Post Urea[1]											
11	0	804	81	50.7	51.6	5.5	18-Jun	1-Jul	25-Jul	39	1	0.4
12	0/45	821	83	50.3	51.7	6.8	20-Jun	3-Jul	28-Jul	42	1	0.1
13	0/90	1229	124	49.3	51.9	5.8	21-Jun	5-Jul	30-Jul	44	1	0.3
14	0/135	1375	139	47.8	52.0	5	21-Jun	5-Jul	30-Jul	44	1	0.3
15	45/45	1137	115	49.6	51.8	8.5	20-Jun	3-Jul	29-Jul	45	1	0.1
16	45/90	1395	141	48.2	52.2	7.8	20-Jun	3-Jul	29-Jul	44	1	0.3
17	45/135	1603	162	47.2	52.4	8	21-Jun	5-Jul	30-Jul	43	1	0.1
LSD @5% Level		159	16	0.6	0.2	1.6	1.1	1.5	1.7	2.8	0	0.5
LSD @10% Level		133	13	0.5	0.2	1.3	0.9	1.2	1.5	2.3	0	0.4
CV(%)		11.3	11.3	0.9	0.3	17.4	4	42.6	4.4	4.6	0	129

[1]N rate in PPI treatments wereapplied at planting time and shallow tilled into soil including all source of nitrogen

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

PPI/Post: First number is urea applied before plant and shallow tilled in and the second numberis urea applied June 6

0 N Rate = 25# N(AMS and MAP fertilizer source) other N rates are listed

[2]Harvested seed cleaned and corrected to 8.5% moisture with trial mean = 988#/acre

[3]Test weight corrected to 8.5% moisture

[4]Early Plant Vigor 6/2/2012: 1 = poorest; 9 = best

[5]Maturity date is when the majority of pods are brown

[6]Lodging: 1 = upright, no lodging noted on any plots.

[7]%Green Seed is based on an average of 2x100 seed samples per plot

Date of Planting Trial

Objectives:
The objective of this trial was to evaluate seeding date effect on performance of glyphosate (Roundup Ready) and glufosinate (Liberty Link) herbicide resistant canola systems.

Methods:
Two canola varieties (DK 72-40 RR and Invigor LL-120) were evaluated in a small plot date of planting trial. Dates of planting were: May 3, May 12, May 21, May 31, and June 13th. The experimental design was a RCB design with four replicates. The entire plot area had a background N fertility of 20 #/ac. Plot size was 5 x 20 ft.

Results:
Yields ranged from 1430 to 1726 pounds/acre for the RR and 1142 to 1574 pounds/acre for LL. In the growing conditions of 2012 the RR variety tended to or did produce more canola seed yield at each planting date compared to the LL variety. In addition, the data indicates that the optimum canola seeding date for both canola varieties was June 13. Previous research would indicate that this is later than optimum planting date for canola. However, in the 2012 growing season the late seeding of canola was likely more able to utilize available moisture, didn't have aster yellows and hail damage which was observed with canola seeded in May.

Table 3: Seed yield and relative seed yield, oil content, test weight, harvest moisture and growth characteristics of DKL 72-40 RR and InVigor LL-120 (Liberty Link) hybrids at the date of planting trial at Roseau in 2012.

Trt.	Planting Date	Variety[1]	Yield[2] #/acre	Yield as[2] % of mean	% Oil	Test[2] Wt. Lbs/Bu.	Moisture at harvest	Early Season Vigor[3]	First Bloom Date	Last Bloom Date	Bloom Duration (Days)	Maturity[4]	Harvest Height (inches)	Lodging[5]	% Green Seed[6]	Aster Yellows[7]
1RR	5/3/2012	DKL 72-40RR	1430	98.0	48.6	52.1	5.6	6.0	19-Jun	9-Jul	20	2-Aug	42	1.8	0.3	5
2LL	5/3/2012	Invigor LL-120	1142	78.3	46.5	51.0	6.1	6.0	21-Jun	12-Jul	20	2-Aug	45	2.0	0.5	5
3RR	5/12/2012	DKL 72-40RR	1587	108.8	49.1	52.2	5.6	6.5	27-Jun	15-Jul	18	9-Aug	45	3.8	0.3	5
4LL	5/12/2012	Invigor LL-120	1264	86.6	46.7	51.6	6.0	6.5	29-Jun	18-Jul	19	9-Aug	46	2.3	0.6	5
5RR	5/21/2012	DKL 72-40RR	1677	114.9	49.7	52.1	5.6	9.0	30-Jun	18-Jul	17	18-Aug	43	6.3	0.5	5
6LL	5/21/2012	Invigor LL-120	1245	85.3	46.7	52.5	5.8	9.0	2-Jul	20-Jul	18	18-Aug	47	2.5	0.6	5
7RR	5/31/2012	DKL 72-40RR	1542	105.7	47.2	52.7	5.7	9.0	8-Jul	24-Jul	17	22-Aug	47	3.8	0.5	3
8LL	5/31/2012	Invigor LL-120	1404	96.2	42.7	52.8	6.0	9.0	9-Jul	28-Jul	19	22-Aug	47	3.5	0.9	3
9RR	6/13/2012	DKL 72-40RR	1726	118.3	48.2	52.2	5.0	9.0	18-Jul	2-Aug	16	31-Aug	44	5.8	0.1	1
10LL	6/13/2012	Invigor LL-120	1574	107.9	45.8	50.7	5.1	9.0	21-Jul	6-Aug	16	31-Aug	45	2.3	2.0	1
	LSD @ 5% level		165	11.3	1.7	0.8	0.2	1.0	1.8	2	1.4	0	3.0	1.2	0.7	0
	LSD @ 10% level		137	9.4	1.4	0.6	0.1	0.7	1.1	1.3	1.2	0	2.6	0.8	0.6	0
	CV(%)		7.8	7.8	2.5	1.0	2.0	7.5	2.7	5.2	5.4	0	4.8	20.2	82.0	0

[1]Variety DKL 72-40RR is a glyphosate tolerant variety; Invigor LL-120 is a glufosinate tolerant variety

[2] Yields and test weights corrected to 8.5% moisture wih the trail mean = 1459#/acre

[3]Early season vigor notes taken 3 weeks after planting

[4] Date when majority of the pods have turned brown

[5]Lodging score: 1 = upright; 9 = flat

[6] %Green Seed is based on an average of 2x100 seed samples per plot

[7]aster yellows ratings ; 1= <1% expression, 2 = 1-5% expression and 5 = > 5% expression

Straight Harvest Trial

Objective:
To compare canola yields from swathing and harvesting compared to straight combine harvest. Plans were to include a dissicant as a component of this trial. However, this treatment was not applied as the due to the rapid dry down which caused significant and pod shatter. As a result, a decision was made to direct harvest the canola to minimize additional seed loss.

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" the 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, as compared to conventionally swathing prior to harvest.

Methods:
The experimental design was a RCB with four replications. The canola variety Nexera 1012 was seeded to a rate of 5 #/ac. Treatments included swathing prior to harvest and straight harvest. Canola was swathed on 8/13/12, and harvest of all plots was completed on 8/21/12. Plot size was 20 x 800 ft.

Results:
Canola yields in the large on-farm swathed and direct harvest trial ranged from 1,584 to 2,033 #/acre. Significant pod shatter occurred in the direct harvest canola due to the extreme dry windy weather. In this trial, the swathed canola produced significantly more (449#/acre) canola seed/acre than direct harvest. In addition, the direct harvested canola had higher seed moisture of 17.6% compared to the swathed canola of 7.1%. The results of this trial suggest that, in a dry year, one of the consequences of direct canola harvest of may result in lower yields compared to swathed canola. These results are contrary to previous year's results. The uneven emergence patterns in 2012 and the hot, dry and windy weather was a major factor in the pod and seed shatter, especially the upper portions of the canola plant.

Table 4: Seed yield, test weight, percent oil, % moisture and % green seed of Nexera 1012 RR, harvesting method trial at Roseau in 2012.

Treatment	Yield #/acre[1]	Test Wt.[1]	%Oil	%Moisture	% Green Seed[3]
Conventional Swath/Combine	2033	53.3	46.3	7.1	1.3
Straight Combine	1584	52.6	47.1	17.6	1.5
LSD @ 5% Level	221	0.4	NS	2.0	NS
LSD @ 10% Level	197	0.3	NS	1.3	NS
CV (%)	6.5	0.4	1.7	6.6	61.2

[1]Yield and test wt. corrected to 8.5% moisture

[2]Seed moisture at harvest

[3]2-100 seed samples taken to determine % of green seed