

# **2022 Minnesota Canola Production Center (CPC)**

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

**2022 Research Summary Report**

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The efforts of many individuals, companies, organizations, and agencies make it possible to conduct this field research in support of the canola industry. The products, services, information, and financial support provided by local and regional sponsors are, in large part, responsible for the success of the CPC. This generous support has made the Minnesota CPC 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 for providing the land for canola research trials in 2022.

## **SITE INFORMATION - 2022 MN Canola Production Center (CPC)**

**Location:** Three miles west of Roseau on Hwy 11 and 0.5 miles north

**Cooperator:** Magnusson Farms

**Previous Crop:** Hybrid rye

### **Soil Test Results:**

Nitrogen - 0-6'	4 ppm
Nitrogen - 6-24"	24 ppm
Phosphorous -	4 ppm
Potassium -	73 ppm
Target Yield Goal	2,500#/ac
Fertilizer Applied (#/ac):	N - 140; P - 20; K - 40; S - 20s
%Organic Matter:	2.5
Soil pH:	8.1

**Tillage Operations:** A single pass with a disk in the fall of 2021, followed by a single pass with a cultivator and harrow in the spring of 2022. All plots were rolled after seeding to improve seed-soil contact.

**Fertilizer Applied:** All small plot trials received 140-20-40-20S except the fertility trials. The fertility trials had variable N rates, sources and timings as listed on trial protocols.

**Seeding Method:** Small plot trials were seeded a 5' Hege plot seeder.

**Herbicides Applied:** Section 3 at 4 oz/ac + 1% crop oil + Warrior 1.5 oz/ac was applied to the entire area for general grass and flea beetle control on 6/10/2020. The herbicides listed below were applied to the appropriate canola varieties.

A) Liberty Link (LL) hybrids - Liberty 280SL @ 26 fl. oz/ac + AMS @ 2.5% on 6-22

B) Roundup Ready (RR) and Truflex hybrids - Roundup Power Max @ 16 fl. oz/ac + AMS @ 2.5% on 6-22.

**Fungicides applied:** Proline at 5.7 oz/ac was applied to all plots at first petal drop (approximately 30% bloom) for white mold control.

**Comments:** The spring of 2022 was cold and wet. Cold fronts were the dominate weather pattern as winds from north and northwest were recorded on 20 days in April (NDAWN). Weather records from the National Weather Service in Grand Forks, ND lists April of 2022 as the second coldest on record with an average temperature of 31.8F. Further, the National Weather Service in Grand Forks listed May of 2022 as the 5<sup>th</sup> wettest on record which dates back 140 years. Temperatures in the first half of May were cold, dominated by high pressure systems and winds from the north and northwest (NDAWN). Springs field work finally began in the latter part of May. Canola seeding began on May 25 at the CPC in a field that was tile drained. All canola trials at the CPC had good emergence and early season vigor. Rainfall totals in June were 50% of normal, July was average and August recorded twice the normal rainfall for the Roseau area. Daily high temperatures were normal for most of the canola growing season. However, the daily minimum temperature was average to 10 degrees above normal. (Source: NDAWN). The number of flowering days in the canola variety trial ranged from 15 to 26 days (Table 1).

Early season canola emergence and vigor was good in all canola trials. Flea beetle pressure was high and all plots were sprayed with Warrior. Reports of canola production fields developed flea beetle populations above threshold levels and required a post emergence insecticide treatment. White mold pressure was low in all canola trials. All trials received a preventative application of Proline for white mold control at approximately 30% bloom. Other diseases and insect problems were generally at low levels, except for early season flea beetles. Late season flea beetles were observed feeding on green canola pods, possibly causing some yield loss.

The 2022 CPC was located 3 miles west and 0.5 miles north of Roseau with cooperation of Magnusson Farms. In addition to the CPC three small plot trials were located at the U of MN Magnusson Research Farm located 6 miles northwest of Roseau. Canola trials at the CPC were seeded on May 25 and 26 and at the U of MN Magnusson Farm on May 28.

**The public canola trials conducted at the 2022 CPC included:**

- Small plot canola variety trials
- Small plot canola shatter trial
- Small plot fertility nitrogen source, rate, and timing trial
- Small plot wide row fertility trial
- Small plot micronutrient trial
- Small plot soil applied herbicide trial
- Seed treatment trial for flea beetle control (two locations)

## **Variety and Systems Trial**

### **Objective:**

To evaluate agronomic characteristics of canola varieties with different herbicide production systems (Liberty Link (LL) and Roundup Ready (RR) grown in the environmental conditions of northern Minnesota.

### **Background:**

Canola varieties with new and emerging technology traits have given canola growers several options for weed control. Yield, lodging resistance, maturity, and crop quality are important traits for growers to consider when making canola variety selections. Canola seed companies were invited to submit current and pending varieties for entry in the canola variety trial for comparison in a small plot replicated research trial.

### **Methods:**

Varieties were seeded at 10-12 PLS/ft.<sup>2</sup> on 5/25. The experimental design was a randomized complete block (RCB) with four replications. Fertilizer applied to the entire area was 140-20-40-20s. Individual plot size was 6 x 27', end end-trimmed to a harvest area of 5 x 20'. The LL and RR canola varieties were seeded in separate blocks with buffers to reduce potential herbicide drift. A post emergence grass herbicide (Section 3) was applied for grass control to all plots on 6/10. Warrior at 1.5 oz/ac was added to Section 3 for flea beetle control. Roundup, and Liberty herbicides were applied on 6/22. Proline at 5.7 oz/ac was applied to all plots at first petal drop (approximately 30% bloom) for white mold control. Canola was swathed on 8/25 and harvested on 9/12. Harvested canola was cleaned and weighted and a sub-sample taken from each plot for moisture, percent oil content and other quality factors. Canola yields are adjusted to 8.5% moisture. Additional data collected include early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

### **Results:**

A total of 23 canola lines were entered in the 2022 CPC (Table 1). A breakdown of the canola varieties: 11 RR and 12 LL varieties were evaluated in this small plot replicated research trial. In 2022, canola yields ranged from 2529 to 3,466#/ac with a trial average of 2,900#/ac. The Roundup and Liberty canola varieties were planted in separate blocks in the field. Canola average yield was 3,051#/ac and 2,760#/ac for Roundup Ready and Liberty Link varieties, respectively. The average number of days in bloom was 21.6 for Roundup Ready and 17.4 for Liberty Link. A canola subsample was taken for each plot and a percent protein, percent oil and test weight is presented in Table 1.

Even with the cold and wet spring of 2022 canola yields were better than average. Canola planted in late May into June seeded into warm moist soil resulted in rapid germination and good early season vigor ratings. Moderate temperatures during flowering and limited white mold pressure contributed to the above average canola yields at the CPC in 2022. A CV of 6.1% for canola yield gives a high level of confidence in this data set.

## **Canola Variety - Shatter Trial**

### **Objective**

The ability of canola plant to hold pods and not dehisce (shatter) seed, is a desirable trait in current canola varieties, especially when considering direct harvest. The option to direct harvest canola will eliminate a pass across the field which will save time, reduce production costs, and increase canola acreage where swathers are not available.

### **Background:**

In the last couple years, canola producers have expressed an interest in direct harvest of canola. In 2016, the CPC conducted the first trial to evaluate canola seed shattering and pod drop in the environmental conditions of northern Minnesota. Canola seed companies that entered lines in the variety trial were invited to enter selected varieties in the canola shatter trial.

### **Materials and Methods:**

In 2022, fourteen canola lines were submitted for testing using the canola shatter trial protocol used since 2016. Canola varieties were seeded in 12-inch rows at 9PLS/ft<sup>2</sup> on May 26th. Plots were maintained using best management practices in the same manner as the variety and systems trial. On September 1<sup>st</sup>, two plastic 7" x 13" collection trays were placed between rows (center of plot and 3 feet in from the edge) of each variety. One pan was placed in the front and one in the back of each plot for a total of eight trays/variety. Seed trays were inspected at weekly intervals with the seeds and pods collected from the trays at three dates (9/8, 9/19 and 9/26). Canola seed loss/ac was calculated from both the seed that shattered directly to the ground (seed) and seed contained in the pods which dropped from the plants into the collection pans.

### **Results:**

Collection trays were placed between the canola rows on September 1<sup>st</sup> which was a week after swathing of the canola variety trial. Results in previous year's canola shatter trials indicate that limited seed shatter and pod drop occurred in the first couple weeks, so placement of collection trays were delayed by a week after swathing in 2022. Collection dates in 2022 were: September 8, 19 and 26 (Table 2). Canola seeds, pods and branches that dropped into the collection pans were recorded at all three dates. Total canola seed collection (seeds and pods) on 9/26 (32 days from swathing) ranged from 48 to 384#/ac. Total percent seed loss after the 32 days from swathing ranged from 1.5 to 13.3%. Results from this trial indicate that canola varieties exhibit a wide range of the ability to hold seed and pods. When considering a direct harvest strategy select a canola variety that will reduce the probability of seed shatter and pod drop.

Weather conditions recorded at the NDAWN station at the U of MN Magnusson Research Farm (Fox) during the four weeks of this shatter trial had reported wind speeds of over 20 mph on fourteen days (44% of the time). Measurable rainfall was recorded on 8 days during this shatter trial. The total recorded rainfall was 2.04 inches

with 1.15 recorded on 9/15. Results from this canola shatter trial suggest that canola varieties adapted for direct harvest can withstand wind and rain and keep the majority of the seeds and pods on the plant. The incorporation of pod shatter reduction technology will allow more canola growers to consider a direct harvest strategy for their farms.

## **Nitrogen Fertility Trial**

### **Objective:**

To evaluate canola yield response from various rates of urea alone and a 50/50 blend of urea + ESN applied PPI and a split nitrogen strategy of PPI urea followed by a post emergence (3-5 leaf canola) application of Agrotain coated urea and liquid nitrogen.

### **Background:**

Canola requires high levels of nitrogen and often shows yield increases with high levels of soil available nitrogen. However, spring applied nitrogen is at risk for environmental losses. One strategy to reduce nitrogen losses into the environment is to delay nitrogen applications until just before peak uptake demand by the canola plant. This delay in nitrogen availability can be accomplished by an early post emergence (three to five leaf) application of nitrogen (dry or liquid). This trial was initiated to evaluate the canola yield response to various rates, timings and combinations of urea, ESN and 28% nitrogen.

### **Methods:**

The canola variety CS-2300 was seeded at 12 PLS/ft.<sup>2</sup> on 5/28. Harvested plot size was 5 x 20'. The experimental design was a RCB with four replicates. The entire plot area had a background nitrogen level (0-24 inch) of 21#/ac. All plots received an application of 9-40-40-20s. Nitrogen treatments included PPI only compared to PPI + dry urea, PPI urea + ESN 50/50 blend and PPI urea + Agrotain coated urea or 28% nitrogen applied postemergence. This trial had 13 treatments.

- Untreated (background nitrogen)
- PPI only 60
- PPI only 90
- PPI only 120
- PPI only 160
- PPI + ESN 60 (50/50 blend)
- PPI + ESN 90 (50/50 blend)
- PPI + ESN 120 (50/50 blend)
- PPI + ESN 160(50/50 blend)
- PPI 40 + 40 as Agrotain Ultra applied postemergence
- PPI 40 + 80 as Agrotain Ultra applied postemergence
- PPI 40 + 40 as 28% post applied with streamer nozzles
- PPI 40 + 80 as 28% post applied with streamer nozzles

Agrotain Ultra and 28% liquid nitrogen were applied to canola at the three to five leaf stage on 6/15. All plots were swathed on 8/18 and harvested on 9/2. Harvested canola plots were individually cleaned, weighted and a sub-sample taken for moisture, oil, and

an oil quality assessment. Additional data collected included early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

### **Results:**

Canola yields ranged from 1,350 to 2,238#/ac (Table XX). All fertility treatments gave higher canola yield than the untreated. The LSD (0.05) for canola yield was 530 #/ac. At this confidence level, all nitrogen fertility sources, rates and timings produced similar canola yields except, treatment 6, the 60 pound total nitrogen in a 50/50 blend of urea and ESN which produced an average canola yield of 1,541#/ac. All fertility treatments, except treatment 6, produced canola yields that ranged from 1,859 to 2,179#/ac and were not statistically different from each other. The highest canola yields in this trial were 2,100 to 2,200#/ac which is a little below average and most likely, environmental conditions limited the ability of the canola plants to utilize the increased levels of nitrogen fertility. Average canola yields at the CPC, which was tilled ground, was 2,900#/ac. This trial was conducted at the U of MN Magnusson Research Farm and this trial had several areas of extended ponded water and saturated soil conditions during the growing season. One of the consequences of this saturated soil condition is a CV of 16%, indicating a high level of yield variability based on location.

## **Top dress fertilizer in wide row canola**

### **Objectives:**

To compare fertilizer application methods in canola seeded in wide rows (18 inch).

### **Background:**

The recent advancements in planter technology presents the opportunity for canola fertility to be applied in a band and/or top dressed. Wide row canola 15-22 inch rows present the opportunity for band application of fertilizer. This project will explore band application methods of fertilizer application in canola.

### **Methods:**

Canola variety CS-2300 was seeded at 3.5#/ac in rows spaced 18 inches on 5/28. This small plot trial was a RCB design with four replications. Canola will be managed for a yield goal of 3,000#/ac. The entire plot area had a background nitrogen level (0-24 inch) of 21#/ac. All plots received an application of 9-40-40-20s. Individual plots were 4 rows x 27' and end trimmed to a harvest area of 2 rows x 20'. All treatments had a total nitrogen rate of 140#/ac. Urea (46-0-0) was applied PPI. Post emergence fertility was applied on 6/15. The four treatments in this trial were:

- PPI 140#/ac
- PPI 70#/ac + Agrotain coated urea (70#/ac) applied over the row at 3-5 leaf stage
- PPI 70#/ac + 28% liquid nitrogen (70#/ac) applied between rows (3-5) leaf stage
- PPI 105#/ac +28% liquid nitrogen (35#/ac) applied between rows (3-5) leaf stage



Data to be collected/assessed will include Crop emergence, vigor ratings, days to row closure, days to first flower, end of flower date, maturity date, plant height, lodging, canola yield, and canola seed quality parameters.

**Results:**

Canola yields ranged from 1,625 to 1,949#/ac (Table XX). At the 95% confidence level no differences were detected between applied fertility treatments in this 18 inch canola trial. This trial was conducted at the U of MN Magnusson Research Farm and ponded water and saturated soil conditions were observed during the growing season. Only three reps were harvested in this trial. Canola yields in this trial were below average. Average canola yields at the CPC, which was tilled ground was 2,900#/ac. The CV for canola yield of 24% is in indication of trial variability, most likely ponded water, and saturated soil conditions during the growing season.

**Soil Applied Herbicides in Herbicide Tolerant Canola**

**Objective:**

To demonstrate the effectiveness of soil applied herbicides followed by a post emergence herbicide as a weed control strategy to reduce the potential development of herbicide resistant weeds in the cropping rotation of northern MN.

**Background:**

Most canola acres rely on two herbicides applied postemergence for weed control, either Roundup or Liberty. Relying solely on these two herbicides, especially in tight rotations, increases the chance for developing herbicide resistance. Weed resistance to Roundup is well documented. As an example, the 2022 North Dakota Weed Control Guide list several weeds resistant to Roundup herbicide including: common lambsquarters, kochia, common ragweed and marestail. Recent additions to this list include Palmer amaranth and waterhemp. Due to the widespread use of Roundup and the technology that allow Roundup to be applied to several crops including: canola, corn, and soybeans the identification of herbicide resistant weeds has increased in the last few years. The rapid spread of these herbicide resistant weeds will require additional planning of crop rotations, herbicide choices and a strategy that will include herbicide programs that include multiple modes of action to control these difficult to control Roundup resistant weeds. One of these strategies is to couple a soil applied herbicide with the standard post emergence herbicide for control of these herbicide resistant weeds in canola. With the development of herbicide tolerant weeds occurring more frequently in highly managed agricultural systems, having additional herbicide

options with different modes of action will be of critical importance for weed control options for canola growers.

## **Methods**

Experimental design was a RCB with four replications. The canola variety in this trial was L340PC and was seeded on 5/25. Individual plot size was 6 x 27', end-trimmed to a harvest area of 5' x 20'. Fertilizer applied was 140-20-40-20s and incorporated prior to planting. Individual herbicide plots were staked out and the preplant herbicides (PPI) Sonalan (2 pints/ac) and Trust (1.5 pt/ac) were applied with a backpack sprayer. Stakes were removed and the PPI herbicides were incorporated with a spike tooth harrow. Plots re-staked and seeded according to treatment plan. After planting Prowl H20 at 3.8 (pt/ac) and Spartan (2 oz/ac) was applied preemergence and the entire area was rolled. Section 3 at 4 oz.ac + Warrior at 1.5 oz/ac was applied for general grass and flea beetle control on 6/10. The entire area received an application of Liberty at 26 oz/ac on 6/22. Plots were kept weed free by hand weeding after Liberty application until swathing. Proline at 5.7 oz was applied to all plots at first petal fall (approximately 30% bloom) for white mold control. Canola was swathed on 8/25 and harvested on 9/12. Harvested canola was cleaned, weighted and a sub-sample taken from each plot for moisture, percent oil content and other quality factors. Canola yields were adjusted to 8.5% moisture. Additional data collected included early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

## **Results:**

Yield results and other agronomic data for individual treatments are presented in Table 3. Canola seed yields ranged from 2,588 to 3,382#/ac (Table 5). Spartan applied pre at 2 oz/ac reduced canola yield and stand compared to Liberty alone. Canola yields were reduced from Prowl H20 applied pre. Canola yields were not influenced by Sonalan or Trust applied PPI compared to Liberty alone at the 95% level of confidence. Recorded rainfall three weeks after herbicide application was 2.28 inches. This location was tilled, light textured soil and an organic matter content of 2.5%. Spartan at 2 oz/ac has been used in research plots in the past showing some early season injury but with no yield decline. However, in 2022 the application of Spartan reduced canola yields 794#/ac compared to Liberty alone.

This trial was primarily conducted for herbicide tolerance as weeds were hand pulled throughout the growing season. The results from this trial suggest that soil applied herbicides may have potential for herbicide resistant weeds. Further research will be conducted in which weeds not pulled by hand weeding which would allow the various herbicide treatments will be evaluated for potential enhancement of weed control compared to post emergence treatments alone.

## **Canola Micronutrient Trial**

### **Objective:**

The objective of this trial was to evaluate several micronutrients applied to flowering canola.

### **Background:**

A high canola yield goal and intensive crop production management increases the probability that micronutrients will limit crop yields compared to crop production systems using average management strategies. The canola yield goal in this trial was 3,000#/ac which is a high, but attainable, canola yield goal for northwest Minnesota. A complete soil analysis in the spring of 2022 indicated that boron, copper, and zinc were testing in the medium to low category based on a 3,000#/ac yield goal.

### **Methods:**

The canola variety CS-2300 RR was seeded at 12 PLS/ft.<sup>2</sup> on 5/26. Fertility applied was a 140-20-40-20s. Plot size was 6 x 27', end trimmed to a harvest plot size of 5 x 20'. The experimental design was a RCB with four replicates. Section 3 at 4 oz./ac + Warrior at 1.5 oz./ac was applied for general grass and flea beetle control on 6/10. Liberty was applied at 22 oz./ac on 6/22. The micronutrients were applied on 7/7 to canola that was in the late bolt to early bloom stage. The seven treatments included: Nachurs 9% Zn (2 pints/ac), Gowan Badge copper (1 pt/ac), Ele-max Sulfur (2 pints/ac), 10-34-0 (1 gallon/ac), Nachurs Boron 10% (2 pints/ac) a combination of all micronutrients and an untreated. Tissue samples were collected 10 days after micronutrient application and sent to AGVISE Labs for analysis. All plots were swathed on 8/30 and harvested on 9/13. Harvested canola plots were individually cleaned, weighted and sampled for moisture and oil content. Additional data collected included early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

### **Results:**

Canola yields in the untreated averaged 2,855#/ac which would be considered an above average yield for the growing conditions of northwest MN (Table 6). Canola yields in this trial ranged from 2,772 to 2,922#/ac. The statistical analysis for yield was non-significant at the 95% confidence level. Soil test levels on all the nutrients applied were low to very low (except for sulfur). On this basis, the treatments were applied. The background tissue micronutrient analysis just prior to treatment (7/5) indicate that all micronutrients were above the lower threshold level. The one exception was zinc which was at the low end of the sufficiency range (22). Data collected on tissue samples 14 days after treatment did show increased levels of zinc, copper, and boron of these treatments in the plant but had no significant yield impact.

## **Canola Seed Treatment Trials**

### **Objective:**

The objective of this trial was to evaluate several commercially available canola seed treatments for early season flea beetle control.

### **Methods**

This trial was conducted at two locations in 2022. One site was at the CPC with the other at the U of MN Magnusson Research Farm (MRF). Untreated Starflex RR canola seed was sent to a lab of the Bayer Corporation to have the various seed treatments applied to the canola seed. The following are the nine treatments and the seed treatment rate applied/kg of canola seed.

<b><u>Trt#</u></b>	<b><u>Treatment</u></b>	<b><u>Rate (100 kg)</u></b>
1	EverGol Prime	21ml
2	Prosper EverGol	1.4L
3	Prosper EverGol+Buteo Start FS480	1.4L+625ml
4	Prosper EverGol +Fortenza	1.4L+500 ml
5	Prosper EverGol+Buteo+Fortenza	1.4L+625ml+500ml
6	Helix Vibrance+Fortenza	1.5L+500ml
7	Helix Xtra Vibrance	1.5L
8	No Treatment	0
9	Helix Xtra Vibrance+Lumiderm	1.5L+500ml

Experimental design was a RCB with four replications. The canola variety in this trial was Starflex RR. Canola planting date at the CPC was 5/26 and at U of MN Magnusson Research Farm on 5/28. Individual plot size was 6 x 27', end-trimmed to a harvest area of 5' x 20'. Fertilizer applied was 140-20-40-20s and incorporated prior to planting. Section 3 at 4 oz/ac + Warrior at 1.5 oz/ac was applied for general grass and flea beetle control on 6/10 at the CPC and 6/17 at the MRF. Roundup was applied for general weed control at approximately 28 days after planting. Proline at 5.7 oz was applied to all plots at first petal fall (approximately 30% bloom) for white mold control. The CPC canola was swathing date 8/25 with a harvest date of 9/13. The canola at the MRF was swathed on 8/31 and harvested in 9/13. Harvested canola was cleaned, weighted and a sub-sample taken from each plot for moisture, percent oil content and other quality factors. Canola yields were adjusted to 8.5% moisture. Additional data collected included; early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

### **Results:**

Flea beetle pressure was moderate to high at the CPC and very high at the U of MN MRF. Warrior at 1.5 oz/ac was applied at both locations. The foliar insecticide was applied at 15 days after planting (DAP) at the CPC and 21 DAP at the MRF. Warrior application was delayed at the U of MN MRF to determine if the soil applied seed

treatments would hold, but after three weeks after planting a decision was made to apply Warrior.

Canola yield results and other agronomic data for individual treatments are presented in Table 4 for the CPC and the MRF. At the CPC, canola seed yield averaged 3,115#/ac for the untreated. All treatments produced similar canola seed yields as the untreated, except treatment #9 Helix Extra Vibrance + Lubriderm which produced 239#/ac more canola seed yield than the untreated. A timely application of Warrior insecticide at 15 DAP resulted in the production of over 3,000#/ac for all treatments.

The high flea beetle pressure and delayed Warrior application produced different results at the MRF than the CPC location. The application of Warrior was made at 21 DAP at the MRF compared to at 15 DAP at the CPC. The untreated (bare seed) canola seed yield averaged 362#/ac. A fungicide only seed treatment (EverGol Prime) averaged 405#/ac. Prosper EverGol and Helix Extra Vibrance produced an average of 619 and 513#/ac, respectively. Seed treatments that contained Buteo produced canola yields over 3,000#/ac. Canola vigor ratings at 21 DAP were a good predictor of canola yield at this location.

The results of this trial indicate that under heavy flea beetle pressure a seed treatment package that includes Buteo, Fortenza or Lubriderm will be needed in addition to a foliar insecticide treatment to produce top end canola yields.

# **2022 Canola Production Center Research Data Summaries for Northwest Minnesota**

This summary and previous annual research summaries are on the Web at:  
<http://www.mncanola.org/CPC.php>

***Table 1. Variety Trial***

***Table 2. Variety Trial Oil Seed Components***

***Table 3. Shatter Variety Trial***

***Table 4. Seed Treatment Trial***

***Table 5. Preemergent Herbicides Applications***

***Table 6. Micro Nutrient Trial***

***Table 7. Nitrogen Use Efficiency***

***Table 8. Wide Row Nitrogen Applications***

Table 1.

**2022 Canola Variety Trial**  
**Magnusson Farm-3 mi. NW of Roseau,Mn**

Entry#	Company	Variety	Herbicide Tolerance*	#/acre <sup>1</sup>	Protein <sup>2</sup>	Oil <sup>2</sup>	Test wt./bu.	Lodging <sup>3</sup>	%			Begin Bloom Date	End Bloom Date	Days of bloom	
									Harvest Height (in)	Ground Cover- 21DAP	ESV- 21DAP <sup>4</sup>				
1	CROPLAN	CP9978TF	TF	2939	19.8	46.4	51.8	3.0	52	63	6.0	4-Jul	30-Jul	26	
2	Star Specialty Seed	StarFlex	TF	3466	18.6	46.7	51.8	1.5	49	90	9.0	3-Jul	26-Jul	23	
3	Pioneer	45M35	RR	3169	17.0	48.6	51.3	2.5	54	86	8.5	6-Jul	25-Jul	19	
4	Nuseed	NC155 TF	TF	3117	20.2	46.9	51.9	1.0	53	76	7.5	3-Jul	25-Jul	22	
5	Nuseed	NC471 TF	TF	2648	19.6	47.5	51.7	2.5	55	64	6.0	4-Jul	25-Jul	21	
6	Nuseed	NC527CR TF	TF	2899	19.3	47.6	50.0	2.0	52	81	8.0	5-Jul	27-Jul	22	
7	BrettYoung	BY 6211TF	TF	3191	19.9	47.3	52.1	1.5	49	84	8.0	4-Jul	27-Jul	23	
8	BrettYoung	BY 6217TF	TF	3161	19.6	48.0	51.3	1.0	58	94	9.0	8-Jul	29-Jul	21	
9	CANTERRA SEEDS	CS3000 TF	TF	3016	18.0	47.3	51.5	3.0	52	86	8.5	2-Jul	24-Jul	22	
10	Wilbur Ellis	Integra 7361RC	RR	3096	19.8	46.8	51.8	3.5	53	70	6.0	6-Jul	26-Jul	20	
11	BASF	InVigor LR344PC	LL+RR	2857	19.8	46.8	51.6	3.0	53	60	5.5	7-Jul	26-Jul	19	
<b>RR/TF only</b>				<b>LSD @ 5% level</b>											
				<b>CV(%)</b>											
				<b>250</b>											
				<b>5.6</b>											
12	CANTERRA SEEDS	CS4000 LL	LL	2884	19.2	47.9	51.7	4.5	56	79	7.0	6-Jul	23-Jul	17	
13	BASF	InVigor L233P	LL	2688	19.3	46.6	51.2	4.0	52	76	7.0	6-Jul	22-Jul	16	
14	BASF	InVigor L340PC	LL	2531	19.7	44.8	50.5	3.0	52	86	8.0	5-Jul	23-Jul	18	
15	BASF	InVigor L343PC	LL	2747	19.4	45.7	50.4	3.5	51	84	8.0	6-Jul	23-Jul	17	
16	BASF	InVigor LR344PC	LL+RR	2704	19.7	46.4	51.6	4.0	54	74	6.5	9-Jul	25-Jul	16	
17	BASF	InVigor LR356PC	LL	2922	20.0	46.1	51.3	4.0	55	86	8.0	9-Jul	27-Jul	18	
18	CROPLAN	CP7130LL	LL	2529	18.9	48.0	50.6	3.0	54	94	9.0	6-Jul	23-Jul	17	
19	CROPLAN	CP7144LL	LL	2588	20.9	47.7	50.4	4.0	53	91	8.5	7-Jul	22-Jul	15	
20	Dekalb	DKTFLL21SC	LL+TF	2776	18.7	47.3	51.5	2.0	52	86	8.5	4-Jul	25-Jul	21	
21	Dekalb	DKLL82SC	LL	2830	19.6	46.2	51.7	2.5	52	93	8.5	5-Jul	26-Jul	21	
22	Dekalb	DKLL83SC	LL	2981	18.3	48.4	51.1	2.5	52	86	9.0	3-Jul	21-Jul	18	
23	Pioneer	P506ML	LL	2944	19.3	47.0	50.6	3.5	56	91	9.0	7-Jul	22-Jul	15	
<b>LL only</b>				<b>LSD @ 5% level</b>											
				<b>CV(%)</b>											
				<b>261</b>											
				<b>6.5</b>											
				<b>LSD @ 5% level</b>	252	1.0	1.1	0.3	1.9	5	14.3	1.4	1	2	2
				<b>10% level</b>	210	0.9	0.9	0.2	1.6	4	11.9	1.2	1	2	2
				<b>CV(%)</b>	6.1	3.8	1.7	0.4	49	7	12	13	12	6.8	8
Trial Mean=				2900											
Mean of RR/TF only varieties=				3051											
Mean of LL only varieties=				2760											

Experimental Design: RCB w/4reps

Seeding rate=12PLS/Ft.<sup>2</sup>

Planting Date- 5/25/2022

\*Herbicide Tolerance--LL=Liberty Link, RR=Roundup Ready,  
and TF=TruFlex Roundup Ready<sup>1</sup>Clean Seed Yields corrected to 8.5% moisture.<sup>2</sup>Protein and oil reported on dry matter basis.<sup>3</sup>-Lodging-1=upright;9=flat.<sup>4</sup>ESV(early season vigor) 21 days after planting 9= best;1=least.

Fertilizer application- 140-20-40-20s applied PPI 5/24/2022.

Past crop= cereal rye on tilled ground-conventional tillage.

Table 2.

**2022 Canola Variety Trial**  
**Magnusson Farm-3 mi. NW of Roseau,Mn**

Entry#	Company	Variety	Tolerance	#/acre <sup>1</sup>	Protein <sup>2</sup>	Oil <sup>2</sup>	Palmitic acid Dry basis	Stearic acid Dry basis	Oleic acid Dry basis	Linoleic acid Dry basis	Linolenic acid Dry basis	Erucic acid Dry basis	Glucosinolates Dry basis	Eicosenoic acid As is
1	CROPLAN	CP9978TF	TF	2939	19.8	46.4	4.1	1.8	53.8	21.0	9.8	0.4	33	1.0
2	Star Specialty Seed	StarFlex	TF	3466	18.6	46.7	4.1	1.9	53.1	20.6	9.7	0.4	30	0.7
3	Pioneer	45M35	RR	3169	17.0	48.6	4.0	2.1	52.5	18.6	8.3	0.0	19	0.6
4	Nuseed	NC155 TF	TF	3117	20.2	46.9	4.2	1.9	57.2	18.5	7.8	0.1	11	1.3
5	Nuseed	NC471 TF	TF	2648	19.6	47.5	4.2	1.9	65.8	17.9	8	0.6	15	1.5
6	Nuseed	NC527CR TF	TF	2899	19.3	47.6	4.2	1.8	71.5	18.1	8.4	1.1	11	1.2
7	BrettYoung	BY 6211TF	TF	3191	19.9	47.3	4.2	1.7	57.0	20.9	10.2	0.1	27	0.8
8	BrettYoung	BY 6217TF	TF	3161	19.6	48.0	4.1	1.7	71.9	18.4	9.2	0.8	22	2.0
9	CANTERRA SEEDS	CS3000	TF	3016	18.0	47.3	3.9	2.0	50.8	19.7	9.1	0.0	22	0.4
10	Wilbur Ellis	Integra 7361RC	RR	3096	19.8	46.8	4.2	1.8	54.2	19.6	9.4	0.2	18	0.9
11	BASF	InVigor LR344PC	LL+RR	2857	19.8	46.8	4.2	1.8	72.8	19.0	8.7	0.9	12	1.6
12	CANTERRA SEEDS	CS4000 LL	LL	2884	19.2	47.9	4.2	1.9	60.6	19.1	8.6	0.0	17	1.0
13	BASF	InVigor L233P	LL	2688	19.3	46.6	4.2	1.9	70.2	18.1	7.6	1.2	8	1.9
14	BASF	InVigor L340PC	LL	2531	19.7	44.8	4.4	1.9	70.2	18.1	7.7	1.7	10	1.3
15	BASF	InVigor L343PC	LL	2747	19.4	45.7	4.3	1.8	70.9	18.7	8.4	1.2	11	1.5
16	BASF	InVigor LR344PC	LL+RR	2704	19.7	46.4	4.2	1.8	71.6	19.0	8.8	1.3	11	1.5
17	BASF	InVigor LR356PC	LL	2922	20.0	46.1	4.3	1.8	71.3	18.3	8.5	0.9	9	1.8
18	CROPLAN	CP7130LL	LL	2529	18.9	48.0	4.3	1.9	72.9	17.5	7.9	1.2	13	0.8
19	CROPLAN	CP7144LL	LL	2588	20.9	47.7	3.9	1.9	74.3	17.3	8.3	0.5	16	1.1
20	Dekalb	DKTFLL21SC	LL+TF	2776	18.7	47.3	4.1	1.9	51.2	20.2	9.3	0.0	28	1.2
21	Dekalb	DKLL82SC	LL	2830	19.6	46.2	4.0	1.9	50.6	20.2	9.4	0.1	32	1.3
22	Dekalb	DKLL83SC	LL	2981	18.3	48.4	4.2	1.8	59.5	19.4	9.5	0.7	24	0.8
23	Pioneer	P506ML	LL	2944	19.3	47.0	4.4	1.9	73.6	17.9	8.3	1.2	14	0.4
		LSD @ 5% level		252	1.0	1.1	0.1	0.1	5.0	0.4	0.5	0.5	3	0.3
		10% level		210	0.9	0.9	0.1	0.1	4.2	0.3	0.4	0.4	2.8	0.3
		CV(%)		6.1	3.8	1.7	1.1	4	5.6	1.5	3.9	64	13	21

Seeding rate=12PLS/Ft.<sup>2</sup>

Experimental Design: RCB w/4reps

\*Herbicide Tolerance--LL=Liberty Link, RR=Roundup Ready,  
and TF=TruFlex=Next level Roundup Ready

Trial was blocked by herbicide tolerance - 1-9 Roundup and 10-21 Liberty Link in each rep.

<sup>1</sup>Clean Seed Yields corrected to 8.5% moisture.

Trial Mean yield =2900#/acre

<sup>2</sup> Protein and oil reported on dry matter basis.



Table 3.

## 2022 Canola Shattering Variety Trial

### Magnusson Farms-3 Mi. NW of Roseau,Mn

Variety	Company	Herbicide tolerance	Yield <sup>1</sup> lb/acre	% Seed Lost <sup>2</sup>	<b>All Source Seed Loss</b>			Source of seed loss by date(#/acre)								
					<b>Total<sup>4</sup></b>	seed <sup>5</sup>	pod <sup>6</sup>	Total seed lost by date(#/acre)			9/8			9/19		
								9/8	9/19	9/26	9/8 seed <sup>5</sup>	9/8 pod <sup>6</sup>	9/19 seed <sup>5</sup>	9/19 pod <sup>6</sup>	9/26 seed <sup>5</sup>	9/26 pod <sup>6</sup>
InVigor L340PC	BASF	LL	2531	3.1	<b>78</b>	52	26	0	30	76	0	0	28	2	54	22
InVigor LR344PC	BASF	LL+RR	2704	3.0	<b>80</b>	48	30	2	18	58	2	0	18	0	28	30
CP7130LL	Cropland	LL	2529	9.8	<b>248</b>	170	78	18	58	174	18	0	36	22	116	58
CP7144LL	Cropland	LL	2588	7.8	<b>202</b>	112	90	8	20	174	6	2	20	0	86	88
DKTFLL21SC	Dekalb	LL+TF	2776	5.9	<b>164</b>	96	70	10	14	140	8	2	14	0	74	66
DKLL82SC	Dekalb	LL	2830	3.7	<b>106</b>	48	58	2	10	94	2	0	10	0	38	58
DKLL83SC	Dekalb	LL	2981	4.2	<b>124</b>	54	68	20	18	86	6	14	18	0	30	54
CP9978TF	Cropland	TF	2939	2.6	<b>76</b>	38	38	2	24	52	2	0	20	4	18	62
NC471 TF	Nuseed	TF	2648	13.3	<b>352</b>	234	120	26	54	274	24	2	46	8	164	110
NC527CR TF	Nuseed	TF	2899	13.2	<b>384</b>	224	160	6	76	302	6	0	62	14	156	146
Integra 7361RC	Wilbur Ellis	RR	3096	3.9	<b>122</b>	46	76	6	36	80	0	0	8	28	32	50
StarFlex	Star Specialty Seed	TF	3466	5.2	<b>180</b>	106	74	12	34	136	6	6	22	10	78	58
BY 6211TF	BrettYoung	TF	3191	1.5	<b>48</b>	42	6	2	16	30	2	0	16	0	26	6
BY 6217TF	BrettYoung	TF	3161	2.7	<b>84</b>	40	44	0	22	62	0	0	16	6	24	38
	LSD @ 5% level		<b>252</b>		122	76	59	7	29	102	4	4	22	15	60	50
	LSD @10% level		<b>210</b>		102	64	49	6	24	85	4	3	19	13	50	41
	CV(%)		<b>6.1</b>		107	112	124	116	132	115	97	281	132	313	128	119

Experimental Design-RCB with 4 reps

Shattered seed collected in 2 - 7" x 13" trays/plot.

Seeding rate(12" row)=9PLS/Ft.<sup>2</sup>

2 Shatter pans placed in each plot 9/1/2022.

<sup>1</sup> Yields taken from the variety trial.

<sup>2</sup> % of total seed lost/total seed harvest in variety trial

<sup>4</sup> Total #/acre of lost seed. Cumulative pod seed + shattered seed lost through 9/26.

<sup>5</sup>Seed shattered directly from the plant to the ground collection pans.

<sup>6</sup>Seed contained in pods and branches dropped from the plant to the ground collection pans.



Table 5.

## 2022 Canola Preemergent Herbicide Screen Magnusson Farms-3 Mi. NW of Roseau,Mn

TRT#	Treatment	Soil applied	#/acre <sup>1</sup>	% Stand 7-7-2022	Protein <sup>2</sup>	Oil <sup>2</sup>	Test wt./bu.	Lodging <sup>3</sup>	Harvest Height (in)	Begin Bloom Date	End Bloom Date	Days of bloom
1	Liberty Only		<b>3382</b>	<b>95</b>	20.1	44.2	50.8	1	55	6-Jul	27-Jul	21
2	Prowl H2O	3pt PRE	<b>2828</b>	<b>95</b>	19.7	44.5	50.7	1	55	6-Jul	27-Jul	21
3	Spartan	2 oz. PRE	<b>2588</b>	<b>60</b>	20	43.7	51.0	1	54	11-Jul	31-Jul	20
4	Sonalan HF 3#/gal	2PT PPI	<b>3123</b>	<b>93</b>	19.7	44.5	51.0	2	55	6-Jul	27-Jul	21
5	Trust(Treflan) 4#/gal	1.5PT PPI	<b>3133</b>	<b>90</b>	19.6	44.6	50.8	1	56	7-Jul	27-Jul	21
	LSD @ 5% level		<b>406</b>	<b>13</b>	NS	0.5	0.6	NS	2	1	1	NS
	10% level		<b>332</b>	<b>10</b>	0.5	0.3	0.5	NS	2	1	1	NS
	CV(%)		8	9	1.9	0.5	0.8	40	3	10	3	3

Experimental Design:RCB w/ 4reps

PPI treatments applied and harrowed in 5/25

All plots seeded 5/26 and Spartan applied immediately after.

<sup>1</sup>Clean Seed Yields corrected to 8.5% moisture.

<sup>2</sup> Protein and oil reported on dry matter basis.

<sup>3</sup> Lodging-1=upright;9=flat.

Variety= L340PC

All plots received 26oz./Acre Liberty on 6/22

TRT#	Soil applied herbicide	Common Name	Rate/acre	#Ai/Gal	timing
1	None				
2	ProwlH2O	pendamethalin	3PT.	3.8	Preemerge
3	Spartan 4F	sulfentrazone	2 oz.	4	Preemerge
4	Sonalan HFP	ethofluralin	2PT	3	PPI
5	Trust(Treflan)	trifluralin	1.5PT	4	PPI

Table 6.

**2022 Micronutrients applied Post Emergent to Canola  
Magnusson Farms-3 Mi. NW of Roseau,Mn**

plants sampled 7-20-2022 -GS= full bloom- 14 DAT																							
Trt#	Treatment	Rate	#/acre <sup>1</sup>	Protein <sup>2</sup>	Oil <sup>2</sup>	Test wt./bu.	Lodging <sup>3</sup>	Harvest Height (in)	Begin Bloom Date	End Bloom Date	Days of bloom	RCI	%N	%P	%K	%S	%Ca	%Mg	Zn-ppm	Fe-ppm	Mn-ppm	Cu-ppm	B-ppm
1	Boron	2pt	2840	17.2	48.6	51.3	3	61	9-Jul	2-Aug	24	268	4.5	0.33	1.9	1.3	4.2	1.1	50	74	101	8.3	20.5
2	10-34-0	1 gallon	2803	17.3	48.5	51.4	3	61	9-Jul	4-Aug	25	309	4.6	0.33	1.8	1.3	4.4	1.1	52	76	104	9.3	17.8
3	Sulfur	2pt	2779	17.4	48.6	51.3	3	62	9-Jul	3-Aug	24	257	4.5	0.34	1.9	1.2	4.4	1.1	54	75	109	8.8	16.8
4	Copper	1pt	2772	17.2	48.9	51.3	3	60	9-Jul	3-Aug	24	282	4.4	0.31	1.8	1.4	4.6	1.2	51	73	104	9.0	16.3
5	Zinc	2pt	2922	17.4	49.0	51.3	3	60	9-Jul	3-Aug	24	280	4.4	0.33	2.0	1.2	4.6	1.2	62	77	116	8.8	17.8
6	combine 1-5		2748	17.2	49.0	51.3	3	59	9-Jul	3-Aug	24	272	4.6	0.33	1.8	1.2	4.5	1.1	47	73	101	11.5	19.5
7	No treatment		2855	17.4	48.9	51.3	3	61	8-Jul	3-Aug	25	276	4.5	0.32	1.8	1.2	4.4	1.1	47	74	109	8.8	17.3
	LSD @ 5% level		NS	NS	0.5	0.1	NS	3	1	1	1	49	0.32	0.03	0.14	0.23	0.36	0.13	8.8	6.1	8.7	2.7	3.5
	10% level		190	NS	0.4	0.1	NS	NS	1	1	1	41	0.26	0.03	0.12	0.20	0.30	0.10	7.3	5.0	7.1	2.3	2.9
	CV(%)		4.5	1.9	0.7	0.2	0	3.1	5.8	2.4	3.5	11.9	4.8	7	5.3	12.6	5.4	7.9	11.5	5.5	5.5	20.1	13

Experimental Design:RCB w/ 4reps      Planting date=5/26/2022      **Plant Tissue**      2022 Micronutrient Canola Background 7-5-2022-GS=first flower

Canola variety=CS-2300 RR      Background      4.8      0.29      2      0.89      2      0.55      22      60      64      4.3      9.5

All applications made 7/7/2022      **Soil Background**      ph      OM      N-0-24"      P-O ppm      K ppm      sulfur      Ca ppm      Mg ppm      Zn ppm      Fe ppm      Mn ppm      Cu ppm      B ppm

9am 68F NNE4-10 71%RH full sun      5/19/2022 0-6"      8.1      2.50%      25#/ac      4      73      16#/ac      4227      633      0.3      20.2      2.98      0.35      0.64

GS=Bolt-first flower 6' backpack sprayer-18GPA      Interpretation      Low      V Low      Low      Medium      High      High      V Low      High      High      Low      Low

- 1 Nachurs Boron 10%      2 pts
- 2 Nachurs 10-34-0      1 gal
- 3 Ele-max Sulfur LC 10-5-0-10s-.4b      2 pt
- 4 Badge Copper hydroxide+copper oxychloride      1pt
- 5 Nachurs Nutri-sync Zinc 4-0-0-9z      2 pt
- 6 6 Combine all trrts 1-5
- 7 7 No treatment

5.7 oz. Proline + .25%NIS 7-13-2022  
4oz Section 3+1.5oz. Warrior 6-10-2022

Table 7.

**2022 Canola Nitrogen Use Efficiency Trial**  
**Magnusson Farms-3 Mi. NW of Roseau, Mn**

	Total Nitrogen added	PPI-urea <sup>1</sup>	PPI-ESN <sup>1</sup>	# N Post emerge <sup>2</sup>	#/acre <sup>3</sup>	Test wt./bu.	% Ground Cover- 21DAP	ESV- 21DAP <sup>4</sup>	Begin Bloom Date	End Bloom Date	Harvest Height (in)	Lodging	RCI	Protein <sup>5</sup>	Oil <sup>5</sup>	
1	0	0	0	0	0	<b>1350</b>	51.4	80	8	12-Jul	12-Aug	59	3.0	319	19.7	44.8
2	60	60	0	0	0	<b>2071</b>	51.6	80	8	13-Jul	13-Aug	58	4.3	355	21.6	42.6
3	90	90	0	0	0	<b>1902</b>	51.8	75	7	13-Jul	13-Aug	58	4.3	409	21.9	41.9
4	120	120	0	0	0	<b>2179</b>	51.8	60	6	14-Jul	13-Aug	59	3.7	491	22.7	40.8
5	160	160	0	0	0	<b>1883</b>	52.0	70	7	14-Jul	13-Aug	60	5.7	372	23.1	40.7
6	60	30	30	0	0	<b>1541</b>	51.6	90	9	12-Jul	11-Aug	63	3.7	355	20.5	43.9
7	90	45	45	0	0	<b>1908</b>	51.7	85	8	13-Jul	12-Aug	58	6.3	413	23.0	40.6
8	120	60	60	0	0	<b>2099</b>	51.7	80	8	13-Jul	13-Aug	59	5.0	440	23.4	40.6
9	160	80	80	0	0	<b>2071</b>	51.8	50	4	15-Jul	13-Aug	58	4.3	433	23.2	40.7
10	90	40	0	50#N+Agrotain Ultra	<b>1927</b>	51.6	90	9	11-Jul	12-Aug	58	3.7	305	21.4	42.7	
11	120	40	0	80#N+Agrotain Ultra	<b>2238</b>	51.6	60	6	14-Jul	12-Aug	58	3.7	443	22.3	41.9	
12	90	40	0	50#N- 28% UAN	<b>1859</b>	51.8	75	7	13-Jul	12-Aug	58	3.0	437	22.9	40.6	
13	120	40	0	80#N- 28% UAN	<b>2155</b>	51.4	55	6	14-Jul	13-Aug	59	3.0	497	23.0	40.2	
				LSD @5% level	<b>530</b>	0.5	35	4	3	2	4	3	138	1.9	2.4	
				CV(%)	<b>16</b>	1	22	24	11	6	5	43	16	4	3	

Experimental Design: RCB with 3 reps\*

Treatments 10-13= only 2 reps due to poor stand

9-40-40-20s added to all plots

Variety= CS-2300 planted May 28,2022

<sup>1</sup>PPI- urea and ESN applied 5/27 prior to final seedbed prep

<sup>2</sup> Treatments 10-13 made 6/15/2022 at 4 leaf stage

Treatments 10&11 = urea + Agrotain Ultra

Treatments 12&13= 28% UAN Liquid fertilizer applied with

3 nozzel streamer @ 22gpa

<sup>3</sup>Yield- clean seed #/acre corrected to 8.5% moisture

<sup>4</sup>ESV-Early season vigor visual rating 1=poor; 9=best

<sup>5</sup>oil and protein on dry matter basis

Table 8.

**2022 Canola Wide Row Fertility Trial**  
**Magnusson Farms-3 Mi. NW of Roseau,Mn**

Trt#	Total Nitrogen added	PPI-Urea <sup>1</sup>	Post Application <sup>2</sup>	Yield <sup>3</sup> (#/acre)	Test wt./bu.	Protein <sup>4</sup>	Oil <sup>4</sup>	% Ground Cover- 21DAP	ESV- 21DAP <sup>5</sup>	Begin Bloom Date	End Bloom Date	Harvest Height (in)	RCI <sup>6</sup>
1	140	140	None	<b>1625</b>	51.5	22.2	41.8	60	6.3	13-Jul	12-Aug	57	366
2	140	70	70#N-urea+Agrotain	<b>1811</b>	51.3	23.1	39.9	63	7.0	12-Jul	12-Aug	56	361
3	140	70	70#N-28%UAN	<b>1949</b>	51.1	22.6	41.3	70	7.7	13-Jul	12-Aug	57	403
4	140	105	35#N-28%UAN	<b>1786</b>	51.2	21.9	41.7	73	8.3	12-Jul	11-Aug	56	393
LSD @5% level				<b>NS</b>	NS	NS	NS	12	1.5	1	1	NS	NS
CV(%)				24	1	4	2	9	10	5	6	4	9

Experimental Design: RCB with 3 reps

Total Fertility Rate to all plots= 140-40-40-20S

18" Rows--planted 5/28/2022 @ 9PLS/ft.2

Variety= CS-2300RR planted 5/28/2022

<sup>1</sup>Nitrogen -Urea broadcasted 5/27/2022 prior to final seedbed prep before planting

<sup>2</sup>Post emergent applications 6-15-2022 to 4-leaf stage canola

#2- 70#N/acre(Agrotain coated urea) applied in 12"band over rows

#3- 70#N/acre-28%N applied with streamer jet nozzels

#4- 35#N/acre- 28%N applied with streamer jet nozzels

<sup>3</sup>Yields corrected to 8.5%moisture

<sup>4</sup>Protein and oil on dry matter basis

<sup>5</sup> ESV(early season vigor) 21 days after planting 9= best;1=least.

<sup>6</sup>Relative Chlorophyll Index-higher number = a higher relative amount of chlorophyll