2023 Minnesota Canola Production Center (CPC)

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

2023 Research Summary Report

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Minnesota Production Center Results

Acknowledgements

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, 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 Northern Resources Cooperative for providing the land for canola research trials in 2023.

SITE INFORMATION - 2023 MN Canola Production Center (CPC)

Location: One mile west of Roseau on Hwy 11

Cooperator: Northern Resources Cooperative

Previous Crop: Soybeans

Soil Test Results:

Nitrogen - 0-6'	15 ppm
Nitrogen - 6-24"	9 ppm
Phosphorous -	12 ppm
Potassium -	146 ppm
Target Yield Goal	2,500#/ac
Fertilizer Applied (#/ac):	N - 140; P - 20; K - 40; S - 20s
%Organic Matter:	4.1
Soil pH:	8.2

Tillage Operations: A single pass with a high-speed disc in the fall of 2022, followed by a single pass with a high-speed disc in the spring of 2023. All plots were rolled after seeding to improve seed-soil contact.

Fertilizer Applied: All small plot trials received 140-20-40-20S which was incorporated with the last tillage pass in the spring.

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, except the flea beetle trials which received Section 3 only, for general grass and flea beetle control on 6/10/23. 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 6/16/23

B) Roundup Ready (RR) and Truflex hybrids - Roundup Power Max @ 16 fl. oz/ac + AMS @ 2.5% on 6/16/23.

Fungicides applied: Proline at 5.7 oz/ac was applied to all plots on 7/7/2023 (approximately 30% bloom) for white mold control.

Priaxor at 6 oz/ac was applied on 7/17 to all plots after a pea to marble sized hail event on 7/13/23.

Comments:
April of 2023 was cold, wet, and snowy. The national Weather Service in Grand Forks documented only 6 days of above normal temperatures were recorded from Feb 20th to April 30th. This trend reversed in May as only 5 days were below normal, and the average high temperatures were 10-15 degrees above normal. April snow events were: 7 inches on the 4th, 4.2 on the 5th , 5 inches on the 20th and 1.3 on the 21st. April snow cover was over 20 inches from April 1-9 falling to 5 inches on the 14th with another 5 inches on April 25th. Cold fronts were the dominant weather pattern in April and into May. The NDAWN weather station in Fox recorded northerly winds in 18 days out of the first 23 days of May. In the latter half of May, the winds patterns shifted to more of a southerly direction. In a six-day period from May 25 to May 30, winds from a southerly direction were recorded with speeds from 25 to 35 mph. Only 5 days of below normal temperatures were recorded in May with most days in the latter half of the month 10-15 degrees above average. May rainfall was 40% of normal and this dry trend continued into June and July.

Canola was seeded over a two-day period on May 24th and 25th. All canola trials at the CPC had good emergence and early season vigor. Rainfall totals were below normal each month from June to September. Daily high temperatures were 10 to 15 degrees above normal for late May into June and were close to average in late June through the end of August. However, the daily minimum temperature averaged 10 to 15 degrees above normal in late May through June. (Source: NDAWN). The number of flowering days in the canola variety trial ranged from 21 to 31 days (Table 1).

Early season canola emergence and vigor was good in all canola trials. Flea beetle pressure was high, and all plots, except the flea beetle trials 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 on 7/7 at approximately 30% bloom. Due to a pea to marble sized hail event with wind gusts of up to 50 mph on 7/13/23 all lots were sprayed with Priaxor at 6 oz/ac on 7/17/13. Other diseases and insect problems were at low levels, except for early season flea beetles. Late season flea beetles and diamondback moth larvae were observed feeding on green canola pods, possibly causing some yield loss.

The 2023 CPC was located 1 mile west of Roseau in cooperation with Northern Resources Cooperative. In addition to the CPC small plot trials four canola fields were sampled for clubroot and soil samples sent to Venkat Chapara's lab in Langdon, ND. Also, two canola fields were sampled for bertha armyworm and diamondback moth.

The public canola trials conducted at the 2023 CPC included:

- Canola variety trial
- Canola shatter trial
- Flea beetle seed treatment trial
- Foliar flea beetle trial
- Soil applied herbicide trial
- Micronutrient trial
- Plant Power Ag-Stoller trial
- Winter canola variety trial
- Bertha armyworm and diamondback moth surveys

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.^{2} on 5/23. The experimental design was a randomized complete block (RCB) with four replications. Broadcast fertilizer rate of 140-20-40-20s applied to the entire area and incorporated prior to planting. Individual plot size was 6 x 30', end end-trimmed to a harvest area of 5 x 25'. The LL and RR canola varieties were seeded in separate blocks with buffers to reduce potential herbicide drift. A post emergent tank mix of the grass herbicide (Section 3) and the insecticide Warrior was applied for grassy weed and flea beetle control to all plots on 6/10. Roundup, and Liberty herbicides were applied on 6/16. Proline at 5.7 oz/ac was applied to all plots at first petal drop (approximately 30% bloom) for white mold control. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. Canola was swathed on 8/22 and harvested on 9/8. Harvested canola was cleaned, 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 20 canola lines were entered in the 2023 CPC (Table 1). A breakdown of the canola varieties: 10 RR and 10 LL varieties were evaluated in this small plot replicated research trial. In 2023, canola yields ranged from 2,526 to 3,321#/ac with a trial average of 2,800#/ac. The Roundup and Liberty canola varieties were planted in separate blocks in the field. The average canola yields for RR varieties were 2,876 and for LL varieties 2,723 #/ac. The average number of days in bloom was 27.2 for Roundup Ready and 24.9 for Liberty Link. A seed subsample was taken for each plot and a percent protein, percent oil and test weight are presented in Table 2.

Even with the warm and dry conditions during much of the growing season and hail damage in July, canola yields in this variety trial were better than average. Canola planted in late May 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 2023. A CV of 6.1 for RR canola yield and 7.3 for LL gives a good indication yield differences between varieties in this trial are true based on the conditions.

Canola Variety - Shatter Trial

Objective
The ability of canola plants 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 of 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 2023, 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^2 on May 23rd. Plots were maintained using best management practices in the same manner as the variety and systems trial. On August 22nd, 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 on four dates (9/4, 9/12, 9/19 and 10/2). 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 August 22nd which was the day of 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. However, with the dry conditions in 2023 shatter pans were placed in the field the day of swathing. Collection dates in 2023 were: September 4, 12, 19 and October 2nd (Table 3). Canola seeds, pods and branches that dropped into the collection, pans were recorded at all four dates. Total canola seed collection (seeds and pods) on 10/2 (42 days from swathing) ranged from 149 to 571#/ac. Total percent seed loss after the 42 days from swathing ranged from 3.9 to 20.9%. 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 (33% of the time). Measurable rainfall was recorded on 8 days and the total recorded rainfall was 1.75 inches with 0.55 inches recorded on 9/21. Results from this canola shatter trial suggest that canola varieties adapted for direct harvest can withstand wind and rain and while keeping most 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.

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
Experimental design was a RCB with four replications. The canola variety in this trial was Bayer DKTFLL 21SC. Canola planting date was 5/24. Individual plot size was 6 x 30', end-trimmed to a harvest area of 5' x 25'. Fertilizer applied was 140-20-40-20s and incorporated prior to planting. 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. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. The canola swathing date 8/25 with a combine harvest date of 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.

The following were the fifteen treatments included in this seed treatment trial. Treatment 6,11 and 15 had a postemergence application of Brigade applied on June 14.

Trt#	Treatment	Rate (ounces)
1	Fungicide Check	
2	Helix Vibrance	23
3	Helix Vibrance + Fortenza	23+10.2
4	Helix Vibrance + Fortenza	23+15.4
5	Helix Vibrance + Fortenza	23+20.5
6	Helix Vibrance + Fortenza+Brigade	23+10.2+2.6
7	Prosper Evergol	21.5
8	Prosper Evergol+ Lumiderm	21.5+9.8
9	Prosper Evergol+ Lumiderm	21.5+14.8
10	Prosper Evergol+ Lumiderm	21.5+19.7
11	Prosper Evergol+ Lumiderm+Brigade	21.5+9.8+2.6
12	Prosper Evergol+ Buteo Start	21.5+9.6
13	Prosper Evergol+Buteo Start	21.5+16
14	Prosper Evergol+Buteo Start+Lubriderm	21.5+9.6+9.8
15	Prosper Evergol+Buteo Start+Brigade	21.5+9.6+2.6

Results:

Flea beetle pressure was moderate to high at the CPC in 2023. Daily high temperatures after planting in May average over 85 degrees F and the average low temperatures averaged over 60 degrees F. These high temperatures were favorable for flea beetle feeding. This trend continued for the first 5 days in June until 1.42 inches of rain fell on May 5. An additional 0.36 inches of rain fell on June 7. Daily high temperatures and daily low temperatures moderated in the second and third week of June.

Canola yield results and other agronomic data for individual treatments are presented in Table 4. Canola seed yield averaged 1,878#/ac for the fungicide treated check. All canola seed treatments produced more canola yield compared to the fungicide check. Helix Vibrance produced an average canola yield of 2,472 #/ac. The addition of Fortenza at 10.2 or 15.4 oz produced canola yields of 3,044 and 2939 #/ac, respectively. Prosper Evergol at 21.5 oz gave an average canola yield of 2,737 #/ac. The addition of Lubriderm, Buteo Start or Brigade applied postemergence did not produce additional canola yield compared to Prosper EverGol alone.

Foliar Flea Beetle Post-emergent Trial

Objective:

The objective of this canola trial was to evaluate postemergence only insecticides for flea beetle control. Treatment #2 had an insecticide + fungicide seed treatment. All other treatments were seeded with an equivalent fungicide only seed treatment.

Methods

This trial was conducted at the CPC in 2023 and had thirteen total treatments of which twelve were post emergence only treatments for flea beetle control. Treatment #2 was the only seed treatment containing an insecticide. Treatments 3-13 were applied on 6/14/2023.

Trt#	Treatment	Rate (ounces)
1	Untreated Check	
2	Helix Vibrance	*23*
3	Brigade 2EC	2.6
4	Ridgeback	5.5
5	Vantacor	2.5
6	Exirel	7
7	Delta Gold	0.08
8	Warrior II	1.92
9	Mustang Maxx	4
10	Plinazolin	0.5
11	Plinazolin	1
12	Plinazolin	1.5
13	Brigade	2.6

Experimental design was a RCB with four replications. The canola variety in this trial was Bayer DKTFLL 21SC. Canola planting date was 5/24. Individual plot size was 6 x 30', end-trimmed to a harvest area of 5' x 25'. Fertilizer applied was 140-20-40-20s and incorporated prior to planting. Roundup was applied for general weed control on 6/16. Proline at 5.7 oz was applied to all plots at first petal fall (approximately 30% bloom) for white mold control. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. The canola swathing date was 8/25 with a harvest date of 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 in 2023. Daily high temperatures after planting in May average over 85 degrees F and the average low temperatures averaged over 60 degrees F. These high temperatures were favorable for flea beetle feeding. This trend continued for the first 5 days in June until 1.42 inches of rain fell on

June 5. An additional 0.36 inches of rain fell on June 7. Daily high temperatures and daily low temperatures moderated in the second and third week of June.

Helix Vibrance as a seed treatment only gave an average canola yield of 2,443 #/ac (Table 5). The untreated check gave an average canola yield of 1,869#/ac. No statistical differences were detected from all foliar insecticide treatments compared to the untreated to the untreated check based on a canola yield of 313#/ac at the (0.05) confidence level.

At canola emergence, a light population of flea beetles was observed. By June 5, the flea beetle population had exploded and flea beetle rating (Knodel scale) were in the 4 to 5 range and optimal timing for post emerge flea beetle control had passed. This site received a total of 1.42 inches of rain on June 4 and 5. An additional 0.36 inches of rain was recorded on June 7th. A decision was made to wait until new growth was observed on the canola plants before the insecticide treatments were applied. The foliar insecticide treatments were applied on June 14th. After the foliar insecticides were applied a light infestation of flea beetles was observed in this trial.

Early season vigor and ground cover ratings at three weeks after emergence were low in all foliar treatments which is an indication that the high populations of flea beetles and the canola plant damage was significant in a three-day period (June 2-4) Further, no appreciable differences were observed between the guard plots and the individual insecticide treatments at the first and end of flowering ratings. The lesson learned from this trial, if a canola insecticide seed treatment is not used at planting daily monitoring of canola fields will be required as flea beetle populations can flare quickly and once the damage is done the canola plants cannot recover the seed yield potential lost due to high levels of flea beetle damage.

Soil Applied Herbicides in Herbicide Tolerant Canola

Objective:

To demonstrate the effectiveness of soil applied herbicides 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 lists 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 allows 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 5/26. The individual plot size was 6 x 30', end-trimmed to a harvest area of 5' x 25'. 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 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 6/16. 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. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. Canola was swathed on 8/23 and harvested on 9/9. 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 6. Canola seed yields ranged from 2,588 to 3,382#/ac (Table 6). Liberty alone gave an average canola yield of 2,969 #/ac. Canola yields were reduced by 380 #/ac from Trust at 1.5 pt/ac applied PPI compared to Liberty alone. Spartan and Sonalan produced similar canola yield as Liberty at the 95% confidence level.

This trial was 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 weed escapes were not pulled by hand weeding. This would allow the various

herbicide treatments to be evaluated for potential canola yield 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 early-stage 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. A complete soil analysis in the spring of 2023 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 L340PC was seeded at 12 PLS/ft.^{2} on 5/24. Fertility applied was 140-20-40-20s. Plot size was 6 x 30', end trimmed to a harvest plot size of 5 x 25'. The experimental design was an 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 26 oz/ac on 6/16. The micronutrients were applied on 6/29 to canola that was in the early bloom stage. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. 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 on 7/26 when the canola was in full bloom and sent to AGVISE Labs for analysis. All plots were swathed on 8/23 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 2,765#/ac which would be considered an average yield for the growing conditions of northwest MN (Table 7). Canola yields in this trial ranged from 2,660 to 2,982#/ac. The statistical analysis for yield was non-significant at the 95% confidence level. A soil test (0-6) inch depth was taken on 5/22/23. Soil test levels for boron were medium, copper and zinc were low, and sulfur was very low. Data collected on tissue samples from canola in full bloom indicated an increased levels of zinc, copper, and boron of these treatments in the plant but had no significant yield impact.

Canola Plant Power Ag- Stoller Trial

Objective:
The objective of this trial was to evaluate several Stoller treatments for improved canola growth, development, and yield.

Methods:
The canola variety L340PC was seeded at 12 PLS/ft.^{2} on 5/24. Fertility applied was a 140-20-40-20s. Plot size was 6 x 30', end trimmed to a harvest plot size of 5 x 25'. The experimental design was an 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 6/16. Proline at 5.7 oz was applied to all plots at first petal fall (approximately 30% bloom) for white mold control. Priaxor at 6 oz/ac was applied on 7/17 as canola plants were damaged by a hailstorm on 7/13. Pea to marble sized hail caused stem breakage and bruising which reduced top-end canola yields. Harvested canola plots were individually cleaned, weighed, 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.

The Stoller Plant Power treatments, rates and timings are listed in the table below.

Trt#	Treatment	Rate	Timing	Application date
1	Bio Forge Advanced	2oz./100#	Seed treat	24-May
2	Bio Forge Advanced + HMUM Nitrate	4oz+2.5#/acre	Herbicide	19-Jun
3	Balancer+xcyte+HMUM	16oz+8oz+2.5#/ac	10-14 days after first flower	29-Jun
4	Sugar Power	64oz/ac	10-14 days after last flower	10-Aug
5	Trts 1-4	all	all	4 times
6	No Treatment			

The Stoller products evaluated are a mixture of various plant nutrients. Bio forge Advanced contains 3% Nitrogen, 3% Potash, 1% Cobalt and 1% Molybdenum. Harvest More Urea Mate (HMUM) contains 5-10-27 plus micros. Nitrate Balancer contains 3% Nitrogen 9% Boron and 0.005% Molybdenum. Sugar Power contains 0-9-6 plus 1% magnesium.

Results:
Canola yields in the untreated averaged 2,827#/ac which would be considered an average yield for the growing conditions of northwest MN (Table 8). Canola yields from the Stoller treatments ranged from 2,472 to 2,758 #/ac. The statistical analysis for canola yield between the untreated and Stoller treatments showed differences were non-significant at the 95% confidence level.

Winter Canola

Objective:

The objective of this trial was to evaluate several winter canola varieties grown in the environmental conditions of Minnesota.

Methods:

Four winter canola varieties were seeded on 8/26/22 at the U of MN research plots in St. Paul, MN. CP1066WC, Plurax, Mercedes and Torrington were the four winter canola varieties in this trial. The canola varieties were seeded in 6-inch rows at 9 PLS. Experimental design was a RCB with 4 reps. Soil test taken indicated that total nitrogen in the 0-24 inch soil profile was 121 ppm, P was over 100 ppm and K was 224 ppm. A top dress fertilizer application of 60-0-0-20S was made on 4/26/23. Reglone was applied as a pre-harvest aid on 6/26/23 and canola harvested on 6/29/23.

Results:

Canola yields ranged from 1,958 to 2,234 #/ac (Table 9). Unusually hot, dry conditions in May and June probably lower yields. No statistical difference was detected at the 95% confidence level. A canola variety trial established in Roseau in the fall of 2021 all winterkilled in the spring of 2022. Results in 2023 from St. Paul indicate that winter canola can survive the winter in Minnesota. Additional research will be needed to improve the reliability of winter survival.

Bertha Armyworm and Diamondback Moth Survey

Objective:

The objective of this survey was to determine the incidence and severity of Bertha Armyworms and Diamondback Moths at two locations in canola fields in northwest Minnesota.

Methods:

In 2023 two canola fields were surveyed for Bertha Armyworm and two fields for Diamondback moth. Pheromone traps were hung from a shepherd hook on edge of canola fields. These traps were placed in the canola field on 6/23 and 6/24. Location 1 was on the edge of a canola field in Ross Township and the other location was at the CPC. Traps were checked weekly until canola pod development (8/11). Pheromone lures were changed after four weeks in the field.

Results:

Pheromone traps were effective in the capture of Bertha armyworm and Diamondback moths (Table 10). Total number of Bertha Armyworms and Diamondback moths were higher at Location 1 than location 2. Total Bertha armyworms capture was 128 at location 1 and 56 at location 2. Total Diamondback moth capture 237 at location 1 and 108 at location 2. This insect survey will continue in the 2024 season.

2023 Canola Production Center Research
Data Summaries for Minnesota

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

table 1.

2023 Canola Variety Trial[5]

Northern Resources Coop- Roseau,Mn

Ent#	Company	Variety	Herbicide Tolerance*	#/acre[1]	Protein[2]	Oil[2]	Test wt./bu.	Lodging[3]	Harvest Height (in)	% Ground Cover-21DAP	ESV-21DAP[4]	Begin Bloom Date	End Bloom Date	Days of bloom
1	CROPLAN	CP9978TF	TF	**3321**	**21.6**	**45.8**	52.4	1.8	50	83	8.5	30-Jun	26-Jul	26
2	CROPLAN	CP9221TF	TF	**3056**	**21.3**	**44.0**	51.5	2.0	46	78	8.0	27-Jun	25-Jul	28
3	Pioneer	P515G	RR	**3127**	**20.8**	**46.0**	52.6	1.0	54	73	8.0	2-Jul	27-Jul	24
4	Pioneer	P511G	Opt. Gly	**2777**	**21.4**	**44.8**	52.0	1.0	54	78	8.5	2-Jul	24-Jul	21
~~6~~	Proseed	TR23127	TF	**2831**	**22.7**	**43.8**	52.9	1.5	52	60	6.0	3-Jul	1-Aug	28
7	Meridian Seeds	CS3100 TF	TF	**2382**	**21.6**	**42.7**	51.9	1.0	59	80	8.0	4-Jul	5-Aug	31
8	Nuseed	NC155 TF	TF	**2572**	**23.2**	**42.7**	53.0	1.0	50	80	8.5	29-Jun	28-Jul	30
9	Nuseed	NC471 TF	TF	**2726**	**21.8**	**44.0**	52.7	1.0	57	83	8.0	2-Jul	27-Jul	29
10	Nuseed	NC527CR TF	TF	**2644**	**22.3**	**43.9**	51.1	1.0	51	85	9.0	30-Jun	28-Jul	28
11	Star Specialty Seed	StarFlex	TF	**3320**	**20**	**47.3**	52.2	1.3	48	85	8.5	30-Jun	26-Jul	27
	RR/TF only		LSD @ 5% level	**253**	**1.1**	**1.2**	0.3	0.8	4	2	1	1	5	
			CV(%)	**6.1**	**3.4**	**1.9**	0.4	45.7	5.4	13.5	11.1	2.0	11.7	
12	Dekalb	DKTFLL21SC	TF+LL	**2609**	19.9	47.8	51.9	2.3	44	88	8.5	28-Jun	23-Jul	25
13	Dekalb	DKLL82SC	LL	**2896**	**20.6**	**47.0**	52.0	1.0	47	88	9.0	30-Jun	24-Jul	24
14	Dekalb	DKLL83SC	LL	**2670**	**21.1**	**45.6**	51.7	1.8	50	83	8.5	28-Jun	23-Jul	25
15	Meridian Seeds	CS4000 LL	LL	**2526**	**20.4**	**46.0**	52.7	1.5	53	80	8.5	2-Jul	25-Jul	23
16	CROPLAN	CP7250LL	LL	**2584**	**21.5**	**44.7**	52.2	1.0	55	80	8.0	2-Jul	29-Jul	27
17	BASF	InVigor L233P	LL	**3072**	**20.7**	**44.3**	51.5	1.5	54	83	8.5	2-Jul	25-Jul	23
18	BASF	InVigor L340PC	LL	**2826**	**20.7**	**43.0**	51.2	1.3	54	80	8.0	1-Jul	26-Jul	26
19	BASF	InVigor L343PC	LL	**2711**	**19.8**	**44.5**	51.3	1.5	58	83	9.0	2-Jul	25-Jul	24
20	BASF	InVigor L345PC	LL	**2751**	**20.7**	**43.1**	52.6	1.0	58	80	8.0	4-Jul	31-Jul	28
21	BASF	InVigor L350PC	LL	**2584**	**20.6**	**45.0**	52.5	1.0	62	78	8.0	7-Jul	3-Aug	24
	LL only		LSD @ 5% level	**290**	1.0	1.2	0.4	0.9	4	1	2	1	3	
			CV(%)	**7.3**	3.5	1.9	0.9	45.9	4.7	9.9	12.6	2.7	6.9	
	All canola varieties		**LSD @ 5% level**	**266**	1.0	1.1	0.3	0.9	4	13	1.4	1.1	3.6	
			LSD @ 10% level	**222**	0.9	1.0	0.3	0.7	3.3	12	1.1	0.9	3.1	
			CV(%)	**6.7**	3.4	1.8	0.4	46.3	5.2	12	12.2	2.4	9.5	
	Trial Mean=			**2800**										
	Mean of RR/TF only varieties=			2876										
	Mean of LL only varieties=			2723										

Experimental Design: RCB w/4reps

Seeding rate=10-12PLS/Ft.[2] Planting Date- 5/24/2023

*Herbicide Tolerance--LL=Liberty Link, RR=Roundup Ready, Opt.Gly=Optimum Glyphosate Tolerant and TF=TruFlex Roundup Ready

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3]-Lodging-1=upright;9=flat.

[4] ESV(early season vigor) 21 days after planting 9= best;1=least.

[5]Pea-marble size hail 7/13- Priaxor at 6oz. Was applied on 7/17/2023

Fertilizer application- 140-20-40-20s applied PPI 5/22/2023.

Past crop= Soybean-conventional tillage.

table 2.

2023 Canola Variety Trial
Northern Resources Coop- Roseau,Mn

Ent#	Company	Variety	Herbicide Tolerance*	#/acre[1]	Protein[2]	Oil[2]	Palmitic acid Dry basis	Stearic acid Dry basis	Oleic acid Dry basis	Linoleic acid Dry basis	Linolenic acid Dry basis	Erucic acid Dry basis	Eicosenoic acid As is
1	CROPLAN	CP9978TF	TF	**3321**	**21.6**	**45.8**	**4.5**	**1.4**	**68.4**	**21.9**	**9.3**	**0.8**	**0.4**
2	CROPLAN	CP9221TF	TF	**3056**	**21.3**	**44**	**4.6**	**1.8**	**67.2**	**18.9**	**7.6**	**1.4**	**0.5**
3	Pioneer	P515G	RR	**3127**	**20.8**	**46**	**4.6**	**1.4**	**67.9**	**22**	**9.3**	**0.8**	**0**
4	Pioneer	P511G	Opt. Gly	**2777**	**21.4**	**44.8**	**4.5**	**1.8**	**69.1**	**19.5**	**8**	**1.6**	**0.7**
6	Proseed	TR23127	TF	**2831**	**22.7**	**43.8**	**4.5**	**1.5**	**64.5**	**21.2**	**7.8**	**1**	**1.3**
7	Meridian Seeds	CS3100 TF	TF	**2382**	**21.6**	**42.7**	**4.6**	**1.8**	**66.6**	**20**	**9.6**	**2.3**	**0**
8	Nuseed	NC155 TF	TF	**2572**	**23.2**	**42.7**	**4.8**	**1.5**	**62.9**	**20.5**	**8.1**	**0.8**	**1.1**
9	Nuseed	NC471 TF	TF	**2726**	**21.8**	**44**	**4.5**	**1.6**	**66**	**19.9**	**8.1**	**1.1**	**1.3**
10	Nuseed	NC527CR TF	TF	**2644**	**22.3**	**43.9**	**4.5**	**1.8**	**64.9**	**18.7**	**8.7**	**1.8**	**0.5**
11	Star Specialty Seed	StarFlex	TF	**3320**	**20**	**47.3**	**4.3**	**1.4**	**71.7**	**21.5**	**8.6**	**0.9**	**0.2**
12	Dekalb	DKTFLL21SC	TF+LL	**2609**	19.9	47.8	**4.3**	**1.5**	**72.5**	**20.8**	**7.9**	**0.4**	**0.8**
13	Dekalb	DKLL82SC	LL	**2896**	**20.6**	**47**	**4.2**	**1.4**	**73.1**	**20.9**	**7.9**	**0.4**	**1**
14	Dekalb	DKLL83SC	LL	**2670**	**21.1**	**45.6**	**4.6**	**1.4**	**68.1**	**21**	**9.1**	**1.4**	**0.5**
15	Meridian Seeds	CS4000 LL	LL	**2526**	**20.4**	**46**	**4.6**	**1.5**	**68.8**	**21.2**	**8.4**	**0.5**	**0.5**
16	CROPLAN	CP7250LL	LL	**2584**	**21.5**	**44.7**	**4.5**	**1.6**	**68.4**	**20.3**	**7.9**	**1.2**	**1.1**
17	BASF	InVigor L233P	LL	**3072**	**20.7**	**44.3**	**4.4**	**1.9**	**67.5**	**18.5**	**7.6**	**1.3**	**1.3**
18	BASF	InVigor L340PC	LL	**2826**	**20.7**	**43**	**4.5**	**2**	**68.2**	**18.4**	**7.9**	**1.8**	**0.2**
19	BASF	InVigor L343PC	LL	**2711**	**19.8**	**44.5**	**4.4**	**1.8**	**67.3**	**18.8**	**8.9**	**1.5**	**0.3**
20	BASF	InVigor LR345PC	LL	**2751**	**20.7**	**43.1**	**4.5**	**1.8**	**65.6**	**20.4**	**9.6**	**1.6**	**0.1**
21	BASF	InVigor L350PC	LL	**2584**	**20.6**	**45**	**4.6**	**1.5**	**68.7**	**21.7**	**8.5**	**0.7**	**1.4**
			LSD @ 5% level	**266**	1.0	1.1	**0.1**	**0.1**	**2.3**	**0.5**	**0.3**	**0.3**	**0.2**
			LSD @ 10% level	**222**	0.9	1.0	**0.1**	**0.1**	**2**	**0.4**	**0.3**	**0.2**	**0.2**
			CV(%)	**6.7**	3.4	1.8	1.6	2.2	2.4	1.6	2.7	16.7	28.4

Trial Mean= **2800**

Mean of RR/TF only varieties= 2876

Mean of LL only varieties= 2723

Experimental Design: RCB w/4reps

Seeding rate=10-12PLS/Ft.[2] Planting Date- 5/24/2023

*Herbicide Tolerance--LL=Liberty Link, RR=Roundup Ready,Opt.Gly=Optimum GLY(glyphosate tolerant) and TF=TruFlex Roundup Ready

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

table 3.

2023 Canola Shattering Variety Trial
Northern Resources Coop- Roseau,Mn

					All Source Seed Loss			Total seed lost by date(#/acre)				Source of seed loss by date(#/acre)							
			Yield[1]	% Seed								9/4	9/4	9/12	9/12	9/19	9/19	10/2	10/2
	Variety	Company	lb/acre	Lost[2]	Total[4]	seed[5]	pod[6]	9/4	9/12	9/19	10/2	seed[5]	pod[6]	seed[5]	pod[6]	seed[5]	pod[6]	seed[5]	pod[6]
1a	BASF	InVigor L340PC	2826	5.4	**153**	136	17	11	5	24	113	2	8	1	4	22	1	110	4
2a	BASF	InVigor LR345PC	2751	5.9	**163**	124	39	27	4	18	113	7	20	1	4	8	9	108	5
3a	BASF	InVigor L350PC	2584	10.9	**281**	181	99	53	7	46	175	27	26	2	5	33	13	119	56
4a	Dekalb	DKTFLL21SC	2609	7.1	**184**	141	44	47	9	15	112	16	32	5	4	14	1	106	7
5a	Dekalb	DKLL82SC	2896	7.3	**212**	169	43	40	3	16	153	10	30	1	1	16	0	141	12
6a	Dekalb	DKLL83SC	2670	6.9	**185**	156	29	33	5	17	131	8	25	2	2	16	1	130	1
7a	CROPLAN	CP7250LL	2584	6.2	**160**	128	32	45	12	26	77	24	21	12	0	23	3	70	7
8a	CROPLAN	CP9978TF	3321	3.9	**128**	96	32	32	5	18	72	13	20	1	4	15	3	67	5
9a	CROPLAN	CP9221TF	3056	4.9	**149**	125	24	38	8	18	86	23	15	5	3	18	0	80	6
10a	Nuseed	NC155 TF	2572	8.6	**220**	173	48	51	18	48	104	24	27	11	6	45	3	92	11
11a	Nuseed	NC471 TF	2726	20.9	**571**	394	176	168	33	106	264	70	97	26	7	82	24	216	48
12a	Nuseed	NC527CR TF	2644	9.7	**257**	222	35	42	14	69	132	21	21	8	6	63	5	130	2
13a	Star Specialty Seed	StarFlex	3320	4.9	**162**	128	34	33	9	38	83	12	20	5	4	32	7	79	4
14A	Proseed	TR23127	2831	5.7	**161**	142	19	14	2	52	94	3	11	2	0	47	5	90	4
		LSD @ 5% level	266		**146**	121	64	69	9	27	130	33	46	7	7	24	11	117	30
		CV(%)	6.7		48	51	93	107	69	53	74	125	122	90	137	54	147	74	169

Experimental Design-RCB with 4 reps

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

Seeding rate(12" row)=9PLS/Ft.[2]

2 Shatter pans placed in each plot 8/25/2023.

[1] Yields taken from the variety trial.

[2] % of total seed lost/total seed harvest in variety trial

[4] Total #/acre of lost seed. Cumulative pod seed + shattered seed lost through 10/4.

[5]Seed shattered directly from the plant to the ground collection pans.

[6]Seed contained in pods and branches dropped from the plant to the ground collection pans.

table 4.

2023 Canola Flea Beetle Control-Seed Treatment
Northern Resources-Roseau,Mn

trt#	Seed Treatment and Rate(oz./100#)	#/Ac[1]	Protein[2]	Oil[2]	#/bu	ht	lod[3]	ESV[4]	Vigor[8]	6-15 % ground cover[7]	6-21 % ground cover[7]	Flea beetle[6]	10%bloom	end bloom
1	Fungicide Check	**1878**	22.0	44.7	52.3	52	1.0	6.0	2.5	15	60	6.8	4-Jul	1-Aug
2	Helix Vibrance @ 23	**2472**	22.0	44.7	52.2	50	1.5	8.0	4.5	35	80	4.8	1-Jul	28-Jul
3	Helix Vibrance @ 23 + Fortenza @ 10.2	**3044**	22.0	44.8	52.1	47	1.3	9.0	5.0	50	83	4.0	30-Jun	26-Jul
4	Helix Vibrance @ 23 + Fortenza @ 15.4	**2939**	22.8	44.3	52.2	51	1.0	8.0	5.5	50	80	5.0	1-Jul	27-Jul
5	Helix Vibrance @ 23 + Fortenza @ 20.5	**2723**	20.9	46.0	52.0	49	1.0	9.0	7.5	55	68	3.0	30-Jun	25-Jul
6*	Helix Vibrance @ 23 + Fortenza @ 10.2 + Brigade 2EC @ 2.6	**3022**	22.8	44.3	52.3	51	1.0	7.5	4.5	30	70	5.8	1-Jul	30-Jul
7	Prosper Evergol @ 21.5	**2737**	22.2	44.8	52.2	52	1.0	7.5	5.0	35	73	5.5	2-Jul	28-Jul
8	Prosper Evergol @ 21.5 + Lumiderm @ 9.8	**2710**	22.0	44.8	52.1	51	1.0	8.5	5.5	45	80	5.0	1-Jul	27-Jul
9	Prosper Evergol @ 21.5 + Lumiderm @ 14.8	**2794**	22.1	44.9	52.2	50	1.0	8.0	5.5	35	80	5.5	1-Jul	28-Jul
10	Prosper Evergol @ 21.5 + Lumiderm @ 19.7	**2356**	20.4	46.3	52.0	48	1.3	9.0	7.0	55	88	4.5	30-Jun	26-Jul
11*	Prosper Evergol @ 21.5 + Lumiderm @ 9.8 + Brigade 2EC @ 2.6	**2983**	20.8	46.2	52.0	49	1.0	9.0	6.0	50	85	5.0	30-Jun	27-Jul
12	Prosper Evergol @ 21.5 + Buteo Start @ 9.6	**2620**	21.1	45.6	52.0	49	1.0	9.0	7.0	50	83	3.8	30-Jun	27-Jul
13	Prosper Evergol @ 21.5 + Buteo Start @ 16	**2563**	20.9	46.3	52.0	51	1.0	8.5	7.0	50	80	3.8	30-Jun	27-Jul
14	Prosper Evergol @ 21.5 + Buteo Start @ 9.6 + Lumiderm @ 9.8	**2508**	21.0	45.6	52.0	51	1.0	9.0	7.5	60	88	3.5	29-Jun	27-Jul
15*	Prosper Evergol @ 21.5 + Buteo Start @ 9.6 + Brigade @ 2.6	**2795**	21.7	45.5	52.2	49	1.0	8.0	6.5	45	73	4.3	30-Jun	27-Jul
	LSD @5% level	**310**	1.4	1.2	0.2	3	0.4	1.5	2.1	1.8	19	1.4	1	2
	CV(%)	8.1	4.7	1.9	0.3	4.8	27.8	13	26	28.4	16.8	20.6	2.5	6.3

Experimental Design: RCB w/4reps Variety=DKTFLL 21 SC (RR+LL)

Seeding rate=12PLS/Ft.[2] Planting Date- 5/24/2023

*Treatments 6,11,&15 had a post emergent treatment of Brigade on 6/12

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3]-Lodging-1=upright;9=flat.

[4] ESV(early season vigor) 6/21 9= best;1=least.

[5]Pea-marble size hail 7/13- Priaxor at 6oz. was applied on 7/17/2023

[6]Flea beetle damage -1=None;9=severe 6/13/2023

[7]Visual estimate of canola ground cover

[8]Plant vigor-1=poor;9=excellent

Past crop= Soybean-conventional tillage.

table 5.

2023 Canola Foliar Treatments for Flea Beetle Control
Northern Resources-Roseau,Mn

Trt#	Trt	Rate	#/acre	Protein[2]	Oil[2]	#/bu	lod[3]	ESV[4]	Vigor[7]	6-15 % ground cover[6]	6-21 % ground cover[6]	10%bloom	end bloom
1	Untreated check		1869	22.1	44.6	52.5	1	5.5	3	10	58	4-Jul	5-Aug
2*	***Helix Vibrance seed trt***	***23 fl oz***	2443	21.3	45.5	52.3	1	8.5	4.5	25	78	2-Jul	3-Aug
3	Brigade 2EC	2.6	2141	22.0	44.7	52.6	1	5.5	3	10	58	4-Jul	5-Aug
4	Ridgeback	5.5	2017	21.0	45.6	52.3	1	6.0	3	10	63	3-Jul	4-Aug
5	Vantacor	2.5	1877	22.4	44.3	52.7	1	6.0	3	10	63	4-Jul	5-Aug
6	Exirel	7	1945	21.3	45.3	52.3	1	7.0	3	10	68	4-Jul	5-Aug
7	Delta Gold	0.8	2097	21.2	45.5	52.2	1	6.5	3	10	68	4-Jul	5-Aug
8	Warrior II	1.92	1939	21.9	44.7	52.4	1	6.0	3.5	10	65	3-Jul	5-Aug
9	Mustang Maxx	4	1926	22.3	44.1	52.5	1	5.0	3	10	55	4-Jul	5-Aug
10	Plinazolin	0.5	1777	21.6	45.0	52.3	1	6.0	3	10	63	4-Jul	4-Aug
11	Plinazolin	1	1901	21.7	45.0	52.4	1	5.5	3	10	58	4-Jul	5-Aug
12	Plinazolin	1.5	1919	22.3	44.4	52.6	1	4.5	3	10	58	4-Jul	6-Aug
13	Brigade 2EC	2.6	1921	21.7	44.6	52.5	1	6.5	3.5	15	65	3-Jul	5-Aug
	LSD @5% level		313	1.1	1.5	0.3	0	1.6	1	6	1.1	1.7	1.5
	CV(%)		11	3.4	2.3	0.4	0	18.1	21.4	35.4	12.6	32.8	22.4

Experimental Design: RCB w/4reps Variety=DKTFLL 21 SC (RR+LL)

*All treatments(except#2) have fungicide match to Helix Vibrance(Vibrance Extreme+Maxim 4FS)

Treatments 1 & 2 had no post emergent flea beetle treatment

All post emergent treatments applied on 6/14/2023

Seeding rate=12PLS/Ft.[2] Planting Date- 5/24/2023

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3]-Lodging-1=upright;9=flat.

[4] ESV(early season vigor) 6/21 9= best;1=least.

[5]Pea-marble size hail 7/13- Priaxor at 6oz. Was applied on 7/17/2023

[6]Visual estimate of canola ground cover

[7]Plant vigor-1=poor;9=excellent

Fertilizer application- 140-20-40-20s applied PPI 5/22/2023.

Past crop= Soybean-conventional tillage.

table 6.

2023 Canola Pre-emergent Herbicide Screen
Northern Resources-Roseau,Mn

TRT#	Treatment	Soil applied	#/Acre[1] 2023	#/Acre[1] 2022	Protein[2]	Oil[2]	Test wt./bu.	Lodging[3]	Harvest Height (in)	Early Season Vigor[4]	% Ground Cover[5]	Begin Bloom Date	End Bloom Date	Days of bloom
1	Liberty Only		**2969**	3382	20.1	43.6	50.7	1	57	8.5	80	1-Jul	30-Jul	30
2	Spartan	2 oz. PRE	**2716**	2588	20.3	43.2	51.1	1	61	8.0	73	2-Jul	2-Aug	32
3	Sonalan HFP	2PT PPI	**2812**	3123	20.1	43.5	50.9	1	60	8.8	85	2-Jul	31-Jul	29
4	Trust(Treflan)	1.5PT PPI	**2589**	3133	20.2	43.5	50.8	1	60	8.5	85	2-Jul	31-Jul	29
	LSD @ 5% level		**328**	406	NS	0.4	0.3	0	2	NS	10	1	2	3
	CV(%)		7.4	8.0	1.9	0.6	0.3	0	2.3	10	8.3	2.8	3.1	3.9

Experimental Design:RCB w/ 4reps Planting date-5/24 Variety= L340PC

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3] Lodging-1=upright;9=flat.

[4]Early Season Vigor(ESV) 6/21/2023 1=poor vigor;9=excellent vigor

[5]Visual estimate of % ground cover on 6/21/2023

All plots received 26oz/ac Liberty on 6/22

applied 5/24/2023

Sonalan and Trust applied on 5/24 and a light harrow after just before planting

Spartan applied just after planting on 5/24

62F SSE 8-12 6:00pm

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

table 7.

2023 Micronutrients applied Post-emergent to Canola
Northern Resources-Roseau,Mn

Trt#	Treatment	Rate	#/acre[1]	Protein[2]	Oil[2]	Test wt./bu.	Early Season Vigor[4]	% Ground Cover[5]	Lodging[3]	Harv. Height (in)	Begin Bloom Date	End Bloom Date	Days of bloom	Plant samples taken 7/26/2023 at Full Bloom %N	%P	%K	%S	%Ca	%Mg	Zn-ppm	Fe-ppm	Mn-ppm	Cu-ppm	B-ppm
1	Boron	2pt	**2698**	20.5	42.9	50.7	7.5	73	3.5	57	2-Jul	29-Jul	27	2.7	0.23	0.88	1.95	5.7	2.0	16	99	73	4.3	47
2	10-34-0	1 gallon	**2862**	20.7	42.8	50.9	7.5	73	3.0	58	2-Jul	29-Jul	27	2.7	0.20	0.70	1.88	5.6	2.1	14	82	68	5.5	38
3	Sulfur	2pt	**2796**	20.4	43.3	50.7	8.5	83	3.3	59	2-Jul	28-Jul	26	2.9	0.20	0.74	1.65	5.5	1.9	14	80	59	3.8	33
4	Copper	1pt	**2982**	20.5	42.6	50.7	7.5	75	3.3	59	3-Jul	30-Jul	27	2.8	0.22	0.74	1.68	5.6	2.0	14	87	66	5.5	37
5	Zinc	2pt	**2765**	20.2	43.3	50.8	8.5	85	3.5	60	1-Jul	29-Jul	28	3.0	0.21	0.77	1.81	5.3	1.9	17	82	78	3.5	31
6	combine 1-5		**2660**	20.2	43.1	50.7	9.0	83	3.5	58	2-Jul	29-Jul	27	3.0	0.21	0.76	1.78	5.5	1.9	15	79	70	5.8	37
7	No treatment		**2765**	20.1	43.3	50.7	8.5	83	3.8	60	2-Jul	28-Jul	26	2.8	0.20	0.71	1.54	5.1	1.8	14	77	66	3.3	31
	LSD @ 5% level		**350**	NS	NS	NS	NS	NS	NS	3	1	2	2	NS	NS	NS	0.25	0.4	0.1	2	17	11	1.7	9
	CV(%)		8.4	5.6	2.6	0.5	16	16	35	3.7	8.9	7.1	6.8	18	22.1	20	9.8	4.5	4.6	11.2	14	10.7	25.6	18

Experimental Design:RCB w/ 4reps Planting date=5/26/2022

Canola variety=L340PC

ALL APPLICATIONS MADE 6-29-2023 9am 68F W8-10 84%RH full sun

GS=early flower 6' backpack sprayer-18GPA@28PSI

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
5/22/2023 0-6"	8.2	4.1	32	7	128	22	4698	842	0.43	14.3	1.7	0.42	1.14

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3] Lodging-1=upright;9=flat.

[4]Early Season Vigor(ESV) 6/21/2023 1=poor vigor;9=excellent vigor

[5]Visual estimate of canola ground cover

	Brand-Treatments		Rate/acre
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 2.27#/gal	1pt
5	Nachurs	Nutri-sync Zinc 4-0-0-9z	2 pt
6	All	Combine all trts 1-5	All
7		No treatment	

table 8.

2023 Plant Power Ag Applications to Canola
Northern Resources-Roseau,Mn

Trt#	Treatment	Rate[6]	Timing	Application date	#/acre[1]	Protein[2]	Oil[2]	Test wt./bu.	Early Season Vigor[4]	% Ground Cover[5]	Lodging[3]	Harv. Height (in)	Begin Bloom Date	End Bloom Date	Days of bloom
1	Bio Forge Advanced	2oz./100#	Seed treat	24-May	**2596**	20.1	43.1	50.8	8.5	88	1	60	2-Jul	1-Aug	30
2	Bio Forge Advanced + HMUM	4oz+2.5#/acre	Herbicide	19-Jun	**2642**	20.0	43.2	50.8	9.0	83	1	57	2-Jul	1-Aug	30
3	Nitrate Balancer+xcyte+HMUM	16oz+8oz+2.5#/ac	10-14 days after first flower	29-Jun	**2676**	19.7	43.3	50.8	9.0	85	1	60	1-Jul	1-Aug	31
4	Sugar Power	64oz/ac	10-14 days after last flower	10-Aug	**2472**	19.8	43.2	50.8	9.0	88	1	58	2-Jul	1-Aug	30
5	Trts 1-4	all	all	4 times	**2758**	20.0	43.0	50.9	9.0	88	1	61	1-Jul	2-Aug	32
6	No Treatment				**2827**	20.0	43.4	50.8	9.0	85	1	60	2-Jul	1-Aug	30
				LSD @ 5% level	**NS**	0.4	NS	NS	NS	NS	0	3	1	NS	2
				CV(%)	7.5	1.5	1	0.3	4.5	7	0	3.7	3.9	3.5	3.8

Experimental Design:RCB w/ 4reps Planting Date=5/24/2023
Variety= L340PC

[1]Clean Seed Yields corrected to 8.5% moisture.

[2] Protein and oil reported on dry matter basis.

[3] Lodging-1=upright;9=flat.

[4]Early Season Vigor(ESV) 6/21/2023 1=poor vigor;9=excellent vigor

[5]Visual estimate of canola ground cover

[6]Rate-treatment 1 is seed treatment amount/ 100# seed. All others are rates/acre

6/19/2023 65F ENE 5-10
6/29/2023 70f w 8-10mph
8/10/2023 80F NW 6-10

	Treatments	Explained treatments
1	Bio Forge Advanced	Seed treatment
2	Bio Forge Advanced + HMUM	Bio Forge + Harvest More Urea Mate 5-10-27
3	Nitrate Balancer+xcyte+HMUM	Nitrate Balancer (3-0-0-9b-.005mo)+xcyte (cytokinin .04%)+HMUM harvest more urea mate(5-10-27-+micros)
4	Sugar Power	Sugar Power (0-9-6-1MG)
5	Trts 1-4	combine 1-4
6	No Treatment	

Treatments 2-4 applied with a CO2 backpack sprayer at 18GPA @28PSI

table 9.

2022-23 Winter Canola Variety Trial
St.Paul,Mn

Variety	Yield[1] (#/acre)	Plants/ Ft.2 Harvest	First Bloom Date
CP1066WC	**2153**	5.0	14-May
Torrington	**2234**	5.8	12-May
Mercedes	**1958**	4.4	11-May
Plurax CL	**1964**	5.1	10-May
LSD @5%	NS	1.3	1
CV(%)	17.4	16.5	6.8

Experimental Design:RCB w/ 4reps
Planted 8/26/22 in 6" rows at 9PLS
60-0-0-20S applied 4/26/2023
Reglone applied 6/26/2023 as pre harvest aid
Combine height=24-28" harvested 6/29/2023

Soil test- 9/2023

depth	ph	%OM	NO3 ppm	P ppm	K ppm
0-6"	6.4	3.4	32	100+	224
6-24"			89		

table 10.

2023 Canola Insect Monitoring Project-Roseau,Mn

[2]Bertha Armyworm and Diamondback Moth

[1]Location		Bertha Armyworm	Diamondback Moth	Growth stage
Magnusson Farm-	3-Jul	**0**	**4**	first bloom
	10-Jul	**1**	**38**	mid-flower-lower pods elongating
	14-Jul	**5**	**5**	lower pods starting to fill
	21-Jul	**62**	**48**	end flowering, seed enlarging in lower pods
	28-Jul	**48**	**27**	seed in lower pods green
	4-Aug	**8**	**58**	seed in lower pods green-yellow
	11-Aug	**4**	**57**	seed in lower pods yellow or brown
Total insects trapped 6/23 - 8/11		**128**	**237**	

^^

[1]Location		Bertha Armyworm	Diamondback Moth	Growth stage
Northern Resources-	3-Jul	**0**	**0**	first bloom
	10-Jul	**1**	**19**	mid-flower-lower pods elongating
	14-Jul	**1**	**8**	lower pods starting to fill
	21-Jul	**8**	**27**	end flowering, seed enlarging in lower pods
	28-Jul	**16**	**17**	seed in lower pods green
	4-Aug	**14**	**15**	seed in lower pods green-yellow
	11-Aug	**16**	**22**	seed in lower pods yellow or brown
Total insects trapped 6/24 - 8/11		**56**	**108**	

[1]Location-

Magnusson Farm- 2 miles north and 6 miles west of Roseau,Mn

Northern Resources- 0.5 miles west of Roseau,Mn

[2]Pheromone trap monitors put into field margin on 6/23/2023 on Magnusson farm location and on 6/24/2023 at the Northern Resources location.

Bertha armyworm- green bucket traps

Diamondback moth-wing traps

Fresh lure put into traps at both locations on 7/21.