2020 Minnesota Canola Production Center (CPC)

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

2020 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 Northern Resources Cooperative for providing the land for canola research trials in 2020.

SITE INFORMATION - 2020 MN Canola Production Center (CPC)

Location: North of Northern Resources Cooperative along MN Hwy 11

Cooperator: Northern Resources Cooperative

Previous Crop: Spring wheat

Soil Test Results:

Nitrogen - 0-6’	9 ppm
Nitrogen - 6-24”	12 ppm
Phosphorous -	6 ppm
Potassium -	148 ppm
Target Yield Goal	2,500#/ac
Fertilizer Applied (#/ac):	N - 140; P - 40; K - 40; S - 20s
%Organic Matter:	3.9
Soil pH:	8.2

Tillage Operations: A single pass with a chisel plow in the fall of 2019, followed by two passes of a vertical tillage tool (joker) in the spring of 2020. All plots were rolled after seeded to improve seed-soil contact.

Fertilizer Applied: All small plot trials received 140-40-40-20S 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 2 at 5 oz/ac + 1% crop oil + Warrior 1.5 oz/ac was applied to the entire area for general grass and flea beetle control on 6/15/2020. The herbicides listed below were applied to the appropriate canola varieties.

A) Liberty Link (LL) hybrids - Liberty 280SL @ 22 fl. oz/ac + 2pt/ac. Amsol (=1# dry AMS) on 6-28 and 6-29

B) Roundup Ready (RR) and Truflex hybrids - Roundup Power Max @ 16 fl. oz/ac +1pt/ac. AMS on 6-28.

C) Clearfield canola - Beyond 4 oz/ac+ 0.25% NIS + 2.5gal/100gal Amsol (=13#dry/100gal AMS) on 6-28.

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 above average rainfall received in the fall of 2019 made fall tillage a challenge. September and October rainfall totaled 9.95 and 4.12 inches compared to the average of 3.33 and 2.22 inches, respectively. April and May were dryer than average, which allowed the topsoil to dry out. However, the incomplete fall tillage and saturated soil conditions in the fall of 2019 made it difficult to prepare a good seedbed for canola seeding in the spring of 2020. Canola seeding was delayed until late May of 2020. All canola trials had good emergence and early season vigor in mid-June. However, saturated soil conditions returned in June and July which limited root development and plant growth. Rainfall totals in June was 6.29 and in July was 8.23 inches which is double the normal rainfall for June and July. Daily high temperatures during the first few days of canola flowering was 5 to 10 degrees warmer than average, but the reminder of the flowering period was close to average. (Source: NDAWN). The number of flowering days ranged from 16 to 22 days, Table 1.

Early season canola stands and emergence were generally better than expected due to the excessive moisture in the fall of 2019. Once fields dried out in the spring, planting proceeded at a rapid pace with no prolonged periods of rainfall. With the canola planting in May, the emergence of canola and flea beetle occurred at the same time. Consequently, many canola fields developed flea beetle populations above threshold levels and required a post emergence insecticide treatment.

Even with the excessive rainfall in June and July white mold levels were low at the CPC in 2020. Other diseases and insect problems were generally at low levels, with the exception of early season flea beetles. All small plot canola trials were seeded on May 30, 2020. All small plot canola trials were located at the Northern Resources field research site approximately 1 mile west of Roseau along MN Hwy 11. The on-farm micro-nutrient trial was conducted with the cooperation of Magnusson Farms 5 miles northwest of Roseau.
Because of the excessive rainfall in June and July, plots were negatively impacted by this saturated soil and standing water for long periods of time during this critical growing period. Based on location, minor field depressions and slight field elevation differences, which wouldn't normally cause problems, this year were issues. CV numbers at the bottom of each data table should probably be noted more closely this year. A high number, above 20 or so, should cause interpretation of the data to be more closely scrutinized. Some of the trial data is fine but the variety trial yield data in particular, with a CV of 33 should indicate using caution interpreting results.

The public canola trials conducted at the 2020 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
- Small plot desiccation and direct harvest trial
- On-farm micro-nutrient trial

Variety and Systems Trial

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

Background:
Canola varieties with new and emerging technologies traits have given canola growers several options for weed control. Further, CL canola varieties are considered a non-genetically modified (GMO) crop and may provide producers with a marketing advantage. 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 trial for comparison in a small plot replicated research trial.

Methods:
All varieties were seeded at 12 PLS/ft.^{2} on 5/30. The experimental design was a randomized complete block (RCB) with four replications. Fertilizer applied to the entire area was 140-40-40-20s. Individual plot size was 6 x 27', and end-trimmed to a harvest area of 5 x 20'. The LL, RR and CL canola varieties were seeded in separate blocks with buffers to reduce potential herbicide drift. A post emergence grass herbicide (Section 2) was applied for grass control to all plots on 6/15. Warrior was added to Section at 1.5 oz/ac for flea beetle control. Roundup, Liberty and Beyond herbicides were applied on 6/28. 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 8/18 and harvested on 8/27. 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 included; early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

Results:
A total of 21 canola lines were entered in the 2020 CPC (Table 1). A breakdown of the canola varieties: 11 RR, 8 LL and 2 CL canola varieties were evaluated in this small plot replicated research trial. In 2020, canola yields ranged from 472 to 1,194#/ac with a trial average of 801#/ac. In contrast, canola yields in 2019 ranged from 1,949 to 2,902#/ac with a trial average of 2,443#/ac. The depressed canola yields in 2020 can be attributed to saturated soil conditions in the fall of 2019, incomplete tillage in the fall of 2019,

delayed planting in 2020, and extended saturated soil conditions in mid-June into July during the 2020 growing season.

Extreme environmental conditions in 2020 resulted in canola yields at the CPC of approximately 30% of the long term average. In addition to the reduced canola growth development and yield, the environmental conditions in 2020 resulted in a CV of 33% which makes recommendations from this data set questionable.

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 canola varieties in the variety trial were invited to enter selected varieties in the canola shatter trial.

Materials and Methods:

In 2020, 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 30th. Plots were maintained using best management practices in the same manner as the variety and systems trial. On August 17th, 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 (8/25, 9/4 and 9/14). 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 17 which would be the approximate date of swathing. Eight days (August 25) after trays were placed between canola rows was the first date canola seeds and pods were observed in the collection pans (Table 2). Canola seeds and pods were collected from the pans at two other dates (9/4 and 9/14). Total canola seed collection (seeds and pods) on 9/14 (four weeks from swathing) ranged from 13 to 181#/ac. Total seed loss after the four weeks ranged 21 to 391#/ac. 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 sixteen days and a recorded wind speed of over 45 mph on (9/6). Measurable rainfall was recorded on 8/20, 9/2, 9/3 and 9/13. Results from this canola shatter trial suggest that canola varieties adapted for direct harvest can withstand wind and rain and still 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 times 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 L345P was seeded at 12 PLS/ft.^{2} on 5/30. 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 6/26. 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 1,221 to 2,421#/ac (Table 7). Generally canola yields tended to increase as the nitrogen rate increased from 60 to 160#/ac. Further, canola yields tended to increase at a given level of nitrogen from a 50/50 blend of urea + ESN applied PPI compared to urea applied alone. This suggests that in a year of above average rainfall, a 50/50 blend of urea and ESN is more efficient than urea applied PPI alone. When applied postemergence, 28% nitrogen tended to be a more efficient nitrogen source than Agrotain Ultra coated urea. Limited canola leaf injury was observed from liquid 28% applied with streamer nozzles in 2020. In 2018, treatments caused canola leaf burn of 14 to 18% was observed from liquid 28% and ammonium thiosulfate. Canola protein increased at nitrogen rates of 90#/ac or more compared to 60#/ac and the untreated. However, untreated canola had the highest oil content compared to all nitrogen rates and timings. This trial had several areas of extended ponded water and saturated soil conditions. One of the consequences of this saturated soil condition is a CV of 19%. This trial will be repeated in 2021 as the saturated soil conditions in June and July resulted in standing and ponded water.

Top dress fertilizer and desiccants in wide row canola

Objectives:

To compare various methods of fertilizer applications in canola seeded in wide rows (18 inch) and to determine if a desiccant will improve the harvest efficiency of direct harvest canola seeded in wide rows.

Background:

The recent advancements in planter technology presents the opportunity for canola fertility to be applied in a band and/or top dressed. Further, the advancement of the pod shatter trait has created an opportunity for more canola acres to be direct harvested. This project will establish a small plot trial to be conducted at the site of the MN CPC in 2020.

Methods:

Canola variety L345P was seeded at 3.5#/ac in rows spaced 18 inches on 5/30. 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 6/26. 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

The desiccant portion of this trial will receive the same level of fertility 140-40-40-20s and the entire area will be managed for best management practices. The desiccant trial will have a total of 3 treatments

- No desiccant
- Roundup + Sharpen (1.5 pt + 2 oz/ac)
- Reglone 1.5 pt/ac

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 quality parameters in the desiccant trial.

Results:
No results of this trial will be reported in 2020 due to extreme variability from standing and ponded water several times in June and July. This small plot trial will be repeated in 2021. In addition to this small plot trial, two on-farm locations will be initiated in 2021.

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:
The majority of 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 2020 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 L345P and was seeded on 5/30. Individual plot size was 6 x 27', end-trimmed to a harvest area of 5' x 20'. Fertilizer applied was 140-40-40-20s 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. Pots re-staked and seeded according to treatment plan. After planting Spartan (2 oz/ac) was applied pre-emergence and the entire area was rolled. Section 2 at 5 oz.ac + Warrior at 1.5 oz/ac was applied for general grass and flea beetle control on 6/15.The entire area received an application of Liberty at 22 oz/ac on 6/29. 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 mild control. Canola was swathed on 8/18 and harvested on 9/2. 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 1,332 to 1,740#/ac. Canola yields were not influenced by herbicide treatment in this trial at the 95% level of confidence. However, a trend was observed with lower seed yield and plant height from Sonalan. No differences were detected from other parameters in this trial.

This trial was primarily conducted for crop herbicide tolerance. The results from this trial suggest that soil applied herbicides are reasonably well tolerated by canola and may have potential for herbicide resistant weed control. Further research will be conducted with an evaluation of post emergent chemicals in addition to the pre emergent treatments to enhance weed control. Weeds not controlied would be evaluated in season along with potential canola injury.

Canola Micronutrient Trial

Objective:

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

Background:

High canola yield goals and intensive crop production management increase 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 2020 indicated that boron, copper and zinc were testing in the low category based on a 3,000#/ac yield goal.

Methods:

The canola variety L345P was seeded at 12 PLS/ft.^{2} on 5/30. Soil type at this location was a clay loam with an organic matter of 4.4% and a pH of 8.1. Fertility applied was a 140-40-40-20s. 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 2 at 5 oz.ac + Warrior at 1.5 oz/ac was applied for general grass and flea beetle control on 6/15. Liberty was applied at 22 oz/ac on 6/29. The micronutrient were applied on 7/17 to canola that was approximately 70% bloom. The seven treatments included: Nachurs 9% Zn (2 pints/ac), Gowan Badge copper (1 pt/ac), Ele-max Sulfur (2 pints/ac), Iron 5% CFA (3 pints/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 8/18 and harvested on 9/2. 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 were 1,932#/ac which would be considered a below average yield for the growing conditions of northwest MN (Table 5). The well above average rainfall in June and July was a primary environmental factor in depressed canola yields in 2020. Canola yields in this trial ranged from 1,674 to 1,932#/ac. The statistical analysis for yield was non-significant at the 95% confidence level. Canola yields tended to be less from all micronutrients, especially sulfur. Tissue test results indicated that canola plant tissue levels were similar to the untreated, except for Cu and ZN which had a higher concentration of these two elements in canola tissue compared to the untreated. This data would suggest micronutrients were not a limiting factor in canola yield in 2020. A micronutrient trial conducted in 2019 suggested a trend for canola yield improvement from micronutrients. With the low canola yields in 2020 would, most likely, reduce the probability of a canola response to micronutrients. This research effort with micronutrients in high yield canola will be continued in 2021.

Large Plot Canola Micronutrient Trial

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

Background:
High yield goals and intensive crop production management increase the probability that micronutrients will limit canola yields than crop production with 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 2020 indicated that copper, sodium and zinc were testing in the low category based on a 3,000#/ac yield goal.

Methods:
This trial was conducted on a canola production field seeded to Liberty Link canola. Soil type at this location was a sandy loam with an organic matter of 1.5% and a pH of 6.2. 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 replications. Section 2 at 5 oz.ac + Warrior at 1.5 oz/ac was applied for general grass and flea beetle control. The four treatments included: Nachurs Zn at 2 pints/ac, Ele-max Sulfur at 2 pints/ac, Zn + Sulfur (2 + 2 pints) and the untreated. Micronutrients were applied on 7/17 to canola that was approximately 80% bloom. Tissue samples were collected 10 days after micronutrient application and sent to AGVISE Labs for analysis. Roundup + Sharpen was applied as a desiccant on and plots were harvested on 8/26. 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:
The results from this trial are listed in Table 4. Canola yields in the untreated was 2,092#/ac which would be considered an average yield for the growing conditions of northwest MN (Table 4). Canola yields in this trial ranged from 2,092 to 2,323#/ac. The statistical analysis for yield was non-significant at the 95% confidence level. Canola yields tended to be more from all micronutrients compared to the untreated. Soil test results indicated low to very low levels of boron, copper and zinc. Tissue test results indicate that canola plant tissue levels generally were similar from the untreated compared to the applied treatments, except all micronutrient treatments increased concentration nitrogen and zinc and sulfur increased the concentration of potassium compared to the untreated. A micronutrient trial conducted in 2019 suggested a trend for canola yield improvement from micronutrients. With the average canola yields in 2020 would, most likely, reduce the probability of a canola response to micronutrients. This research effort with micronutrients in high yield canola will be continued in 2021.

Direct Harvest Canola Trial

Objective:
To evaluate Reglone and Roundup + Sharpen applied as desiccants compared to no desiccant in direct harvest canola.

Background:
Direct harvest canola is an option for growers that don't have a swather or choose not to use a swather to windrow canola prior to harvest. Canola desiccants are a consideration to hasten the dry down of the canola crop before harvest or to control weeds that can slow the harvest. Reglone has been used as a canola desiccant for several years. A tank mix of Roundup and Sharpen has the potential to be used as a desiccant in Liberty link canola to speed the dry down of weeds and the canola crop. A Roundup + Sharpen tank mix will have to be applied before (approximately 14 days) Reglone (approximately 7 days). This trial will evaluate these two desiccants in Liberty Link canola.

Methods:
The canola variety L345P was seeded at 12 PLS/ft.^{2} on 5/30. The experimental design was a randomized complete block (RCB) with four replications. Fertility applied was 140-40-40-20s. Individual plot size was 6 x 27', end-trimmed to a harvest area of 5 x 20'. Liberty at 22 oz/ac + 2.5% AMS was applied for weed control on 6/29 and Proline at 5.7 oz./ac was applied to all plots at first petal fall for white mold control. Canola desiccants used were Reglone and a tank mix of Roundup + Sharpen. Roundup (1.5 pt/ac) + Sharpen (2 oz/ac) + 1% MSO + 2.5% AMS was applied on 8/20. Reglone at 1.5 pt/ac + 0.5% NIS was applied on 8/27. Canola was harvested on 9/4. 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 included; early season vigor and percent ground cover, beginning and end of bloom, plant height and lodging.

Results:
The results from this trial is listed in Table 6. Canola yields in the trial ranged from 1,385 to 1,455#/ac. No difference in canola yield was detected from any treatment compared to the untreated. Weed control in this trial was excellent with no visible weeds were observed above the canola canopy. At the time of harvest, no visual difference in canola maturity was observed from the two desiccants compared to the untreated. Field observations suggest that the canola plants treated with Roundup + Sharpen were dry down to the soil surface while with Reglone canola dry down was limited to the upper portion of the plant. This data suggests that weather conditions in 2020 were conducive for canola dry down as the untreated canola looked similar to the two desiccants. Results from this trial suggest direct harvest is a viable option for canola growers who don't have access to a swather.

2020 Canola Production Center Research Data Summaries
Northwest Minnesota

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

Table 1. Variety/Systems Trial

Table 2. Shatter Trial

Table 3. Preemergent Herbicides Applications

Table 4. Micro Nutrient Large Plot Trial

Table 5. Micro Nutrient Trial

Table 6. Desiccation Trial

Table 7. Nitrogen Use Efficiency

Greater attention this year should be paid to the CV numbers at the bottom of each data table. A high number, above 20 or so, should cause greater scrutiny in the review and interpretation of the data. While some of the trial data is fine, caution should be used in scrutinizing the variety trial yield data in particular, with a CV of 33.

Table 1.

2020 Canola Variety Trial
Northern Resources -West Plant-Roseau,Mn

Company	Entry	PLS/#	Herbicide tolerance*	Maturity	Yield #/acre[1]	Protein[2]	Oil[2]	Test wt./bu.	% ground cover-21DAP	Begin Bloom Date	End Bloom Date	Days of bloom	harvest height (in)	Lodging[3]	ESV-21DAP[4]	% stand at harvest
BrettYoung	BY 19-6284CL	94,500	CL	M/L	626	21	43.5	52.4	48	10-Jul	28-Jul	19	32	9.0	4.0	63
Pioneer	P502CL	94,696	CL	M/L	801	21	45.0	51.4	50	7-Jul	25-Jul	18	31	9.0	4.5	56
Wilbur Ellis	Integra 7361RC	115,000	RR	ML	798	21	44.9	52.1	38	7-Jul	27-Jul	19	30	9.0	3.5	50
Winfield United	CP9919RR	81,720	RR	L	507	20	43.9	51.7	38	8-Jul	26-Jul	18	26	9.0	3.5	31
Winfield United	CP9978TF	97,200	TruFlex	L	784	22	44.0	52.0	48	7-Jul	27-Jul	20	29	9.0	4.0	38
Dekalb	DKTF91SC	97,281	TruFlex	E	639	21	45.3	51.8	43	6-Jul	24-Jul	18	30	9.0	5.0	63
Dekalb	DKTF96SC	82,382	TruFlex	L	983	21	44.6	52.3	60	8-Jul	29-Jul	22	33	9.0	5.5	63
Pioneer	45CM39	67,282	RR	M/L	721	18	48.6	50.3	53	8-Jul	26-Jul	19	32	9.0	5.5	63
Dekalb	DKTFLL21SC	100,322	TF + LL	L	1080	19	47.4	51.8	60	5-Jul	25-Jul	20	33	9.0	6.0	63
Proseed	TF Exp 1	100,000	RR/LL	M	642	19	45.6	52.5	28	10-Jul	29-Jul	19	31	8.5	3.0	69
Star Specialty Seed	StarFlex	105,000	TruFlex	M	1194	19	47.4	51.7	53	7-Jul	27-Jul	20	33	8.0	6.0	81
BrettYoung	6090 RR	119,000	RR	M/L	472	21	41.2	52.0	48	13-Jul	1-Aug	20	37	8.5	5.0	63
BrettYoung	BY 6204TF	103,000	TF	M	634	21	41.7	51.5	53	10-Jul	27-Jul	17	33	8.5	5.5	81
BASF	InVigor L233P	100,800	LL	E	930	20	43.4	51.3	58	9-Jul	26-Jul	16	31	8.5	5.5	69
BASF	InVigor L255PC	84,000	LL	L	760	20	44.6	52.1	48	10-Jul	27-Jul	18	33	8.5	5.0	69
BASF	InVigor L234PC	96,500	LL	E	613	20	42.6	51.6	40	9-Jul	26-Jul	17	32	9.0	4.0	44
BASF	InVigor L345PC	89,000	LL	E	990	20	43.3	52.2	48	9-Jul	28-Jul	18	33	8.5	5.0	63
Dekalb	DKLL82SC	103,445	LL	L	834	20	46.9	51.2	55	8-Jul	27-Jul	18	32	9.0	4.5	56
Pioneer	P501L	82,818	LL	M/L	957	20	44.3	50.2	53	9-Jul	29-Jul	20	33	8.5	5.5	63
Meridian Seeds	CSEXP20-1	76,000	LL	L	944	19	46.0	51.3	63	6-Jul	25-Jul	19	34	9.0	6.0	38
Meridian Seeds	CSEXP20-2	105,000	LL	L	917	18	46.4	51.2	50	8-Jul	26-Jul	18	35	9.0	5.5	63
				LSD @5% level	**377**	1	1.6	0.9	20	1.5	2.6	3	5	0.9	1.8	27
				CV(%)	**33**	5	2	1	30	13	7	10	11	7	26	33

Seeding rate=12PLS/Ft.2 Trial Mean yield =801#/acre

Experimental Design: RCB w/4reps Planting Date- 5/30/2020

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

[1] Pounds per acre seed yield corrected to 8.5% moisture.

Statistical analysis indicate a high degree of yield variability based on field location making variety comparisons difficult.

[2] Oil and protein reported on dry matter basis.

[3]Lodging at harvest-1=flat ; 9=upright

[4] ESV(early season vigor) 9= best;1=least

Table 2.

2020 Canola Shattering Variety Trial
Northern Resources -West Plant-Roseau,Mn

Variety	Company	Herbicide tolerance	Yield[1] lb/acre	ESV[2]	% Ground cover	Lodging[3]	Days of Bloom	**Total[4] Lost seed #/acre**	Total seed lost by date 8/25	9/4	9/14	Source of seed loss by date 8/25 seed[5]	8/25 pod[6]	9/4 seed[5]	9/4 pod[6]	9/14 seed[5]	9/14 pod[6]
InVigor L233P	Bayer Crop Science	LL	930	6.0	43	2.5	16	**27**	5	8	13	5	1	4	4	5	9
InVigor L255PC	Bayer Crop Science	LL	760	6.0	45	1.5	19	**52**	1	20	32	1	0	12	8	22	10
InVigor L234PC	Bayer Crop Science	LL	613	5.5	43	3.5	17	**21**	0	3	18	0	0	1	2	6	12
InVigor L345PC	Bayer Crop Science	LL	990	5.0	40	2.0	20	**50**	0	13	37	0	0	7	6	16	21
DKLL82SC	Dekalb	LL	834	6.0	45	2.0	19	**49**	2	14	34	2	0	8	6	17	17
DKTFLL21SC	Dekalb	TF+LL	1080	5.5	45	3.0	20	**38**	0	7	31	0	0	4	3	13	18
CP9919RR	Winfield United	RR	507	5.5	45	5.0	17	**75**	2	21	52	2	0	18	4	39	13
CP9978TF	Winfield United	TF	784	6.0	50	2.0	20	**39**	0	10	29	0	0	2	8	4	25
DKTF91SC	Dekalb	TF	639	6.0	50	3.0	19	**46**	4	13	29	4	1	8	5	17	12
DKTF96SC	Dekalb	TF	983	6.5	48	1.0	22	**98**	0	30	68	0	0	16	13	30	38
Integra 7361RC	Wilbur-Ellis	RR	798	5.5	43	3.0	19	**51**	4	20	28	4	0	13	7	16	11
StarFlex	Star Specialty Seed	TF	1194	6.5	60	1.0	21	**84**	0	24	60	0	0	14	10	24	36
TF Exp 1	Proseed	TF	642	5.0	35	1.0	19	**102**	0	31	71	0	0	29	2	51	20
6090 RR	Brett Young	RR	472	6.0	53	1.0	25	**391**	0	211	181	0	0	184	28	150	30
		LSD @10% level		1.0	11	1.5	1	**29**	4	53	22	4	1	24	6	15	13
		CV(%)		15	21	56	6	**28**	254	59	37	253	461	77	68	40	57

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 8/17/2020.

[1] Yields taken from the variety trial. Because of poor,inconsistent seed yields in the variety trial, a % loss due to shattering is not being shown.

[2]ESV-Early Season Vigor 21 days after planting. 9=best ;1=least vigor

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

[4] Total #/acre of lost seed. Cumulative pod seed + shattered seed lost (Counted seed x seeds per pound provided by company) as of 9/14/2020.

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

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

Table 3.

2020 Canola Tolerance to Pre-Emergent Herbicide Applications
Northern Resources -West Plant-Roseau,Mn

	Treatment*	Rate	Yield[1]	Test Weight	Protein[2]	Oil[2]	Stand	Vigor[3] 11-Jun	%ground cover 11-Jun	start bloom	end bloom	Harvest Ht.(in)	Lodging[4]
1	Liberty Only	22oz. Post	1622	52	19	44	12.5	6.5	58	8-Jul	29-Jul	35	8.5
2	Spartan	2 oz. PRE	1740	52	19	43	12.5	5.5	53	9-Jul	29-Jul	38	8.0
3	Sonalan HFP	2PT PPI	1332	52	19	44	13.0	5.0	48	9-Jul	30-Jul	32	9.0
4	Trust 4#/gal	1.5PT PPI	1605	52	19	43	14.5	6.0	55	9-Jul	29-Jul	35	8.5
	LSD @ 5%level		**NS**	NS	NS	NS	NS	NS	NS	NS	NS	5	NS
	CV(%)		21	0.3	3	3	13	26	19	10	2	10	12

Experimental Design: RCB with 4 reps

* Spartan applied 5/30 after planting. Sonolan and Trust applied 5/29 prior to final tillage before planting.

Treatment applications made with backpack sprayer @ 18GPA.

Liberty applied to all plots at 22 oz. +1# AMS per acre 6/29/2020

Canola variety L345P

Seeded and rolled 5/30/2020

[1]Clean seed yield adjusted to 8.5% moisture

[2]Protein and oil on dry matter basis

[3]Plant vigor 1= least ; 9=best

[4]Lodging- 1=flat ; 9=upright

Soil Depth	Olsen P ppm	NH_4OAc-K ppm	LOI OM (%)	Water pH	Zinc ppm	SO_4-S #/acre	NO_3-N #/ac
0-6"	5	137	4.4	8.1	0.32	12	8
6-24"							12

Soil texture= clay loam

Treatment #	common name	#Ai/Gal	timing	Liberty-Post
1 None				22oz.
2 Spartan 4F	sulfentrazone	4	Pre	22oz.
3 Sonolan HFP	ethofluralin	3	PPI	22oz.
4 Trust	trifluralin	4	PPI	22oz.

140-40-40-20S fertility applied prior to final seedbed prep

Standard best management practices used throughout the season

Table 4.

2020 Large plot Micronutrient Trial
Magnusson Farm-Roseau,Mn

Treatment	Rate/ Acre	Yield[1]	Test Weight	Protein[2]	Oil[2]	RCI[3] 18-Jul	RCI[3] 27-Jul	RCI[3] 3-Aug	end bloom	Harvest Ht.(in)	Lodging[4]
1 Ele-max Sulfur	2 pts	2127	51	20	45	250	262	245	24-Jul	41	7
2 Nachurs 4-0-0-9z	2 pt	2242	51	20	44	292	323	248	24-Jul	40	6
3 Zinc+Sulfur	2+2	2323	51	20	44	247	268	245	24-Jul	41	6
4 No Treatment		2092	51	20	45	253	262	249	24-Jul	42	6
LSD @5% level		**NS(400)**	NS	NS	NS	NS	NS	NS	NS	1	1
CV(%)		11	1	6	3	12	17	14	5	2	9

		Tissue samples 14DAT										
		% OF PLANT MATERIAL						PPM				
Treatment	Rate/ Acre	N	P	K	S	CA	MG	ZN	FE	MN	CU	B
1 Ele-max Sulfur	2 pts	3.4	0.28	1.32	1.3	5.2	1.7	19	57	169	2.5	34
2 Nachurs 4-0-0-9z	2 pt	3.7	0.29	1.48	1.1	5.1	1.6	25	59	140	2.5	33
3 Zinc+Sulfur	2+2	3.4	0.29	1.45	1	5.1	1.6	31	58	153	2.5	42
4 No Treatment		3.1	0.27	1.26	1	5.1	1.6	17	58	160	2.5	36
LSD @5% level		0.1	NS	0.15	NS	NS	NS	11	NS	NS	NS	NS
CV(%)		1	2	3	11	3	2	16	6	6	33	11
Plant tissue base sample prior to micro nutrient application 7-14-2020												
		N	P	K	S	CA	MG	ZN	FE	MN	CU	B
		3.81	0.51	1.7(L)	0.43	2.53	0.61	18(L)	61	237	2(D)	27

Experimental Design- RCB with 4 reps

[1]Yield- clean seed yield corrected to 8.5% moisture

[2]RCI- relative chlorophyl index higher number=more chlorophyl

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

Application Date-7/17/2020 10:30 am full sun

78F 54%RH wind SSE 10 80% Bloom

Application made with 9' backpack sprayer @ 28PSI and 12GPA

Table 5.

2020 Micronutrient application to Canola
Northern Resources -West Plant-Roseau,Mn

	Element Added	Rate	Yield[1]	Test Weight	% Protein	% oil	RCI[2] 18-Jul	RCI[2] 26-Jul	Ht.(in.)	Lodging[3]	ESV[4]	% ground cover	days of bloom
1	Boron	2 pt	1790	52	19.3	42.8	290	274	42	8.5	6.0	70	20
2	Iron	3 pt	1812	52	18.8	44.1	315	271	41	7.0	6.0	63	21
3	Sulfur	2 pt	1674	52	19.0	43.4	286	255	41	8.0	6.0	63	20
4	Copper	1 pt	1832	52	18.8	43.8	301	268	40	8.0	6.0	60	20
5	Zinc	2 pt	1733	52	18.6	44.1	317	252	40	8.0	5.5	53	20
6	combine 1-5	2+2	1812	52	19.0	43.3	295	277	40	8.0	6.0	58	20
7	No treatment		1932	52	18.9	44.1	326	264	43	7.0	6.0	55	20
	LSD @5% level		NS	NS	0.7	1.0	NS	NS	NS	1.3	NS	13	NS
	CV(%)		9	0.4	2	1	12	8	5	11	6	14	2

Tissue samples 14DAT

	Element Added	Rate	% OF PLANT MATERIAL N	P	K	S	CA	MG	PPM ZN	FE	MN	CU	B
1	Boron	2 pt	2.8	0.21	1.5	1.8	5.6	1.49	22.5	53	117	2	54
2	Iron	3 pt	2.6	0.18	1.5	1.9	5.8	1.26	20.0	69	112	2	46
3	Sulfur	2 pt	2.8	0.20	1.4	1.8	5.7	1.35	22.0	53	119	5	50
4	Copper	1 pt	2.7	0.20	1.5	1.8	5.8	1.39	21.0	52	114	17	46
5	Zinc	2 pt	2.7	0.19	1.4	1.9	5.7	1.45	28.5	54	108	4	48
6	combine 1-5	2+2	2.9	0.20	1.5	1.8	5.5	1.49	24.5	63	108	7	63
7	No treatment		2.5	0.19	1.3	1.9	6.0	1.33	17.0	58	111	4	48
	LSD @5% level		NS	0.03	NS	NS	NS	0.17	6.7	14	NS	4	13
	CV(%)		8	6	8	9	6	5	12	10	8	29	11

Plant tissue sample pı	% OF PLANT MATERIAL						PPM				
prior to application	N	P	K	S	CA	MG	ZN	FE	MN	CU	B
	4.2	0.32	2.2	1.18	3.42	0.86	22	55	115	2	37

Experimental Design- RCB with 4 reps

Canola variety L345P

[1]Yield- clean seed yield corrected to 8.5% moisture

[2]RCI- relative chlorophyl index higher number=more chlorophyl

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

[4]ESV-early season vigor-6-21-2020

Application Date-7/17/2020 9am full sun 6' backpack sprayer @ 28psi 18GPA

wind-SSE 5 74F 65% RH G stage=60%-70% bloom

	Element	Rate	Formulation
1	Boron	2 pt	Nachurs Boron 10%
2	Iron	3 pt	5% Iron CFA
3	Sulfur	2 pt	Ele-max Sulfur LC 10-5-0-10s-.4b
4	Copper	1 pt	Gowen Badge SC 2.27#/Gal metalic copper
5	Zinc	2 pt	Nachurs 9% Zinc EDTA
6	Add 1-5	2+2	

Table 6.

2020 Canola Desiccation Trial
Northern Resources -West Plant-Roseau,Mn

	Yield[1]	% Protein[2]	% oil[2]	test weight	ESV[3] 21DAP	% ground cover-21DAP	days of bloom	Harvest Ht.(in.)	Lodging[4]
No desiccation	**1396**	18.7	44.2	52	6.0	58	20	35	9
Roundup PowerMax + Sharpen(1.5pt+2oz/acre)	**1455**	18.4	44.0	52	6.5	58	20	36	9
Reglone 1.5pts/acre	**1385**	19.1	43.9	52	6.0	58	20	35	9
LSD @5% level	**NS**	NS	NS	NS	NS	NS	NS	NS	NS
CV(%)	11	3	1	1	21	17	1	5	1

Experimental Design: RCB with 4 reps
Direct combined all plots 9-4-2020
Roundup+Sharpen+Amsol applied 8/19/2020 8:00pm 70F wind SSW 3-6

6' backpack sprayer --18GPA @ 28psi
Reglone+ .25% Preference applied 8-31-2020 canola 95% brown upper pods
6:30pm clear 62F 65%RH wind W 5-10
Fertility - 140-40-40-20s

[1]Clean seed Yield corrected to 8.5% moisture

[2]Protein and oil on dry matter basis

[3]ESV-Early Season Vigor 1=least; 9=best

[4]Lodging-1=upright; 9=flat

Table 7.

2020 Canola Nitrogen Use Efficiency Trial
Northern Resources -West Plant-Roseau,Mn

Trt.#	Total Nitrogen added	PPI-urea[1]	PPI[1] urea + ESN	# N Post emerge[6]	**Yield[2]**	% oil	% Protein	test weight	RCI[3]	Lodging[4]	Harvest Ht.(in.)	ESV[5] 21DAP	% ground cover-21DAP	days of bloom
1	0				1221	44.3	18.2	52.1	176	8	35	5.0	53	19
2	60	60			1461	42.1	19.4	52.3	192	8	37	5.7	53	19
3	90	90			1618	42.2	19.7	52.4	199	8	43	5.7	60	20
4*	12	120			NH	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	160	160			2180	42.0	20.2	52.6	260	8	42	7.0	70	20
6	60		30+30		1934	43.8	18.8	52.2	263	8	42	7.7	73	20
7	90		45+45		2106	42.6	19.9	52.4	275	9	44	7.7	80	21
8	120		60+60		1877	41.9	20.1	52.5	213	8	42	7.0	70	20
9	160		80+80		2421	42.7	19.9	52.3	287	8	44	7.7	77	21
10	90	40		50+ Agrotain Ultra	1867	43.4	19.1	52.4	275	8	41	7.0	70	20
11	120	40		80+Agrotain Ultra	1749	42.3	19.7	52.4	246	8	41	5.7	60	20
12	90	40		50+ 28% UAN 4 leaf streamer	2152	41.9	19.7	52.3	217	9	42	7.7	73	20
13	120	40		80+ 28% UAN 4 leaf streamer	1879	42.8	19.6	52.5	236	8	37	6.3	63	20
				LSD @5% level	600	1.5	1.3	0.3	70	NS	6	NS	19	1
				CV(%)	19	2	4	1	18	11	8	23	17	3

Experimental Design: RCB with 4 reps(only 3 reps used because of water damage)

Variety=L345P planted on May 30,2020

*- Treatment 4 had sufficient water damage to not permit reasonable data and yield data collection.

[1]PPI- urea application rates 5/29 prior to final seedbed prep

[2]Yield- clean seed #/acre corrected to 8.5% moisture

[3]RCI-Relative Chlorophyl Index- higher number = more chlorophyl

[4]Lodging at harvest- 1=flat; 9=upright

[5]ESV-Early season vigor visual rating 1=poor; 9=best

[6]Liquid fertilizer applications made 6/26/2020