

FINAL REPORT for AGRI Crop Research Grant

Project Title: Direct Harvest Canola - Strategies to Increase Harvest Efficiency and Profitability

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Organization Name: U of MN

It is the policy of the State of Minnesota to monitor progress on state grants by requiring grantees to submit written progress reports until all grant funds have been expended and all of the terms in the grant agreement have been met. Grant payments **shall not** be made on grants with past due progress reports unless the state agency has given the grantee a written exemption. We recommend you read the instructions on the final report document so that you can collect required information in your progress reports throughout the duration of your project.

Information provided in this report will be used to measure the outcomes of the AGRI Crop Research Grant program and may be included in the annual AGRI legislative report. Accordingly, please provide accurate, concise responses to the following questions:

1. List the objectives of this project.

- 1) Conduct small plot replicated canola research trials to document LL and RR canola variety response to direct harvest methods.**
- 2) Conduct small plot replicated research trials to evaluate various rates, timings and water volumes for desiccants used in direct harvest canola.**
- 3) Document the scope and evaluate late season flea beetle damage in direct harvest canola**

Objectives for this project were accomplished with small plot research methodologies. These field research trials were conducted at the MN Canola Production Center (CPC) and area canola grower's fields in 2024 and 2025. The data and summaries for these and other canola research trials are available on the internet at MN Canola Council website, mncanola.org.

2. List **all** outcomes from this project that were produced since any prior grant report. Please include brief (1-2 sentence) accounts of all the research and outreach efforts. Examples include but are not limited to experiments, releasing cultivars, patents, publications, presentations, and field days.

Project Progress reports were written and submitted to MDA in June 2024, January 2025, June 2025 and February 2026. Canola field research trials for this project were conducted at the CPC and area canola grower's fields in 2024 and 2025. Research results have been collected, data analysis completed and summaries written. These summary results are available online at the MN Canola Council Website, [MN canola.org](http://MNcanola.org).

Field Days, meetings, grower fact sheets are discussed in the outreach section below.

A comparison of canola harvest method (swath and harvest vs direct harvest) was conducted on four RR and four LL varieties. The range in canola yields for the four RR canola varieties were -20 to + 23 and the four LL varieties ranged from -3 to + 11%. This data would suggest the RR canola varieties selected in this trial were influenced more by harvest method than the LL varieties. The data in this trial also suggests a trend for higher canola yields from direct harvest compared to swathing. However, this data set also points out the importance of knowing how a canola variety will respond to swathing and harvest compared to direct harvest.

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. However, if canola is allowed to stand in the field too long before harvest, pod shatter and pod drop will have a negative impact on harvested yield. The degree of pod shatter and pod drop will vary based on the canola variety and environmental conditions. The MN Canola Council conducted pod shatter and pod drop trials at the CPC over a three-year period in 2021-2023. Results can be viewed at the Canola Council Web site: www.mncanola.org. Data from 2023 indicated the total percent seed loss after the 42 days in the field after 60% SCC ranged from 3.9 to 20.9%.

One of the challenges with direct harvest canola is the seeds are generally at harvest moisture (<10%), but the straw is still green. This is especially the case with precision planting of canola which has a final plant stand of 2-3 canola plants/square foot compared to traditional seeding of 7-10 plants/square foot. Canola can adapt to various plant populations and produce similar yields. However, as the canola plant stand decreases the individual stem diameter increases and plants with larger stem diameter take longer to dry down than stems with smaller stem diameters.

The two-year summary of canola yields and other agronomic data in the canola desiccation trial suggest no differences in Liberty link canola that was swathed and harvested compared to a desiccant (Roundup + Sharpen) applied and direct harvested. The results of these trials indicate that Roundup + Sharpen gave similar canola yield as swathing. The canola stand at this trial was uniform at harvest and early season herbicides control resulted in a high level of season long weed control. However, one of the field observations from the Roundup treatments at harvest was that the canola stalks were brown to the soil level. Canola stalks brown to the soil level had increased harvest efficiency compared to the untreated. Canola in the Reglone and Sharpen alone treatments were green halfway down to the soil level.

The proper timing of a desiccant application in canola will depend on the product. Proper swathing timing in canola is after 60% seed color change (SCC) on the main stem. The recommended timing for Roundup alone or Roundup + Sharpen is the same as swathing, 60% SCC. If Sharpen is used alone 80% SCC is the recommended application timing and for Reglone the timing is 90% SCC. With average environmental conditions Roundup alone and Roundup + Sharpen will be ready for harvest in 14 to 21 days. Reglone will be ready in approximately a week and the Sharpen treated canola will fall between Roundup and Reglone. Cool environmental conditions will take more time for the desiccant to work than if applied in warmer environmental conditions.

Reasons to consider a desiccant in canola include: 1) dry down weeds prior to harvest, 2) dry down canola plants in fields that exhibit variable maturity, and 3) increase harvest efficiency. A desiccant will assist in both drying down green weeds and making the canola field more uniform prior to harvest which generally will improve harvest efficiency.

An application of Roundup + Sharpen will increase the harvest efficiency of direct harvest canola compared to canola without a desiccant. In small plot research trials at the CPC, Roundup + Sharpen applied at 60% SCC to Liberty Link canola resulted in twice as many plots harvested in an hour compared to canola harvested without a desiccant. Further, in a canola grower's field in 2025, harvest of canola without a desiccant ranged from 4 to 5.5 acres/hour compared 10.9 to 13.6 acres/hour from Liberty Link canola treated with Roundup + Sharpen.

In addition to the CPC, two canola fields in Roseau County were surveyed on a weekly basis after flowering for late season flea beetle infestations. This late season flea beetle survey of direct harvest canola fields was conducted in 2024 and 2025 and indicated low populations of late season flea beetles in both years. Flea beetle counts were less than 20/plant throughout the duration of this trial. Research from Canada suggest flea beetle populations have to be over 100/plant before canola seed yield is impacted from late season flea beetle feeding.

3. Outreach activities.

The primary outreach activities during this project were, 1) a Canola Field Day and golf outing and 2) a winter educational meeting. The objective for the summer field day is to view research plots at the CPC and the associated golf outing. This field day and golf outing had over 100 people attend each year and was held on July 17, 2024, and July 16, 2025. The second was an educational event (Canola Symposium) held at the Roseau Community Center in Roseau, MN on December 5, 2024, and December 4, 2025. An average of 70 people attended these day-long educational events. The speaker lineup for this event ranged from canola seed agronomists, University researchers and canola marketing experts. The agenda for this event can be found on the MN Canola Council website, mncanola.org.

A secondary activity was the development of a grower fact sheet that illustrates the proper timing for canola desiccation in direct harvest canola and an economic comparison of canola that is swathed and harvested compared to direct harvest canola. These documents are included as a separate file.

4. Longer term outcomes - None.

5. Improved Ag Quality or Value

The number of farmers trained is listed in the outreach section above. The annual CPC research results are published and available on the Canola Council Website (mncanola.org). A fact sheet that illustrates the optimum timing for canola desiccation was produced as was an economic analysis of swathing and harvesting canola compared to the direct harvest of canola.

6. Economic Impact - None

7. List and briefly describe any challenges that have slowed progress or impacted the budget of the project.

All objectives of this project were completed and research reports written and results submitted as a part of the annual canola research report.

8. If you have changed the scope or objectives of your project, please provide a short summary and justification of the changes.

No changes were made to the original project scope or objectives for 2024 and 2025.

A suggestion for future canola desiccation research would be to conduct the trial in cooperation with a canola grower as in that manner a field could be selected that had weeds prior to swathing to get a better evaluation of canola desiccation products.

Canola Desiccation Guide

Direct Harvest Canola

Shatter tolerant canola varieties have made it possible to straight cut (direct harvest) canola. The recent development of the canola pod shatter trait have accelerated grower acceptance of direct harvest canola. However, swathing canola is a proven practice, and swath timing will serve as a benchmark for canola dry down and harvest aid product timings.

Swath Timing of Canola

Recommendations of when to swath canola have been updated based on several years of field research. Research conducted by the Canadian Canola Production Centers have demonstrated an 8 to 10% canola yield advantage when swathing was delayed from 30-40% to 50-60% seed color change (SCC) on the main stem. This research points out optimal canola yield and quality resulted from delaying canola swathing until at least 60% SCC.

How to Determine 60% SCC

Once the canola plant begins to turn color, seed moisture drop will range from 1.3 (cool and wet) to over 2%/day (hot and dry). Canola seed moisture will be approximately 40% at the first signs of SCC and 20% at 50-60% SCC. In an average year it will take 10-15 days from 40% seed moisture to 20% seed moisture. To determine 60% SCC, divide the canola plant into three sections, bottom, middle and top. Canola plants mature from the bottom of the main stem up the plant and from the center of the plant outward to the branches. To determine canola SCC, collect pods from the bottom, middle and top of main stem and evaluate the seed color from the from each section of the plant.

Canola seeds from the bottom third of the plant will be brown to black in color.



Canola seeds from the middle third of the plant will be a mottled brown to black color



Canola seeds from the top third of the plant will be green in color and will be firm when rolled between finger and thumb.



Photo credit for the three pictures above Canadian Canola Council.

The development of the pod shatter trait is the primary driving factor in the recent popularity of direct harvest canola. 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. However, the longer the canola plants are allowed to stand in the field before harvest, the higher probability of pod shatter and pod drop. The degree of pod shatter and pod drop will vary based on the variety and environmental conditions. The MN Canola Council conducted canola pod shatter and pod drop at the CPC over a three year period in 2021-2023. Results can be viewed at the Canola Council Web site: www.mncanola.org. Data from 2023 indicated the total percent seed loss after 42 days after 60% SCC ranged from 3.9 to 20.9%.

Why Consider a Desiccant in Canola?

Weeds



Uneven Canola Maturity



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When the crop is close to 60% SCC canola fields should be evaluated for a harvest strategy. Is swathing, direct harvest with a harvest aid or direct harvest without a harvest aid the best course of action? When considering a harvest aid, it's important to understand the goal. Is it canola desiccation only, controlling weeds (annual or perennial) prior to harvest, drying down the crop, or a combination. If weed control is the primary objective, a product such as glyphosate (Roundup) will be required. If the primary objective is desiccation, a product such as Reglone or Sharpen are choices. To get the best of both worlds a tank mix of Roundup + Sharpen is often the recommendation. Remember, Roundup will not assist in the dry down of Roundup Ready canola.

One of the considerations to improve harvest efficiency in straight cut canola is the use of a harvest aid. Reasons to consider a harvest aid in canola include: 1) dry down weeds prior to harvest, 2) dry down canola plants in fields that exhibit variable maturity, 3) increase harvest efficiency and 4) perennial weed control with Roundup.

Roundup + Sharpen - Weeds on Day of Treatment L and at Harvest R



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The ideal timing of harvest aid products in canola will depend on the product. Proper swathing timing in canola is after 60% seed color change (SCC) on the main stem. The recommended timing for Roundup alone or Roundup + Sharpen is the same as swathing, 60% SCC. Sharpen alone is 80% SCC for Reglone the timing is 90% SCC. With average environmental conditions Roundup alone and Roundup + Sharpen will be ready for harvest in 14 to 21 days. Reglone will be ready in approximately a week and the Sharpen treated canola will fall between Roundup and Reglone. Cool environmental conditions will take more time for the harvest aid to work than if applied in warmer environmental conditions. A Roundup + Sharpen tank mix will assist in both drying down of green weeds and dry down of Liberty Link canola varieties which generally improve harvest efficiency.

Roundup has the earliest application timing of the canola products used as a harvest aid. One thing to keep in mind is make sure canola seed moisture is less than 30 per cent in the least-mature areas of the field. By waiting until 50 to 60 per cent seed color change in the least-mature areas of the field, growers can be confident seed moisture will be at less than 30 per cent.

Untreated Canola in Desiccation Trial

Canola Regrowth and Green Stalks



Green Canola Stalks After Harvest



An application of Roundup + Sharpen will increase the harvest efficiency of direct harvest canola compared to canola without a harvest aid. In small plot research trials at the CPC, Roundup + Sharpen applied at 60% SCC to Liberty Link canola resulted in twice as many plots harvest/hour compared to no treatment. Further, in a canola grower's field in 2025, harvest of canola without Roundup + Sharpen ranged from 4 to 5.5 acres/hour compared 10.9 to 13.6 acres/hour from Liberty Link canola treated with Roundup + Sharpen.

Canola Stubble and Regrowth - Untreated L and Roundup + Sharpen R



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One of the challenges with direct harvest are the canola seeds are generally at harvest moisture (<10%), but the straw is still green. This is especially the case with precision planting of canola which has a final plant stand of 2-3 canola plants/square foot compared to traditional seeding of 7-10 plants/square foot. Canola can adapt to various plant populations and produce similar yields. However, as the canola plant stand decrease the individual stem diameter increase and plants with larger stem diameter take longer to dry down than stems with smaller stem diameters.

Results from small plot research at the CPC indicate that Roundup + Sharpen gave similar canola yield as swathing. One of the field observations from the Roundup treatments was that the canola stalks were brown to the soil level. Canola stalks that were brown to the soil level had increased harvest efficiency compared to untreated or the Reglone and Sharpen applied alone which had green canola stalks.

Swathing Compared to Direct Harvest Canola

Research conducted in Canada has shown that when canola harvest aids are timed properly, canola yield, oil content, seed loss, green count and grade are generally similar from canola that received a harvest aid compared to swathing.

Straight cutting canola generally saves \$15 to \$25/acre in direct swathing costs. This assumes the canola will be straight cut without a harvest aid. So, if environmental conditions favor canola dry down, that \$15 to \$25/acre will be a cost savings. However, if environmental conditions are not favorable for canola dry down, a harvest aid should be considered. Canola allowed to stand in the field too long before harvest will increase the probability of canola seed shatter and pod drop.

A survey conducted by the Western Producer in 2025, listed the chemical cost for pre-harvest aids in canola ranged from \$15 to \$35/acre depending on the products and rate used. A custom rate survey by NDSU in 2024 lists the average ground sprayer application cost of \$8/acre. The total cost harvest aid applications in canola will range from \$23 to \$43/acre. The choice of harvest-aid chemicals and potential yield losses and the net economics will depend on canola variety selection, weed pressure, time, labor and machinery constraints.

A recent report from Canada indicated that canola fields treated with pre-harvest products, such as Reglone, or Sharpen + Roundup before straight-cutting were generally easier to combine and were combined more quickly and efficiently and with fewer in-field delays than swathed canola.

Summary

Canola swathing is a proven practice in canola harvest management. However, the recent development of the pod shatter trait has accelerated the acceptance of direct harvest (straight cut) canola. Both swathing and combine harvest and direct harvest have a place in canola harvest management. Environmental conditions, canola stand, machinery and labor requirements are factors to consider when making a canola harvest decision. The use of a harvest aid in canola can increase the harvest efficiency in direct harvest canola. The harvest aid selected will depend on the goals of canola harvest management.