

Effect of paraquat and diquat applied preharvest on canola yield and seed quality

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Progress Report

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Research objectives:

1. Determine the effect of paraquat applied preharvest at three timings on canola yield, seed moisture, and seed quality.
2. Determine the effect of diquat applied preharvest at three timings on canola yield, seed moisture, and seed quality.
3. Compare yield, seed moisture, and seed quality of swathed canola to paraquat and diquat-treated canola.
4. Determine the effect of harvest timing following a paraquat or diquat application on canola yield, seed moisture, and seed quality.

Research procedures:

The study was conducted at three locations in 2005: 1) North Central Research Extension Center, Minot, ND, 2) Langdon Research Extension Center, Langdon, ND, and 3) Montana State University, Bozeman, MT. Only the Minot results are summarized here. A complete report summarizing all locations will be submitted by February 1.

Paraquat and diquat were applied preharvest at three timings approximately as outlined in Table 1. The three applications were made on August 2, 5, and 9. A tractor-mounted sprayer with the boom raised approximately 18" above the canola canopy was used to apply paraquat and diquat. Paraquat was applied at 1.3 pt/A with NIS at 0.25% v/v. Diquat was applied at 1.5 pt/A with NIS at 0.25% v/v.

Table 1. Target canola stages for preharvest paraquat and diquat applications.

Canola seed color	Application #1	Application #2	Application #3
Top 1/3	Green	Green to light green	Light green to yellow
Middle 1/3	Light green with a few just starting to turn reddish brown	Fewer light green with most light brown or reddish brown	Some light brown, but most reddish brown
Bottom 1/3	Light brown to reddish brown, some purple	Fewer light brown, mostly reddish brown to purple	Reddish brown or purple

One treatment was swathed with a plot swather on the same days the paraquat/diquat treatments were applied as a comparison to current grower practices. The paraquat, diquat, and swath treatments were harvested on Aug 9, 12, 16, and 23, approximately 7 and 14 days after application.

The study was a 3-factor factorial (desiccant, timing, harvest date) arranged in a randomized complete block design. Individual plots were 10 by 30 ft with four replications. Data collected

included canola yield, test weight, seed moisture content at harvest, % oil content, green count, seed damage, grade, and seed loss due to shattering prior to harvest. Four sticky cards were placed on the ground under the canopy just prior to or following the desiccant treatment. Sticky cards were collected just prior to harvest and seeds were counted and the numbers converted to estimate yield loss per acre. We took pictures of seed and pod color at all swath and harvest dates, which will be presented in the final report. All data were analyzed using SAS (PROC GLM or PROC MIXED). Means were separated using Fisher's Protected LSD test at $\alpha = 0.05$.

Results and Discussion:

Canola Yield:

Paraquat- and diquat-treated plots produced similar canola yields compared to swathed treatments averaged across all timings and harvest dates. Canola yields were also similar for the two harvest dates (7 and 14 days) averaged across desiccants and timings. There was a significant difference in yield for application Timing 2 compared to Timing 1 and 3. However, the Timing 2 yield was likely lower due to operator error. All canola plots were harvested by one operator, except for one harvest date. The regular operator was not available to harvest the "Timing 2 – Harvest 7 day" plots and thus the plot had to be harvested by a less experienced operator. Canola yields from that day were significantly lower compared to other harvest dates. We believe that if our regular operator had been available, there would likely be no significant difference in yield between application timings.

Seed Loss Due to Pre-Harvest Shattering:

There was very little canola yield lost to shattering. The highest yield loss in any treatment was 75 lb/A. Averaged across all timings and harvest dates, paraquat-treated plots lost 37 lb/A compared to 24 and 18 for diquat and the swath treatment, respectively. This small loss would be acceptable in normal canola production. As might be expected, Timing 3 had a lower yield than Timing 2 and 3. Also, there was slightly lower yield when harvesting 14 DAT compared to 7 DAT. However, these yield losses would be considered minimal and acceptable. It should be noted that we had maximum wind speeds of 14 to 26 mph from August 2 to August 23.

Test Weight and Oil Content:

There were no significant differences in test weight or oil content between desiccants, timings, and harvest dates.

Green Count:

There was higher green count in the diquat-treated plots compared to paraquat or swathing. As might be expected, there was slightly higher green count in the Timing 1 application compared to Timing 2 and 3. We intended to make the Timing 1 application a little early to determine whether the desiccants would result in higher green count. The 7 DAT-harvest date had slightly higher green count than the 14 DAT-harvest date, which was due mostly to the high green count in the "diquat- Timing 1- Harvest 7 day" treatment.

Total Damage:

There was higher total damage from diquat compared to paraquat and swath treatments. There was higher total damage from the Timing 1 application compared to the Timing 2 or 3 applications. There was slightly higher total damage from the 7 DAT harvest date compared to

14 DAT. Again, most of the higher damage was probably associated with the early diquat application and early harvest.

Heat Damage:

There were no significant differences in heat damage between desiccants, timing, or harvest dates. However, there was a trend for higher heat damage with:

Desiccant: paraquat > diquat > swath

Timing: Timing 3 > Timing 2 > Timing 1

Harvest date: 14 DAT > 7 DAT

Moisture at Harvest:

There was slightly less seed moisture at harvest in the diquat-treated treatments compared to paraquat and swathing. The higher moisture in Timing 2 compared to 1 and 3 is likely due to harvest following a rain and/or heavy dew. There was no significant difference in moisture levels between harvest dates (7 DAT or 14 DAT)

Grade:

There was no significant difference in Grade between any desiccants, timings, or harvest dates.

Conclusion:

Based on these preliminary results, we believe that there is potential to successfully use paraquat or diquat to desiccate canola without suffering drastic losses due to shattering or lower seed quality. This study should be conducted at least one or two more years to determine the effect of different years and environmental conditions on shattering and seed quality.