Comparison of Desiccant Timing and Harvest Method in Canola

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Introduction

The concept of straight combining canola is gaining favor among growers in North Dakota. Some growers have indicated they would increase canola acres if they could eliminate swathing, which is very time consuming and leaves the crop susceptible to strong winds.

However, under cool, wet conditions straight combining may not be advisable without the assistance of a desiccant to help dry down the crop. In 2005, a Section 18 emergency exemption was approved to use Reglone as a pre-harvest desiccant. However, essentially no Reglone was used due to cost, lack of information, and experience with applying a desiccant followed by straight combining. This experience is what prompted this study.

Thus, there are questions to be answered regarding proper desiccant use. For example, what is the proper canola stage for application? How many days must one wait to harvest? Will a desiccant increase shattering potential or pod drop? Does application timing or harvest date affect green seed count, yield, test weight, oil content, or grade compared to swathing?

Table 1. Target canola stages for pre-harvest 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 to purple

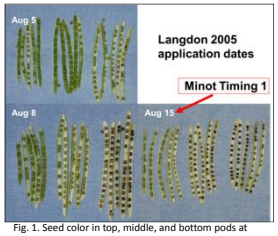

Fig. 1. Seed color in top, middle, and bottom pods at application at Langdon in 2005.

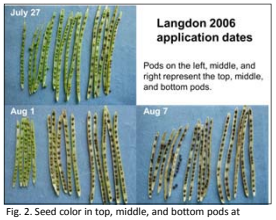

Fig. 2. Seed color in top, middle, and bottom pods at application at Langdon in 2006.

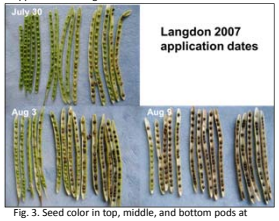

Fig. 3. Seed color in top, middle, and bottom pods at application at Langdon in 2007.


Fig. 4. Yellow sticky cards were placed under canopy before application to estimate yield loss due to seed shatter.

Fig. 5. Comparison of diquat vs. untreated at 3 DAT.

Table 8. Advantages and disadvantages straight cutting vs. swathing.

Swath	Desiccant / Straight cut
•Strong winds can blow swath	•Strong winds will cause shattering if too ripe
•Swath tolerates moderate winds	•Little shattering in 30 mph wind (wil 10 days)
•Crop harvested in 10-14 days or more	•Crop harvested 7 days after treatment
•Maybe slightly lower cost	•Slightly higher cost than swathing
•Swathing is time consuming	•Less time spent in field
•No tracking in field	•Ground application leaves tracks, ↓ yield
•Timely swathing needed	•Timely application and harvest needed
•Difficult to swath lodged canola	•Poorer coverage on lodged canola ↑ green
•Green seed a concern when hot, dry	•Very early application may result in ↑ green
•Swather expense & maintenance	•No expense for swather

Research Objectives

- Determine the effect of Gramoxone and Reglone applied pre-harvest at three timings on canola yield, seed moisture, and seed quality.
- Compare Gramoxone and Reglone-treated canola to swathed canola.
- Determine the effect of harvest timing following a Gramoxone or Reglone application on canola yield, seed moisture, and seed quality.

Materials and Methods

This study was conducted at Minot and Langdon, ND and Bozeman, MT in 2005, 2006, and 2007. Only the ND data will be presented here. Gramoxone (paraquat) and Reglone (diquat) were applied pre-harvest at three timings approximately as outlined in Table 7. Gramoxone was applied at 1.3 pt/A with NIS at 0.25% v/v. Reglone was applied at 1.5 pt/A with NIS at 0.25% v/v. One treatment was swathed with a plot swather on the same day the Gramoxone and Reglone treatments were applied as a comparison to current grower practices. The Gramoxone, Reglone, and swath treatments were harvested 7 and 14 days after treatment (DAT).

Figures 1, 2, and 3 show the approximate canola stages that desiccants were applied in Langdon, ND. Each picture shows, from left to right, open pods from the top-, middle-, and bottom-third of canola plants for each application timing. For example, on August 5, seed in the bottom-third of the plants are just starting to turn color, while seed in the top- and middle-third of the plants are still green. On August 8, seed in the bottom-third are mostly turned, while the middle-third is just beginning to turn color, and so on. At Minot in 2005, desiccant applications were made slightly later compared to Langdon, as Minot timing 1 would have been equivalent to timing 3 in Langdon. At Minot in 2006, the applications stages were similar to Langdon in 2006.

The study evaluated three factors (desiccant, timing, harvest date) and was arranged in a randomized complete block design. Individual plots were 10 by 30 ft with four replications. Data collected included seed loss due to shattering prior to harvest, canola yield, test weight, seed moisture content at harvest, percent oil content, green count, seed damage, and grade. Four sticky cards (6-inch by 12-inch) were placed on the ground under the canopy just prior to or following the desiccant treatment (Fig. 4). Sticky cards were collected just prior to harvest and seeds were counted and the numbers converted to estimate yield loss per acre. Plots were harvested with a plot combine to determine canola yield and test weight. Samples from all locations were analyzed for oil content in Minot, then sent to Archer Daniels Midland, Velva, ND for green count, seed damage, and grade analyses.

Results

Desiccant comparison:
Gramoxone- and Reglone-treated plots produced similar results to swathing when comparing canola yield and seed quality parameters, with the exception of green seed content. Swathing generally (not always) had lower green content and thus less total damage. Green count was generally lower when 1) plants were not lodged, 2) desiccants were applied when seeds in middle pods had started to turn, and 3) harvest moisture was near 10%.

Timing comparison:
Desiccant-treated plots generally produced similar canola yield, test weight, and oil content to swathing. However, at Langdon in 2005, swathing or desiccating at timing 1 and 2 resulted in lower yield and test weight. This was likely due to canola being too green with high harvest moisture. In 2006, desiccant applications and swathing were done slightly later and did not affect yield or test weight. As would be expected, green content generally was slightly lower at timing 3 compared to timings 1 and 2. At Minot in 2007, yield was slightly lower for the desiccant treatments compared to swathing, again at the very early application. However, there was no difference in yield at the later timings.

Harvest date comparison:
There was minimal seed lost due to shattering at either harvest date at either location, generally less than 50 lb/A. At Minot and Langdon, both desiccated and swathed canola harvested 14 DAT had lower green count and less total damage than canola harvested 7 DAT. Thus, leaving the crop in the field allowed the seeds to continue maturing and drying.

Conclusions:
Based on this three-year study, there may be potential to successfully use a desiccant to desiccate canola without suffering drastic losses due to shattering or lower seed quality. In these studies, if the desiccant or swathing operations were done when seed in the middle pods had started to turn color, crop quality parameters including canola yield, test weight, oil content, seed loss, green count, and grade were generally similar for desiccant treatments compared to swathing. However, the data indicate that very early applications could result in lower yield and seed quality, most specifically higher green content. Regarding efficacy, Gramoxone and Reglone appeared to dry down the crop equally fast.

Table 2. Canola yield and quality at Minot, ND (2005).

	Application Moisture	Harvest Moisture	Yield	Test weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	lb/bu	%	lb/A	%	%	
Gramoxone		10.7 a	2525 a	53.6 a	42.9 a	37 a	0.6 b	0.8 b	1.5 a
Reglone		10.1 b	2519 a	53.6 a	43.1 a	24 b	1.6 a	1.7 a	1.5 a
Swath		10.0 b	2526 a	53.5 a	42.7 a	18 b	0.5 b	0.6 b	1.2 a
Timing 1	40.7	9.5 b	2573 a	53.5 a	43.2 a	21 b	1.7 a	1.7 a	1.4 a
Timing 2	34.5	11.8 a	2331 b	53.6 a	42.8 a	17 b	0.5 b	0.6 b	1.3 a
Timing 3	23.3	9.4 b	2667 a	53.5 a	42.6 a	40 a	0.6 b	0.8 b	1.5 a
7 DAT		10.4 a	2505 a	53.6 a	43.0 a	19 b	1.4 a	1.5 a	1.4 a
14 DAT		10.1 a	2541 a	53.6 a	42.7 a	33 a	0.5 b	0.6 b	1.4 a

Table 3. Canola yield and quality at Minot, ND (2006).

	Application Moisture	Harvest Moisture	Yield	Test weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	lb/bu	%	lb/A	%	%	
Gramoxone		8.7 b	2401 a	53.2 a	45.8 b	19 a	0.7 ab	0.9 ab	1.0 b
Reglone		8.8 b	2503 a	53.2 a	46.5 a	17 a	1.0 a	1.3 a	1.1 a
Swath		9.3 a	2352 a	52.9 b	45.8 b	19 a	0.5 b	0.8 b	1.0 b
Timing 1	42.9	9.0 a	2375 a	52.9 b	45.6 b	17 a	0.8 a	1.0 a	1.0 a
Timing 2	39.5	9.2 a	2412 a	53.1 ab	46.0 ab	19 a	0.8 a	1.1 a	1.1 a
Timing 3	36.7	8.6 b	2468 a	53.2 a	46.4 a	20 a	0.5 a	0.9 a	1.0 a
7 DAT		9.8 a	2425 a	52.9 b	46.1 a	7 b	1.0 a	1.3 a	1.1 a
14 DAT		8.1 b	2412 a	53.2 a	45.9 a	30 a	0.4 b	0.7 b	1.0 a

Table 4. Canola yield and quality at Minot, ND (2007).

	Application Moisture	Harvest Moisture	Yield	Test weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	lb/bu	%	lb/A	%	%	
Gramoxone		9.6 a	1337 a	52.5 a	38.9 a	25 a	1.2 a	2.7 a	2.9 a
Reglone		9.6 a	1357 a	52.5 a	38.8 a	17 ab	1.3 a	3.0 a	3.1 a
Swath		8.9 b	1382 a	52.4 a	38.7 a	16 b	0.9 a	2.5 a	3.0 a
Timing 1		9.8 ab	1236 b	51.8 c	38.4 b	4 c	2.4 a	4.1 a	2.9 a
Timing 2		8.2 b	1428 a	52.5 b	39.2 a	19 b	0.6 b	2.2 b	3.0 a
Timing 3		10.1 a	1412 a	53.0 a	38.9 a	36 a	0.4 b	1.9 b	3.1 a
7 DAT		9.8 a	1390 a	52.1 b	39.0 a	6 b	1.5 b	2.9 a	2.9 a
14 DAT		8.9 b	1327 a	52.8 a	38.7 a	33 a	0.8 a	2.5 a	3.1 a

Table 5. Canola yield and quality at Langdon, ND (2005).

	Application Moisture	Harvest Moisture	Yield	Kernel weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	g/1000	%	lb/A	%	%	
Gramoxone		16.5 a	2595 a	3.38 a	46.2 a	17 c	3.5 a	3.8 a	1.8 a
Reglone		15.2 b	2705 a	3.33 a	46.4 a	25 b	3.5 a	3.8 a	1.6 a
Swath		14.3 b	2648 a	3.33 a	45.6 b	38 a	1.6 b	1.7 b	1.2 b
Timing 1	45.3	17.6 a	2265 c	3.02 c	45.5 b	34 a	2.0 a	2.3 b	1.4 b
Timing 2	38.2	16.0 b	2550 b	3.30 b	46.6 a	29 a	4.5 b	4.8 a	1.9 a
Timing 3	32.3	12.4 c	3132 a	3.73 a	46.1 a	17 b	1.9 a	2.3 b	1.3 b
7 DAT		21.4 a	2583 b	3.32 b	46.2 a	20 b	3.9 a	4.2 a	1.8 a
14 DAT		9.3 b	2715 a	3.38 a	45.9 a	34 a	1.7 b	2.0 b	1.3 b

Table 6. Canola yield and quality at Langdon, ND (2006). (without 2nd harvest date due to hail)

	Application Moisture	Harvest Moisture	Yield	Test weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	lb/bu	%	lb/A	%	%	
Gramoxone		11.2 b	1714 a	53.2 a	47.9 a	48 a	1.3 a	1.5 a	1.3 a
Reglone		11.2 b	1809 a	53.3 a	47.9 a	59 a	2.1 a	2.5 a	1.4 a
Swath		12.8 a	1797 a	52.7 b	48.1 a	37 a	0.7 a	1.1 a	1.0 a
Timing 1	43.1	11.0 b	1697 a	53.3 a	47.7 a	51 a	2.4 a	2.5 a	1.4 a
Timing 2	37.6	11.2 b	1852 a	53.3 a	48.5 a	49 a	1.5 a	1.8 ab	1.3 a
Timing 3	23.1	13.0 a	1770 a	52.5 b	47.8 a	44 a	0.1 b	0.7 b	1.0 a

Table 7. Canola yield and quality at Langdon, ND (2007).

	Application Moisture	Harvest Moisture	Yield	Test weight	Oil content	Seed loss	Green count	Total damage	Grade
	%	%	lb/A	lb/bu	%	lb/A	%	%	
Gramoxone		12.8 b	1871 a	53.7 a	40.0 a	9 b	4.5 a	7.0 a	3.3 a
Reglone		12.3 b	1883 a	53.7 a	40.2 a	10 b	5.2 a	7.2 a	3.1 a
Swath		13.7 a	1811 a	52.9 b	39.9 a	17 a	2.4 b	4.7 b	3.0 a
Timing 1	44.7	16.2 a	1801 a	53.2 b	39.6 b	8 b	5.8 a	8.0 a	3.2 a
Timing 2	40.0	12.8 b	1868 a	53.6 a	40.4 a	11 b	3.8 b	6.4 b	3.3 a
Timing 3	31.9	9.8 c	1895 a	53.6 a	40.2 ab	18 a	2.4 c	4.5 c	3.0 a
7 DAT		16.8 a	1863 a	53.3 b	40.1 a	8 b	4.9 a	7.2 a	3.3 a
14 DAT		9.0 b	1847 a	53.7 a	40.0 a	17 a	3.2 b	5.4 b	3.1 a