Kansas Agricultural Experiment Station Research Reports

Volume 5
Issue 6 *Kansas Field Research*

Article 24

2019

Harvest Method, Cultivar, and Time of Swathing Effects on Yield and Oil Content of Winter Canola

M. J. Stamm
Kansas State University, mjstamm@ksu.edu

S. J. Dooley
Kansas State University, sjdooley@k-state.edu

K. L. Roozeboom
Kansas State University, kraig@ksu.edu

Harvest Method, Cultivar, and Time of Swathing Effects on Yield and Oil Content of Winter Canola

Abstract

Producers want to achieve the highest yield and oil content possible using either swathing or direct cutting to harvest winter canola. Multi-year experiments were conducted to evaluate the effects of harvest method (swathing versus direct cutting) and cultivar on seed moisture, yield, and oil content; and to evaluate the effects of swathing timing on yield and oil content. The harvest method experiments were conducted for two seasons at the Redd Foundation Field near Partridge, KS. The time of swathing experiments were conducted for two seasons near Manhattan, KS. In 2016 and 2017, harvest method had a significant effect on seed moisture, yield, and oil content. Swathing produced seed with lower moisture content and greater yield, but direct cutting produced seed with the highest oil content. Cultivars differed in their response to yield depending on the harvest method used. Some cultivars responded positively to swathing, others responded positively to direct cutting, and some showed no response to harvest method. Time of swathing had a significant effect on yield and oil content. As a rule, as seed color change progressed, yield and oil content increased. All swathing treatments had greater yield than direct cutting except when swathing was done at green seed. Seed from direct cutting had significantly greater oil content than seed from all swathing treatments. Both swathing and direct cutting can be used effectively to harvest winter canola.

Keywords

canola, harvest, oil content, swathing, direct cutting, seed color change

Harvest Method, Cultivar, and Time of Swathing Effects on Yield and Oil Content of Winter Canola

M.J. Stamm, S.J. Dooley, and K.L. Roozeboom

Summary

Producers want to achieve the highest yield and oil content possible using either swathing or direct cutting to harvest winter canola. Multi-year experiments were conducted to evaluate the effects of harvest method (swathing versus direct cutting) and cultivar on seed moisture, yield, and oil content; and to evaluate the effects of swathing timing on yield and oil content. The harvest method experiments were conducted for two seasons at the Redd Foundation Field near Partridge, KS. The time of swathing experiments were conducted for two seasons near Manhattan, KS. In 2016 and 2017, harvest method had a significant effect on seed moisture, yield, and oil content. Swathing produced seed with lower moisture content and greater yield, but direct cutting produced seed with the highest oil content. Cultivars differed in their response to yield depending on the harvest method used. Some cultivars responded positively to swathing, others responded positively to direct cutting, and some showed no response to harvest method. Time of swathing had a significant effect on yield and oil content. As a rule, as seed color change progressed, yield and oil content increased. All swathing treatments had greater yield than direct cutting except when swathing was done at green seed. Seed from direct cutting had significantly greater oil content than seed from all swathing treatments. Both swathing and direct cutting can be used effectively to harvest winter canola.

Introduction

Producers have two options when harvesting canola. They can swath it into windrows, allow it to dry, and then pick it up, or they can cut it directly when it has reached seed moisture of 10% or less. Each harvest method can be employed effectively in the southern Great Plains, but few studies have compared each method's effects on harvested seed moisture, yield, and oil content. Although canola is typically swathed at 50% seed color change, determining when to swath can be challenging for inexperienced canola producers. Some producers have been led to swath too early, before seed color change begins, which results in poor yields and low oil content. Canola producers are subject to price discounts for low oil content upon delivery of harvested seed to the crusher. Oil discounts typically begin at -3% of contract price and drop 1% for each percent of oil below 38%. Investigating the right time to swath will help producers make a more informed decision and reduce the chance of delivering low oil seed to the crusher.

Procedures

The harvest method experiments took place during the 2015–16 and 2016–17 growing seasons at the Redd Foundation Field near Partridge, KS. The time of swathing experiments took place during the 2016–17 and 2017–18 growing seasons at Manhattan, KS. The cultivars used in the harvest method experiment included Riley, HyCLASS115W, and Mercedes in 2016; with DKW45-25 substituted for HyCLASS115W in 2017. The cultivars used in the time of swathing study included two hybrids (Hekip and Mercedes) and two open-pollinated cultivars (Riley and DKW16-15). Treatments for the time of swathing experiment were green seed, 10% seed color change (SCC), 50% SCC, 80% SCC, and direct cutting. Dates of planting, swathing, and harvesting for both experiments are summarized in Table 1. Plot size at Partridge was 5 feet by 50 feet and plot size at Manhattan was 5 feet by 25 feet. Seeding rate was approximately 4 lb/a. Best management practices for fertility, weed, and pest control were followed. The swath treatments were imposed using a 5-foot plot swather (Swift Manufacturing, Saskatchewan) to cut and form windrows that were subsequently harvested using a Kincaid 8-XP (Kincaid Manufacturing, Haven, KS) plot combine equipped with a HarvestMaster Classic Grain Gauge (Juniper Systems, Logan, UT). Oil content was estimated using near-infrared spectroscopy (NIR) manufactured by FOSS at the Brassica Breeding and Research program at the University of Idaho, Moscow, ID.

Results

Harvest Method Experiment

Results for the harvest method experiment are presented by year because of differences in the cultivars used.

Moisture

Harvest method had a significant effect on seed moisture in both years (Table 2). Swathing resulted in lower moisture content than direct cutting. Each harvest method resulted in seed with moisture contents less than the recommended harvest moisture content of 10% for canola.

Yield

Although swathing resulted in greater yields in both years, the difference was significant only in 2016 (Table 2). Swathing had 35% greater yields than direct cutting in 2016, but only 1% greater yields in 2017. The interaction between harvest method and cultivar was significant in both years (Table 3). In 2016, the Mercedes-swath treatment produced 70% higher yields than the Mercedes-direct treatment. The Riley-swath and Riley-direct treatments did not differ. HyCLASS115W-swath had 32% higher yields for HyCLASS115W-direct. In 2017, the highest yielding treatment was Mercedes-swath, but this treatment was not different from the DK45-25-direct, Riley-swath, or Riley-direct treatments. Similar to 2016, the 2017 Mercedes-swath treatment was greater than the Mercedes-direct treatment, and Riley did not differ in yield between harvest methods. The DKW45-25-direct treatment had 19% greater yields than DKW45-25-swath treatment.

Oil

In 2016, the direct treatment had significantly higher oil content than the swath treatment, a difference of 0.9% (Table 4). Across harvest treatments, Mercedes had 2.3% greater oil content than Riley and 3.6% greater oil content than HyCLASS115W. There was no significant interaction between cultivar and method for oil. Oil content was not measured in 2017 because of a sampling error at harvest.

Conclusions

The lower moisture content of swathed canola was the result of cutting the crop to begin the dry down process for harvesting. The moisture contents for swathed canola were typical for the region. Swathing returned higher yields than direct cutting in both 2016 and 2017. Cultivars reacted differently to harvest method. The Mercedes-swath treatment had the highest yield in both years. Mercedes is a hybrid, and the 2016 and 2017 growing seasons benefited hybrids because of warm winter temperatures. Mercedes did not respond as well to direct cutting, most likely due to the hybrid having higher moisture content than the other varieties when direct cut. More green pods and seed could have been thrown out the back of the combine as a result. On the other hand, DKW45-25 benefited from direct cutting, HyCLASS115W benefited from swathing, and Riley had nearly equal yields for both harvest methods. Since all harvest treatments were completed on the same day, some of the yield difference could be a result of not fine-tuning the direct harvest treatment to the individual cultivar. Thus, responses might be different in an actual production scenario. Oil content differed by harvest method and cultivar. Direct cutting produced the highest oil content. Mercedes had the highest oil content followed by Riley and HyCLASS115W. The higher oil content from direct cutting may be the result of not cutting the plant off early and allowing it to have the full complement of oil production.

Time of Swathing Experiment

Yield

Yield response to treatment was similar in both years, so data were analyzed across years (Table 5). The 10%, 50%, and 80% SCC treatments yielded significantly more than the green SCC and the direct cutting treatments. The highest yielding treatment was 80% SCC, followed by 50% and 10%. The green SCC and direct cut treatments yielded 26% and 18% less than the 50% SCC treatment, respectively.

Oil

Similar to yield, there was a significant effect on oil content for the time of swathing treatment over two years (Table 5). Direct cutting had the highest oil content, having 1.1% greater oil than 80% SCC and 1.8% greater oil than 50% SCC. The lowest oil content was the green SCC treatment, which was 2.1% less than 50% SCC.

Conclusions

Time of swathing had a large effect on yield and oil content. Yields increased as swathing was delayed to greater SCC progression. Direct cutting resulted in the lowest yields, which could be the result of harvesting before dry down was complete for some cultivars. Adjusting direct harvest dates to match cultivars might have improved yields. In both years, there was no loss of yield from shattering. Direct cutting produced the highest oil contents, more than 1.1% greater than the closest swathing treatment. Also,

waiting to swath until a greater degree of SCC may be a way to increase oil content. Producers will have to weigh the advantages and disadvantages of delayed swathing as the risk of shatter loss increases as the crop ripens. It is recommended to hold off on swathing until at least 50% SCC.

Table 1. Planting, swathing, and harvest dates for the harvest method and time of swathing experiments, 2015–2018

		Harvest method experiment		
Location	Season	Planting date	Swathing date	Harvest date
Partridge	2015–16	9/23/15	6/3/16	6/10/16
	2016–17	9/21/16	6/10/17	6/27/17

		Time of swathing experiment					
			Time of swathing				
Location	Season	Planting date	Green seed	10% SCC†	50% SCC	80% SCC	Swath harvest	Direct cut
Manhattan	2016–17	9/30/16	5/26/17	6/2/17	6/5/17	6/8/17	6/12/17	6/15/17
	2017–18	9/20/17	6/4/18	6/7/18	6/9/18	6/11/18	6/13/18	6/16/18

†SCC = seed color change.

Table 2. Moisture content (%) and yield (bu/a) of canola seed by harvest method

	2016		2017	
Method	Moisture	Yield	Moisture	Yield
Direct	9.3 a	26.5 b	9.4 a	51.1 a
Swath	5.6 b	35.7 a	5.8 b	53.4 a

Values within a column followed by the same letter are not different at $\alpha = 0.05$.

Table 3. Canola cultivar yields by harvest method

	2016		2017	
Method	Cultivar	Yield (bu/a)	Cultivar	Yield (bu/a)
Direct	HyCLASS115W	23.8 c	DKW45-25	55.3 a
	Mercedes	27.4 bc	Mercedes	44.4 c
	Riley	28.3 bc	Riley	53.5 abc
Swath	HyCLASS115W	31.5 b	DKW45-25	46.6 bc
	Mercedes	46.5 a	Mercedes	59.6 a
	Riley	29.0 b	Riley	53.9 ab

Values within a column followed by the same letter are not different at $\alpha = 0.05$.

Table 4. Main effect means for oil content in 2016

Method	Cultivar	Oil (%)
Direct	---	40.7 A
Swath	---	39.8 B
---	HyCLASS115W	38.6 c
---	Mercedes	42.2 a
---	Riley	39.9 b

Values within a column followed by the same uppercase or lowercase letter are not different at $\alpha = 0.05$.

Table 5. Yield and oil content of canola at different stages of seed color change (SCC) compared to direct cutting, 2017 and 2018

Timing	Yield	Oil
	bu/a	%
Direct	42.7 b	40.0 a
80% SCC	51.4 a	38.9 b
50% SCC	50.5 a	38.2 c
10% SCC	49.6 a	37.9 c
Green	40.0 b	36.1 d

Values within a column followed by the same letter are not different at $\alpha = 0.05$.