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Heather Darby
University of Vermont, heather.darby@uvm.edu

Hannah Harwood
University of Vermont

Erica Cummings
University of Vermont

Rosalie Madden
University of Vermont

Susan Monahan
University of Vermont

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NW CROPS & SOILS PROGRAM

UNIVERSITY OF VERMONT EXTENSION

CULTIVATING HEALTHY COMMUNITIES

2012 Winter Canola Planting Date Trial

Dr. Heather Darby, UVM Extension Agronomist
Hannah Harwood, Erica Cummings, Rosalie Madden, and Susan Monahan
University of Vermont Crops and Soils Technicians
(802) 524-6501

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2012 WINTER CANOLA PLANTING DATE TRIAL

Heather Darby, University of Vermont Extension
heather.darby[at]uvm.edu

Because winter canola is a relatively new crop for the Northeastern United States, optimal planting dates for winter canola have not yet been established for this region. Therefore, the goal of this project was to determine the impact of planting date and variety selection on winter canola plant characteristics, as well as seed and oil yields. Winter canola is planted in late summer/early fall and harvested the following summer. Getting canola planted as early as possible is often recommended for Midwest producers, but growers in the Northeast struggle with timing canola seeding after harvesting another crop, as well as wet fall conditions for planting. While the data presented are only representative of one year, this information can be combined with other research to aid in making planting date decisions for canola in the Northeast.

MATERIALS AND METHODS

To evaluate the impact of planting date on winter canola yield and quality, a research trial was conducted at Borderview Research Farm in Alburgh, VT. Agronomic information for trial can be found in Table 1. The soil was a Benson rocky silt loam and plots were prepared with fall chisel plow and disk, and finished with a spike-toothed harrow. The experimental design was a randomized complete block with split plots replicated four times. The plot size was 6'x20,' and plots were seeded with a Kincaid cone seeder at a rate of 8 lbs viable seed per acre. The main plots were four planting dates (24-Aug, 1-Sep, 9-Sep, and 19-Sep 2011). The subplots were three varieties: Baldur, Riley, and Wichita, all treated with Syngenta Helix® XTra insecticide and fungicide, which is a mix of thiamethoxam, difenoconazole, metalaxyl-M and S-isomer, and fludioxonil. The fertilizer ProGro from North Country Organics (with an analysis of 5-3-1) was applied at a rate of 2000 lbs per acre just prior to planting on 23-Aug 2011. Additional fertilizer was added to the trial on 10-Apr 2012 with a total rate of 50 lbs per acre of N and 40 lbs per acre of both P and K.

Table 1. Agronomic practices for the 2012 winter canola planting date trial at Borderview Research Farm.

Location	Borderview Research Farm – Alburgh, VT
Soil type	Benson rocky silt loam
Previous crop	Spring canola
Tillage operations	Fall chisel plow, disk and spring-toothed harrow
Seeding rate (lbs ac^{-1})	8
Planting equipment	Kincaid cone seeder
Row width (in.)	6
Plot size (ft)	6 x 20
Planting dates	24-Aug, 1-Sep, 9-Sep, and 19-Sep 2011
Varieties	Baldur, Riley, and Wichita
Seed treatment	Helix® XTra
Starter fertilizer (at planting)	2000 lbs ac^{-1}, ProGro (5-3-1) on 23-Aug 2011
Additional fertilizer	50 lbs N ac^{-1}, 40 lbs P ac^{-1}, 40 lbs K ac^{-1}, mix of ammonium sulfate (21-0-0) and starter fertilizer (10-20-20) on 10-Apr 2012
Harvest dates	6-Jul and 13-Jul 2012

On 24-Oct 2011, plots were assessed for fall vigor (on a scale of 0 to 10, where 0 is equal to no stand and 10 represents an extremely vigorous stand) and plant population. In the spring of 2012, the stands were evaluated for winter survival, equal to the difference in estimated vigor since late fall. When at least 75% of each plot was in bloom, the date was noted; this occurred between 10-May and 21-May 2012. In early June, a noise-emitting “squawk box” was installed in the trial to deter bird activity, and on 14-Jun the entire trial was covered with bird netting (Figure 1). With this method, bird damage was kept to a minimum. Prior to harvest, the number of pods per plant was recorded.

Figure 1. Netting was laid out and staked down over the trial to minimize bird damage.

Plots were harvested on 6-Jul and 13-Jul, according to physiological maturity, with an Almaco SPC50 plot combine. Following harvest, test weight was measured with a Berckes Test Weight Scale and a Dickey-John M20P moisture meter was used to measure harvest moisture levels. Yields were calculated at an adjusted level of 8% moisture. Harvested seeds were then cleaned with a Clipper fanning mill. A seed counter and scale were used to determine the average weight of 100 seeds from a subsample of each plot. Prior to oil extraction, seed samples were dried and moisture levels quantified. Oil was extruded from a subsample of each harvested plot using a Kern Kraft Oil Press KK40. After pressing, oil content and yields were determined. Oil yields were calculated and reported at an adjusted level of 7.5% moisture.

All data was analyzed using a mixed model analysis where replicates were considered random effects. The LSD procedure was used to separate means when the F-test was significant ($P < 0.10$).

Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among treatments is real or whether it might have occurred due to other variations in the field. All data was analyzed using a mixed model analysis where replicates were considered random effects. At the bottom of each table a Least Significant Difference (LSD) value is presented for each variable (e.g. yield). LSDs at the 10% level (0.10) of probability are shown. Where the difference between two treatments within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of

10 chances that there is a real difference between the two values. Treatments that were not significantly lower in performance than the highest value in a particular column are indicated with an asterisk.

In the example at right, treatment A is significantly different from treatment C but not from treatment B. The difference between A and B is equal to 200, which is less than the LSD value of 300. This means that these treatments did not differ in yield. The difference between A and C is equal to 400, which is greater than the LSD value of 300. This means that the yields of these two treatments were significantly different from one another. The treatment in bold had the top observed performance, while treatments with an asterisk did not differ significantly from the top performer.

Planting date	Yield
A	**2100***
B	1900*
C	1700
LSD (0.10)	300

RESULTS

Using data from an on-site Davis Instruments Vantage Pro2 Weather Station at Borderview Research Farm in Alburgh, VT, weather data are summarized for the 2011-2012 winter canola growing season (Table 2). In general, this growing season was warmer and drier than average. Monthly temperatures averaged above normal for every month with the exception of Aug 2011. In addition, precipitation was below average with the exception of Aug and Sep 2011. Tropical Storm Irene swept through Vermont in late Aug 2011, contributing to the notable 10.2 inches of monthly precipitation. For this trial, Growing Degree Days (GGDs) are calculated with a base temperature of 32°F and a maximum temperature of 90°F. There were 7075 accumulated GDDs for the 2011-2012 growing season, 877 more than the 30-year average.

Table 2. Summarized weather data for 2011–2012, Alburgh, VT.

	2011					2012						
Alburgh, VT	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Average temperature (°F)	67.7	62.8	50.1	43.4	29.5	22.2	26.0	39.7	44.9	60.5	67.0	71.4
Departure from normal	-1.1	2.2	1.9	5.2	3.6	3.4	4.5	8.6	0.1	4.1	1.2	0.8
Precipitation* (inches)	10.2	5.6	3.5	1.4	2.2	1.5	0.7	1.5	2.6	3.9	3.2	3.8
Departure from normal	6.3	1.9	-0.1	-1.7	-0.1	-0.6	-1.1	-0.8	-0.2	0.5	-0.5	-0.4
Growing Degree Days	1119	932	578	344	110	55	59	331	396	884	1046	1221
Departure from normal	-20	74	76	142	91	55	59	205	12	128	32	23

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger. Historical averages are for 30 years of NOAA data (1981-2010).
* Precipitation data from Jun-Sep 2012 are based on Northeast Regional Climate Center data from an observation station in Burlington, VT.

Planting Date by Variety Interactions

With the exception of the level of moisture at harvest, there were no significant interactions between winter canola planting date and variety. This suggests that the varieties performed similarly across planting dates. There was an interaction between planting date and variety for harvest moisture (Figure 2). The variety 'Baldur' was much higher in moisture than 'Riley' and 'Wichita' at the first and last planting dates, but drier than or comparable to other varieties in the second and third planting dates. Baldur plots planted on 1-Sep (the second planting date) were harvested one week later than the other varieties because they were judged to be still green and not ready to harvest. Because canola is harvested when it is between 8 and 10% moisture, this data suggests that Baldur needs more time than Riley and Wichita to reach harvest readiness.

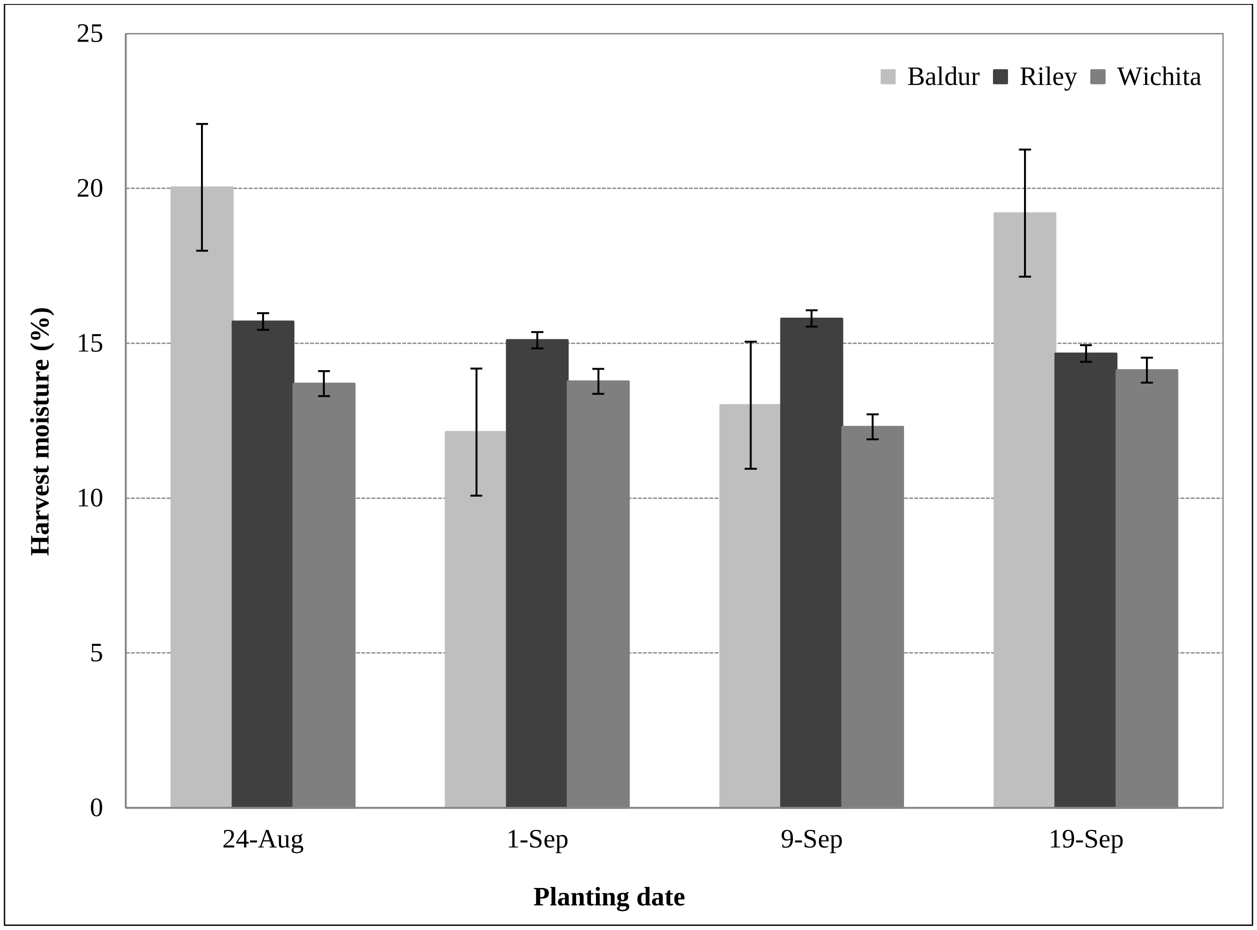

Figure 2. Effect of planting date and variety on harvest moisture. ***Vertical bars represent +/- one standard deviation.***

Impact of Planting Date

There was no statistical difference in the visual estimation of fall vigor (Table 3). However, fall populations were greatest in the third planting date (175 plants per square meter). This was statistically greater than the populations among canola plots planted at all other planting dates (Figure 3). This may indicate better weather and soil conditions at this specific date. The trial average survival rate through the winter was 66.9%. However, the canola planted latest (19-Sep) survived at a significantly lower rate than other planting dates (44.4%).

Table 3. Effect of planting date on winter canola fall stand, winter survival, pods per plant, and seed yield.

Planting date	Fall vigor	Fall population	Winter survival	Average pods	Seed yield	Harvest moisture
	(0-10 scale)	plants m^{-2}	%	pods $plant^{-1}$	lbs ac^{-1}	%
1 – 24-Aug	**4.44**	113	73.9*	174*	**1338***	**16.5***
2 – 1-Sep	4.00	135	72.8*	114	883	13.7
3 – 9-Sep	4.33	**175***	**76.7***	101	1202*	13.7
4 – 19-Sep	3.56	141	44.4	**180***	776	16.0*
LSD (0.10)	NS	29	6.9	40	215	1.8
Trial mean	4.08	141	66.9	142	1050	15.0

Treatments indicated in bold had the top observed performance.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.
NS – No significant difference was determined between treatments.

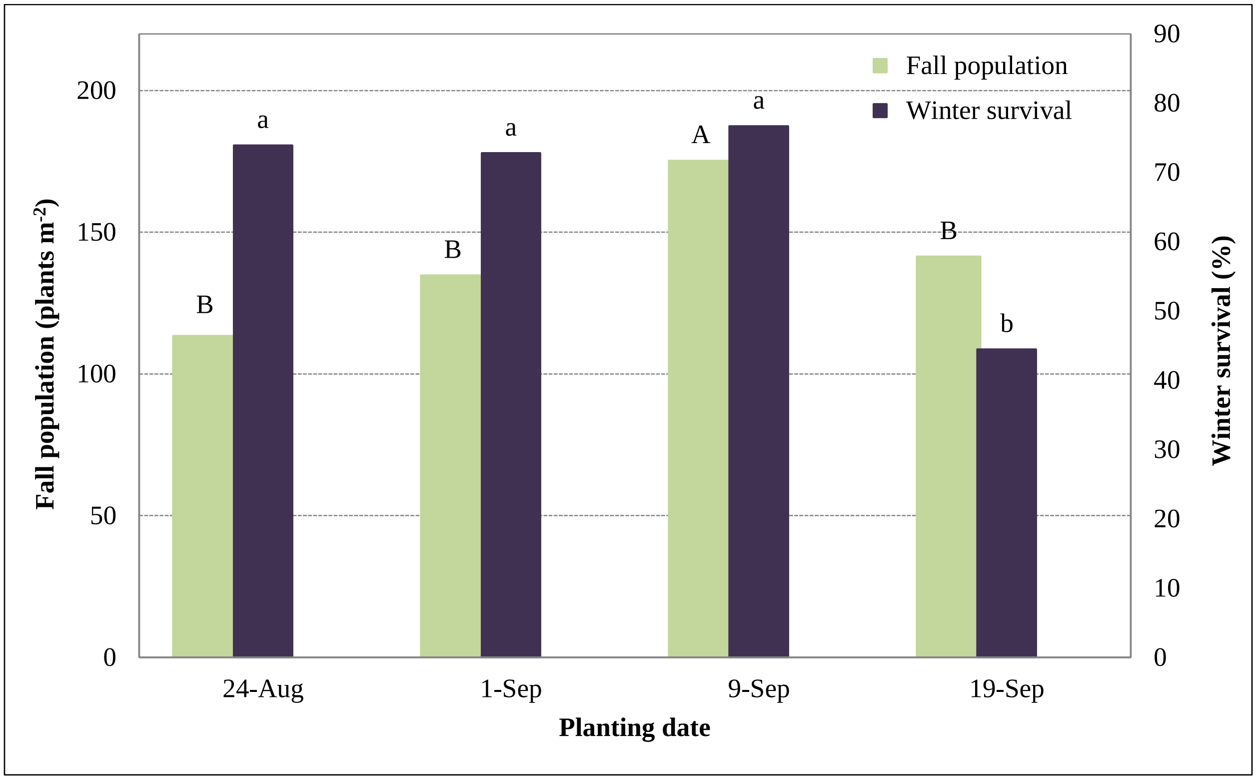

Figure 3. Effect of planting date on fall population (24-Oct) and winter survival (10-Apr). Treatments with the same letter did not differ statistically (p=0.10; compare capital letters for fall population and lower-case letters for winter survival).

The number of pods per plant was significantly highest in the fourth planting date (180 pods per plant). The first planting date did not differ statistically from the top performance (Table 4). Average harvest moisture for this trial was 15.0%, higher than recommended. The first and last planting dates were wettest at the time of harvest in early to mid-July.

Seed yield was highest in the earliest planting date (24-Aug), 1338 lbs per acre. Seed yields are adjusted to a standard moisture level (8.0%) before reporting.

Average seed weights were impacted by planting date, but the only significant outlier in 100-seed weight was the last planting date, 19-Sep (0.31 g). Pressing moisture varied slightly by planting date. Oil content did not vary significantly by planting date. Oil yields, directly related to seed yields, were significantly greatest in the earliest planting date (24-Aug). Trial averages were 332 lbs or 42.1 gallons per acre (Figure 4).

Table 4. Effect of planting date on winter canola seed weights and oil yield.

Planting date	100-seed weight	Pressing moisture	Oil content	Oil yield	
	G	%	%	lbs ac^{-1}	gal ac^{-1}
1 – 24-Aug	**0.33***	7.40*	**31.6**	**422***	**55.3***
2 – 1-Sep	**0.33***	6.69	30.4	272	35.6
3 – 9-Sep	**0.33***	6.94	28.9	348	45.6
4 – 19-Sep	0.31	**7.74***	30.7	244	32.0
LSD (0.10)	0.02	0.41	NS	62	8.1
Trial mean	0.32	7.19	30.4	322	42.1

Treatments indicated in bold had the top observed performance.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.
NS – No significant difference was determined between treatments.

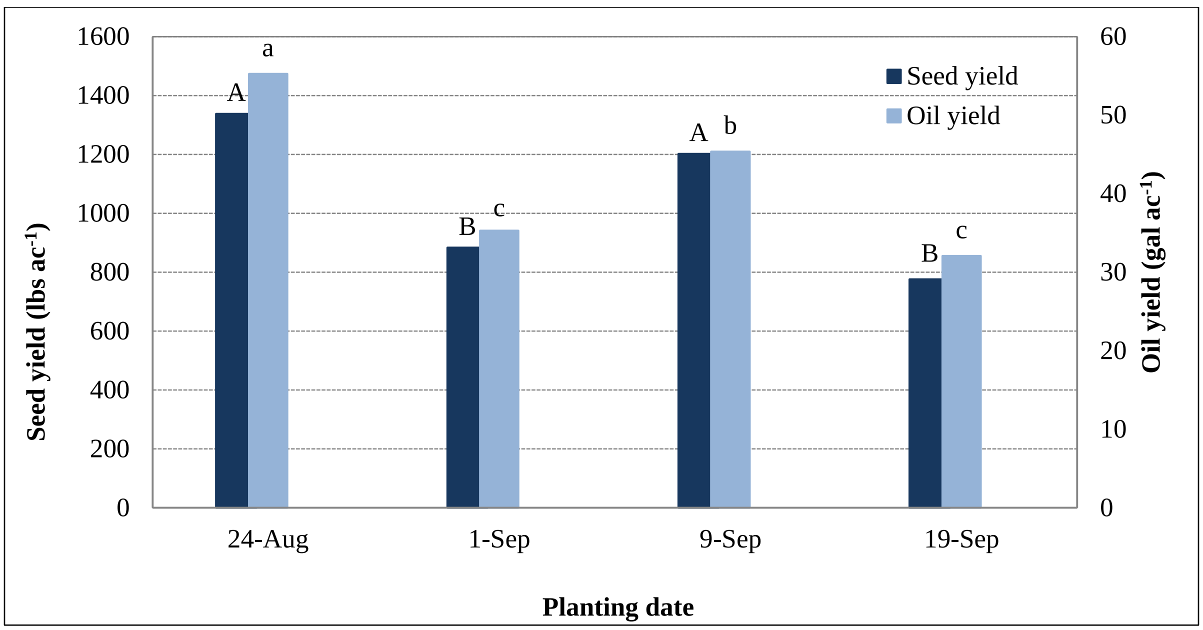

Figure 4. Effect of planting date on seed and oil yields. Treatments with the same letter did not differ statistically (p=0.10; compare capital letters for seed yield and lower-case letters for oil yield).

Impact of Variety

In this trial, there was no significant impact of variety on fall vigor or population, though Baldur was slightly more robust in late Oct 2011 when assessments were made. Winter survival was not impacted significantly by variety, with an average rate of 66.9% survival. Immediately prior to harvest, the number of pods per plant was estimated, and there was no significant difference according to variety. Seed yield was highest in the variety Riley, though this was not statistically higher than other varieties. At the time of harvest, moisture varied significantly by variety. The highest harvest moisture was in Baldur (16.1%), though this was not significantly higher than Riley (Table 5).

Table 5. Effect of variety on winter canola plant stand characteristics and seed yield.

Variety	Fall vigor	Fall population	Winter survival	Average pods	Seed yield	Harvest moisture
	(0-10 scale)	plants m^{-2}	%	pods $plant^{-1}$	lbs ac^{-1}	%
Baldur	**4.42**	**149**	67.5	143	937	**16.1***
Riley	3.92	128	65.0	**161**	**1160**	15.3*
Wichita	3.92	146	**68.3**	123	1052	13.5
LSD (0.10)	NS	NS	NS	NS	NS	1.5
Trial mean	4.08	141	66.9	142	1050	15.0

Treatments indicated in bold had the top observed performance.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.
NS – No significant difference was determined between treatments.

Across all planting dates, there was a significant varietal difference in the average weight of 100 seeds. The greatest 100-seed weight was in Riley (0.33 g), though this was not significantly greater than the average 100-seed weight of Baldur (Table 6). Moisture at the time of pressing varied significantly by variety, with the greatest moisture level in Baldur (7.42%).

Table 6. Effect of variety on winter canola seed weight and oil yield.

Variety	100-seed weight	Pressing moisture	Oil content	Oil yield	
	G	%	%	lbs ac^{-1}	gal ac^{-1}
Baldur	0.32*	**7.42***	28.7	273	35.8
Riley	**0.33***	6.92	**32.3***	**374***	**48.9***
Wichita	0.31	7.25*	30.3	319*	41.7*
LSD (0.10)	0.02	0.36	1.9	71	9.3
Trial mean	0.32	7.19	30.4	322	42.1

Treatments indicated in bold had the top observed performance.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.

Oil content was greatest in the variety Riley (32.3%), and the trial average was 30.4% oil. Oil yields ranged from 273 lbs (35.8 gallons) to 374 lbs (48.9 gallons) per acre. Though seed yields were not statistically different by variety, the greatest oil yields came from the variety Riley (Figure 5).

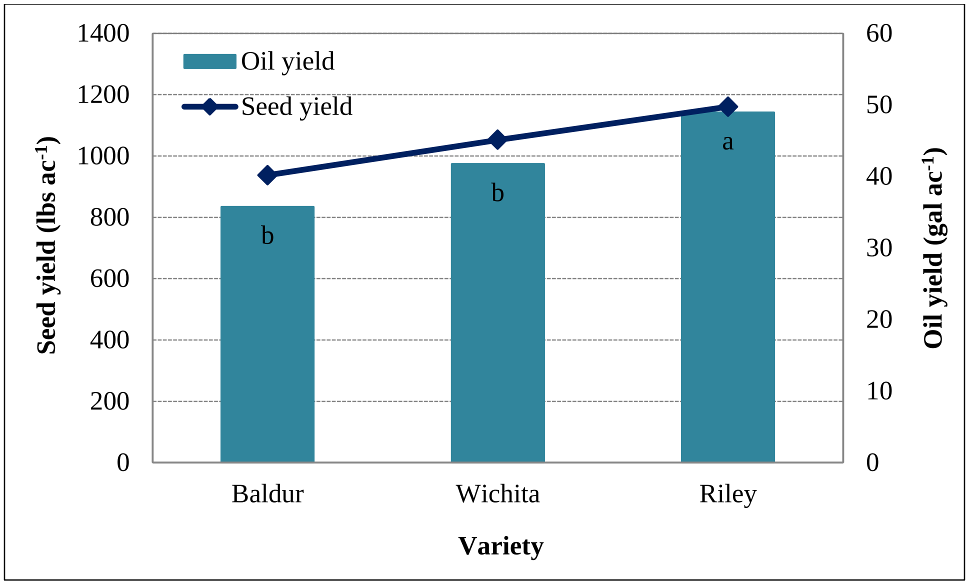

Figure 5. Effect of variety on seed and oil yields. Varieties with the same letter did not differ statistically in oil yield (p=0.10). There was no significant difference in seed yield by variety.

DISCUSSION

This winter canola trial was harvested at a moisture level higher than typical recommendations (8-10%); the trial average was 15.0% moisture. Harvest moisture was highest in the first planting date (24-Aug), but not significantly higher than the moisture of the last planting date (19-Sept). This is not surprising, since the majority of the first planting date was harvested one week earlier than the rest, and the fourth planting date may not have been quite ready when it was harvested, as the canola had less time to reach maturity than other planting dates. Interestingly, the number of pods per plant was also greatest in the first and last planting dates, indicating that plants with more pods may take longer to dry down. The average number of pods per plant was highest in the last planting date (19-Sep), which was also the planting date with the lowest estimated fall vigor. Because the number of pods per plant can increase when plants are spaced further apart, it may be that with decreased plant cover and vigor, individual plants in the latest planting date compensated by putting on more pods per plant. Overall, winter canola seed and oil yields were relatively low, likely due to low fertility and wet soils that contributed to unfavorable early fall establishment. Oil content averaged 30.4%, slightly lower than winter canola trials in the same location in years past.

Canola planted on the fourth planting date (19-Sept) had the lowest seed weight (0.31 g). Average seed weight is sometimes used as an indicator of seed fill or overall quality in winter canola. Oil content, though not statistically different by planting date, was greatest in the earliest-planted canola. Oil yields were significantly greatest in the first planting date (24-Aug).

In general, earlier winter canola planting dates allow for better fall establishment and vigor and increase the winter survivability of the crop. Canola planted in August had significantly higher seed yield, high seed quality, oil content, and overall oil yield. The latest planting date (19-Sep) performed among the worst in seed yield, oil content, and oil yield. Based on this initial trial we would recommend planting winter canola in mid to late August to ensure proper stand establishment prior to fall dormancy. Better stand establishment in the fall will translate into higher seed and oil yields in the preceding year. Planting in September will impose additional risk to the crop and hence should be avoided.

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