NORTHWEST CROPS & SOILS PROGRAM

2016 Winter Canola Variety Trial

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2016 WINTER CANOLA VARIETY TRIAL

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Winter canola is a relatively new crop to the Northeast. The majority of the canola grown in North America is grown in the Midwestern U.S. and Canada for both culinary oil as well as biodiesel production. Winter canola is planted in the late summer where it grows through the fall before entering a period of dormancy for the winter. The following spring the plants resume growth and seed is harvested during the summer months. Winter canola could potentially be a useful crop to growers in the Northeast for diversifying rotations, farm products and markets, and producing fuel on farm. However, for winter canola to be a viable crop in our region, we must identify the varieties that can survive the winter months. To do this, the Northwest Crops and Soils Team conducted a variety trial in 2015-2016. This trial was initiated as part of the National Winter Canola Variety Trial.

MATERIALS AND METHODS

A trial was conducted during the 2015-2016 season at Borderview Research Farm in Alburgh, VT. The experimental design was a randomized block with four replicates and fifteen varieties as treatments. Plots were 5'x 20' and were seeded with a Great Plains grain drill (5' wide) at a rate of 6 lbs ac^{-1} of viable seed on 23-Aug 2015 (Table 1). The soil was a Benson rocky silt loam and the previous crop was spring wheat. Plant populations, height, and vigor were assessed in each plot on 14-Oct 2015. Populations were measured in a 0.25m^2 area. Height was measured in three random locations in each plot. Vigor was assessed visually on a whole plot basis using a 1-5 scale where 1 was poor and 5 was very vigorous. The following spring plots were again assessed for populations to evaluate winter survival on 29-Apr 2016. Plots were fertilized on 18-May 2016 with 10-20-20 at a rate of 500 lbs ac^{-1}.

Table 1. Trial information and agronomic information 2015-2016.

Location	**Borderview Research Farm - Alburgh, VT**
Soil type	Benson rocky silt loam
Previous crop	Spring wheat
Plot size (ft.)	5 x 20
Seeding rate (lbs ac^{-1})	6
Replicates	4
Planting date	23-Aug 2015
Harvest date	18-Jul 2016
Tillage operations	Fall chisel plow, disk and spring-toothed harrow
Topdress fertilizer	500 lbs ac^{-1} 10-20-20

Plots were covered with bird netting on 16-Jun 2016. Canola seed was harvested using an Almaco SPC50 plot combine on 18-Jul 2016. At harvest, moisture was determined using a DICKEY-john M20P moisture meter. Test weight was measured using a Berckes Test Weight Scale. Seeds were pressed with a Kern Kraft Oil Press KK40, and the amount of oil and meal were measured to determine oil content.

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 were analyzed using a mixed model analysis where replicates were considered random effects. At the bottom of each table a LSD value is presented for each variable (e.g. yield). Least Significant Differences (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 listed in bold had the top performance in a particular column; treatments that did not perform significantly lower than the top-performer in a particular column are indicated with an asterisk. In the example above, treatment A is significantly different from treatment C but not from treatment B. The difference between A and B is equal to 400, which is less than the LSD value of 500. This means that these treatments did not differ significantly in yield. The difference between A and C is equal to 650, which is greater than the LSD value of 500. This means that the yields of these treatments were significantly different from one another. When this was not possible, due to inconsistent sample size across varieties, multiple pairwise comparisons were performed with the Tukey-Kramer adjustment.

Variety	Yield
A	**1600***
B	1200*
C	950
LSD (0.10)	500

RESULTS

Weather data was collected with an onsite Davis Instruments Vantage Pro2 weather station equipped with a WeatherLink data logger. Temperature, precipitation, and accumulation of Growing Degree Days (GDDs) are consolidated for the 2015-2016 growing season (Table 2). Historical weather data are from 1981-2010 at cooperative observation stations in Burlington, VT, approximately 45 miles from Alburgh, VT.

Table 2. Weather data and GDDs for winter canola in Alburgh, VT 2015-2016

	2015					2016						
Alburgh, VT	August	September	October	November	December	January	February	March	April	May	June	July
Average temperature (°F)	69.7	65.2	46.5	42.2	37.6	22.7	23.2	33.9	39.8	58.1	65.8	70.7
Departure from normal	1.00	4.70	-1.60	4.00	11.7	4.00	1.60	2.90	-4.90	1.80	0.00	0.10
Precipitation (inches)	0.00	0.30	2.50	1.80	3.50	1.30	3.60	2.50	2.60	1.50	2.80	1.80
Departure from normal	-3.91	-3.30	-1.09	-1.30	1.13	-0.74	1.81	0.29	-0.26	-1.92	-0.88	-2.37
Growing Degree Days (base 32°F)	1184	1010	464	329	220	50	64	209	291	803	1017	1201
Departure from normal	45	154	-37	117	189	50	60	85	-98	50	3	4

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) from Burlington, VT.

In general, the 2015-2016 season was drier and warmer than normal. The fall and winter months in 2015 were warmer than normal by an average of 4 degrees with December being 11.7 degrees above normal. Precipitation was below normal for every month of the growing season except for December, February, and March. Despite excessively dry conditions during establishment the trial looked very healthy and

populations acceptable in the fall of 2015. A mild temperatures in the winter months allowed much of the trial to survive. Overall, there were 6842 GDDs at a base temperature of 32°F, 622 more than the 30-year average.

Varieties differed significantly in height and vigor in the fall (Table 3). The tallest variety was Mercedes at a height of 37.5 cm, while the shortest was Wichita at 26.4 cm. Eight other varieties performed statistically similarly to Mercedes in terms of height. The average height for the trial was 32.3 cm. Plant vigor, which was determined visually by rating each plot on a scale of 1-5 (where 1 = poor vigor and 5= high vigor) also varied significantly by variety. Mercedes also had the highest vigor rating of 4.25 which was statistically similar to six other varieties. The variety Wichita had the lowest vigor rating of 2.00. The average vigor rating for the trial was 3.28.

Table 3. Fall height and vigor of 15 winter canola varieties.

Variety	Fall height cm	Fall vigor 1-5ŧ
Edimax CL	32.9*	3.25
Einstein	33.2*	3.50*
Hekip	32.3*	3.25
Helix	33.9*	3.50*
Hornet	31.3	3.75*
Inspiration	35.6*	3.75*
Kadore	33.0*	3.25
KS4506	31.0	3.00
Mercedes	**37.5***	**4.25***
Quartz	28.9	3.00
Riley	28.8	2.25
Virginia	35.7*	4.25*
Wichita	26.4	2.00
15.UI.WC.1	33.8*	3.50*
15.UI.WC.05633	29.5	2.75
LSD (p = 0.10)	5.45	0.768
Trial Mean	32.3	3.28

Treatments followed by an asterisk* performed statistically similarly to the top performer in **bold.**

ŧ Fall vigor; 1=low vigor and 5=high vigor.

Seed yield, moisture, and test weight all differed statistically by variety (Table 4). Yields ranged from 1103 to 2391 lbs ac^{-1} at 8% moisture. Mercedes, the highest yielding variety (2391 lbs ac^{-1}), performed statistically similar to eight other varieties (Figure 1). All varieties except for Hekip, Helix, and Hornet, were harvested at a moisture of less than 10.0%. Although this moisture content is good for long term storage of seed it may have led to higher losses during harvest. Seed that is excessively dry at harvest is likely to be more prone to shattering. The ideal test weight for canola seed is 50.0 lbs bu^{-1}. The trial average was 49.5 with the highest test weight of 51.3 lbs bu^{-1} being produced by Kadore. However, this was statistically similar to all but four varieties in the trial.

Table 4. Harvest characteristics for 15 winter canola varieties.

Variety	Seed yield lbs ac^{-1}	Moisture %	Test weight lbs bu^{-1}
Edimax CL	1987*	9.28*	49.9*
Einstein	1855	10.6	49.4*
Hekip	1878*	13.5	46.4
Helix	1103	16.9	48.6
Hornet	2120*	12.0	50.4*
Inspiration	2169*	8.03*	49.5*
Kadore	2139*	6.90*	51.1*
KS4506	1883*	6.73*	49.4*
Mercedes	**2391***	8.70*	49.1*
Quartz	1951*	7.60*	49.1*
Riley	1775	5.53*	**51.1***
Virginia	1437	8.53*	48.6
Wichita	1322	**5.43***	50.9*
15.UI.WC.1	1960*	8.43*	49.9*
15.UI.WC.05633	1843	9.78*	48.8
LSD (p = 0.10)	521	5.18	2.21
Trial Mean	1854	9.19	49.5

Values followed by an asterisk* performed statistically similarly to the top performer in **bold.**

Varieties also differed significantly in oil content and oil yield (Table 5). Oil yield is reported at 7.5% moisture. Mercedes was the top performing variety in both oil content and oil yield. It produced seed with an oil content of 32.0%, which was statistically similar to five other varieties. This translated into oil yields of 760 lbs or 100 gallons ac^{-1} which was statistically similar to four other varieties. Overall, oil content averaged 30.7%, slightly lower than we have observed in the past.

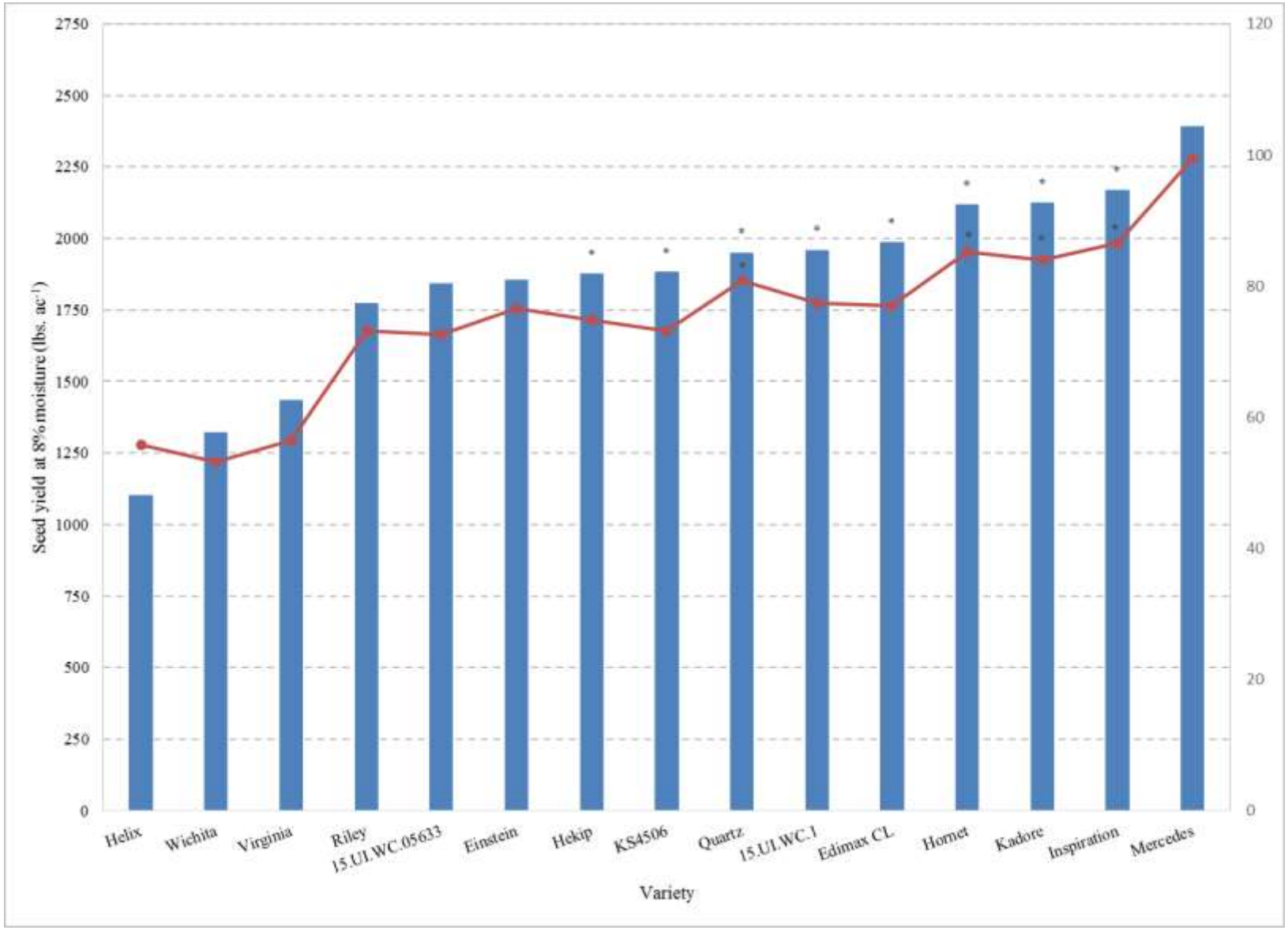

Figure 1. Seed yield of 15 winter canola varieties, Alburgh, VT, 2016.

Values followed by an asterisk* performed statistically similarly to the top performer.

Table 5. Oil yield and content for 15 winter canola varieties.

Variety	Oil Content	Oil Yield	
	%	lbs ac^{-1}	gal ac^{-1}
Edimax CL	29.8	588	77
Einstein	31.8*	585	77
Hekip	30.5	572	75
Helix	30.8	426	56
Hornet	30.9*	651*	85*
Inspiration	30.6	661*	87*
Kadore	29.9	642*	84*
KS4506	29.6	559	73
Mercedes	**32.0**	**760**	**100**
Quartz	31.0*	617*	81*
Riley	31.7*	558	73
Virginia	30.1	431	57
Wichita	31.0*	406	53
15.UI.WC.1	30.3	591	77
15.UI.WC.05633	30.2	555	73
LSD (p = 0.10)	1.10	158	20.7
Trial Mean	30.7	574	75

Values followed by an asterisk* performed statistically similarly to the top performer in **bold.**

Overall oil yields averaged 574 lbs or 75 gallons ac^{-1}, considerably higher than we have observed in the past due to the substantial seed yields obtained and adequate oil content. Despite the drought, the winter canola performed very well this year with all varieties producing over 1100 lbs ac^{-1} with at least 30% oil content yielding over 50 gallons of oil ac^{-1}. Mercedes was a top performing variety with high yields and oil content. Winter canola is a promising oilseed crop for the northeast when winter survival is not compromised.

DISCUSSION

Due to mild winter conditions, all canola varieties successfully overwintered and were harvestable in the summer of 2016. Despite differences in vigor and height seen in the fall, all canola varieties produced yields over 1000 lbs ac^{-1}. The dry conditions did not seem to impact production as yields averaged over 1800 lbs ac^{-1} and test weights averaged 49.5 lbs bu^{-1}. Oil content averaged 30.7%, slightly lower than past year observations, however with increased seed yield, oil yields averaged 75 gal ac^{-1}. These results indicate that there is good potential for winter canola as a viable crop in the northeast when winter survival is not an issue. By participating in the National Winter Canola Variety Trial we hope to provide data and encouragement for the development of hardier winter canola varieties suitable for this region.

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