NORTHWEST CROPS & SOILS PROGRAM

2014 Winter Canola Variety Trial

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2014 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 in summer. 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 survive and perform well here. To do this, the Northwest Crops and Soils Team conducted a variety trial in 2013-2014. This trial was initiated as part of the National Winter Canola Variety Trial.

MATERIALS AND METHODS

A trial was conducted during the 2013-2014 season at Borderview Research Farm in Alburgh, VT. The experimental design was a randomized block with three replicates and seventeen varieties as treatments. Plots were 5'x 20' and were seeded with a Great Plains plot grain drill (5' wide) at a rate of 6 lbs. of viable seed per acre on 23-Aug 2013 (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 1-Oct 2013. Ammonium sulfate fertilizer was applied at a rate of 70 lbs. per acre on 4-Oct 2013. At this time, plots were also sprayed with clethodim herbicide at a rate of 12 oz. per acre to control grass weeds. The following spring plots were again assessed for populations to evaluate winter survival on 21-Apr 2014. Plots were again fertilized on 29-Apr 2014 with Chilean nitrate at a rate of 120 lbs. per acre. Canola seed was harvested using an Almaco SPC50 plot combine on 30-Jul 2014. 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.

Table 1. Trial information for the winter canola variety trial 2013-2014.

Location	Borderview Research Farm - Alburgh, VT
Soil type	Benson rocky silt loam 3-8% slope
Previous crop	Spring wheat
Plot size (ft.)	5 x 20
Seeding rate (lbs. ac^{-1})	6
Replicates	3
Planting date	23-Aug 2013
Harvest date	30-Jul 2014
Tillage operations	Fall chisel plow, disk and spring tooth harrow
Starter fertilizer	70 lbs. ac^{-1} 21-0-0 Ammonium sulfate
Topdress fertilizer	120 lbs. ac^{-1} 27-0-0 Chilean nitrate
Weed control	12 oz. ac^{-1} clethodim

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 to the right, 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 2013-2014 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 2013-2014.

	2013					2014						
Alburgh, VT	August	September	October	November	December	January	February	March	April	May	June	July
Average temperature (°F)	67.7	59.3	51.1	35.1	20.0	16.8	19.0	22.2	43.0	57.4	66.9	69.7
Departure from normal	-1.1	-1.3	2.9	-3.1	-5.9	-2.0	-2.5	-8.9	-1.8	1.0	1.1	-0.9
Precipitation (inches)	2.41	2.2	1.87	3.16	0.23	0.85	0.65	1.70	4.34	4.90	6.09	5.15
Departure from normal	-1.5	-1.44	-1.73	0.04	-2.14	-1.20	-1.11	-0.51	1.52	1.45	2.4	1
Growing Degree Days (base 32°F)	1112	825	600	176	16	31	14	25	330	789	1041	1171
Departure from normal	102	38	150	-40	16	31	14	25	-54	33	27	-27

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 2013-2014 seasons were drier and cooler than normal. We saw particularly low temperatures in December and January with some extended periods with temperatures well below zero.

There was also below average precipitation during the fall and winter of 2013 followed by a slightly above average precipitation in the spring and summer of 2014. Overall, there were 6130 GDDs for winter canola, 95 more than the 30-year average.

With the exception of fall height, plant stand characteristics did not significantly differ between varieties (Table 3). Due to extremely low winter survival and therefore many missing data points, individual pairwise comparisons were conducted. The tallest plants were of the variety Visby at 21.9 cm. However, this only statistically varied from the shortest variety Chrome which was 11.3 cm. Winter survival was extremely low due to extended periods of subzero temperatures, minimal snow cover, and high winds during the winter. The average winter survival was only 15.8% with some varieties that did not survive at all. The variety X10W665C had the highest survival of 35.6% although this did not significantly vary from the other varieties. The varieties Chrome, Dimension, Inspiration, NK Petrol and NK Technic all had survival rates that were less than 10%.

Table 3. Plant stand characteristics for 17 winter canola varieties.

Variety	Fall height	Winter survival	Test weight
	cm	%	lbs. bu^{-1}
Argos	20.1ab	11.9	47.8
Baldur	20.1ab	16.3	49.7
Chrome	11.3b	1.00	48.0
Dimension	17.1ab	1.00	48.5
Edimax CL	16.9ab	22.3	48.8
Hornet	14.8ab	19.0	43.8
Inspiration	18.4ab	6.70	49.0
Kronos	16.6ab	23.8	48.7
NK Petrol	18.9ab	1.00	49.0
NK Technic	17.6ab	4.10	48.0
Riley	14.3ab	22.3	49.2
Safran	16.8ab	14.8	48.2
Sitro	15.0ab	17.0	48.5
Visby	21.9a	16.8	48.3
Wichita	17.1ab	30.1	**49.8**
X10W665C	16.0ab	**35.6**	49.5
X12W377C	16.4ab	27.1	48.3
Probability level	*	NS	NS
Trial Mean	17.0	15.8	48.5

Probability level *, **, and *** for 0.1, 0.05 and 0.001 respectively.
Values that share letters do not statistically differ from one another.
NS- No significant difference.

The highest test weight was produced by the variety Wichita at 49.8 lbs per bushel. However, this was not statistically different from the other varieties. All varieties except for Hornet had test weights close to the standard of 50 lbs per bushel.

Because of the high proportion of weeds and other debris that was mixed in with the seed at harvest, errors in measuring seed moisture occurred for all varieties. Therefore, the seed and oil yields reported at harvest moisture (Table 4).

Table 4. Harvest characteristics for 17 winter canola varieties.

Variety	Seed yield lbs. ac^{-1}	Oil content %	Oil yield lbs. ac^{-1}	Oil yield gal ac^{-1}
Argos	1003	34.0b c	332 abcd	44.0 abcd
Baldur	1142	32.6 c	375 abcd	49.0 abcd
Chrome	710	34.8 abc	247 bcd	32.0 bcd
Dimension	977	**41.0 a**	400 abcd	52.0 abcd
Edimax CL	1205	31.3 c	380 abcd	50.0 abcd
Hornet	781	36.1 abc	290 abcd	38.0 abcd
Inspiration	910	35.3 abc	321 abcd	42.0 abcd
Kronos	1255	32.3 c	404 abcd	53.0 abcd
NK Petrol	495	30.4 c	151 d	20.0 d
NK Technic	1076	31.3 c	336 abcd	44.0 abcd
Riley	1266	35.3 abc	448 abcd	59.0 abcd
Safran	1094	31.7 c	345 abcd	45.0 abcd
Sitro	689	34.4 bc	237 cd	31.0 cd
Visby	1713	35.9 abc	615 ab	81.0 ab
Wichita	1764	32.2 c	573 abc	75.0 abc
X10W665C	**1812**	38.0 ab	**666 a**	**87.0 a**
X12W377C	1059	34.5 bc	385 abcd	50.0 abcd
Probability level	NS	***	**	**
Trial Mean	1186	34.1	396	51.9

Probability level *, **, and *** for 0.1, 0.05 and 0.001 respectively.
Values that share letters do not statistically differ from one another.
NS- No significant difference.

Seed yields ranged from 495 to 1812 lbs per acre although differences between varieties were not statistically different (Table 4). Oil content and yield varied statistically across varieties. The greatest oil content of 41% was seen in the variety Dimension (Figure 1). This was statistically the same as six other varieties. Oil yields ranged from 151 lbs or 20 gal per acre to 666 lbs. or 87 gal per acre. The highest oil yield was in the variety X10W665C which produced 666 lbs per acre or 87 gal per acre. NK Petrol produced the lowest seed yield, oil content, and oil yield of the trial. This variety also had very poor winter survival.

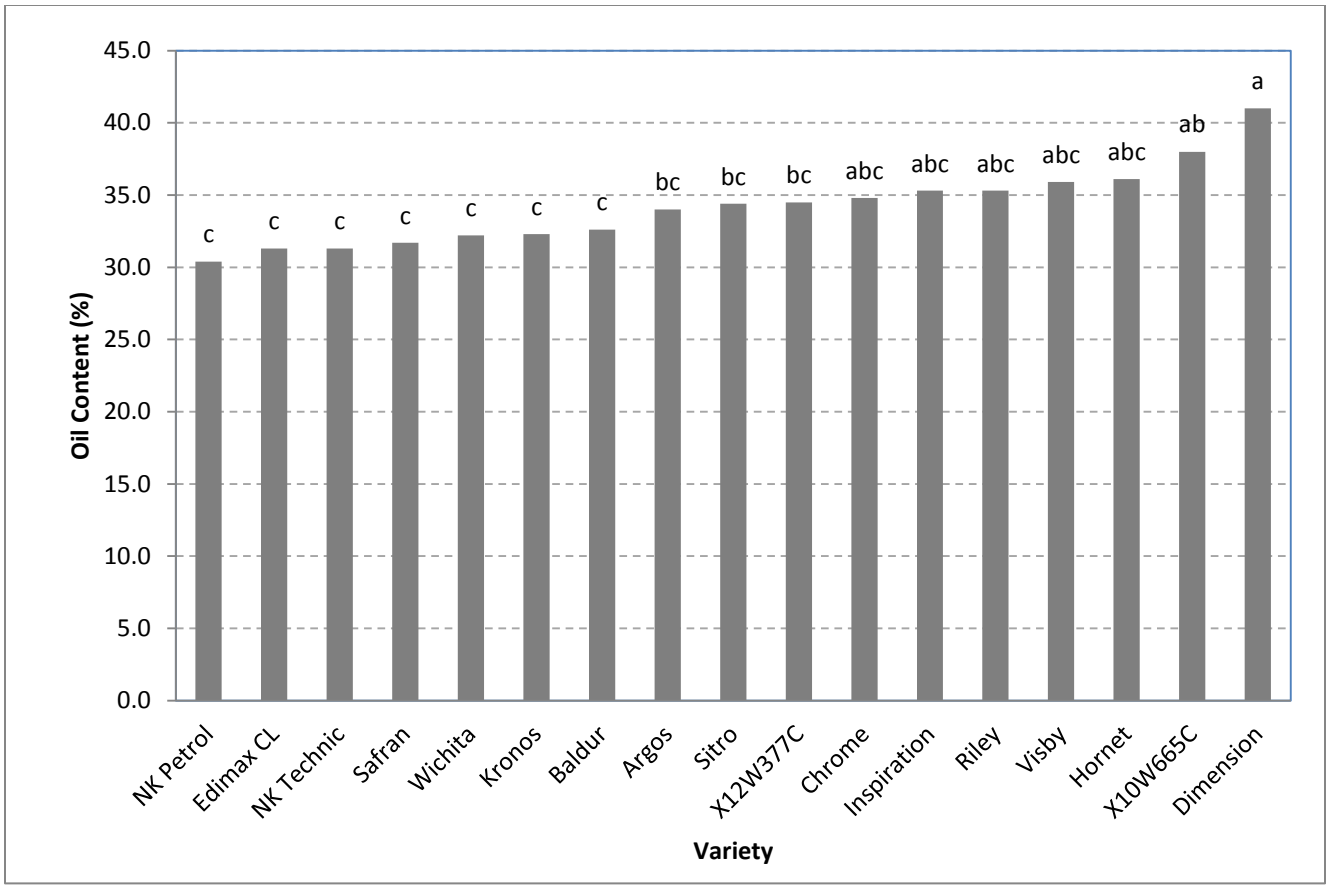

Figure 1. Oil content of 17 winter canola varieties, Alburgh, VT, 2014.
Values that share letters do not statistically differ from one another

DISCUSSION

Despite planting in late August, winter survival was low across the entire trial, likely due to below average temperatures and precipitation during the winter. Winter survival was highly variable within varieties depending on the location in the field. Hence, field conditions likely had more of an impact on winter survival than the variety itself. Although winter survival did not statistically differ across varieties, the highest survival was seen in the variety X10W665C. This variety also had the highest seed yield, second highest oil content, and highest oil yields. Hornet, which has been a top performing variety in previous years, also produced an oil content and yield similar to the top performer this year. However, it is important to remember that these values, due to equipment difficulties in measuring harvest moisture, are not reported at standard moisture and therefore are not as easily comparable. Despite this, there are substantial differences across winter canola varieties in oil content which is a key characteristic to consider when selecting winter canola varieties, as higher oil content could compensate some for lower seed yields due to issues with winter survival and low stand densities, bird damage, or disease. Further research is needed to evaluate winter canola varieties that are more suited to our climate and to better understand the variable that impact their winter survival. It is important to remember that these results only capture one season and should not alone be used to select varieties or make management decisions.

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