

NORTHWEST CROPS & SOILS PROGRAM



2023 Winter Canola Variety Trial



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2023 WINTER CANOLA VARIETY TRIAL
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Most 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 Program conducted a variety trial in 2022-2023, which was part of the National Winter Canola Variety Trial (<https://www.agronomy.k-state.edu/outreach-and-services/crop-performance-tests/canola/>).

MATERIALS AND METHODS

A variety trial was conducted during 2022-2023 at Borderview Research Farm in Alburgh, VT. The experimental design was a randomized complete block with four replicates and fifteen varieties as treatments (Table 1).

Table 1. Winter canola variety information, 2022-2023.

Variety	Source	Type [†]
CP1055WC	CROPLAN	H
CP1066WC	CROPLAN	OP
CP1077WC	CROPLAN	H
DK Exception	Bayer	H
DK Exclaim	Bayer	H
DK Sequel	Bayer	H
Griffin	Kansas State University	OP
Inspiration	Rubisco Seeds	H
KS4662	Kansas State University	OP
PT264	Rubisco Seeds	H
PT293	Kansas State University	H
PT297	Kansas State University	H
Riley	Kansas State University	OP
Surefire	Kansas State University	OP
Torrington	Kansas State University	OP

[†]H = hybrid; OP = open pollinated.

Plots were 5' x 20' and were seeded on 25-Aug 2022 with a Great Plains grain drill (5' wide) at a rate of 500,000 and 300,000 live seeds ac⁻¹ for open pollinated and hybrid varieties respectively (Table 2). Row spacing was 6 inches. The soil type was Covington silty clay loam, 0-3% slopes and the previous crop was meadow fescue and alfalfa. Plots were assessed for fall stand and vigor on 6-Oct 2022. Fall stand was

ranked using a visual scale of 1-10, where 1 was poor emergence and 10 indicated excellent emergence. Vigor was ranked using a visual scale of 1-5, where 1 indicated low vigor and 5 indicated very vigorous plants. Winter survival was visually assessed as a percentage on 27-Apr 2023. Bloom dates were recorded when at least 50% of the plot had bloomed and were reported as days after 1-Jan 2023. The trial was covered with bird netting in late-Jun and removed just before harvest.

Table 2. Trial information and agronomic information 2022-2023.

Location	Borderview Research Farm - Alburgh, VT
Soil type	Covington silty clay loam, 0-3% slopes
Previous crop	Meadow fescue & alfalfa
Plot size (ft)	5 x 20
Seeding rate (live seeds ac⁻¹)	500,000 for open pollinated varieties 300,000 for hybrid varieties
Replicates	4
Tillage operations	Pottinger TerraDisc™
Planting date	25-Aug 2022
Harvest date	20-Jul 2023
Pressing date	4-Dec 2023

On 20-Jul 2023, just prior to harvest, average plant height was determined by taking three measurements of plants in centimeters in each plot. There was minimal lodging this year, and therefore was not recorded. Canola seed was harvested using an Almaco SPC50 plot combine on 20-Jul 2023. At harvest, yields were recorded, and moisture and test weight were determined using a DICKEY-john Mini-GAC Plus moisture and test weight meter. Oil was extruded from the seeds with an AgOil M70 oil press on 4-Dec 2023, and the amount of oil captured was measured to determine oil content and oil yield.

Data were analyzed using a general linear model procedure of SAS (SAS Institute, 1999). Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure where the F-test was considered significant, at $p < 0.10$. Variations in genetics, soil, weather, and other growing conditions can result in variations in yield and quality. Statistical analysis makes it possible to determine whether a difference between treatments is significant or whether it is due to natural variations in the plant or field. At the bottom of each table, an LSD value is presented for each variable (i.e. yield). Least Significant Differences (LSDs) at the 0.10 level of significance are shown. This means that when the difference between two varieties within a column is equal to or greater to the LSD value for the column, there is a real difference between the varieties 90% of the time. Varieties that were not significantly lower in performance than the highest value in a particular column are indicated with an asterisk.

In the example to the right, variety C was significantly different from variety A, but not from variety B. The difference between C and B is 1.5, which is less than the LSD value of 2.0 and so these varieties were not significantly different in yield. The difference between C and A is equal to 3.0, which is greater than the LSD value of 2.0. This

Variety	Yield
A	6.0
B	7.5*
C	9.0
LSD	2.0

means that the yields of these varieties were significantly different from one another. The asterisk indicates that variety B was not significantly lower than the top yielding variety, indicated in bold.

RESULTS

Weather data were recorded with a Davis Instruments Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT. Temperature, precipitation, and accumulation of Growing Degree Days (GDDs) are consolidated for the 2022-2023 growing season (Table 3). Temperatures were below average in August and September, around the time of planting. Temperatures in September were 2.5 degrees cooler than average. But during the fall and winter, temperatures remained quite warm, with above average temperatures from October to February. January was particularly warm, with a monthly average temperature of 26.9° F, 6 degrees above average. Temperatures in April 2023 were above average by 2.7 degrees, but in the following months, May through July, temperatures remained below average. Reduced precipitation occurred during most of the canola growing season, with the exception of July 2023. From August 2022 to June 2023 there was a total of 32.4 inches of rain, 1.1 inches below average. In July, there were several large rain events, resulting in a total of 10.8 inches of rain for the month, 6.69 inches above normal. After the rain in July, there was a season total of 43.1 inches of rain, which is 9.64 inches above the 30-year normal. There was a total of 6684 accumulated Growing Degree Days (GDDs) during the 2022-2023 winter canola growing season, which is typical for this region.

Table 3. Weather data and GDDs for winter canola in Alburgh, VT, 2022-2023.

Alburgh, VT	2022					2023						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Average temperature (°F)	70.3	60.2	51.3	41.5	30.7	26.9	23.6	32.2	48.3	57.1	65.7	72.2
Departure from normal	-0.44	-2.52	0.96	2.24	2.50	6.01	0.65	-0.07	2.70	-1.28	-1.76	-0.24
Precipitation (inches)	3.24	4.40	2.56	3.01	2.43	2.04	1.36	2.00	4.94	1.98	4.40	10.8
Departure from normal	-0.30	0.73	-1.27	0.31	-0.07	-0.09	-0.41	-0.24	1.87	-1.78	0.14	6.69
Growing Degree Days (base 32°F)	1193	861	607	346	112	42	77	103	280	766	1023	1274
Departure from normal	-6	-61	39	111	64	42	66	-35	-132	-53	-40	22

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.

Historical averages are for 30 years of NOAA data (1991-2020) from Burlington, VT.

All the winter canola varieties established moderately well in the fall of 2022 (Table 4). The trial average fall stand rating was 6.73 out of 10. The top performing varieties were CP1055WC, CP1077WC, DK Exclaim, and Griffin, which all had fall stand ratings of 8, indicating very good emergence. These were not statistically different from seven other varieties. DK Exclaim had the highest fall vigor rating, 4.5 out of 5, and was not statistically different from seven other varieties. The trial average vigor rating was 3.58 out of 5. Winter survival was quite high, with a trial average of 93.6% survival, and there were no significant differences between varieties. Bloom date is reported as the number of days after 1-Jan 2023. For example, 1-May is 121 days. CP1066WC had the latest bloom date, 11-May, or 131 days. This was not statistically different from PT297 and Surefire.

Table 4. Pre-harvest characteristics for 15 winter canola varieties, Alburgh, VT, 2022-2023.

Variety	Fall stand	Fall vigor	Winter survival	Bloom date
	1-10 rating†	1-5 rating‡	%	Days after 1-Jan, 2023
CP1055WC	8.00	4.00*§	98.8	127.5
CP1066WC	4.25	2.50	91.3	131.3
CP1077WC	8.00	4.25*	86.3	128.8
DK Exception	6.25*	3.50	93.8	129.0
DK Exclaim	8.00	4.50	91.3	129.3
DK Sequel	5.25	3.00	93.8	126.8
Griffin	8.00	3.75*	95.0	125.5
Inspiration	4.00	3.00	91.3	126.0
KS4662	6.75*	3.50	93.8	129.8
PT264	7.75*	3.75*	98.8	130.0
PT293	7.25*	4.25*	98.8	127.0
PT297	4.50	2.75	88.8	130.3*
Riley	7.75*	4.00*	93.8	126.8
Surefire	7.75*	3.25	93.8	130.5*
Torrington	7.50*	3.75*	95.0	129.0
LSD ($p=0.10$)¥	1.87	0.88	NS€	1.097
Trial mean	6.73	3.58	93.6	128.5

†Stand emergence rating- 1 indicates low emergence and 10 indicates high emergence.

‡Vigor rating- 1 indicates low vigor and 5 indicates very high vigor.

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

¥LSD- Least significant difference ($p=0.10$).

€NS; No significant difference between treatments.

The harvest characteristics of the winter canola varieties are summarized in Table 5. KS4662 had the greatest plant height at harvest, 61.6 cm, and this was not statistically different from six other varieties. The average seed moisture at harvest was 13.2% and was not significantly different between varieties. Additional dry was required for all varieties to reach a safe storage moisture of 8%. Winter canola seed yields were also not statistically different between varieties. The average seed yield this season was 1951 lbs ac⁻¹ at 8% seed moisture. Average test weight was 44.5 lbs bu⁻¹, which is below the industry standard of 50 lbs bu⁻¹. Oil content was significantly different between varieties. PT264 had the highest oil content, 35.4%, and this was statistically similar to five other varieties. Despite differences in oil content, there were no significant differences in oil yield between varieties. The average oil yield at 7.5% seed moisture was 616 lbs or 80.7-gal ac⁻¹.

Table 5. Harvest characteristics for 15 winter canola varieties, Alburgh, VT, 2022-2023.

Variety	Plant height	Harvest moisture	Seed yield at 8% moisture	Test weight	Oil content	Oil yield at 7.5% moisture	
	cm	%	lbs ac ⁻¹	lbs bu ⁻¹	%	lbs ac ⁻¹	gal ac ⁻¹
CP1055WC	56.2	12.9	1615	43.4	31.3	502	65.8
CP1066WC	58.6*†	13.6	1446	43.6	33.2*	477	62.5
CP1077WC	61.1*	13.3	2433	44.4	30.8	745	97.6
DK Exception	54.2	14.5	1811	42.4	30.4	583	76.4
DK Exclaim	55.7	14.0	2237	45.6	34.3*	755	98.9
DK Sequel	47.4	13.9	1843	44.0	33.0*	705	92.3
Griffin	53.1	12.4	2180	44.9	33.6*	725	95.0
Inspiration	58.5*	13.0	1791	44.4	31.8*	562	73.6
KS4662	61.6	12.7	2222	44.0	29.4	649	85.0
PT264	58.8*	12.0	1996	46.1	35.4	696	91.1
PT293	57.0	14.0	2101	44.2	27.4	605	79.3
PT297	56.1	13.6	1932	45.2	29.8	575	75.3
Riley	54.7	12.5	1967	45.6	29.5	578	75.7
Surefire	58.5*	13.2	1656	44.5	30.0	498	65.2
Torrington	58.6*	12.6	2029	45.0	29.6	592	77.6
LSD ($p=0.10$)‡	3.74	NS§	NS	NS	3.82	NS	NS
Trial mean	56.7	13.2	1951	44.5	31.3	616	80.7

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

‡LSD; Least Significant Difference ($p=0.10$).

§NS; no significant difference between treatment.

DISCUSSION

Despite cool temperatures following winter canola planting in the fall of 2022, temperatures during the winter months of 2022 into 2023 were quite warm. January was unseasonably warm with a monthly average temperature of 26.9° F which is 6 degrees warmer than normal. Dry conditions persisted for much of the spring in 2023, but excessive rainfall in July resulted in above average rainfall for this growing season. There was a total of 6684 accumulated Growing Degree Days (GGDs) during the 2022-2023 winter canola growing season, which is typical for this region. Overall, winter canola establishment and growth during the fall of 2022 was good, and winter survival was over 90% for this year's trial. The high winter survival rate is likely due to warm winter conditions this season. There were very few differences in harvest characteristics between varieties. The average seed yield this season was 1951 lbs ac⁻¹, and there were no statistical differences between varieties. Figure 1 summarizes winter survival and seed yield for the past five years of winter canola variety trials at Borderview Research Farm. Since 2018, there has been great significant variability in winter survival, and likely related to winter weather conditions each season. Higher winter survival rates did not necessarily result in higher seed yields at harvest. In 2019 for example, winter

survival was less than 20% but the trial average seed yield was about 2500 lbs ac⁻¹. It is important to note that these data represent only one year of data at one location. The UVM Extension NWCS program intends to repeat this trial in the 2023-2024 growing season.

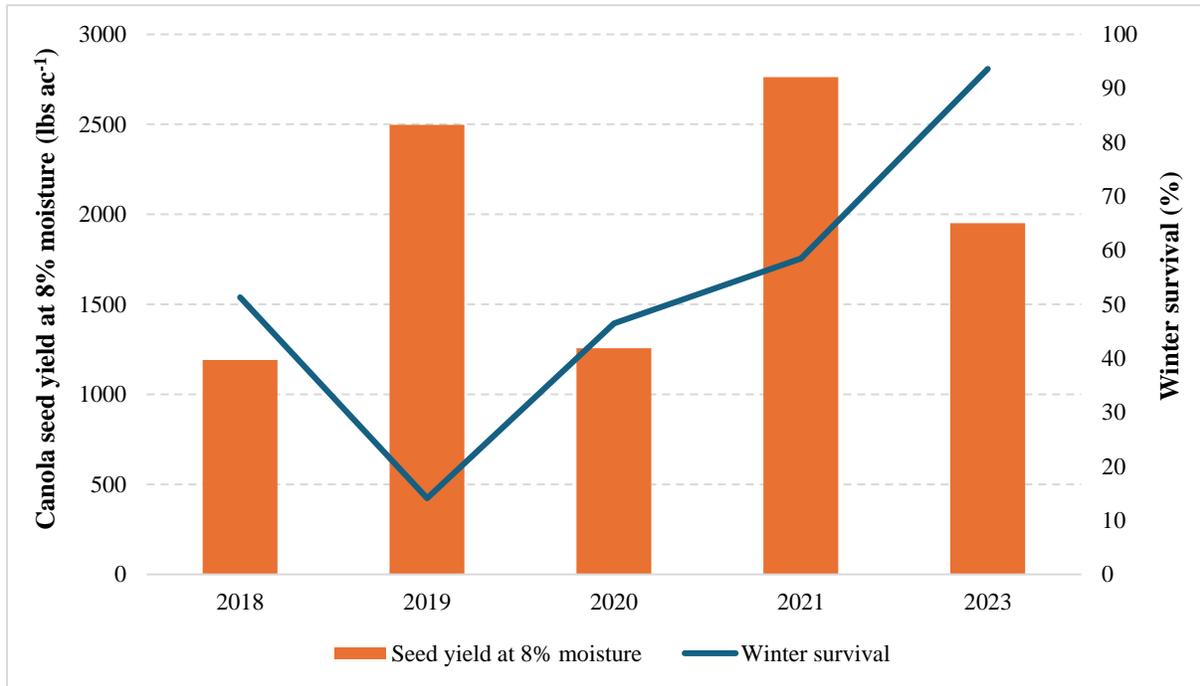


Figure 1. Winter survival and seed yield for winter canola grown at Borderview Research Farm, 2018-2023. Data for 2022 was not reported due to excessive weed pressure and bird damage at harvest.

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