



2016 Cereal Rye Variety Trial



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The interest in growing cereal rye for grain to be sold as cover crop seed, or to other value-added markets (distillers and bakers), has increased considerably across the Northeast region. As a result, farmers and end-users are requesting yield and quality information on cereal rye varieties. In 2016, University of Vermont Extension Northwest Crops and Soils (NWCS) Program conducted a variety trial to evaluate yield and quality of cereal rye. The varieties were Huron, Spooner, Abruzzi, Brasetto, Musketeer, and one variety that was not specified (VNS).

MATERIALS AND METHODS

The experimental design of the study was a randomized complete block with treatment plots replicated three times. Treatments were six varieties of cereal rye: Abruzzi, Brasetto, Huron, Musketeer, Spooner, and one variety not specified (VNS) (Table 2). The field was plowed, disked, and prepared with a spike tooth harrow to prepare the seedbed for planting. The plots were planted with a Great Plains cone seeder on 25-Sep 2015; plots were 5' x 20' (Table 1). Previous to harvest, on 19-Jul 2016, three plant heights per plot were measured.

Table 1: Agronomic and trial information for the rye cover crop variety trial, 2015-2016.

	Borderview Research Farm, Alburgh, VT
Soil Type	Benson rocky silt loam
Previous Crop	Corn
Tillage Operations	Fall plow, disc, and spike tooth harrow
Harvest Area (ft.)	5 x 20
Seeding Rate (live seeds m ⁻²)	350
Replicates	3
Planting Date	25-Sep 2015
Harvest Date	21-Jul 2016

Grain plots were harvested at the Alburgh site with an Almaco SPC50 plot combine on 21-Jul. Following harvest, seed was cleaned with a small Clipper M2B cleaner (A.T. Ferrell, Bluffton, IN). Grain moisture, test weight, and yield were calculated. An approximate one pound subsample was collected to determine quality. Quality measurements included standard testing parameters used by commercial mills. Test weight was measured by the weighing of a known volume of grain. Once test weight was determined, the samples were then ground into flour using the Perten LM3100 Laboratory Mill. At this time, flour was evaluated for its protein content, falling number, and mycotoxin levels. Grains were analyzed for protein content using the Perten Inframatic 8600 Flour Analyzer. The determination of falling number (AACC Method 56-81B, AACC Intl., 2000) was measured on the Perten FN 1500 Falling Number Machine. The falling number is related to the level of sprout damage that has occurred in the grain. It is measured by the time it takes, in seconds, for a stirrer to fall through a slurry of flour and water to the bottom of the tube.

Deoxynivalenol (DON) analysis was done using Veratox DON 5/5 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5 to 5 ppm. Samples with DON values greater than 1 ppm are considered unsuitable for human consumption.

Table 2. Winter rye varietal information, Alburgh, VT, 2016.

Variety	Source
Abruzzi	Southeast Agriseeds
Brasetto	Seedway LLC
Huron	King's Agriseeds
Musketeer	Saved Seed
Spooner	Albert Lea
VNS (variety not specified)	Seedway LLC

Variations in project results 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. At the bottom of each table, a LSD value is presented for each variable (e.g. yield). Least Significant Differences (LSD's) at the 10% level 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 following example, 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 treatments were significantly different from one another.

Treatment	Yield
A	2100*
B	1900*
C	1700
LSD	300

RESULTS

Weather data was recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT. September and May had above average temperatures while October and April had below average temperatures (Table 3). Temperatures in June and July were average. All growing months had below average precipitation, accruing 9.82 inches less rainfall than the historical average. There were 4786 growing degrees days (GDDs) accumulated over the course of the growing season, 73 more growing degree days than the historical average.

Table 3. Temperature and precipitation summary for Alburgh, VT, 2015 and 2016.

Alburgh, VT	Sep-15	Oct-15	Apr-16	May-16	Jun-16	Jul-16
Average temperature (°F)	65.2	46.5	39.8	58.1	65.8	70.7
Departure from normal	4.60	-1.70	-4.90	1.80	0.00	0.10
Precipitation (inches)	0.340	2.51	2.60	1.50	2.80	1.80
Departure from normal	-3.30	-1.09	-0.26	-1.92	-0.88	-2.37
Growing Degree Days (base 32°F)	1010	464	291	803	1017	1201
Departure from normal	152	-38	-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.

(http://www.nrcc.cornell.edu/page_nowdata.html).

Heights, lodging, flowering, yield and test weight was measured prior to cereal rye harvest (Table 4). Abruzzi was the tallest variety, Musketeer, Spooner, and VNS were not statistically different from Abruzzi. Two varieties, Abruzzi and VNS, did not experience any lodging, but were not statistically significant from Brassetto, Huron, and Spooner. The average lodging for the trial was 12.2%. There were no significant differences in flowering date or yield between the varieties tested. Varietal flowering dates ranges between 14-May and 26-May. Harvest moisture was omitted from the statistical analysis as the majority of plots were higher than the equipment calibration. Yields are presented at harvest moisture. Yields at harvest ranged between 2311 and 3591 lbs ac⁻¹. The ideal test weight for rye is 56 lbs bu⁻¹; no varieties reached this ideal weight. The top performing variety was Abruzzi with a test weight of 55.3 lbs bu⁻¹ and was statistically higher than all other varieties.

Table 4: Pre-harvest measurements of winter rye varieties, Alburgh, VT 2016.

Variety	Height cm	Lodging %	Flowering date	Yield lbs ac ⁻¹	Test weight lbs bu ⁻¹
Abruzzi	122*	0.00*	22-May	2514	55.3*
Brassetto	87.6	6.67*	24-May	3591	46.5
Huron	95.1	26.7*	26-May	3126	51.5
Musketeer	98.3*	33.3	26-May	2914	51.8
Spooner	109*	6.67*	14-May	2311	50.8
VNS	110*	0.00*	16-May	2826	51.7
Trial mean	104	12.2	21-May	2881	51.3
LSD (0.10)	26.2	30.2	NS	NS	2.60

*Treatments with an asterisk are not significantly different than the top performer in **bold**.

LSD – Least significant difference.

NS – No significant difference between treatments.

The six cereal varieties were analyzed for crude protein content, falling number, and the vomitoxin DON (Table 5). Abruzzi had the highest crude protein at 14.1%, and was significantly higher than the other varieties in the trial. Falling number ranged between 136 and 252; an ideal falling number falls around 260 seconds. The top performing variety was Abruzzi at 252 seconds, but was not significantly different

from Brasetto at 243 seconds. Brasetto did not have any DON present, and was not significantly different from Huron, Musketeer, and VNS.

Table 5: Grain quality for six cereal rye varieties, Alburgh, VT, 2016.

Variety	Crude protein @ 12% moisture %	Falling number seconds	DON ppm
Abruzzi	14.1*	252*	0.200
Brasetto	10.2	243*	0.000*
Huron	11.5	136	0.033*
Musketeer	10.9	183	0.133*
Spooner	12.3	157	0.183
VNS	12.0	173	0.033*
Trial mean	11.8	191	0.097
LSD (0.10)	1.16	35.5	0.150

*Treatments with an asterisk are not significantly different than the top performer in **bold**.
LSD – Least significant difference.

DISCUSSION

The hot, dry conditions in 2016 emulated the weather in the west, which led to high cereal rye yields and quality. There were no statistical differences between varieties in terms of yield, and while there were some significant difference in quality, overall, the six varieties performed very well.

Many farmers question if growing VNS types of cereal rye will limit yield and quality. There were very few statistically significant differences between the cereal rye varieties. Based on this year of data collection combined with 2015, it appears that VNS rye is comparable in yield and quality to other commercially available varieties.

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