2015

Cereal Rye Variety Trial

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NORTHWEST CROPS & SOILS PROGRAM

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2015 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. As a result, farmers and end-users are requesting yield and quality information on cereal rye varieties. In 2015, 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, 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 four times. Treatments were three varieties: Huron, Spooner, and one variety not specified (VNS). The trial field was fall plowed. The field was 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 18-Sep 2014; plots were 5' x 20' (Table 1). On 27-Jul 2015, three plant heights per plot were measured prior to harvest.

Table 1: Agronomic and trial information for the rye cover crop variety trial, 2014-2015.

	Borderview Research Farm, Alburgh, VT
Soil Type	Benson rocky silt loam
Previous Crop	Winter canola
Tillage Operations	Fall plow, disc, and spike tooth harrow
Harvest Area (ft.)	5 x 20
Seeding Rate (lbs ac^{-1})	100
Replicates	4
Planting Date (2014)	18-Sep
Harvest Date (2015)	27-Jul

Grain plots were harvested at the Alburgh site with an Almaco SPC50 plot combine on 27-Jul. Following harvest, seed was cleaned with a small Clipper 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.

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

Using data from a Davis Instruments Vantage Pro2 Weather Station on-site at Borderview Research Farm in Alburgh, VT, weather data were summarized for the 2014-2015 growing season (Table 2). The growing season was marked by lower than average temperatures in April, June, and July, and lower than normal rainfall during September, April, May, and July. In June we faced above average rainfall. In Alburgh, there was an accumulation of 4911 Growing Degree Days (GDDs), which is 200 GDDs above the 30 year average.

Table 2. Temperature and precipitation summary for Alburgh, VT, 2014 and 2015.

Alburgh, VT	Sep-14	Oct-14	Apr-15	May-15	Jun-15	Jul-15
Average temperature (°F)	60.6	51.9	43.4	61.9	63.1	70.0
Departure from normal	0.0	3.7	-1.4	5.5	-2.7	-0.6
Precipitation (inches)	1.33	4.27	0.09	1.94	6.42	1.45
Departure from normal	-2.31	0.67	-2.73	-1.51	2.73	-2.70
Growing Degree Days (base 32°F)	860	622	373	930	938	1188
Departure from normal	2	120	-11	174	-75	-10

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.
◊ October 2013 precipitation data based on National Weather Service data from cooperative stations in Burlington, VT (http://www.nrcc.cornell.edu/page_nowdata.html).

There were no significant differences in the measures of height, harvest moisture, test weight, or yield between the cereal rye varieties (Table 3). Harvest moisture were high (average 20.9%) due to a weather-related early harvest. The mean yield for the trial was 1710 lbs ac^{-1}.

Table 3: Height, populations, and test weight at harvest, Alburgh, VT 2015.

Variety	Height cm	Yield lbs ac^{-1}	Harvest moisture %	Test weight lbs bu^{-1}
Huron	122	**1835**	21.1	52.8
Spooner	**127**	1509	21.0	53.4
VNS	127	1785	**20.8**	**53.5**
LSD	NS	NS	NS	NS
Trial mean	125.7	1710	20.9	53.2

Treatments indicated in **bold** had the top observed performance.
LSD – Least significant difference.
NS – No significant difference.

Huron, Spooner, and VNS rye varieties did not significantly differ in crude protein and DON concentrations (Table 4). Overall, the crude protein (average 8.8%) and DON concentrations (average .51 ppm) were low. All varieties were well below the DON threshold for human consumption, 1 ppm. Huron performed the best in the falling number test with a falling number of 126 seconds.

Table 4: Grain quality of 3 cereal rye varieties, Alburgh, VT, 2015.

Variety	Crude protein @ 12% moisture %	Falling number seconds	DON ppm
Huron	8.7	**126***	0.53
Spooner	**8.9**	106	0.53
VNS	8.7	104	**0.48**
LSD	NS	12	NS
Trial Mean	8.8	112	0.51

*Treatments with an asterisk are not significantly different than the top performer in **bold**.
LSD – Least significant difference.
NS – No significant difference.

DISCUSSION

Many farmers question if growing VNS types of cereal rye limit yield and quality. There were very few statistically significant differences between the cereal rye varieties evaluated. Based on this single year of data collection, it appears that cereal rye varieties performed similarly in yield and quality. Ideally, rye should have a test weight of 56 lbs bu^{-1} and all three varieties tested fell short of that quality parameter. Huron did have a higher falling number, and it may be a more suitable candidate for baking and distilling. In the future, it will be important to determine if other quality metrics should be evaluated to determine suitability of rye for baking or distilling.

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