2014

Cereal Rye Variety Trial

Heather Darby
University of Vermont, heather.darby@uvm.edu

Julian Post
University of Vermont

Erica Cummings
University of Vermont

Susan Monahan
University of Vermont

Sara Ziegler
University of Vermont

NORTHWEST CROPS & SOILS PROGRAM

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Dr. Heather Darby, UVM Extension Agronomist
Julian Post, Erica Cummings, Susan Monahan and Sara Ziegler
UVM Extension Crops and Soils Technicians
(802) 524-6501

Visit us on the web at: http://www.uvm.edu/extension/cropsoil

UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2014 CEREAL RYE VARIETY TRIAL

Dr. Heather Darby, University of Vermont Extension
heather.darby[at]uvm.edu

In 2014, University of Vermont Extension Northwest Crops and Soils Program conducted a variety trial of three varieties of winter rye. The varieties were Huron, Spooner, and one variety that was not specified (VNS). Recently, there has been increased interest in cereal rye as a culinary grain. The purpose was to determine which variety performs best in Vermont when grown for grain.

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. Liquid manure was spread on 23-Sep 2013 to provide 60lbs nitrogen (N) per acre. The field was disked and prepared with a spike tooth harrow to prepare the seedbed for planting. The plots were planted with a Kincaid cone seeder on 27-Sep; plots were 5' x 20' (Table 1). On 24-Oct 2013, populations were taken by counting the number of plants in three 12" sections of each plot. In the 2014 season, three plant heights per plot were measured on 21-Jul. Lodging was also assessed.

Table 1: Agronomic and trial information for the rye cover crop variety trial, 2013-2014.

	Borderview Research Farm, Alburgh, VT.
Soil type	Benson rocky silt loam
Previous crop	Forage summer annuals
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 (2013)	27-Sep
Harvest date (2014)	1-Aug

Grain plots were harvested at the Alburgh site with an Almaco SPC50 plot combine on 1-Aug. 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 example below, 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 2013-2014 growing season (Table 2). The growing season this year was marked by lower than normal temperatures in September, April, and July, and higher than normal rainfall throughout the growing season (Apr-Jul). In Alburgh, there was an accumulation of 4756 Growing Degree Days (GDDs), which is 284 GDDs below the 30 year average.

Table 2. Temperature and precipitation summary for Alburgh, VT, 2013 and 2014.

Alburgh, VT	Sep-13	Oct-13	Apr-14	May-14	Jun-14	Jul-14
Average temperature (°F)	59.3	51.1	43.0	57.4	66.9	69.7
Departure from normal	-1.30	2.90	-1.80	1.00	1.10	-0.90
Precipitation (inches)	2.20	2.39	4.34	4.90	6.09	5.15
Departure from normal	-1.44	-1.21	1.52	1.45	2.40	1.00
Growing Degree Days (base 32°F)	825	600	330	789	1041	1171
Departure from normal	-33.4	98.2	-53.9	32.8	27.3	-26.9

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 was no significant difference in plant populations or plant height among the cereal rye varieties evaluated in the trial (Tables 3 and 4).

Table 3: Cereal rye populations recorded on 24-Oct 2013, Alburgh, VT.

Variety	Plants
	m^2
VNS	235
Spooner	278
Huron	**282**
LSD	NS
Trial mean	268

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

Table 4: Height of 3 cereal rye varieties on 21-Jul 2014, Alburgh, VT.

Variety	cm
Huron	**143**
Spooner	140
VNS	135
LSD	NS
Trial Mean	139

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

Variety VNS had the highest yield, although it was not significantly different from the other two varieties (Table 5, Figure 1). Huron had the highest test weight, also not significantly different from the other two. Harvest moisture was significantly lower in Spooner than in Huron and VNS (Table 5).

Table 5: Yield, harvest moisture and test weight by variety, Alburgh, VT 2014.

Variety	Yield @ 13.5% moisture	Harvest moisture	Test weight
	lbs acre^{-1}	%	lbs bu^{-1}
Huron	1998	20.8	**51.3**
Spooner	2150	**20.1**	50.3
VNS	**2299**	20.8	51.1
LSD	NS	0.38	NS
Trial mean	2149	20.6	50.9

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

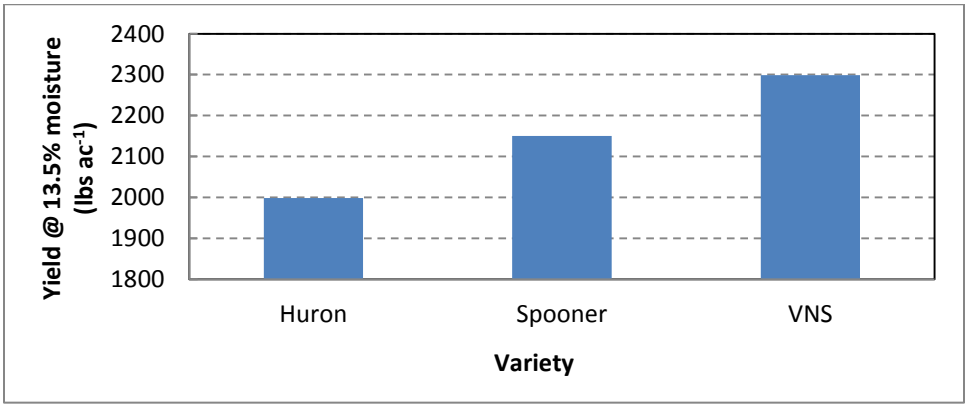

Figure 1: Yield of 3 cereal rye varieties, Alburgh, VT 2014.

Grain quality did not differ by cereal rye variety with average crude protein across the varieties being 8.08 percent and DON levels falling below the acceptable level for human consumption of 1ppm (Table 6). Falling numbers for cereal rye were well below the wheat acceptable standard of 250 seconds. It is unclear if falling number is a good indicator of cereal rye baking quality.

Table 6: Grain quality of 3 cereal rye varieties, Alburgh, VT 2014

Variety	Crude protein @ 12% moisture	Falling number	DON
	%	seconds	ppm
Huron	8.06	120.5	**0.63**
Spooner	**8.19**	**126.5**	0.93
VNS	7.99	**126.5**	0.83
LSD	NS	NS	NS
Trial Mean	8.08	125	0.80

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

DISCUSSION

Many farmers question if growing VNS types of cereal rye limit yield and quality. Based on this single year of data collection it appears that cereal rye varieties performed similarly in yield and quality. 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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