2012

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2012 OAT VARIETY TRIAL

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INTRODUCTION

Oats (*Avena sativa* L.) have a long history of production in the Northeast. Although most oats are planted for a cover crop or hay, grain oats are a potential revenue source for farmers. According to the 2007 census, about 200 acres of land in Vermont is cultivated for oat grain production, with an average yield of 1747 lbs per acre. With the exception of hull-less varieties, oats need to be de-hulled before being used for human consumption and further processing is required to make oatmeal, steel cut oats or oat flour. Since 2009, the University of Vermont Extension has conducted oat variety trials to provide yield comparisons in Vermont's climate. Varietal selection is one of the most important aspects of crop production and significantly influences yield potential. It is important to remember, however, that the data presented are from replicated research trials from only one location in Vermont and represent only one season. The goal of this project was to evaluate yields and protein of thirteen oat varieties.

METHODS

In 2012, an oat variety performance trial was conducted at Borderview Research Farm in Alburgh, VT. Thirteen oat varieties were evaluated for yield and quality (Table 1).

Table 1. Oat varieties planted in Alburgh, VT, 2012.

Variety	Seed source
Badger	Albert Lea Seed House
Bia	La Coop Fédérée
Canmore	Semican Atlantic Inc.
Cantal	Semican Atlantic Inc.
Colt	Albert Lea Seed House
Esker	Albert Lea Seed House
Excel	Albert Lea Seed House
Jim	Albert Lea Seed House
Nice	La Coop Fédérée
Reeves	Albert Lea Seed House
Rockford	Albert Lea Seed House
Spurs	Albert Lea Seed House
Tack	Albert Lea Seed House

The trial was planted at Borderview Research Farm in Alburgh, VT on a Benson rocky silt loam (Table 2). The experimental design was a randomized complete block with four replications. The previous crop was no-till sunflower. The research plots were each 5' x 20' and the seedbed was prepared by

conventional tillage methods. These included fall plow, disc and spike-toothed harrow. The oats were planted on 7-Apr with 6" row spacing at a rate of 125 lbs per acre. Pre-harvest plant measurements were taken to understand many factors affecting yield. These assessments included population, height, and incidence and severity of lodging. Plots were harvested on 23-Jul with an Almaco SPC50 plot combine.

Table 2. Agronomic practices for the 2012 oat variety trial, Borderview Research Farm, Alburgh, VT.

	Borderview Research Farm Alburgh, VT
Soil type	Benson rocky silt loam
Previous crop	No-till sunflower
Tillage operations	Fall plow, disc, and spike-toothed harrow
Row spacing (in)	6
Plot size (ft)	5 x 20
Seeding rate (lbs ac^{-1})	125
Replicates	4
Planting date	7-Apr
Harvest date	23-Jul

A one-pound subsample was collected from each plot and used to determine quality. Quality measurements included standard testing parameters used by commercial mills. After combining, harvest moisture was determined for each plot using a Dickey-john M20P. Test weight was measured using a Berckes Test Weight Scale, which weighs a known volume of grain. Subsamples were ground into flour with hulls on, using the Perten LM3100 Laboratory Mill, and were evaluated for crude protein (CP) content, falling number and mycotoxin levels. Grains were analyzed for CP using the Perten Inframatic 8600 Flour Analyzer. CP is reported at 12% flour moisture. Deoxynivalenol (DON) analysis was performed using the Veratox DON 5/5 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5 to 5.0 ppm.

All data was analyzed using a mixed model analysis where replicates were considered random effects. The LSD procedure was used to separate cultivar means when the F-test was significant ($P< 0.10$).

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 varieties 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 Difference (LSD) at the 10% level of probability is shown. Where the difference between two varieties 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 varieties. Oat varieties that were not significantly lower in performance than the highest variety in a particular column are indicated with an asterisk. In the example, variety A is significantly different from variety C but not from variety B. The difference between A and B is equal to 729 which is less than the LSD value of 889. This means that these varieties did not differ in yield. The difference between A and C is equal to 1454 which is

Variety	**Yield**
A	**4615***
B	3886*
C	3161
LSD	**889**

greater than the LSD value of 889. This 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.

RESULTS

Using data from an onsite Davis Instruments Vantage Pro2 weather station at Borderview Research Farm in Alburgh, VT, weather data was summarized for the 2012 growing season (Table 3). The 2012 growing season was warmer than normal, with less than average precipitation throughout the season, except for the month of May. Growing Degree Days (GDDs) were calculated at a base temperature of 32°F. From planting to harvest, there was an accumulation of approximately 3547 GDDs. This is 195 more GDDs than the 30-year average, but similar to GDDs accumulated in 2011.

Table 3. Temperature, precipitation and Growing Degree Days (GDDs), 2012.

Borderview Research Farm, Alburgh, VT	April	May	June	July
Average temperature (°F)	44.9	60.5	67.0	71.4
Departure from normal	0.10	4.10	1.20	0.80
Precipitation (inches)*	2.6	3.9	3.2	3.8
Departure from normal	-0.2	0.5	-0.5	-0.4
Growing Degree Days (base 32°F)	396	884	1046	1221
Departure from normal	12	128	32	23

Based on data from an onsite Davis Instruments Vantage Pro2 weather station with a Weatherlink data logger.
Historical averages are for 30 years of NOAA data from Burlington, VT (1981-2010).
*Precipitation data from Jul-Sep 2012 is based on Northeast Regional Climate Center data from an observation station in Burlington, VT.

Pre-harvest measurements were collected on 23-Jul (Table 4). Plant height, lodging and the severity of lodging was assessed. The trial mean for height was 114 cm, 44.9 inches. The tallest varieties were Canmore and Cantal (130 cm), though this was not significantly different from two other varieties, Nice and Rockford. Lodging was assessed visually on a 0-100% scale. The trial mean for lodging was 18.8%, with Reeves and Cantal having the greatest incidence of lodged plants. Although some of the taller varieties seemed more prone to lodging this was not always the case. For example, Nice one of the tallest varieties had 0.00% incidence of lodging.

Table 4. Pre-harvest data for Borderview Research Farm, Alburgh, VT, 2012.

Variety	Height	Lodging	Lodging severity
	cm	%	(1-5)
Badger	102	18.8	2.50
Bia	116	2.50*	0.50*
Canmore	**130***	16.3	2.25
Cantal	**130***	82.5	4.50
Colt	109	6.30*	1.25*
Esker	108	3.80*	1.50
Excel	103	7.50*	1.25*
Jim	114	6.30*	1.00*
Nice	123*	**0.00***	**0.00***
Reeves	112	77.5	4.25
Rockford	124*	13.8*	2.75
Spur	103	**0.00***	**0.00***
Tack	103	10.0*	2.00
LSD (0.10)	7	15.2	1.44
Trial mean	114	18.8	1.83

Treatments shown in **bold** are top-performing.
*Treatments that did not perform significantly lower than the top-performing treatment in a particular column are indicated with an asterisk.
NS-Treatments were not significantly different from one another.

The oat variety 'Excel' had the highest yield (3362 lbs per acre), though this was not significantly different than four other varieties which included Badger, Esker, Jim, and Tack (Table 5, Figure 1). Mean oat yields for the trial were 2544 lbs (or 1.27 tons) per acre. Rockford had the highest harvest moisture (15.3%) with the trial average being 11.5%. Crude protein was measured at 12% flour moisture with the trial mean being 10.9%. Test weight, a measure of grain density, is the most commonly used indicator of oat quality. All of the oat varieties had test weights above the 32 pound per bushel industry standard, with a trial average of 37.8 lbs per bushel. Colt had the highest test weight (40.6 lbs per bushel), though there was no significant difference in test weight by variety. The milling market prefers higher test weights greater than 38 lbs per bushel. Five out of the thirteen oat varieties met this standard, including Cantal, Colt, Esker, Jim and Spur. All of the oat varieties except for one, Cantal, had DON levels less than the 1.00 ppm standard for human consumption, with Esker having the lowest level of all the varieties (0.16 ppm). DON levels did not differ significantly by variety.

Table 5. Harvest and quality data for Borderview Research Farm, Alburgh, VT, 2012.

Variety	Yield		Harvest moisture	Test weight	Crude protein @ 12% moisture	DON
	lbs ac^{-1}	tons ac^{-1}	%	lbs bu^{-1}	%	ppm
Badger	2891*	1.45*	12.4	36.1	11.0	0.23
Bia	2142	1.07	11.0	34.8	10.4	0.48
Canmore	2286	1.14	9.8	36.5	10.9	0.43
Cantal	1513	0.76	12.3	38.3	11.2*	1.03
Colt	2557	1.28	11.6	**40.6**	11.2*	0.53
Esker	2668*	1.33*	11.0	40.0	11.2*	**0.16**
Excel	**3362***	**1.68***	9.7	37.8	11.2*	0.31
Jim	3265*	1.63*	10.9	40.3	11.0*	0.35
Nice	2385	1.19	10.2	37.3	10.7	0.68
Reeves	1969	0.98	12.7	36.6	10.9	0.45
Rockford	2442	1.22	**15.3***	36.3	10.8	0.18
Spur	2427	1.21	11.3	39.8	**11.3***	0.24
Tack	3163*	1.58	11.7	37.4	10.5	0.58
LSD (0.10)	793	0.4	1.8	NS	0.3	NS
Trial Mean	2544	1.27	11.5	37.8	10.9	0.43

Treatments shown in **bold** are top-performing.
*Treatments that did not perform significantly lower than the top-performing treatment in a particular column are indicated with an asterisk.
NS-Treatments were not significantly different from one another.

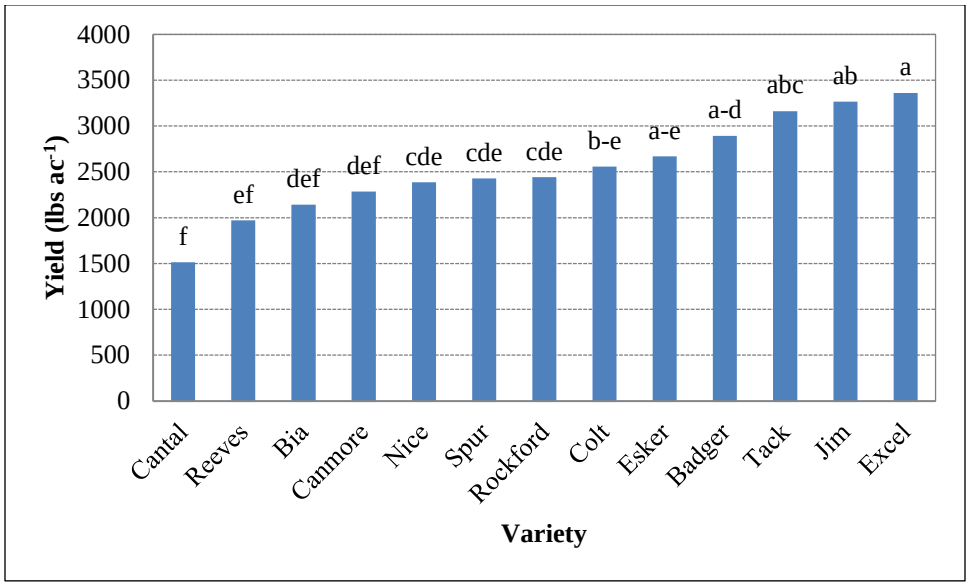

Figure 1. Yield of 13 oat varieties evaluated in Alburgh, VT, 2012. Varieties that share a letter did not differ significantly from one another (p=0.10).

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