

NORTHWEST CROPS & SOILS PROGRAM



2022 Oat Variety Trial



Dr. Heather Darby, UVM Extension Agronomist
Laura Sullivan, Anna Brown, Hillary Emick, and Sophia Wilcox Warren
UVM Extension Crops and Soils Technicians
(802) 524-6501

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2022 OAT VARIETY TRIAL

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

Oats (*Avena sativa* L.) have a long history of production in the Northeast. Although most oats are planted for a cover crop or forage, grain oats are a potential revenue source for farmers. According to the 2017 census, about 80 acres of land in Vermont is cultivated for oat grain production, with an average yield of 1956 lbs ac⁻¹. With the exception of hull-less varieties, oats need to be de-hulled before they can be used for human consumption and even further processing is required to make oatmeal, steel cut oats, or oat flour. Yearly, the University of Vermont Extension Northwest Crops and Soils Program conducts oat variety trials to provide yield and quality comparisons for oats grown 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 twenty-eight oat varieties.

MATERIALS AND METHODS

In 2022, an oat variety performance trial was conducted at Borderview Research Farm in Alburgh, VT. Twenty-eight oat varieties were evaluated for yield and quality (Table 1).

Table 1. Oat varieties planted in Alburgh, VT, 2022.

Variety	Seed source
AAC Richmond	Semican
AC Gehl	Semican
Antigo	Albert Lea Seed
Betogene	Albert Lea Seed
Canmore	Semican
CDC Orrin	Semican
Corral	Seedway
Deon	Albert Lea seed
Esker	Albert Lea seed
Hayden	Seedway
Jerry	Welter Seed & Honey Co.
Jim	Welter Seed & Honey Co.
Kame	Lakeview Organics
Keuka	Lakeview Organics
Laker	Albert Lee Seed
Leonard	Lakeview Organics
Marin	Atlantic Maritime Heirloom Oat
MS-19O71	Meridian Seeds
Morton	Albert Lee Seed

Pringles Progress	VT heirloom oat
Reims	Albert Lea Seed
Richmond	Seedway
Rushmore	Albert Lee Seed
Saddle	Albert Lea Seed
Shelby 427	Albert Lea Seed
Streaker (hulless)	Albert Lea Seed
Sumo	Albert Lea Seed
VNS (lot# 18-6034)	Seedway

The trial was planted at Borderview Research Farm in Alburgh, VT on a Benson rocky silt loam, over shaly limestone, 8 to 15% slope (Table 2). The experimental design was a randomized complete block with four replications. The previous crop was milkweed. The research plots were 5' x 20' and the seedbed was prepared by conventional tillage methods including spring plow, disc and spike tooth harrow. The oats were planted on 25-Apr with 6" row spacing at a rate of 125 lbs ac⁻¹.

Table 2. Agronomic practices for the 2022 oat variety trial, Alburgh, VT.

Location	Borderview Research Farm, Alburgh VT
Soil type	Benson rocky silt loam, over shaly limestone, 8-15% slope
Previous crop	Milkweed
Tillage operations	Pottinger TerraDisc
Row spacing (in)	6
Plot size (ft)	5 x 20
Seeding rate	125 lbs ac ⁻¹
Replicates	4
Planting date	25-Apr
Harvest date	8-Aug

On 8-Aug, plant measurements of heights and lodging were taken prior to harvest. Plots were harvested with an Almaco SPC50 plot combine. After combining, oats were cleaned with a small Clipper cleaner (A.T. Ferrell, Bluffton, IN). Harvest moisture was determined for each plot using a Dickey-john Mini GAC moisture and test weight meter. An approximate one-pound grain sample per plot was collected for quality analysis. Grains were analyzed for protein and starch content using the Perten Inframatic 9500 Grain Analyzer. Plot samples were then ground into flour with hulls on, using the Perten LM3100 Laboratory Mill, and at this time, flour was evaluated for mycotoxin levels. Deoxynivalenol (DON) analysis was analyzed using Veratox DON 5/5 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5-5 ppm. Samples with DON values greater than 1 ppm are considered unsuitable for human consumption. DON testing was performed on 1 replicate of each variety, and all varieties were below the detectable limit for the test (data not shown).

All data were analyzed using a mixed model analysis where replicates were considered random effects. The Least Significant Difference (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). LSD at the 10% level of probability are 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. 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 725, 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 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 shown in bold.

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

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 (Table 3). Temperatures in May were slightly warmer than normal, resulting in 65 more Growing Degree Days (GDDs) than the 30-year average. Unfortunately, June was quite cool, averaging about 2.81 degrees below the 30-year average and resulting in 64 less growing days than normal. Despite generally cooler temperatures, a total of 3510 GDDs (base 32° F) were accumulated April through July. This was 36 GDDs less than the 30-year normal. 20.1 inches of rain fell from April through July; overall this amounted to 4.97 more inches of rain than normal.

Table 3. Temperature and precipitation summary for Alburgh, VT, 2022.

	2021			
Alburgh, VT	April	May	June	July
Average temperature (°F)	44.8	60.5	65.3	71.9
Departure from normal	-0.81	2.09	-2.81	-0.54
Precipitation (inches)	5.57	3.36	8.19	3.00
Departure from normal	2.50	-0.40	3.93	-1.06
Growing Degree Days (32-95°F)	391	883	1000	1236
Departure from normal	-20.0	65.0	-64.0	-17.0

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.

Heights and lodging were assessed prior to harvest (Table 4). Oat varieties were not significantly different in terms of height or lodging. The average height was 109 cm and ranged from 96.6 cm (*MS-19071*) to 122

cm (*Marin*). The average percent lodging was 33.7% and ranged from 01.67% (*AC Gehl*) to 61.7% (*Streaker*). *Streaker* also had the greatest percent lodging in the year prior. No varieties in the trial displayed 0.0% lodging.

Table 4. Height and lodging by oat variety prior to harvest, Alburgh, VT, 2022.

Variety	Height	Lodging
	cm	%
AAC Richmond	113	15.0
AC Gehl	107	1.67
Antigo	110	28.3
Betogene	114	43.3
Canmore	98.0	23.3
CDC Orrin	98.0	11.7
Corral	112	40.0
Deon	102	23.3
Esker	116	38.0
Hayden	113	55.0
Jerry	106	31.7
Jim	109	34.3
Kame	104	11.7
Keuka	112	50.3
Laker	104	41.7
Leonard	102	38.3
Marin	122	21.7
Morton	106	45.0
MS-19O71	96	31.7
Pringles Progress	109	32.7
Reims	109	41.7
Richmond	117	58.3
Rushmore	117	36.0
Saddle	115	39.3
Shelby 427	107	38.3
Streaker (hulless)	112	61.7
Sumo	109	10.0
VNS (lot# 18-6034)	111	40.0
LSD (0.10) [‡]	NS [¥]	NS
Trial mean	109	33.7

[¥]NS: no significant differences at p=0.10.

There were some significant differences in harvest and quality measures between varieties (Table 5). The average yield this season was 2906 lbs ac⁻¹ and ranged from 2066 lbs ac⁻¹ (*AC Gehl*) to 3690 lbs ac⁻¹ (*Hayden*). There was no statistically significant difference between yields amongst the varieties. The ideal storage moisture for oats is 14% or below. Several of the varieties met or were below 14% moisture, including *Corral*, *Hayden*, *Kame*, *Leonard*, *Marin*, and *Saddle*. Moisture ranged from 13.2% (*Corral*) to

21.4% (*Jim*) with an average harvest moisture of 14.7%. The average test weight was 32.0 lbs bu⁻¹ and ranged from 23.7 lbs bu⁻¹ (*VNS*) to 38.9 lbs bu⁻¹ (*Streaker*). *Streaker*, a hullless oat, had a test weight that was statistically similar to 2 other varieties - *Hayden* and *Sumo*. Sixteen of the twenty-eight varieties had test weights that met or exceeded the industry standard of 32 lbs bu⁻¹ for oats. The average crude protein was 9.78%. *Sumo* had the highest crude protein 12.1% and was statistically similar to one other variety (*Morton*). It is important to note that *Streaker* is a hullless variety and hence, would have higher crude protein because the hulls are not present.

Table 5. Harvest and quality measures, Alburgh, VT, 2022.

Variety	Yield @ 13.5% moisture lbs ac ⁻¹	Harvest moisture %	Test weight lbs bu ⁻¹	Crude protein @ 12% moisture %	Starch %
AAC Richmond	2455	16.8	29.2	9.04	55.0
AC Gehl	2066	15.0	32.3	9.84	52.6
Antigo	2830	14.2	33.7	10.8	51.2
Betagene	2956	14.7	29.9	9.93	53.1
Canmore	2476	15.4	29.2	8.90	53.6
CDC Orrin	2937	15.4	30.7	8.72	54.0
Corral	3430	13.2	33.9	9.36	53.2
Deon	3103	15.5	33.1	10.1	52.2
Esker	3248	15.3	31.3	10.2	53.5
Hayden	3690	13.8	35.4*	9.29	52.4
Jerry	3241	14.1	33.4	9.90	53.8
Jim	3033	21.4	32.5	9.67	53.1
Kame	2868	13.9	30.5	9.46	54.9*
Keuka	2378	14.9	28.6	9.80	52.7
Laker	2849	15.4	29.6	10.2	53.8
Leonard	3098	13.6	31.2	9.28	54.4*
Marin	2315	13.8	32.6	9.67	52.4
Morton	3882	14.4	33.6	11.6*	54.1
MS-19071	2634	12.1	28.0	8.40	54.0
Pringles Progress	2443	14.3	29.6	9.73	52.7
Reims	3423	14.1	34.4	9.80	54.2*
Richmond	2663	14.4	32.0	9.24	52.8
Rushmore	3405	15.2	34.5	10.0	54.4*
Saddle	3802	13.9	34.4	9.50	55.0*
Shelby 427	2946	14.5	34.7	9.35	52.6
Streaker (hullless)	2089	14.3	38.9	10.5	49.4
Sumo	2849	14.8	35.6*	12.1	53.0
VNS (lot# 18-6034)	2254	14.8	23.7	9.30	52.4
LSD (0.10) †	NS‡	NS	3.92	0.663	0.897
Trial mean	2906	14.7	32.0	9.78	53.2

†Treatments with an asterisk (*) are not statistically different from the top performer, shown in **bold**.

‡LSD; least significant differences at p=0.10.

‡NS; no significant differences between treatments at p=0.10.

DISCUSSION

It is important to remember that the results only represent one year of data. Despite a cooler June and July, the warm spring balanced the overall temperature enough to produce strong yields. The average yield at 13.5% moisture in 2022 was 2906 lbs ac⁻¹; 73lbs ac⁻¹ higher than the 2021 average. The average height for all varieties in 2022 was 109 cm, the tallest variety being 122 cm (*Marin*) with 14 other statistically similar varieties. Lodging increased significantly from 2021 to 2022 with average lodging being 33.7% to 2021's 1.08%. Harvest moisture was 14.7%, with six of the varieties being below the ideal storage moisture rate of 14%. The mean crude protein was 9.78% and average test weight was 32 lbs bu⁻¹. As you make variety choices on your farm, it is important that you evaluate data from test sites that are as similar to your region as possible.

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