

NORTHWEST CROPS & SOILS PROGRAM



2016 Organic Soybean Variety Trial



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2016 ORGANIC SOYBEAN VARIETY TRIAL
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In 2016, the University of Vermont Extension Northwest Crops and Soils Team evaluated yield and quality of organic soybean varieties at Borderview Research Farm in Alburgh, VT. Growing conditions in Alburgh are conducive to grow soybeans from maturity group 1.8 and under. Due to the short growing season in Vermont, little research has been conducted on soybeans and the insects and diseases that can affect their harvest yield and quality. Soybeans are grown for human consumption, animal feed, and biodiesel. In an effort to support and expand the local soybean market throughout the northeast, the University of Vermont Extension Northwest Crop and Soils (NWCS) Program, as part of a grant from the Eastern Soybean Board, established trials in 2016 to evaluate soybean varieties under conventional management to evaluate which ones thrive in our northern climate.

MATERIALS AND METHODS

Several seed companies submitted varieties for evaluation (Table 1). Ten soybean varieties were evaluated ranging in maturity from 0.8 to 1.8. Company and maturity group are listed for the varieties in Table 2.

Table 1. Participating companies and contact information.

Albert Lea Seed Seed	Blue River Hybrids
1414 W. Main, POB 127 Albert Lea Seed, MN 56007 800-352-5247	2326 230 th Street Ames, IA 50014 800-370-7979

Table 2. Organic soybean varieties evaluated in Alburgh, VT, 2016.

Variety	Company	Maturity Group
Viking O.Sheyenne	Albert Lea Seed	0.8
Viking O.1202N	Albert Lea Seed	1.2
1F44	Blue River Hybrids	1.4
Viking O.1544AT	Albert Lea Seed	1.5
Viking O.1518N	Albert Lea Seed	1.5
15C6	Blue River Hybrids	1.5
Viking O.1706N	Albert Lea Seed	1.7
17C2	Blue River Hybrids	1.7
Viking O.1955AT	Albert Lea Seed	1.8
18C7	Blue River Hybrids	1.8

The soil type at the Alburgh location was Benson rocky silt loam (Table 3). The seedbed was moldboard plowed and disked prior to planting and the previous crop was corn. Starter fertilizer (10-20-20) was applied at a rate of 200 lbs per ac⁻¹. Plots were planted on 26-May with a Monosem NG-Plus 2-row

precision air planter (Edwardsville, KS). The plot design was a randomized complete block with three replications. The treatments were 10 varieties that ranged in maturity group from 0.8 to 1.8. The plots were weeded by hand, using hoes, and mechanical cultivation.

Table 3. Organic soybean variety trial specifics for Alburgh, VT, 2016.

Borderview Research Farm Alburgh, VT	
Soil types	Benson rocky silt loam, 3% slope
Previous crop	Corn
Tillage operations	Moldboard plowed and disked
Plot size (feet)	5 x 20
Row spacing (inches)	30
Replicates	3
Starter fertilizer (lbs ac ⁻¹)	200 lbs ac ⁻¹ 10-20-20
Planting Date	26-May
Harvest date	10-Oct

The plots were also scouted for insect pests and disease symptoms on 7-Jul and 10-Aug using a 0.25 m² quadrat placed randomly in a plot.

On 10-Oct, the soybeans were harvested using an Almaco SPC50 small plot combine. Seed was cleaned with a small Clipper M2B cleaner (A.T. Ferrell, Bluffton, IN). They were then weighed for plot yield, tested for harvest moisture using a DICKEY-John M20P moisture meter, and evaluated for test weight using a Berckes Test Weight Scale.

Yield data and stand characteristics were analyzed using mixed model analysis using the mixed procedure of SAS (SAS Institute, 1999). Replications within trials were treated as random effects, and hybrids were treated as fixed. Hybrid mean comparisons were made using the Least Significant Difference (LSD) procedure when the F-test was considered 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 hybrids 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 (i.e. yield). Least Significant Differences (LSDs) at the 0.10 level of significance are shown. Where the difference between two hybrids within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure that for 9 out of 10 times, there is a real difference between the two hybrids. In this example, hybrid C is significantly different from hybrid A but not from hybrid B. The difference between C and B is equal to 1.5, which is less than the LSD value of 2.0. This means that these hybrids did not differ in yield. The difference between C and A is equal to 3.0, which is greater than the LSD value of 2.0. This means that the yields of these hybrids were significantly different from one another.

Hybrid	Yield
A	6.0
B	7.5*
C	9.0*
LSD	2.0

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. Missing precipitation data from 17-Aug through 31-Oct was supplemented using data provided by the NOAA from Highgate, VT. May through September was unusually dry, accumulating 7.27 inches less rain than in a usual year (Table 4). Despite the lack of rain, June and July were close to the average temperature. However, late summer and early fall were hotter than the average. Overall, there were an accumulated 2708 Growing Degree Days (GDDs) this season, approximately 302 more than the historical 30-year average.

Table 4. 2016 weather data for Alburgh, VT.

Alburgh, VT	May	June	July	August	September	October
Average temperature (°F)	58.1	65.8	70.7	71.6	63.4	50.0
Departure from normal	1.80	0.00	0.10	2.90	2.90	1.90
Precipitation (inches)	1.5	2.8	1.8	3.0	2.5	5.0
Departure from normal	-1.92	-0.88	-2.37	-0.93	-1.17	1.39
Growing Degree Days (base 50°F)	340	481	640	663	438	146
Departure from normal	74	7	1	82	104	34

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. Alburgh precipitation data from 8/17/16-10/31/16 was missing and was replaced by data provided by the NOAA for Highgate, VT.

Soybean Scouting

Soybean plots were scouted twice during the growing season, and several insect and disease pests were identified (Table 5). Red headed flea beetles and potato leafhoppers, as well as their feeding symptoms, were found on all varieties in this trial. Japanese beetles caused the greatest amount of damage to leaves, defoliating large amounts of leaves in each plot. The major disease present was downy mildew with nearly every variety in the trial exhibiting the characteristic lime green-yellow spots on the leaves (Image 1). There was some evidence of bacterial leaf blight and sunscald in the plots.



Image 1. Downy mildew on soybean

Table 5. 2016 soybean arthropod and disease pests identified in organic plots at Alburgh, VT.

Variety	Company	Red Headed Flea Beetle	Potato Leafhopper	Japanese Beetle	Downy Mildew	Bacterial Leaf Blight	Sunscald
Viking O.Sheyenne	Albert Lea Seed	X	X	X	X		
Viking O.1202N	Albert Lea Seed	X	X	X			
1F44	Blue River Hybrids	X	X	X	X	X	
Viking O.1544AT	Albert Lea Seed	X	X	X	X		
Viking O.1518N	Albert Lea Seed	X	X	X			
15C6	Blue River Hybrids	X	X	X	X		
Viking O.1706N	Albert Lea Seed	X	X	X	X		
17C2	Blue River Hybrids	X	X				X
Viking O.1955AT	Albert Lea Seed	X	X	X	X	X	X
18C7	Blue River Hybrids	X	X		X		

Soybean Harvest

Soybeans were harvested on 10-Oct and were all above the optimal storage moisture of 13%. The average moisture for the trial was 15.4% (Table 6). The average test weight was 55.9 lbs bu⁻¹, which was below the optimal test weight of 60 lbs bu⁻¹. The variety 15C6 had the highest yield at 4281 lbs ac⁻¹, or 71.5 bu ac⁻¹, but was not statistically different from Viking O.1202N, Viking O.1518N, Viking O.1706, 17C2, Viking O.1955AT, and 18C7. The average yield was 3669 lbs ac⁻¹, or 61.3 bu ac⁻¹.

Table 6. Harvest characteristics of organic soybean varieties – Alburgh, VT, 2016.

Variety	Company	Relative maturity	Harvest moisture %	Test Weight lbs bu ⁻¹	Yield @ 13% moisture lbs ac ⁻¹	Yield @ 13% moisture bu ac ⁻¹
Viking O.Sheyenne	Albert Lea Seed	0.8	15.1	56.6	3013	50.3
Viking O.1202N	Albert Lea Seed	1.2	14.7	55.7*	3806*	63.6*
1F44	Blue River Hybrids	1.4	15.7	55.3	2606	43.5
Viking O.1544AT	Albert Lea Seed	1.5	15.2	56.2*	3404	56.8
Viking O.1518N	Albert Lea Seed	1.5	15.0	56.1*	3775*	63.0*
15C6	Blue River Hybrids	1.5	15.1	56.0*	4281*	71.5*
Viking O.1706N	Albert Lea Seed	1.7	15.0	55.7*	4180*	69.8*
17C2	Blue River Hybrids	1.7	14.9	56.5*	4087*	68.3*
Viking O.1955AT	Albert Lea Seed	1.8	15.9	55.9*	3761*	62.8*
18C7	Blue River Hybrids	1.8	17.7	54.6	3775*	63.0*
<i>LSD (0.10)</i>		--	1.15	1.15	736	12.3
<i>Trial Mean</i>		1.66	15.4	55.9	3669	61.3

Top performing varieties are indicated in **bold**.

*Varieties that did not perform significantly lower than the top performing variety are indicated with an asterisk.

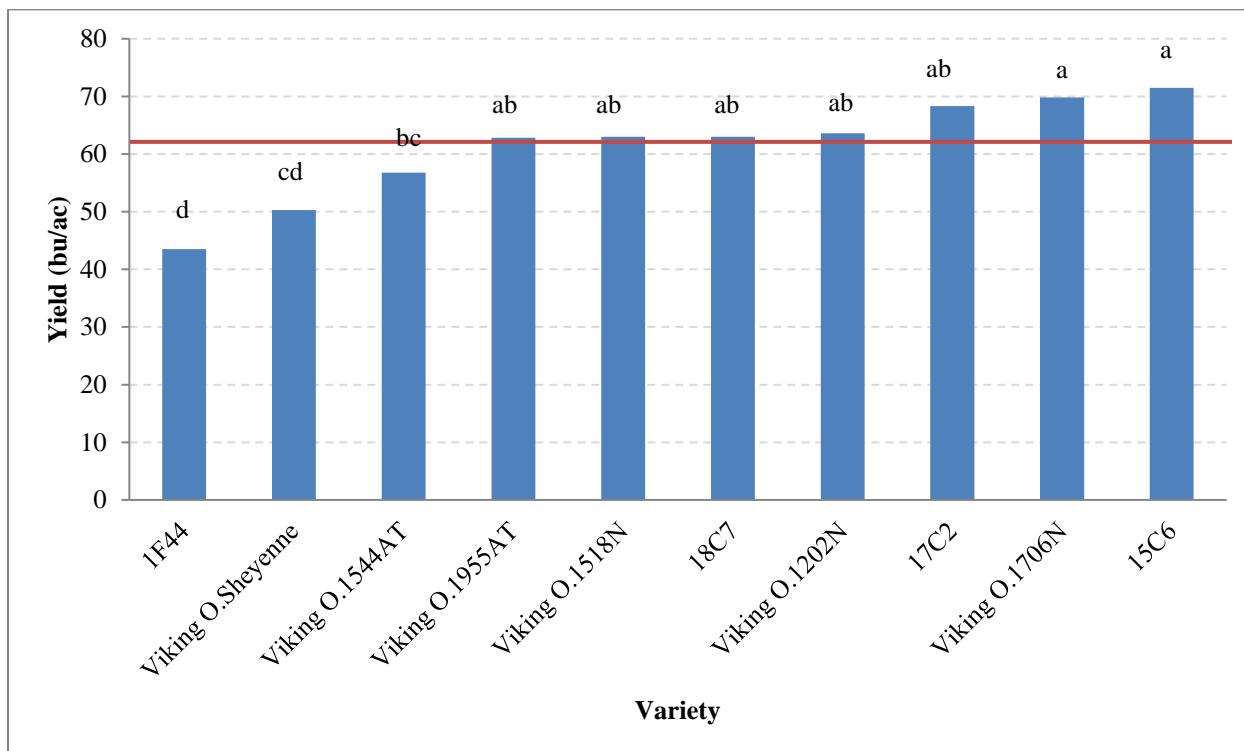


Figure 1. Yield at 13% moisture for 10 organic soybean varieties.

The red line indicates the average yield.

Varieties with the same letter are not statistically different from each other.

DISCUSSION

It is important to remember that the results only represent one year of data. 2016 was a challenging growing season due to lack of rain. Soybeans require a lot of water to grow well, however these soybeans performed very well given the suboptimal growing conditions. The plants were very bushy and dense and did not appear to be largely affected by the lack of rain.

It is interesting to note the presence of downy mildew on these soybeans, which was confirmed by the UVM Plant Pathologist. The main transport mechanism of downy mildew is water; since there was very little rain this season, it seemed unlikely that this pathogen would be so widespread. While there was little rain, the plants may have been able to effectively trap moisture due to their bushy stature. The presence of downy mildew did not appear to affect harvest yield or quality, but in a year with more precipitation, its presence may have more severe consequences.

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