



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.

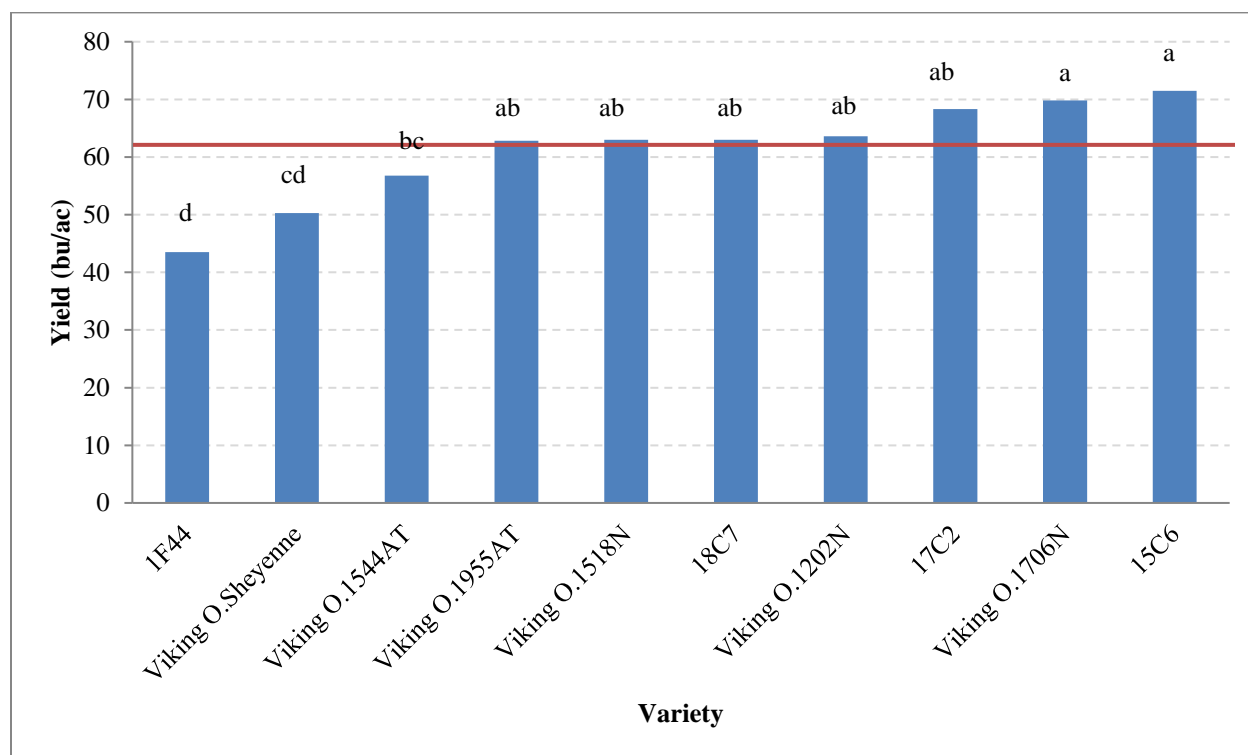


Figure 1. Yield at 13% moisture for 10 organic soybean varieties.

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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