



2021 Organic Soybean Variety Trial



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**2021 ORGANIC SOYBEAN VARIETY TRIAL Dr.
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In 2021, the University of Vermont Extension Northwest Crops and Soils Program evaluated yield and quality of short season organic soybean varieties at Borderview Research Farm in Alburgh, VT. Soybeans can be grown for human consumption, animal feed, and biodiesel. As farmers look to reduce feed costs or diversify markets, soybean acreage across Vermont is increasing. Local research is needed to identify varieties that are best adapted to this region. 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 established a trial in 2021 to evaluate yield and quality of organic soybean varieties.

MATERIALS AND METHODS

Fifteen soybean varieties submitted by two participating seed companies (Table 1) were evaluated from maturity groups 0.5 to 2.0 (Table 2).

Table 1. Participating companies and contact information.

Albert Lea Seed	Blue River Organic Seed
1414 W. Main Albert Lea, MN 56007 800-352-5247	2326 230 th Street Ames, IA 50014 515-239-5925

Table 2. Soybean varieties evaluated in Alburgh, VT, 2021.

Company/Brand	Variety	Relative maturity
Blue River Organic Seed	V0522	0.5
Blue River Organic Seed	07DC8	0.7
Albert Lea Seed	O.0821N	0.8
Albert Lea Seed	O.1202N	1.2
Blue River Organic Seed	12A2	1.2
Blue River Organic Seed	1F44	1.4
Albert Lea Seed	O.1518N	1.5
Blue River Organic Seed	V1621	1.6
Albert Lea Seed	O.1718N	1.7
Blue River Organic Seed	e17Y993	1.7
Blue River Organic Seed	18C7	1.8
Blue River Organic Seed	V1821	1.8
Albert Lea Seed	O.E1993	1.9
Blue River Organic Seed	20AR5	2.0
Blue River Organic Seed	e20Y993	2.0

The soil type at the Alburgh location was Benson rocky silt loam (Table 3). The seedbed was prepared using a Pottinger Terra Disc prior to seeding. The previous crop was perennial forage. Plots were planted

on 25-May with a 4-row cone planter with John Deere row units fitted with Almaco seed distribution cones (Nevada, IA). Plots were 20' long and consisted of four rows spaced at 30 inches. The seeding rate was 185,000 seeds ac⁻¹. The plot design was a randomized complete block with four replications. The treatments were 15 varieties that ranged in relative maturity from 0.5 to 2.0.

Plots were monitored for pest and disease pressure throughout the season. On 2-Sep, plots were assessed for severity of infection from downy mildew (*Peronospora manshurica*), Septoria brown spot (*Septoria glycines*), frogeye leaf spot (*Cercospora sojina*), and bacterial blight (*Cercospora glycines*). Assessments were made by inspecting each plot and assigning a rating (0-10) where 0 equated to infection not present and 10 equated to infection present on 100% of leaf area (Image 1). On 20-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 and tested for harvest moisture and test weight using a DICKEY-John Mini-GAC Plus moisture and test weight meter.

Table 3. Soybean trial details for Alburgh, VT, 2021.

	Borderview Research Farm Alburgh, VT
Soil types	Benson rocky silt loam
Previous crop	Perennial forage
Tillage operations	Pottinger Terra Disc
Plot size (feet)	10 x 20
Row spacing (inches)	30
Replicates	4
Planting date	25-May
	20-Oct



Image 1. Foliar disease infection scale (left to right) 1, 3, 5, and 7. Ratings above 7 were not observed.

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

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

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.

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 4). Temperatures remained above normal for much of the summer except for July which was over 4 degrees cooler than normal. These temperatures contributed to above normal Growing Degree Day (GDD) accumulations of 2830 May through October, 143 above the 30-year normal. Rainfall was below normal for much of the season with the region being designated as D0, abnormally dry or D1, moderate drought (Drought.gov) throughout the season. Much of the rain that fell came in short duration storms.

Table 4. Weather data for Alburgh, VT, 2021.

Alburgh, VT	May	June	July	August	Sept	Oct
Average temperature (°F)	58.4	70.3	68.1	74.0	62.8	54.4
Departure from normal	-0.03	2.81	-4.31	3.25	0.14	4.07
Precipitation (inches)	0.66	3.06	2.92	2.29	4.09	6.23
Departure from normal	-3.10	-1.20	-1.14	-1.25	0.42	2.40
Growing Degree Days (50-86°F)	334	597	561	727	394	217
Departure from normal	33	73	-134	85	7	79

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger. Historical averages are for 30 years of NOAA data (1991-2020) from Burlington, VT.

Soybeans were harvested on 20-Oct. Harvest results are shown in Table 5. Soybean yields were considerably depressed compared to previous years was likely a result of the dry and hot conditions. Soybeans in 2021 averaged 2242 lbs ac⁻¹ or 37.4 bu ac⁻¹, considerably lower than 2020's average of 3350 lbs ac⁻¹ or 55.8 bu ac⁻¹. The top yielding variety was O.1718N which performed statistically similarly to 10 other varieties that spanned all maturity groups in the trial (Figure 1). Typically, we'd expect longer season varieties to outperform shorter season varieties in years with favorable growing conditions. However, in this trial variety performance varied across all maturity groups with some long season varieties performing well and some performing poorly in comparison to shorter season varieties. The lowest yielding variety, for example, was one of the longest season varieties belonging to maturity group 2 but only produced half the yield of the top performing variety. Although all varieties reached maturity and a harvestable moisture content, all required additional drying for safe storage as the average moisture content at harvest was 16.5%. Test weights ranged from 54.9 to 56.4 lbs bu⁻¹ with all test weights being slightly below the industry standard of 60 lbs bu⁻¹.

The dry conditions, especially surrounding the time of seed fill, likely contributed to low test weight. These data highlight the importance of local variety evaluation and varietal selection on farms to maximize productivity.

Table 5. Harvest characteristics of soybean varieties – Alburgh, VT, 2021.

Company	Variety	Maturity group	Harvest	Test	Yield @ 13%	
			moisture %	weight lbs bu ⁻¹	lbs ac ⁻¹	bu ac ⁻¹
Blue River Organic Seed	V0522	0.5	17.0	55.3	2000	33.3
Blue River Organic Seed	07DC8	0.7	17.0	55.6	2050	34.2
Albert Lea Seed	O.0821N	0.8	17.8	55.0	2257*	37.6*
Albert Lea Seed	O.1202N	1.2	16.1*†	55.6	2222*	37.0*
Blue River Organic Seed	12A2	1.2	16.0*	55.8*	2428*	40.5*
Blue River Organic Seed	1F44	1.4	18.2	54.9	1876	31.3
Albert Lea Seed	O.1518N	1.5	16.0*	56.4*	2463*	41.0*
Blue River Organic Seed	V1621	1.6	16.0*	56.0*	2245*	37.4*
Albert Lea Seed	O.1718N	1.7	17.4	55.2	2743	45.7
Blue River Organic Seed	e17Y993	1.7	15.7	56.1*	2291*	38.2*
Blue River Organic Seed	18C7	1.8	15.8*	56.4	2581*	43.0*
Blue River Organic Seed	V1821	1.8	15.8*	56.0*	2570*	42.8*
Albert Lea Seed	O.E1993	1.9	16.4*	56.1*	2377*	39.6*
Blue River Organic Seed	20AR5	2.0	16.9	55.5	1335	22.3
Blue River Organic Seed	e20Y993	2.0	15.8*	56.2*	2188*	36.5*
LSD ($p = 0.10$)			0.872	0.625	587	9.78
Trial Mean			16.5	55.7	2242	37.4

†Varieties with an asterisk * performed statistically similarly to the top performer in **bold** at the $p=0.10$ level.

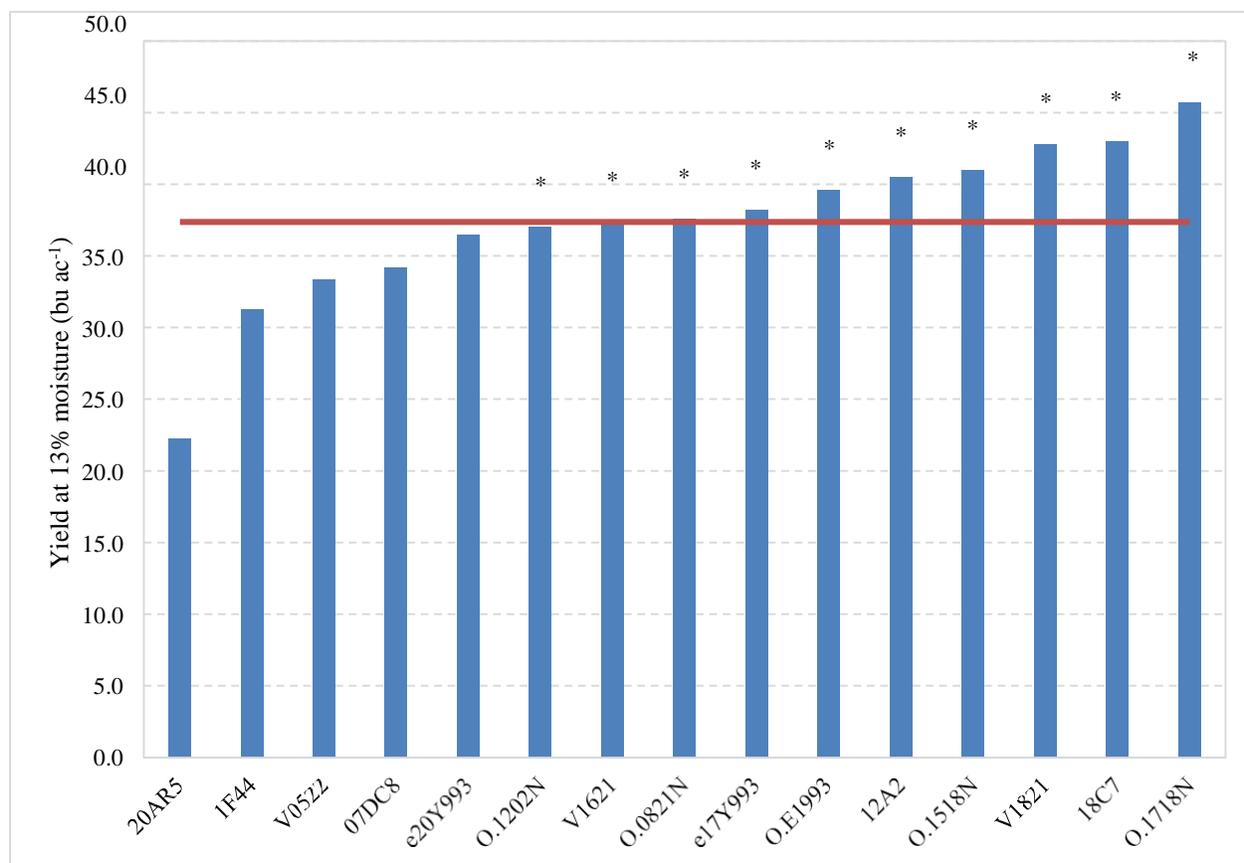


Figure 1. Yield of 15 organic soybean varieties.

*Varieties with an asterisk performed statistically similarly to the top performing variety.

The trial average seed yield is indicated by the line.

Hot dry weather also contributed to very little disease or insect pressure observed throughout the season (Table 6). The only diseases that varied across varieties were bacterial blight and downy mildew. Bacterial blight infection was only found in one variety, e17Y993, but the severity was still quite low. Downy mildew, however, was found in all varieties. The least infection occurred in the variety 20AR5 which averaged 0.250 on the 0-10 scale. This was statistically similar to nine other varieties. The variety 12A2 had significantly higher downy mildew incidence averaging 4.00 on the 0-10 scale. This variety was also the most severely infected variety in the 2020 trial. Frogeye leaf spot and Septoria brown spot were also found in all varieties but did not differ statistically across varieties. Despite the presence of these diseases, severity of infections were low and did not appear to significantly impact soybean performance. However, these data show significant differences in disease susceptibility which could negatively impact yields in years with higher rainfall and cooler temperatures.

Table 6. Insect and disease pressure of soybean varieties – Alburgh, VT, 2021.

Company	Variety	Relative maturity	Bacterial blight	Downy mildew	Frogeye leaf spot	Septoria brown spot
					0-10 scale†	
Blue River Organic Seed	V0522	0.5	0.00*‡	0.750*	0.500	1.00
Blue River Organic Seed	07DC8	0.7	0.00*	0.250*	0.750	1.25
Albert Lea Seed	O.0821N	0.8	0.00*	0.250*	1.00	1.00
Albert Lea Seed	O.1202N	1.2	0.00*	0.250*	1.00	0.750
Blue River Organic Seed	12A2	1.2	0.00*	4.00	0.750	1.00
Blue River Organic Seed	1F44	1.4	0.00*	0.250*	0.250	1.00
Albert Lea Seed	O.1518N	1.5	0.00*	0.750*	0.750	1.00
Blue River Organic Seed	V1621	1.6	0.00*	1.00*	0.750	0.500
Albert Lea Seed	O.1718N	1.7	0.00*	0.250*	1.00	1.00
Blue River Organic Seed	e17Y993	1.7	0.50	1.25	0.750	1.00
Blue River Organic Seed	18C7	1.8	0.00*	2.50	1.00	0.500
Blue River Organic Seed	V1821	1.8	0.00*	1.25	0.750	0.500
Albert Lea Seed	O.E1993	1.9	0.00*	1.00*	0.750	1.00
Blue River Organic Seed	20AR5	2.0	0.00*	0.250	1.00	0.500
Blue River Organic Seed	e20Y993	2.0	0.00	2.00	1.00	0.750
LSD ($p = 0.10$)			0.173	0.862	NS‡	NS
Trial Mean			0.033	1.07	0.800	0.850

†0 to 10 scale; 0 = no infection and 10 = 100% of leaf area infected.

‡Varieties with an asterisk* performed statistically similarly to the top performer in **bold** at the $p=0.10$ level.

‡NS- Not statistically significant.

DISCUSSION

Overall, organic soybean yields were significantly lower than previous years. Although test weights were all below the industry standard of 60 lbs bu⁻¹, they were similar to the 2020 trial which also experienced similar drought conditions. Low-test weight may have been a result of dry conditions. Varieties with a range of relative maturities in all groups 0-2 yielded statistically similar to the top performing variety. Dry conditions limited the incidence of disease, however, varieties did differ significantly in infection of several diseases, downy mildew in particular. Although the presence of disease did not appear to impact soybeans significantly, yields may be impacted in years where weather conditions are more suitable to the proliferation of these diseases. These data highlight the importance of local varietal evaluations and the impact varietal selection on farms can have on feed or product availability and economics. Furthermore, these data demonstrate that soybeans can be a viable crop in our northern region under organic management. It is important to remember that these data only represent one year from one location. Additional data should be considered prior to making management decisions.

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