

2017

Organic Soybean Variety Trial

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2017 SOYBEAN VARIETY TRIAL
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In 2017, the University of Vermont Extension Northwest Crops and Soils Team evaluated yield and quality of short season soybean varieties at Borderview Research Farm in Alburgh, VT. 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 a trial in 2017 to evaluate soybean varieties under organic management to see which varieties and characteristics thrive in our northern climate.

MATERIALS AND METHODS

Several seed companies submitted varieties for evaluation (Table 1). Fourteen soybean varieties with maturities ranging from 0.5 to 1.8 were evaluated in 2017. Details for the varieties including company and maturity group are listed in Table 2.

Table 1. Participating companies and contact information.

Albert Lea Seeds	Blue River Organic Seed	King's Agriseed
1414 West Main Street Albert Lea, MN 56007 (800)-352-5247	2326 230 th Street Ames, IA 50014 (800)-370-7979	1828 Freedom Rd. Lancaster, PA 17601 (717)-687-6224

Table 2. Soybean varieties evaluated in Alburgh, VT, 2017.

Variety	Company	Maturity group
O.0555AT	Albert Lea Seeds	0.5
O.1202N	Albert Lea Seeds	1.2
O.1572N	Albert Lea Seeds	1.5
O.1706N	Albert Lea Seeds	1.7
O.IA1029	Albert Lea Seeds	1.8
O.MN0810	Albert Lea Seeds	0.9
08F6	Blue River Organic Seed	0.8
12A2	Blue River Organic Seed	1.2
13P8	Blue River Organic Seed	1.3
15C6	Blue River Organic Seed	1.5
17C2	Blue River Organic Seed	1.7
18C7	Blue River Organic Seed	1.8
PB1561	King's Agriseed	1.5
OAC Drayton	King's Agriseed	1.0

The soil type at the Alburgh location was Benson rocky silt loam (Table 3). The seedbed was prepared using a moldboard plow and then disked prior to seeding. The previous crop was annual cover crop mixtures. Plots were planted on 31-May with a Monosem NG-Plus 2-row precision air planter (Edwardsville, KS). Plots were 20' long and consisted of two rows spaced at 30 inches. The seeding rate was 185,000 seeds ac⁻¹. The plot design was a randomized complete block with three replications. The treatments were 14 varieties that ranged in maturity group from 0.5 to 1.8.

Table 3. Soybean trial specifics for Alburgh, VT, 2017.

	Borderview Research Farm Alburgh, VT
Soil types	Benson rocky silt loam 8-15% slope
Previous crop	Cover crop mixtures
Tillage operations	Moldboard plow and disc
Plot size (feet)	5 x 20
Row spacing (inches)	30
Replicates	3
Planting date	31-May
Harvest date	28-Oct

On 28-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 Mini-GAC Plus 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. Overall the season was cooler and wetter than normal. Almost 1.5 inches of rain fell immediately following planting. Unseasonably cool temperatures and above average rainfall persisted through August followed by above average temperatures and below average rainfall in September and October. The dry warm weather in the fall provided good weather for the soybeans to mature and to be harvested at optimal moisture content. Overall, a total of 2335 growing degree days (GDDs) were accumulated June-October, 209 above the 30-year normal.

Table 4. Weather data for Alburgh, VT, 2017.

Alburgh, VT	June	July	August	September	October
Average temperature (°F)	65.4	68.7	67.7	64.4	57.4
Departure from normal	-0.39	-1.90	-1.07	3.76	9.2
Precipitation (inches)	5.64	4.88	5.54	1.84	3.30
Departure from normal	1.95	0.73	1.63	-1.80	-0.31
Growing Degree Days (base 50°F)	468	580	553	447	287
Departure from normal	-7	-60	-28	129	175

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.

Despite adverse weather through most of the growing season, the average organic soybean yield for the trial was 2945 lbs ac⁻¹ equating to 49.1 bu ac⁻¹ (Table 5). The top yielding variety, 15C6, produced 3719 lbs ac⁻¹, and was statistically similar to three other varieties (Figure 1). At the time of harvest, soybeans ranged from 13.6% to 16.3% moisture. Ideally, the soybeans would have been a bit drier at the time of harvest to limit the need for extra drying prior to storage. Higher weed presence in the organic trial may have contributed to delays in dry down. Test weights ranged from 50.7 to 60.8 lbs bu⁻¹. Only the variety OAC Drayton produced soybeans with a test weight reaching the 60 lbs bu⁻¹ industry standard. Lower than optimum test weight was likely due to the wet and cool conditions during pod development and seed fill. Due to seed shape influencing packing, test weight and yield are not always associated. For example, although variety OAC Drayton produced soybeans with a test weight of 60.8 lbs bu⁻¹, this variety only yielded 2243 lbs ac⁻¹ while the highest yielding variety, 15C6, produced soybeans with a test weight of only 54.7 lbs bu⁻¹.

Varieties also differed in oil content and oil yield (Table 6). Oil contents ranged from 6.70% to 13.1%. The variety OAC Drayton had the highest oil content which was statistically similar to the variety PB1561, both varieties from King's Agriseed. Oil yields ranged from 185 lbs ac⁻¹ to 317 lbs ac⁻¹ or 24.3 gal ac⁻¹ to 41.5 gal ac⁻¹. Interestingly, two of the top varieties in terms of seed yield did not produce the most oil. These data demonstrate the importance of varietal selection based on the goals and end use for growing the crop.

Table 5. Harvest characteristics of soybean varieties – Alburgh, VT, 2017.

Variety	Company	Maturity group	Harvest moisture	Test weight	Yield @ 13% moisture	
			%	lbs bu ⁻¹	lbs ac ⁻¹	bu ac ⁻¹
O.0555AT	Albert Lea Seeds	0.5	15.2	55.4	2497	41.6
O.1202N	Albert Lea Seeds	1.2	14.5	54.0	3048	50.8
O.1572N	Albert Lea Seeds	1.5	14.8	56.0	2861	47.7
O.1706N	Albert Lea Seeds	1.7	14.1*	56.1	3239*	54.0*
O.IA1029	Albert Lea Seeds	1.8	16.3	50.7	3062	51.0
O.MN0810	Albert Lea Seeds	0.9	16.1	55.8	2694	44.9
08F6	Blue River Organic Seed	0.8	14.5	52.2	3122	52.0
12A2	Blue River Organic Seed	1.2	14.6	54.8	3241*	54.0*
13P8	Blue River Organic Seed	1.3	14.1*	55.0	2569	42.8
15C6	Blue River Organic Seed	1.5	14.5	54.7	3719*	62.0*
17C2	Blue River Organic Seed	1.7	14.3*	54.7	3353*	55.9*
18C7	Blue River Organic Seed	1.8	14.4*	56.8	3091	51.5
PB1561	King's Agriseed	1.5	14.3*	56.8	2492	41.5
OAC Drayton	King's Agriseed	1.0	13.6*	60.8*	2243	37.4
LSD ($p = 0.10$)			0.859	3.90	534	8.89
Trial Mean			14.7	55.3	2945	49.1

*Varieties with an asterisk performed statistically similarly to the top performer in **bold**.

Table 6. Oil content and yield of soybean varieties – Alburgh, VT, 2017.

Variety	Company	Oil content	Oil yield at 13% moisture	
		%	lbs ac ⁻¹	gal ac ⁻¹
O.0555AT	Albert Lea Seeds	9.27	224	29.4
O.1202N	Albert Lea Seeds	8.41	256*	33.5*
O.1572N	Albert Lea Seeds	7.56	216	28.3
O.1706N	Albert Lea Seeds	8.45	273*	35.7*
O.IA1029	Albert Lea Seeds	7.59	232	30.4
O.MN0810	Albert Lea Seeds	7.04	185	24.3
08F6	Blue River Organic Seed	8.58	274*	35.9*
12A2	Blue River Organic Seed	7.83	252	33.0
13P8	Blue River Organic Seed	8.19	211	27.7
15C6	Blue River Organic Seed	6.70	250	32.8
17C2	Blue River Organic Seed	7.62	256*	33.5*
18C7	Blue River Organic Seed	7.60	231	30.2
PB1561	King's Agriseed	12.7*	317*	41.5*
OAC Drayton	King's Agriseed	13.1*	293*	38.4*
LSD ($p = 0.10$)		1.65	63.5	8.31
Trial Mean		8.62	248	32.5

*Varieties with an asterisk performed statistically similarly to the top performer in **bold**.

DISCUSSION

Despite poor weather conditions throughout much of the growing season the organic soybeans performed reasonably well. However, yields this year averaged 750 lbs ac⁻¹ less than last year when warmer and drier than normal conditions were experienced throughout much of the growing season. These data suggest that, even in years with suboptimal weather conditions, soybeans have the potential to produce seed yields over 1 ton ac⁻¹ and oil yields over 30 gal ac⁻¹ in our region where the growing season is quite short. However, it should be recognized that these data only represent one season and should not be used alone to make management decisions.

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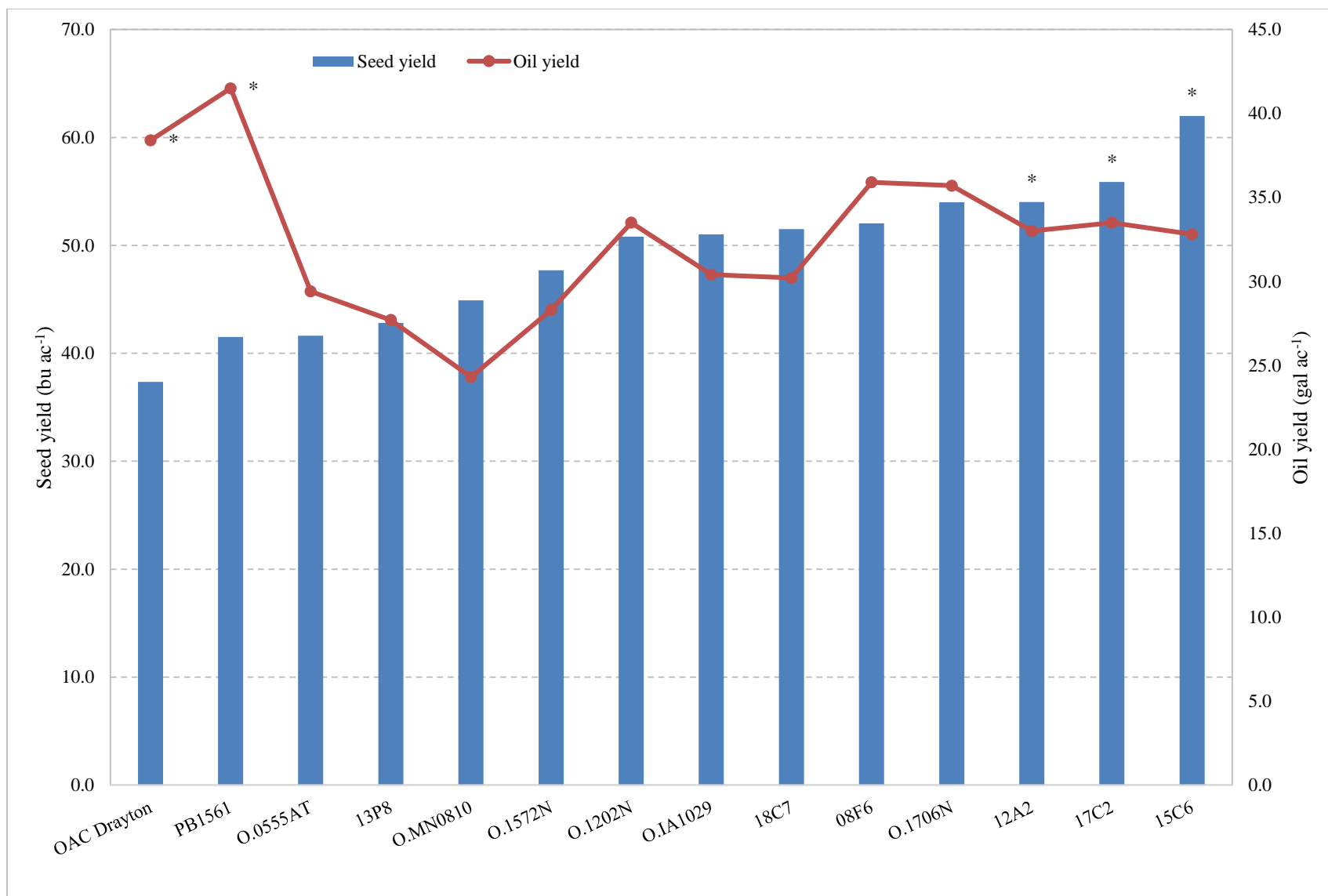


Figure 1. Seed and oil yield of 14 soybean varieties.

**Varieties that performed statistically similarly ($p = 0.10$) to the top yielding variety are indicated with an asterisk.*

