2021 Conventional Soybean Variety Trial

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2021 CONVENTIONAL SOYBEAN VARIETY TRIAL
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In 2021, 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. Soybeans can be grown for human consumption, animal feed, and biodiesel production. 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, as part of a grant from the Eastern Soybean Board, established a trial in 2021 to evaluate yield and quality of soybean varieties appropriate for the region.

MATERIALS AND METHODS

Several seed companies submitted varieties for evaluation (Table 1). Twenty-nine soybean varieties were evaluated from maturity groups 0, 1, and 2. Details for the varieties including company, genetic traits, and relative maturity are listed in Table 2.

Table 1. Participating companies and contact information.

Asgrow Seed Co., LLC	Brevant	Dyna-Gro (Crop Protection Services)	Seedway, LLC
Nathan Holt Bayer Crop Science Canandaigua, NY	Claude Fortin St. Albans, VT 05478 802-363-2803	Tom Barber East Aurora, NY (716) 912-5494	Rachel Tomko Bomoseen, VT 05732 (802) 338-6930

The soil type at the Alburgh location was a Covington silty clay loam (Table 3). The seedbed was prepared using a Pottinger Terra Disc prior to seeding. The previous crop was grain corn. Plots were planted on 25-May with a 4-row cone planter with John Deere row units fitted with Almaco seed distribution units (Nevada, IA). Starter fertilizer (9-18-9) was applied at a rate of 5 gal ac^{-1}. 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 29 varieties that ranged in maturity group from 0.7 to 2.8. Plots were sprayed with Roundup Power Max at a rate of 1 qt ac^{-1} on 14-Jun to control weeds. Plots were monitored for pest and disease pressure throughout the season. On 31-Aug, plots were assessed for severity of infection with downy mildew (*Peronospora manshurica),* bacterial blight (*Pseudomonas syringae pv. glycinea*), brown spot (*Septoria glycines*), and frogeye leaf spot (*Cercospora sojina*). These were the only pests and diseases observed in the trial. Assessments were made by inspecting each plot and assigning a rating (0-10) where 0 equated to damage/infection not present and 10 equated to infection or damage present on 100% of leaf area. On 26-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 2. Soybean varieties evaluated in Alburgh, VT, 2021.

Company	Variety	Traits	Maturity
Seedway, LLC	SG 0720XT	RR2X	0.7
Seedway, LLC	SG 1077XT	RR2X	1.0
Seedway, LLC	SGX 10XTF	XtendFlex	1.0
Asgrow	AG11XF2	XtendFlex	1.1
Brevant	B119EE	ENLIST E3	1.1
Dyna-Gro	S12EN72	ENLIST E3	1.2
Dyna-Gro	S12XF92	XtendFlex	1.2
Seedway, LLC	SG 12XTF	XtendFlex	1.2
Seedway, LLC	SG 13E3	ENLIST E3	1.3
Seedway, LLC	SG 1320E3	ENLIST E3	1.3
Asgrow	AG14XF2	XtendFlex	1.4
Brevant	B149EE	ENLIST E3	1.4
Seedway, LLC	SG 1432XTF	XtendFlex	1.4
Dyna-Gro	S15XF82	XtendFlex	1.5
Asgrow	AG15XF2	XtendFlex	1.5
Dyna-Gro	S17XF02	XtendFlex	1.7
Seedway, LLC	SG 1708GTLL	GT LL	1.7
Seedway, LLC	SG 1776RR	RR2Y	1.7
Asgrow	AG17XF2	XtendFlex	1.7
Brevant	B171EE	ENLIST E3	1.7
Dyna-Gro	S18EN52	ENLIST E3	1.8
Seedway, LLC	SG 1863XT	RR2X	1.8
Asgrow	AG18XF1	XtendFlex	1.8
Seedway, LLC	SG 1945	ENLIST E3	1.9
Seedway, LLC	SG 2055XT	RR2X	2.0
Brevant	B210EE	ENLIST E3	2.1
Seedway, LLC	SG 2120E3	ENLIST E3	2.1
Seedway, LLC	SG 2217GTLL	GT LL	2.2
Seedway, LLC	SG 2832XT	RR2X	2.8

ENLIST E3- These soybeans are resistant to 2, 4-D, glyphosate, and glufosinate herbicides.
GT LL- These soybeans are resistant to glyphosate and glufosinate herbicides.
RR2X – Roundup Ready 2 Xtend soybeans are resistant to glyphosate and dicamba herbicides.
RR2Y – Roundup Ready 2 Yield soybeans contain genes to increase the number of 3, 4, and 5-bean pods per plant.
XtendFlex- These soybeans are resistant to dicamba, glyphosate, and glufosinate herbicides.

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

	Borderview Research Farm Alburgh, VT
Soil type	Covington silty clay loam
Previous crop	Grain corn
Tillage operations	Pottinger Terra Disc
Plot size (feet)	5 x 20
Row spacing (inches)	30
Starter fertilizer (lbs ac^{-1})	5 gal ac^{-1} (9-18-9)
Weed control	Roundup Power Max 1 qt ac^{-1}
	14-Jun
Planting date	25-May
Harvest date	26-Oct

Yield and stand characteristic data were analyzed using the mixed model procedure of SAS (SAS Institute, 1999). Replications within trials were treated as random effects, and hybrids were treated as fixed. Hybrid mean comparisons for harvest characteristics and disease data were made using the Least Significant Difference (LSD) procedure when the F-test was considered significant ($p<0.10$). Hybrid mean pairwise comparisons for yield were made using the Tukey-Kramer adjustment. Treatments were considered different at the 0.10 level of significance.

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,

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

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). The season began with cooler than normal temperatures. However, temperatures were 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 throughout the season came in short duration storms.

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

Alburgh, VT	May	Jun	Jul	Aug	Sep	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 26-Oct. Harvest results are shown in Table 5. Although above average precipitation fell in October, all soybeans were harvestable. However, the average moisture content of 21.5% indicated that supplemental drying would be required for safe storage. Test weights ranged from 53.0 to 55.6 lbs bu^{-1}. All soybean varieties produced test weights below the industry standard of 60 lbs bu^{-1}. This was likely influenced by the drought conditions that persisted through the season, especially during critical developmental stages including pod formation and seed fill. Yields ranged from 2532 to 3959 lbs ac^{-1} or 46.9 to 73.7 bu ac^{-1} and averaged 3357 lbs ac^{-1} or 62.3 bu ac^{-1}. The highest yielding variety, Seedway, LLC variety SG 2055, performed statistically similarly to 8 other varieties across maturities 1.2 to 2.8. These data suggest that soybeans from maturity groups 1-2 can produce high yields in northern climates. However, it is important to note some large differences between varieties even within similar relative maturities. For example, the three varieties with relative maturity 1.2 ranged in yield from 46.9 to 71.4 bu ac^{-1}. These data highlight the importance of utilizing local variety evaluation information in variety selection. Comparisons between all varieties can be seen in Figure 1, where varieties that are marked with an asterisk (*) yielded statistically similarly to the top performer.

Soybeans experienced little pest and disease pressure throughout the season (Table 6). Bacterial blight was observed on some varieties, however, differences were not statistically significant. Infections of frogeye leaf spot and Septoria brown spot were low. Severity of downy mildew infection ranged widely with rankings from 0.00-6.67. Unlike 2020, this year downy mildew infection severity varied across all maturities and was not limited to longer season varieties. These apparent differences in disease susceptibility are important to consider when selecting a variety as performance may be more severely impacted in wetter years with more disease pressure.

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

Company	Variety	Relative maturity	Harvest moisture	Test weight	Yield @ 13% moisture	
			%	lbs bu^{-1}	lbs ac^{-1}	bu ac^{-1}
Seedway, LLC	SG 0720	0.7	23.3	53.4	2660	49.8
Seedway, LLC	SG 1077	1.0	22.5	53.2	2583	48.6
Seedway, LLC	SGX10XTF	1.0	21.6	54.1	3221	59.6
Asgrow	AG11XF2	1.1	**19.2**	**55.6**	3309	59.6
Brevant	B119EE	1.1	21.9	53.5	3146	58.8
Dyna-Gro	S12EN72	1.2	22.2	53.6	3827*†	71.4*
Dyna-Gro	S12XF92	1.2	21.9	53.9	3179	59.0
Seedway, LLC	12XTF	1.2	21.9	53.9	2532	46.9
Seedway, LLC	13E3	1.3	21.7	53.6	3098	57.8
Seedway, LLC	SG 1320	1.3	21.7	54.0	3332	61.7
Asgrow	AG14XF2	1.4	21.8	53.8	3242	60.3
Brevant	B149EE	1.4	20.8	54.6	3323	60.9
Seedway, LLC	1432XTF	1.4	20.7	53.0	3743*	70.5*
Dyna-Gro	S15XF82	1.5	21.7	53.3	3774*	70.9*
Asgrow	AG15XF2	1.5	21.7	54.0	3374	62.6
Dyna-Gro	S17XF02	1.7	19.4	55.6	3612*	64.8*
Seedway, LLC	SG 1708	1.7	22.2	53.8	3205	59.6
Seedway, LLC	SG 1776	1.7	22.4	53.0	3614	68.1
Asgrow	AG17XF2	1.7	20.3	54.7	3547	64.8
Brevant	B171EE	1.7	21.0	54.3	3217	59.2
Dyna-Gro	S18EN52	1.8	21.6	53.9	3577*	66.4*
Seedway, LLC	SG 1863	1.8	21.2	53.6	3041	56.8
Asgrow	AG18XF1	1.8	22.9	53.1	3662*	68.9*
Seedway, LLC	SG 1945	1.9	20.3	54.8	3930	71.7
Seedway, LLC	SG 2055	2.0	21.5	53.7	**3959**	**73.7**
Brevant	B210EE	2.1	22.5	53.6	3242	60.4
Seedway, LLC	SG 2120	2.1	21.0	54.4	3316	60.9
Seedway, LLC	SG 2217	2.2	21.5	53.4	3352	62.7
Seedway, LLC	SG 2832	2.8	21.3	53.6	3741*	69.8*
LSD ($p = 0.10$) ‡			NS§	NS	526	9.70
Trial mean			21.5	53.9	3357	62.3

†Values in **bold** indicate the top performer for the production metric and varieties with an asterisk * performed statistically similarly to the top performer.

‡LSD –Least significant difference at p=0.10

§NS- No statistical difference between varieties for the performance metric.

Table 6. Disease and stand characteristics of soybean varieties – Alburgh, VT, 2021.

Company	Variety	Relative Maturity	Bacterial blight	Downy mildew	Frogeye leaf spot	Septoria brown spot
				0-10 scale†		
Seedway, LLC	SG 0720	0.7	0.667	3.000	0.333*	1.67
Seedway, LLC	SG 1077	1.0	0.333	2.000	0.333*	0.667*
Seedway, LLC	SGX10XTF	1.0	0.333	0.667*‡	1.00	1.00
Asgrow	AG11XF2	1.1	0.333	1.00*	0.667	1.00
Brevant	B119EE	1.1	0.00	1.33*	0.667	0.667*
Dyna-Gro	S12EN72	1.2	0.00	1.33*	0.333*	0.333*
Dyna-Gro	S12XF92	1.2	0.00	0.333*	2.00	1.67
Seedway, LLC	12XTF	1.2	0.00	0.00*	1.33	0.000*
Seedway, LLC	13E3	1.3	0.333	1.00*	0.333*	0.333*
Seedway, LLC	SG 1320	1.3	0.333	2.33	0.333*	0.000*
Asgrow	AG14XF2	1.4	0.00	2.00	0.667	1.33
Brevant	B149EE	1.4	0.00	4.67	0.667	0.000*
Seedway, LLC	1432XTF	1.4	0.00	1.00*	0.667	0.333*
Dyna-Gro	S15XF82	1.5	0.333	1.00*	1.00	0.667*
Asgrow	AG15XF2	1.5	0.333	0.333*	1.00	0.667*
Dyna-Gro	S17XF02	1.7	0.00	1.67	0.333*	0.667*
Seedway, LLC	SG 1708	1.7	0.00	1.00*	0.333*	0.667*
Seedway, LLC	SG 1776	1.7	0.00	0.333*	0.333*	0.333*
Asgrow	AG17XF2	1.7	0.667	1.00*	1.00	0.000*
Brevant	B171EE	1.7	0.333	2.00	0.000*	0.333*
Dyna-Gro	S18EN52	1.8	0.00	6.67	0.000*	1.00
Seedway, LLC	SG 1863	1.8	0.00	**0.000**	0.667	0.333*
Asgrow	AG18XF1	1.8	0.00	2.00	1.00	1.00
Seedway, LLC	SG 1945	1.9	0.333	4.33	0.000*	0.333*
Seedway, LLC	SG 2055	2.0	0.00	0.000*	1.00	0.667*
Brevant	B210EE	2.1	0.333	0.000*	1.00	0.667*
Seedway, LLC	SG 2120	2.1	0.00	2.33	0.000*	0.667*
Seedway, LLC	SG 2217	2.2	**0.00**	3.33	**0.000**	**0.000**
Seedway, LLC	SG 2832	2.8	0.00	0.667*	0.333*	0.333*
LSD (*p* = 0.10) §			NS¥	1.36	0.563	0.741
Trial Mean			0.161	1.63	0.598	0.598

†0 to 10 scale; rating of 0 = no infection or damage and rating of 10 = 100% infection or damage.

‡Values in **bold** indicate the top performer for the production metric and varieties with an asterisk * performed statistically similarly to the top performer.

§LSD –Least significant difference at p=0.10.

¥NS- No statistical difference between varieties for the performance metric.

DISCUSSION

Overall, soybean varieties performed well averaging over 62 bu ac^{-1} despite very droughty conditions through much of the season. Under these conditions, all soybean varieties, ranging in relative maturity from 0.7 to 2.8, reached maturity and a harvestable moisture, but all required additional drying in order to be stored safely. Although little pest and disease pressure was observed, some differences were still observed and highlight the importance of local variety evaluation in soybean variety selection. Overall, these data suggest that soybeans in maturity groups 0, 1, and 2 can produce high yields under conventional management in Vermont's northern climate. It is important to remember that these data only represent one year at one location and therefore should not solely be used to make management decisions.

ACKNOWLEDGEMENTS

UVM Extension helps individuals and communities put research-based knowledge to work.
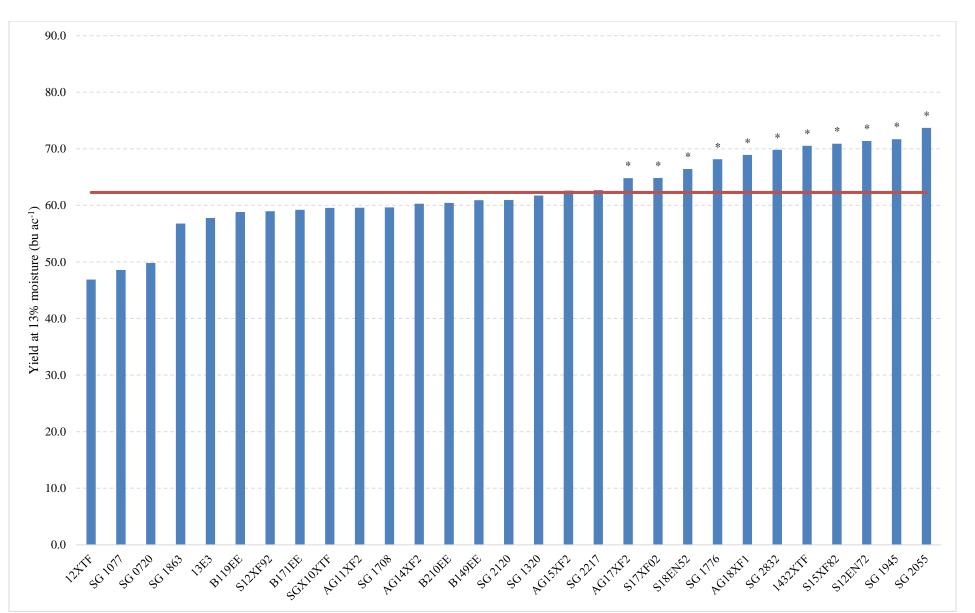
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Figure 1. Seed yield at 13% moisture for 19 soybean varieties. The red line indicates the average yield.
Varieties that are marked with an asterisk performed statistically similarly to the top performer.