2019 IMPACT OF PLANTING DATE AND VARIETY ON SOYBEAN YIELD

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In 2019, the University of Vermont Extension Northwest Crops and Soils Program investigated the impact of planting date and variety on soybean yield and quality at Borderview Research Farm in Alburgh, VT. Soybeans can be grown for human consumption, animal feed, and biodiesel. Livestock farmers are interested in producing more of their own grains and as a result, soybean acreage in Vermont is increasing. Given the short growing season in Vermont, it is important to understand optimum planting dates to obtain the highest yields. 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 2019 to determine optimal planting dates for soybeans that maximize yield and quality in our northern climate.

MATERIALS AND METHODS

The soil type at the Alburgh location was Benson rocky silt loam. The seedbed was prepared using a moldboard plow and then disked prior to seeding. The previous crop was industrial hemp. The plot design was a randomized block with split plots and four replications. The main plots were five planting dates and the split plots were two varieties with varying maturities (Tables 1 and 2).

Table 1. Soybean varieties evaluated in Alburgh, VT, 2019.

Variety	Company	Traits	Maturity group
SG0975	Seedway, LLC	RR2Y	0.9
SG1776	Seedway, LLC	RR2Y	1.7

RR2Y – Roundup Ready 2 Yield soybeans contain genes to increase the number of 3, 4, and 5-bean pods per plant.

Table 2. Soybean trial specifics for Alburgh, VT, 2019.

and diseases observed in the trial. Assessments were made by inspecting each plot and assigning a rating from 0 to 5, where 0 equated to damage/infection not present and 5 equated to infection or damage present on 100% of leaf area.

On 15-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 and test weight using a DICKEY-John Mini-GAC Plus moisture and test weight meter. Soybean oil was extruded from the seeds with an AgOil M70 oil press on 14-Nov, and the amount of oil captured was measured to determine oil content and oil yield.

Yield data and stand characteristics were analyzed using mixed model analysis using the mixed procedure of SAS (SAS Institute, 1999). Replications within trials were considered random effects, and treatments were treated as fixed. Treatment 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.

RESULTS

Weather data was recorded with a Davis

Table 3. Weather

for both varieties likely due to variable weather conditions following planting. Test weights varied slightly between varieties with the later maturing variety producing seed with a test weight of 56.6 lbs bu^{-1}, 0.4 lbs bu^{-1} higher than the early maturing variety. However, both were below the target of 60 lbs bu^{-1} likely due to low rainfall throughout the growing season leading to reduced seed fill. Yields also varied statistically between the two varieties. The late maturing variety, 1776, yielded 3915 lbs ac^{-1} or 65.3 bu ac^{-1}. Overall, this was 757 lbs ac^{-1} more than the early maturing variety. Because the varieties had similar oil contents, oil yield was significantly higher in the later maturing variety, which produced 34.6 gal ac^{-1}, 5.5 gal ac^{-1} more than the early maturing variety.

Table 4. Harvest characteristics of soybeans by variety, 2019.

Variety	**Maturity group**	**Population**	**Harvest moisture**	**Test weight**	**Yield @ 13% moisture**		**Oil content**	**Oil yield**	
	1	plants ac^{-1}	%	lbs bu^{-1}	lbs ac^{-1}	bu ac^{-1}	%	lbs ac^{-1}	gal ac^{-1}
[redacted]0975	0.9	119645	**15.2**	56.2	3158	52.6	**6.98**	194	29.1

than any of the other three planting dates (Figure 2). The five planting dates performed statistically similar in oil content and oil yield.

Table 6. Harvest characteristics of soybeans by planting date, 2019.

Planting date	Population	Harvest moisture	Test weight	Yield @ 13% moisture		Oil content	Oil yield	
	plants ac^{-1}	%	lbs bu^{-1}	lbs ac^{-1}	bu ac^{-1}	%	lbs ac^{-1}	gal ac^{-1}
17-May	126324	**14.7**	56.4	3249	54.2	6.86	195	29.3
23-May	**133584**	15.3	**56.6**	3391	56.5	**7.59**	226	34.0
31-May	129228	15.4	56.5	**3993**	**66.5**	6.80	**234**	**35.3**
7-Jun	121968	15.6	56.4	3793*	63.2*	6.69	224	33.7
13-Jun	118338	15.4	56.2	3259	54.3	6.37	180	27.1
LSD (*p* = 0.10)	NS							

Table 7. Disease and insect pressure of soybeans by planting date, 2019.

Planting date	Downy mildew	Japanese beetles
	0-5 scale†	
17-May	**0.375**	1.63
23-May	0.875	1.50
31-May	1.13	1.75
7-Jun	1.25	1.75
13-Jun	1.13	**1.50**
LSD (*p* = 0.10)	0.264	NS
Trial Mean	0.95	1.63

†0 to 5 rating, where 0 equated to damage/infection not present and
5 equated to infection or damage present on 100% of leaf area.
The top performing variety is indicated in **bold**. NS- Not statistically significant.

DISCUSSION

Soybean yields were significantly impacted by planting date with the highest yields observed when soybeans were planted at the end of May and first week of June. Cool temperatures and wet conditions experienced in early May likely impacted soybean yields from these planting dates. There was no significant difference in oil content or oil yield between planting dates. Soybean yield was also significantly impacted by maturity group, with the later maturing variety having higher test weight, yield and oil yield. However, the early maturing variety produced soybeans with a significantly higher oil content.

Soybean planting dates have been evaluated since 2017 in Vermont. Interestingly in 2017, soybeans planted in May yielded lower than those planted in mid-June. In 2018, soybeans planted in the last two weeks of May had the highest yields. Overall, these data indicate that a soybean maturity range from 0.9 to 1.7 can mature in Vermont even when planted into mid-June. Early season planting should only occur if weather and soil conditions are advantageous for soybean germination and growth. Further research over additional years and environments will help develop optimum planting date ranges for Vermont.

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