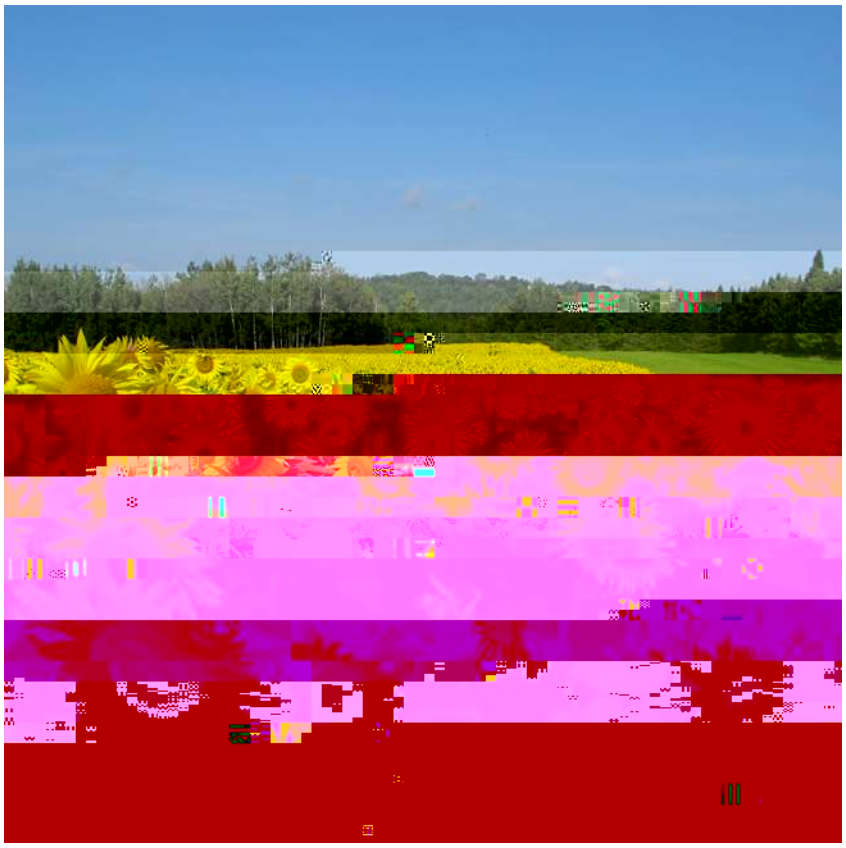
2016 Sunflower Planting Date x Variety Trial



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2016 SUNFLOWER PLANTING DATE x VARIETY TRIAL

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Sunflowers are being grown in the Northeast for their potential to add value to a diversified operation as fuel, feed, fertilizer, and an important rotational crop. However, pest pressures from seed-boring insects, disease, and birds can limit yield and quality, making the crop less viable for existing and potential growers. Addressing some of these pest pressures with agronomic management strategies may help mitigate yield losses. One cultural pest control strategy is manipulation of planting date. To evaluate the impacts of altered planting dates on sunflower pests and yields across varieties,

Table 2. Variety information for six sunflower varieties, 2016.

Variety	Maturity	Market	Traits
Camaro II	Medium	NuSun®	Clearfield®, DMR
Cobalt II	Early	High oleic	Clearfield®, DMR
Duet	Medium	NuSun®	Clearfield®, DMR
Falcon	Medium	NuSun®/bird seed	Express Sun®
N5LM307	Med-Early	Conoil	Clearfield®, DMR
N4HM354	Med-Early	High oleic	Clearfield®, DMR

Clearfield® = tolerant of Beyond® ammonium salt of imazamox herbicide;
ExpressSun® = tolerant of Express® tribenuron methyl herbicide; NuSun® = 55-75% oleic acid;
DMR = Downy Mildew Resistant.

Populations were counted in each plot on 7-Jul. Due to late timing of counting populations, sunflowers were not thinned. Dates when at least 75% of the plot was in full bloom were recorded on an ongoing basis. Plant stand characteristics such as bird damage, disease incidence, and lodging were measured just prior to harvest. Disease incidence was recorded simply as absence or presence of disease on any part of any plant within the plot. Issues with white mold (*Sclerotinia sclerotiorum*), a fungus which can overwinter in the ground and spread quickly in wet seasons, has proven problematic in the Northeast in the past. Assessing 10 random plants in each plot and estimating the percentage of each head that was missing seed measured the amount of bird damage. Lodging was visually estimated on a per plot basis by estimating the percentage of the plants in the plot that had lodged. All plots were harvested with an Almaco SPC50 plot combine with a 5' head and specialized sunflower pans made to efficiently collect sunflower heads. At harvest, test weight and seed moisture were determined for each plot with a Berckes Test Weight Scale and a Dickey-john M20P moisture meter. Subsamples were assessed for seed damage from boring insects by counting the number of seeds out of 100 randomly selected seeds from each plot that had an insect exit hole present. Oil from a known volume of each seed sample was extruded on 28-Feb and 1-Mar 2017 with an AgOil M70 385.03 Tm[(b)] TJET4.1 Tm 0 1 9eS Tm 0 Tc[(t)] TJET(g)] TJE3s047 Tc[(fr)] TJETBT1 7 0 1

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. The asterisk indicates that hybrid B was not significantly lower than the top yielding hybrid C, indicated in bold.

RESULTS

Weather data was collected with an onsite Davis Instruments Vantage Pro2 weather station equipped with a WeatherLink data logger. Temperature, precipitation, and accumulation of Growing Degree Days (GDDs) are consolidated for the 2016 growing season (Table 3). Historical weather data are from 1981-2010 at cooperative observation stations in Burlington, VT, approximately 45 miles from Alburgh, VT.

In general, the summer of 2016 was drier than normal, with all months except October having below normal precipitation. Temperatures were slightly above average August-October. From June through October there were an accumulated 3179 GDDs for sunflower (calculated at a base temperature of 44°F), 231 more than the long term average.

Table 3. Consolidated weather data and GDDs for sunflowers 2016, Alburgh, VT.

Alburgh, VT	June	July	August	Septe

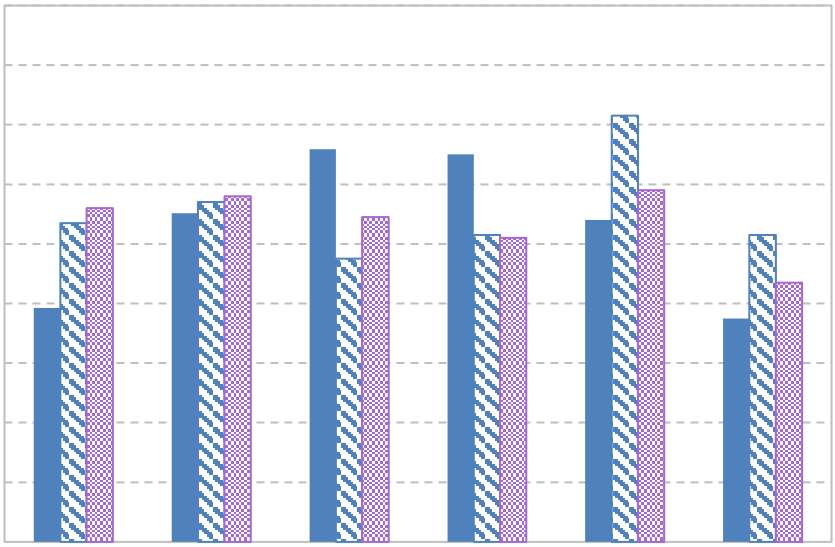

Figure 1. Planting date by variety interaction for test weight, 2016.

Some varieties exhibited drastic differences in insect damage across the three planting dates while others varied very little (Figure 2). For example, Camaro II had 4.0% damage when planted on the first planting date but only 0.25% when planted on the third planting date. However, Duet had 0.5% damage on the first planting date and 1.0% damage on the third planting date. Again this may be related to plant maturity ranges differing across the varieties.

Figure 2. Planting date by variety interaction for insect damage, 2016.

Similarly, varieties did not respond similarly, in terms of bird damage to the heads, to delayed planting. Most varieties saw the largest bird damage in the first planting date, upwards of 60%, and the smallest on the third planting date (Figure 3). However, the variety N5LM307 hardly varied across planting dates with about 15.0% damage occurring regardless of planting date. This may indicate that this variety has a head position or architecture that protects the seeds from being eaten by the birds.

Figure 3. Planting date by variety interaction for bird damage, 2016.

Impacts of planting date

Plant characteristics, including bird damage and lodging, varied significantly across planting dates (Table 4). Bird damage ranged from 14.7% to 49.5% with a trial average of 29.7%. There were lower levels of bird damage observed in later planting dates. Lodging ranged from 10.3% to 24.2% with an average of 16.8% for the trial. The third planting date also had the lowest lodging but was statistically similar to the first planting date. Sclerotinia was present in the trial, however it was not surveyed for severity, only presence in each plot. On average, 22.2% of plots in each planting date had some Sclerotinia present.

Table 4. Plant stand characteristics by planting date, 2016.

Planting date	Bird damage %	Sclerotinia presence % plots	Lodging %
24-May	49.5	20.8	15.8*
1-Jun	25.0	25.0	24.2
9-Jun	**14.7***	**20.8**	**10.3***

Seed moisture at harvest, insect damage, and seed yield, also varied significantly by planting date (Table 5).

Oil content and yield also differed significantly by planting date (Table 6). Oil content ranged from 35.1 to 38.2% and increased with later planting dates, however the second and third planting date were statistically similar. Oil yields ranged from 304 to 819 lbs ac^{-1} and were the highest at the latest planting date. The third planting date yielded 819 lbs ac^{-1}, which equates to 107 gal ac^{-1}, more than twice that of the other two planting dates. Oil content was exceptionally high compared to what we typically see in our trials, for instance, in 2015 oil content averaged only 23.1%.

Table 6. Oil content and yield by planting date, 2016.

Planting date	Oil content %	Oil yield	
		lbs ac^{-1}	gal ac^{-1}
24-May	35.1	304	40
1-Jun	37.9*	364	48
9-Jun	**38.2***	**819***	**107***
LSD (0.10)	1.65	156	20.5
Trial Mean	37.1	495	65

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

Image 2. AgOil M70 press.

Impacts of Variety

Plant stand characteristics, including bird damage and Sclerotinia presence, statistically varied by variety (Table 7, Figure 5). Bird damage ranged from 15.4% to 43.2% with a trial average of 29.7%. The lowest bird damage was observed in the variety N5LM307 which was statistically similar to Duet. The variety N5LM307 was the only conoil variety in the trial which may have influenced its lack of appeal to the birds compared to some of the other high-oil and bird seed market sunflower varieties. Conoil varieties are typically utilized by dehulling for kernel use in the baking industry. The highest bird damage was observed in the variety Falcon.

Sclerotinia presence ranged from 0.00 to 50.0% presence with an average of 22.2% for the trial. The lowest disease presence was observed in Duet, which was statistically similar to Falcon, Camaro II, and N5LM307. The highest incidence of disease was noted in Cobalt II where 50.0% of plots had Sclerotinia present. It is important to note that the figures here only reflect the percent of plots within each variety in which at least one Sclerotinia infected sunflower plant was observed; it does not indicate the severity or potential differences in infection severity between varieties. Lodging ranged from 10.0 to 20.8% but did not differ significantly by variety.

Table 7. Stand characteristics by variety, 2016.

Variety	Bird damage %	Sclerotinia presence % plots	Lodging % plants
Camaro II	35.7	16.7*	**10.0**
Cobalt II	29.0	50.0	20.0
Duet	21.0*	**0.00***	16.3
Falcon	43.2	8.33*	14.6
N5LM307	**15.4***	25.0*	18.8
N4HM354	34.1	33.3	20.8
LSD (0.10)	9.10	28.1	NS
Trial mean	29.7	22.2	16.8

Treatments with an asterisk* performed similarly to the top performer in **bold**.
NS-No

Camaro produced almost 90 gal ac^{-1} oil, 16 more gal ac^{-1} than the next highest yielding variety Duet.

Table 9. Oil content and yield by variety, 2016.

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

DISCUSSION

Overall, the sunflowers performed very well this year despite very droughty conditions throughout the entire season.

ACKNOWLEDGEMEN