NORTHWEST CROPS & SOILS PROGRAM

2020 Hemp Flower Harvest Date

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THE UNIVERSITY OF VERMONT EXTENSION

2020 HEMP FLOWER HARVEST DATE

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In the Northeast, hemp harvest can take place any time from late August through October or later depending on hemp varieties and weather conditions. Harvest for autoflowering varieties can somewhat reliably be determined with the use of recommended harvest dates for individual varieties whereas full term or photoperiod sensitive varieties more often require careful monitoring through the use of visual or aromatic cues. Primarily harvest date for flower crops is determined by a number of noticeable changes in the physical characteristics of trichomes, bracts, and pistils. The trichomes, known as capitate-stalked resin glands, will begin to form as stalked structures capped with a bulbous head (similar to a small mushroom) on flower surfaces. Depending on growth operation, these glands will also begin to turn opaque and eventually amber before degradation. Other flower components such as the bracts of each individual flower will begin to swell, similar to as if flowers were pollenated, and pistils of each flower will begin to turn brown. Once approximately 90% of those pistils have begun browning, in conjunction with these other visual cues, we generally begin to harvest plants.

However, outdoor cultivation can bring various challenges as a result of environmental conditions and pest pressure. A major concern for Northeast growers, and other cooler or erratic weather regions, is the shortening of days and increased risks of frost damage for crops. Risk of frost or crop loss as a result of pest pressure can be major driving factors that will often hasten the necessity for harvest. Harvest date can also impact the chemical composition of flowers impacting cannabinoid and terpene concentrations. Concerns revolving around low cannabinoid concentrations as a result of early harvest are a major concern as crop value can be determined by these concentrations. Additionally, many farmers have concerns surrounding the production of compliant crops. Main concerns often revolve around leaving a crop too long in the field, resulting in THC spikes above state or federal limits as plants are left in the field beyond target harvest date. To better understand how harvest time impacts flower quality, UVM Extension initiated their first hemp flower harvest date study at Borderview Research Farm in Alburgh, VT in 2020.

MATERIALS AND METHODS

The experimental design was a randomized complete block with 4 replicates. Plots consisted of three plants spaced 5’ apart in the row and between rows, from which one plant was selected for the harvest date study to be sampled on a weekly basis (Table 1). Treatments consisted of the 4 unique harvest dates and individual hemp flower varieties. Fertility amendments were based on soil test results received from the University of Vermont Agricultural and Environmental Testing Laboratory (Burlington, VT). On 5-Jun, all plots were fertilized with 180 lbs N ac^{-1}, 20 lbs P ac^{-1}, 72 lbs K ac^{-1}, using Kreher’s (8-2-2) (Kreher’s Family Farm; Clarency, NY), Pro-Booster (10-0-0) (North Country Organics; Bradford, VT), and sulfate of potash (0-0-52).

Table 1. Agronomic information for the hemp variety trial, Alburgh, VT, 2020.

Location	**Borderview Research Farm Alburgh, VT**
Soil type	Benson rocky silt loam, 3-5% slope
Previous crop	Winter Canola
Plant spacing (ft)	5 x 5
Planting date	8-Jun, 25-Jun, 7-Jul
Fertilization	180 lbs N ac^{-1}, 20 lbs P ac^{-1} 72 lbs K ac^{-1}
Harvest Dates	6-Oct 13-Oct 20-Oct 27-Oct

Three hemp cultivars were selected from the Variety Trial established at Borderview Research Farm for use in the harvest date trial (Table 2). Cultivars were selected based on relative maturity with the aim of capturing the development of cannabinoids and trichomes over a four-week period for "Early," "Mid," and "Late" maturing varieties. The "Early" variety for this trial was 'Boax,' "Mid" variety was 'Cherry Blossom,' and the "Late" maturing variety was 'Southern Sunset.' Plants for the harvest date trial were grown within our Hemp Flower Variety Trial, where approximate flowering week and harvest week were recorded for each variety. The selection of these varieties to fall within the early, mid, and late maturing categories were selected using aforementioned visual cues, which included trichome formation, bract development, and pistil senescence.

Table 2. Approximate flowering and harvest times for selected CBD cultivars. Alburgh, VT 2020.

Variety	Flowering Week	Harvest Week	Weeks to finish
Boax	32	41	9
Cherry Blossom	36	43	7
Southern Sunset	35	43+	8+

+ Varieties with a "+" listed next to harvest date could have had an additional 1-2 weeks to fully mature.

Each plot was established using clonally propagated plants started within the UVM Greenhouses (Burlington, VT) to reduce the potential for genetic variability observed within cultivars for plant chemotypes. Greenhouse temperatures were maintained at 70-75º F during the day and 68-72º F at night and received 18 hours of supplemental light at 400 W/m^2 from 1000W metal halide fixtures. Greenhouse pests, including thrips and fungus gnats, were managed with predatory mites, insects, and nematodes including *Amblyseius cucumeris, Orius insidiosus, Stratiolaelaps scimitus, and Steinernema feltiae.* Unrooted cuttings for varieties used in the trial were allowed to soak in H_2O for 3-4 hours to increase turgidity before sticking. Cuttings were removed from H_2O soak, cut fresh at a 45-degree angle (approximately 1/4" below a node), and dipped up to 2" in Clonex Rooting Hormone Gel (Lansing, MI). Cuttings were placed in pre-soaked peat rooting cubes and covered with propagation domes. For two-three weeks, cuttings were allowed to callus and begin root formation in greenhouse with a shade cloth covering over domes to reduce transpiration. After roots began to protrude from peat cubes and cuttings were fully rooted (approximately 2" roots emerging from callused stem), cuttings were transplanted into Fort Light potting mix (Vermont Compost Company) in trays of 1801 pots. Plants roots were allowed to fill out pots

(approximately 1-2 weeks) prior to planting. All entries were transplanted into black plastic mulch with drip tape irrigation. At each given harvest date, one 12" cola was selected per plant and flowers were collected randomly from each. Sampled flower was observed under microscope and pictures were taken of each harvest date to observe trichome formation. A subsample for each individual variety and harvest date was collected from each harvested cola. Samples from each plot were sent to ProVerde Laboratories (Milford, MA) to be analyzed for cannabinoids and terpenes.

Data were analyzed using a general linear model procedure of SAS (SAS Institute, 2008) when datasets were complete. Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure where the F-test was considered significant, at $p<0.10$. When data were missing, the Mixed Procedure of SAS (SAS Institute, 2008) was used. Treatment mean pairwise comparisons were made using the Tukey-Kramer adjustment at the 0.10 level of significance. Variations in genetics, soil, weather, and other growing conditions can result in variations in yield and quality. Statistical analysis makes it possible to determine whether a difference between treatments is significant or whether it is due to natural variations in the plant or field. At the bottom of each table, a p-value is presented for each variable (i.e. yield). The p-value refers to whether the treatment was statistically significant overall, while the letters are drawn from the means comparison. In the example to the right, treatment C was significantly different from treatment A, but not from treatment B. A lack of significant difference is indicated by shared letters.

Treatment	Yield
A	**2100a**
B	1900ab
C	1700b
LSD	300

RESULTS

Seasonal precipitation and temperature were recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT (Table 3). The growing season was defined by hot and dry conditions throughout the summer months, punctuated by a handful of larger, infrequent rain events seen largely in August. June was especially dry during the transplant and establishment period for our hemp trials with below average precipitation in much of the growing season. Average temperatures during the growing period were 4.11 degrees higher than the 30-year average for the season with a 5.5% higher growing degree day accumulation for the year.

Table 3. Seasonal weather data collected in Alburgh, VT, 2020.

Alburgh, VT	June	July	August	September	October
Average temperature (°F)	66.9	74.8	68.8	59.2	48.3
Departure from normal	1.08	4.17	0.01	-1.33	0.19
Precipitation (inches)	1.86	3.94	6.77	2.75	3.56
Departure from normal	-1.77	-0.28	2.86	-0.91	0.00
Growing Degree Days (Base 50°F)	516	751	584	336	126
Departure from normal	35	121	2	-24	-6

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.

Variety x Harvest Date interactions

Within the harvest date study, there were a large number of significant interactions between the selected varieties and harvest date indicating that each variety responded differently to harvest date for these significant interactions. Of the measured parameters for cannabinoids, everything other than THCA was significant (Table 4). This suggests that for each of these significant interactions, levels of the various cannabinoids reacted differently for harvest dates. This could be expected as each variety was selected based on their relative maturation rate. Additionally, cultivars have differing chemical profiles and proportions of each analyzed cannabinoid.

Table 4. Variety by harvest date interactions for cannabinoid profiles. Alburgh, VT, 2020.

Variety	Harvest Date	Weeks from Flowering	D9-THC	THCA	CBD	CBDA	Total THC	Total CBD	Total Cannabinoids
			% weight	% weight	% weight	% weight	% weight	% weight	% weight
Boax	1	8	0.034	0.203	0.293	6.47	0.212	5.97	6.36
Boax	2	9	0.047	0.191	0.454	6.79	0.214	6.40	6.84
Boax	3	10	0.056	0.193	0.573	6.71	0.225	6.46	6.94
Boax	4	11	0.048	0.183	0.476	6.57	0.209	6.24	6.65
Cherry Blossom	1	4	0.054	0.192	0.467	6.97	0.223	6.58	7.11
Cherry Blossom	2	5	0.092	0.178	1.080	8.19	0.249	8.26	8.80
Cherry Blossom	3	6	0.094	0.232	1.129	10.15	0.298	10.03	10.73
Cherry Blossom	4	7	0.095	0.217	1.162	10.02	0.285	9.95	10.62
Southern Sunset	1	5	0.064	0.122	0.623	4.70	0.171	4.75	5.18
Southern Sunset	2	6	0.066	0.110	0.627	4.63	0.162	4.68	5.02
Southern Sunset	3	7	0.064	0.134	0.684	5.31	0.181	5.34	5.71
Southern Sunset	4	8	0.068	0.131	0.735	5.46	0.183	5.52	5.88
p-value (0.10)			0.0955	NS†	0.0239	0.0022	0.0546	0.0009	0.0011
Trial mean			0.065	0.174	0.692	6.83	0.218	6.68	7.15

†**NS –** Not significant at the p=0.10 level.

When looking at individual varieties, Boax remained relatively consistent throughout the four-week sampling period for each analyzed cannabinoid with a slight peak in total cannabinoids observed in week three, whereas Southern Sunset and Cherry Blossom showed more noticeable changes in total cannabinoids, peaking in the last two weeks of the study (Figure 1). Total CBD concentrations for Boax ranged from 5.97% in the first week, peaking at 6.46% in the third week and decreasing afterwards. Cherry Blossom showed the greatest changes over the sampling period with over 3% increase in total CBD over the sampling period. It is also worth noting that none of these varieties exceeded thresholds for compliancy of D9-THC or Total THC over the four week period and tracked similarly to CBD concentrations: as one increased or decreased over time, the other did as well.

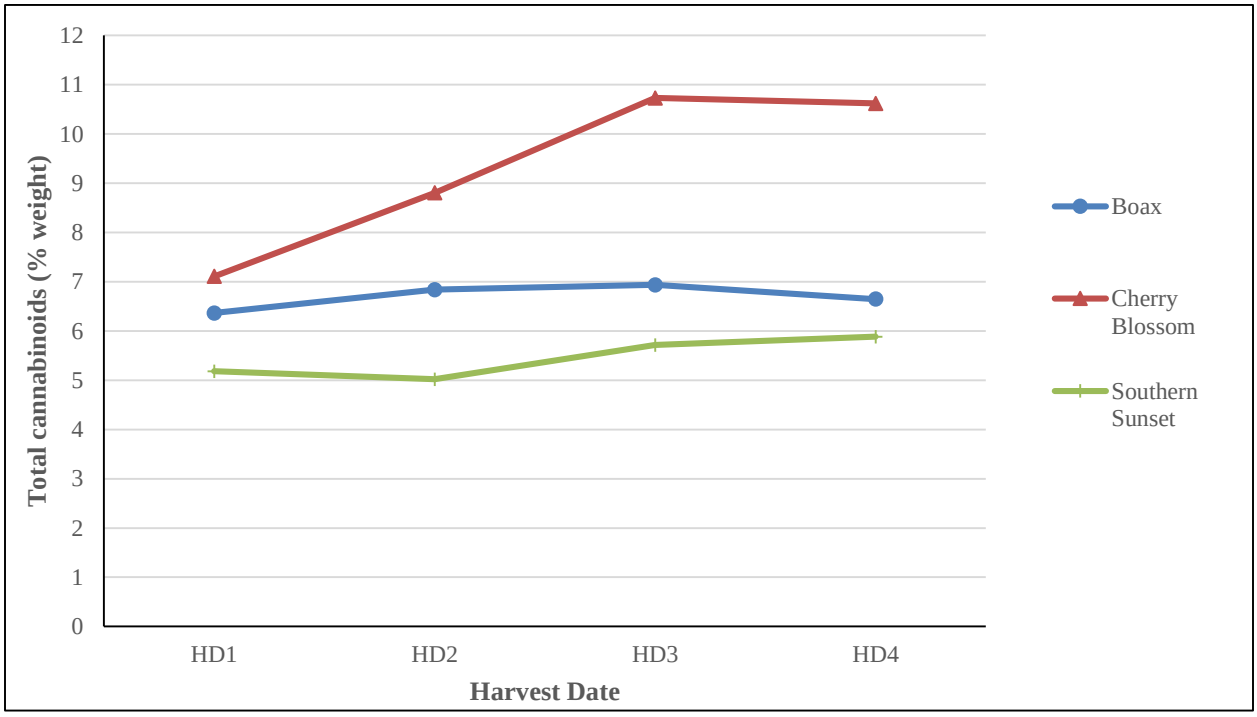

Figure 1. Total cannabinoids for each variety over four-week harvest date period. Alburgh, VT, 2020.

Terpene profiles were also analyzed for each variety and harvest date. Terpene profiles were analyzed for each harvest date and replication for each variety (Table 5). Results are included for 18 analyzed, unique terpenes, which have distinct chemical compositions and associated aromas that contribute to individual plant characteristics. The cannabis plant contains a wide array of non-cannabinoids that contribute to aromatic profiles and may potentially have similar health benefits to some cannabinoids. Terpenes make up one group of many types of compounds found in hemp. Some terpenes may have medicinal uses as anti-irritants, anti-inflammatories, anti-microbials, or pain relievers, however the medicinal effects of many known compounds remains to be unseen. As highly volatile compounds, many of these terpenes can be subject to high levels of loss as a result of various harvest, drying, processing, or storage methods. Each of these factors should be carefully considered when evaluating and determining your growing practices, as well as desired end-product.

Similar to cannabinoid profiles, a large number of these terpenes showed statistically significant variety x harvest date interactions, which once again indicates that these varieties responded differently to changes in harvest dates. Terpenes that did not show significant interactions included alpha-bisabolol, alpha-terpinene, beta-pinene, camphene, gamma-terpinene, terpinolene, and L-fenchone. Terpene profiles are known to differ across unique hemp cultivars, and variations can be observed within the same varieties based on drying temperatures and other handling as many of these compounds are highly volatile. This could be a further contributing factor as each variety may have responded differently to environmental conditions influencing the volatility of these compounds.

Table 5. Variety by harvest date interactions for terpenes. Alburgh, VT, 2020.

Variety	Harvest Date	Alpha-bisabolol	Alpha-humulene	Alpha-ocimene	Alpha-pinene	Alpha-terpinene	Beta-caryophyllene	Beta-myrcene	Beta-pinene
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Boax	1	57.1	126	1.38	11.3	1.66	400	172	8.77
Boax	2	33.7	32.5	0.370	3.88	0.838	106	41.8	2.28
Boax	3	29.0	45.0	0.300	6.64	0.670	127	64.8	5.15
Boax	4	48.0	84.0	0.528	7.43	1.39	291	73.3	5.40
Cherry Blossom	1	283	607	0.663	5.83	3.48	1638	112	6.70
Cherry Blossom	2	435	109	0.350	3.87	1.79	323	44.6	3.18
Cherry Blossom	3	279	130	0.565	6.83	1.36	364	121	8.02
Cherry Blossom	4	488	204	0.563	5.65	1.76	582	119	7.53
Southern Sunset	1	334	319	0.608	67.0	3.86	646	149	28.4
Southern Sunset	2	292	176	0.413	35.5	2.67	361	80.3	13.5
Southern Sunset	3	117	144	0.693	59.7	1.45	315	274	26.2
Southern Sunset	4	246	195	0.540	43.8	1.93	415	157	19.2
P-value (0.10)		NS	0.0075	0.0007	0.0643	NS	0.00230	0.01390	NS
Trial mean		220	181	0.58	21.4	1.90	464	117	11.2

NS – Not significant.

Table 5 continued. Variety by harvest date interactions for terpenes. Alburgh, VT, 2020.

Variety	Harvest Date	Camphene	Caryophyllene Oxide	Cis-beta-ocimene	D-limonene	Eucalyptol	Gamma-terpinene	Guaiol	L-fenchone	Linalool	Terpinolene
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Boax	1	0.823	21.9	50.9	25.4	0.600	1.90	3.16	3.39	5.75	1.36
Boax	2	0.285	9.57	7.74	6.06	0.500	0.868	2.26	1.03	0.808	0.213
Boax	3	0.435	10.9	7.78	10.3	0.163	0.853	1.23	0.49	0.683	0.428
Boax	4	0.978	19.2	16.6	12.3	1.95	1.78	1.60	2.42	2.89	1.24
Cherry Blossom	1	0.888	75.3	19.4	22.9	15.8	4.38	229	6.53	23.2	2.57
Cherry Blossom	2	0.418	64.6	6.53	7.41	3.71	2.02	255	2.63	1.23	0.703
Cherry Blossom	3	0.775	46.4	12.0	19.9	2.79	1.78	224	3.77	1.32	0.738
Cherry Blossom	4	1.30	78.2	13.0	18.7	4.43	2.35	466	6.63	3.74	1.74
Southern Sunset	1	1.14	61.9	26.9	17.5	14.5	4.65	446	2.99	3.66	2.27
Southern Sunset	2	0.603	49.9	10.8	8.90	6.52	3.08	379	1.29	0.89	0.85
Southern Sunset	3	1.18	31.5	25.3	23.0	7.22	2.02	193	0.285	0.87	0.67
Southern Sunset	4	1.36	74.8	14.2	16.1	7.23	2.30	493	2.77	3.31	1.38
P-value (0.10)		NS	0.08510	0.01420	0.07450	0.01690	NS	0.0	NS	0.0	NS
Trial mean		0.849	45.3	17.6	15.7	5.5	2.33	224	2.85	4.03	1.18

NS – Not significant.

Impact of harvest date

Cannabinoid concentrations were analyzed and grouped by harvest date (HD). When data was analyzed by harvest date, each of the analyzed cannabinoids within the trial appeared to peak in week three (20-Oct) of the trial (Table 6). Significant differences for each of these cannabinoids were observed across the four trialed harvest dates as well. Highest total cannabinoids observed in HD3 at 7.79% were statistically similar to HD4 at 7.72% total cannabinoids. For D9-THC and CBD, the last three harvest date values were statistically similar whereas total cannabinoids, total CBD, CBDA, and total THC values were statistically similar for the last two harvest dates. These values appeared similar in concentration suggesting that peak concentrations for many of these cannabinoids could be observed for many of these after HD1 or HD2 in this trial.

Table 6. Cannabinoid concentrations for hemp harvest dates. Alburgh, VT, 2020.

Harvest Date	D9-THC		THCA		Total THC		CBD		CBDA		Total CBD		Total Cannabinoids	
	%		%		%		%		%		%		%	
1	0.051	b†	0.173	ab	0.202	b	0.461	b	6.05	b	5.76	c	6.22	c
2	0.068	a	0.160	b	0.208	b	0.720	a	6.53	b	6.45	b	6.89	b
3	**0.071**	**a**	**0.186**	**a**	**0.234**	**a**	**0.795**	**a**	**7.39**	**a**	**7.27**	**a**	**7.79**	**a**
4	0.070	a	0.177	a	0.226	a	0.791	a	7.35	a	7.24	a	7.72	a
P-value (0.10)	0.0033		0.0362		0.0067		0.0003		0.0002		<.001		<.001	
Trial mean	0.07		0.17		0.22		0.69		6.83		6.68		7.15	

†Within a column treatments marked with the same letter were statistically similar (p=0.10). Top performing treatments are in **bold.**

Similarly, terpene profiles were analyzed by harvest date (Table 7). Compared to cannabinoid concentrations, terpene profiles appeared to react differently to harvest date for the varieties within this trial. These were essentially grouped into two categories in which peak concentrations were either observed in HD1 or HD4 for those analyzed terpenes. Those that had peak concentrations in HD4 included camphene, caryophyllene-oxide, guaiol, and alpha-bisabolol. Conversely, every other analyzed terpene appeared to have peak concentrations in the first harvest date (HD1) and values were significantly higher (with the exception of L-fenchone) compared to the other three analyzed harvest dates (HD2, HD 3, and HD4). Each of these analyzed terpenes generally falls within one of two categories: monoterpenes and sesquiterpenes. Distinctions in terpene structure, synthesis, and volatility may be contributing factors to those peak periods for analyzed terpenes.

Table 7. Terpene concentrations for hemp harvest dates. Alburgh, VT, 2020.

Harvest Date	Alpha-bisabolol		Alpha-humulene		Alpha-ocimene		Alpha-pinene		Alpha-terpinene		Beta-caryophyllene		Beta-myrcene		Beta-pinene	
	Ppm		ppm		ppm		ppm		ppm		ppm		ppm		ppm	
1	224	a†	**351**	**a**	**0.883**	**a**	**28.0**	**a**	**3.00**	**a**	**895**	**a**	**144**	**a**	**14.6**	**a**
2	253	a	106	b	0.378	c	14.4	c	1.76	b	264	b	55.6	b	6.33	c
3	142	b	106	b	0.519	bc	24.4	ab	1.16	c	269	b	153	a	13.1	ab
4	**261**	**a**	161	b	0.543	b	19.0	bc	1.69	b	430	b	116	a	10.7	b
P-value (0.10)	0.041		<.001		<.001		0.0109		<.001		<.001		0.0008		0.0007	
Trial mean	220		181		0.581		21.4		1.90		464		117		11.2	

†Within a column, treatments marked with the same letter were statistically similar (p=0.10) Top performing treatments are in **bold.**

Table 7 continued. Terpene concentrations for hemp harvest dates. Alburgh, VT, 2020.

Harvest Date	Camphene		Caryophyllene-Oxide		Cis-beta-ocimene		D-limonene		Eucalyptol		Gamma-terpinene		Guaiol		L-fenchone		Linalool		Terpinolene	
	ppm		ppm		ppm		ppm		ppm		ppm		ppm		ppm		ppm		ppm	
1	0.951	b†	53.0	a	**32.4**	**a**	**21.9**	**a**	**10.3**	**a**	**3.64**	**a**	226	b	**4.30**	**a**	**10.9**	**a**	**2.06**	**a**
2	0.435	c	41.4	b	8.36	b	7.46	c	3.57	b	1.99	b	212	bc	1.65	b	0.975	b	0.588	c
3	0.798	b	29.6	c	15.0	b	17.7	b	3.39	b	1.55	b	139	c	1.51	b	0.959	b	0.610	c
4	**1.21**	**a**	**57.4**	**a**	14.6	b	15.7	b	4.53	b	2.15	b	**320**	**a**	3.94	a	3.31	b	1.45	b
P-value (0.10)	<.001		<.001		<.001		<.001		<.001		<.001		0.0026		<.001		<.001		<.001	
Trial mean	0.849		45.3		17.6		15.7		5.45		2.33		224		2.85		4.03		1.18	

†Within a column, treatments marked with the same letter were statistically similar (p=0.10) Top performing treatments are in **bold.**

Throughout the analyzed harvest dates, pictures were taken for each variety and are included below (Images 1, 2, 3, and 4) for comparison. As mentioned previously, there are a number of visual cues that are traditionally used for determining harvest window, of which these pictures attempt to capture. This includes overall form of harvested cola, pistils of sampled flowers, and capitate resin glands (bracts are not included in the following picture set). As the selected cultivars fell into "early," "mid," and "late" maturing categories, pictures for each reflect their relative maturities. In image 1, harvest Boax cola shows denser flower clusters along harvest cola, approximately 60% pistil browning, and well-formed trichomes. Comparatively, Cherry Blossom in HD1 had flower clusters that were much less dense at this time, roughly 10% pistil browning, and well-formed trichomes. Southern Sunset during HD1 had only barely begun flower maturation and pistils were still firm and bright white, with sparse trichomes with underdeveloped stalks. These characteristics can be observed throughout the four-week period in some of these picture sets as "peak" maturity can be observed in HD 3 and HD 4 for Boax and Cherry Blossom respectively. Following peak maturity for Boax (and starting in HD3) some trichome degradation can be observed as capitate resin gland collapse and oxidize in some cases, whereas Cherry Blossom and Southern Sunset trichomes do not appear to go beyond a clear or opaque coloration. Furthermore,

during this four-week period, Southern Sunset did not appear to reach full maturity based on these visual cues, with comparatively lower cannabinoid concentrations and overall observable flower mass.

Image 1. Harvest date 1 pictures for harvested cola, flower pistils, and trichomes of Boax, Cherry Blossom, and Southern Sunset cultivars.

Image 2. Harvest date 2 pictures for harvest cola, flower pistils, and trichomes of Boax, Cherry Blossom, and Southern Sunset cultivars.

Image 3. Harvest date 3 pictures for harvested cola, flower pistils, and trichomes of Boax, Cherry Blossom, and Southern Sunset cultivars.

Image 4. Harvest date 4 pictures for harvested cola, flower pistils, and trichomes of Boax, Cherry Blossom, and Southern Sunset cultivars.

DISCUSSION

With many concerns surrounding hemp compliancy and overall crop quality, hemp harvest timing can be one of the most important components of hemp production. Furthermore, pre-harvest sampling for compliancy is required for many growers and becomes another important factor and will be an early indicator for crop compliancy. Rules and regulations for sampling can differ between states so it is important to follow your states growing requirements. Vermont rules and regulations can be found online here:

https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/hemp-program

Various quality parameters are evaluated for hemp crops with a wide array of cannabinoids and terpenes being produced by plants. These can serve as important parameters for distinguishing the quality of the crop and be major considerations for end users in purchasing. Within the study, terpene levels that were observed peaked either in the first or fourth harvest dates. Many of these known, analyzed terpenes fall into general categories of monoterpenes and sesquiterpenes that may have various, or potentially unknown, health benefits when consumed in conjunction with the cannabinoids produced by the hemp plant. When looking at peak cannabinoid levels throughout all harvest dates (regardless of variety) the majority appeared to have highest concentrations in the third harvest date. When broken down by variety, each of these did appear to act differently which could be expected based on differences in chemical profiles and maturation rates.

While our study showed that crops remained within compliant levels throughout the last four weeks of our growing season, it is also important to note that varieties may perform differently in other growing regions. A longer window for harvest, or other environmental conditions, may lead to “hot” crops that are not compliant within your state. Additionally, this represents only one year of data under this past seasons growing conditions. Studies within other warmer, more southernly regions have shown some cultivars exceeding THC limits in the later weeks of September for similar cultivars. More research would be required in order to determine the main cause of some of these discrepancies, however it may be that chemical expressions may differ based on growing conditions.

Some of these currently recommended visuals cues did seem to coincide with peak chemical compositions for cannabinoids, however other considerations should be taken into account when determining when to harvest a hemp crop. While higher concentrations of cannabinoids can be more desirable, peak does not always coincide with compliant. Additional sampling prior to required state sampling periods may be most useful in determining your ideal harvest window and allow for harvest of compliant crops. Various other factors for harvest date determination can include harvest time and labor, total planted acres, desired end product, equipment limitations, and disease pressure to name a few. Working within the confines of our Northeast climate, weather can often dictate harvest through cold and wet fall conditions or even hard frosts. These are but a few items to take into account and harvesting some crop regardless of cannabinoids or terpene concentrations is more important than losing and entire crop to inclement weather or disease. We hope to continue with this study in 2021 and expand our sampled varieties and sampling period to develop a more comprehensive view of cannabinoid and terpene development over time. This could further aid with crop compliancy and help to determine if crops would exceed action limits for THC.

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