

2020-2021 Hemp Flower Storage Trial

2020-2021 HEMP FLOWER STORAGE TRIAL
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Hemp is a non-psychoactive variety of *cannabis sativa L.* Hemp is a crop of historical importance in the U.S. and re-emerging worldwide as a popular crop, as it is sought out as a renewable and sustainable resource for a wide variety of products. Hemp that is grown for fiber, grain oil, or as an intended health supplement contains less than 0.3% tetrahydrocannabinol (THC). When hemp is grown to produce cannabidiol (CBD), it is grown more intensively, similar to vegetable production, and can be grown indoors or in the field. As hemp production for CBD products is rapidly increasing in the northeast, research on the impact of storage on quality is needed, as farmers may have to store harvested hemp flowers for months before transporting it to a processor or store. Information on the effect of temperature on product quality can aid growers in selecting
Soils Team examined the impact of storage temperature and time on CBD, THC, and terpene concentrations of hemp flower.

MATERIALS AND METHODS

The trial was initiated 20-Nov 2020 at the E.E. Cummings Crop Quality Testing Lab (Burlington, VT). Hemp

tetrahydrocannabinolic acid (THCA), cannabichromene (CBC), and cannabichromic acid (CBCA) were measured. CBGA is a precursor to three major cannabinoids; THCA, CBDA, and CBCA. CBC and CBG are not included in statistical analysis in this report. The CBDA compound becomes CBD, and so on, when a carboxyl group is removed from the acid during decarboxylation. This occurs when the flower is heated to high temperatures in an oven or during combustion or slowly over time. Drying, temperature, length of storage, and other storage factors can all have the potential to impact cannabinoid profiles.

Samples were analyzed for cannabinoids via liquid chromatography, with an Ultra-Performance Convergence Chromatography System (UPC2) from Waters Corp., which utilizes carbon dioxide as the primary mobile phase component. The terpene profile was measured by head-space gas chromatography. A combination of flame ionization detection and/or mass spectrometric detection with mass spectral confirmation against the National Institute of Standards and Technology (NIST) Mass Spectral Database, Revision 2017, were used.

Data were analyzed using a general linear model procedure of SAS (SAS Institute, 2008)

RESULTS

Impact of Storage Time

Within this trial there were significant differences observed across the time interval treatments for THCA, CBD, CBDA, Total CBD, and CBD: THC ratio (Table 2). Between treatments, highest values for CBD were observed at the 90-day storage period when compared to the other storage treatments at 16.4% total potential CBD, also leading to the highest ratio of CBD to THC at 30.7. Decarboxylated components THC and CBD were highest at the 180-day storage period. This could perhaps be indicative of slow conversions from THCA and CBDA over time compared to more common, rapid decarboxylation which occurs at higher temperatures than those within this study. None of the observed compounds showed linear decreasing or increasing trends for concentrations over time, however these highest observed values for D9-THC and CBD occurred at the 180-day period at 0.053% and 0.532% respectively and were statistically similar to the 150-day treatment. THCA, in addition to total potential THC, remained consistent over time with no statistically significant differences observed across time storage treatments, despite the slight fluctuations observed in D9-THC.

Table 2. Cannabinoid analysis results by storage time, 2021.

Treatment	D9- THC	THCA	CBD	CBDA	Total CBD	Total THC	CBD : THC
	%	%	%	%	%	%	
90-day	0.048 b						

Table 3. Cannabinoid analysis results by storage temperature, 2021.

Treatment	D9-THC	THCA	CBD	CBDA	Total CBD	Total THC	CBD : THC
	%	%	%	%	%	%	
Ambient	0.080 a[‡]	0.504 b	0.782 a	16.2 b	15.0	0.521	28.8 a
Freezer	0.032 b	0.569 a	0.296 b	17.0 a	15.2	0.531	28.5 b

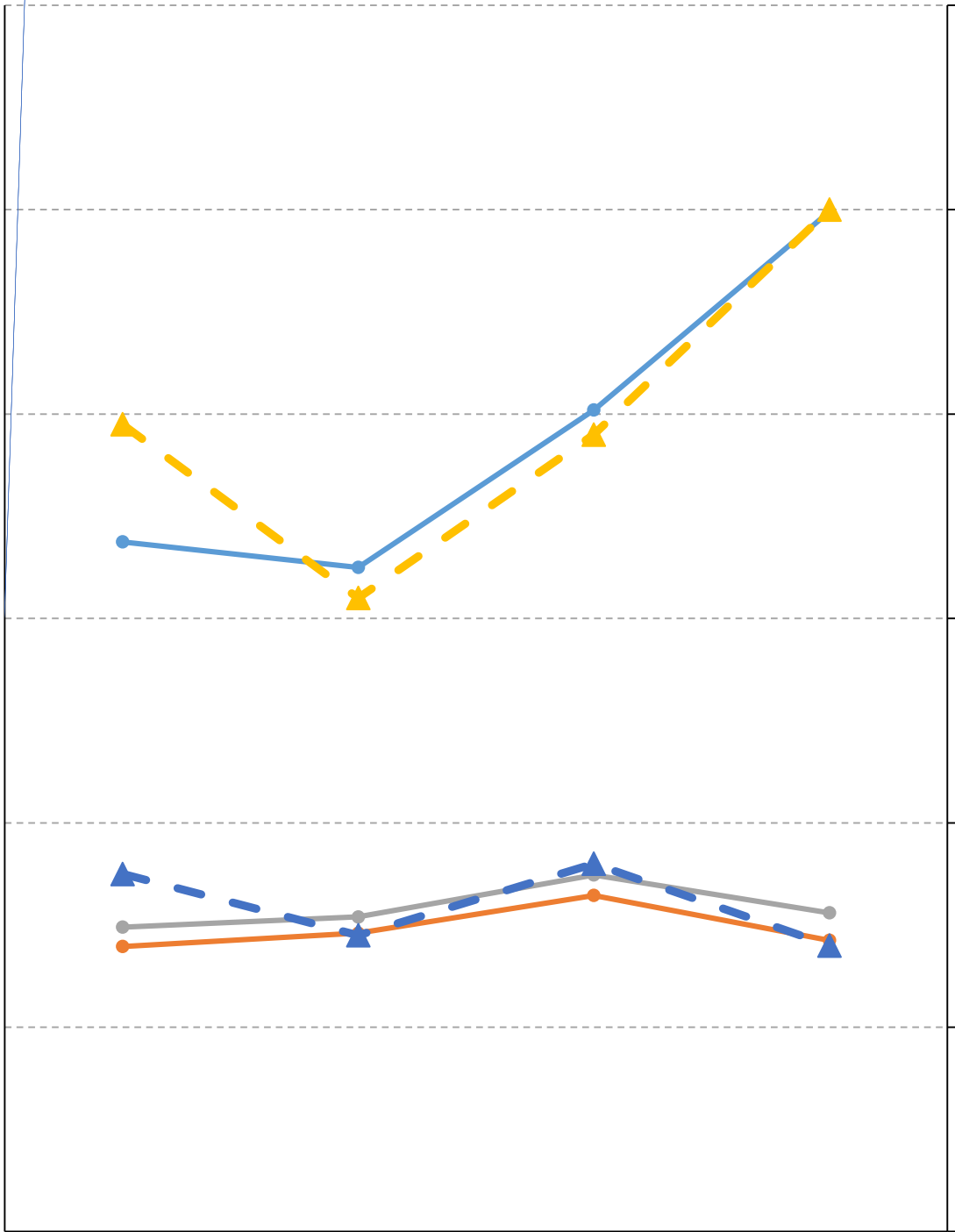


Figure 1. CBD and D9-THC percentages by storage temperature over time, 2021.

DISCUSSION

These results show an increase of CBD and THC concentrations over time as CBDA and THCA decarboxylate