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2020 K-State Industrial Hemp CBD Variety Trial

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2020 K-State Industrial Hemp CBD Variety Trial

Jason Griffin,[1] Clint Wilson, and Tami Myers

Introduction

Hemp is a broad term used to describe the many varieties of *Cannabis sativa* L. that produce less than 0.3% tetrahydrocannabinol (THC). The crop is globally significant, but only recently was allowed to be grown once again in the United States. Varieties have been selected and are currently grown with a wide cannabinoid profile. Cannabinoids are of high interest for their putative medical and therapeutic role in humans and companion pets. Cannabidiol (CBD) and THC are the two cannabinoids of primary interest. THC is of interest because it determines whether the final product is considered hemp (<0.3% THC) or marijuana (>0.3% THC). CBD is of interest because of its potential therapeutic properties and its legal status across many states. Currently, there is no information available regarding adaptability or cannabinoid production of these varieties in Kansas.

In 2020, Kansans were allowed to apply for research licenses to grow industrial hemp for the second year. There are wild remnant populations of *C. sativa* flourishing at numerous locations across the state, so it was no surprise that hemp grew successfully in 2019. Controlled variety trials are necessary to determine which varieties are best adapted to Kansas and which methods produce the greatest yield. Currently, growers must rely on only one growing season's data in Kansas or information generated from other states with vastly different growing conditions. Variety selection is vital in CBD hemp production, considering that environmental conditions strongly influence cannabinoid ratios and ultimately, total cannabinoid content.

The objective of this study was to evaluate the date of potting of three commercially available varieties of CBD hemp in south-central KS grown in containers inside a high tunnel. Flowering of hemp is light sensitive. Therefore, regardless of when plants are propagated and potted, if exposed to natural photoperiod they should mature and flower at the same time. Potting plants earlier in the season should yield larger plants. However, larger plants are not always ideal given cultural requirements to support large plants and potential extended exposure to pests and diseases.

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Methods

On May 1, June 1, July 1, and August 1 of 2020, clones (from rooted cuttings) of industrial hemp CBD varieties Cherry, Otto II Stout, and The Wife that were in 1 gallon pots were re-potted into 7 gallon plastic containers and placed in a 20- × 99-ft high tunnel covered with plastic and 30% shade cloth on the top and insect netting on the sides and end-walls. Due to propagation issues there was no Otto II Stout used in the June potting. Pots were filled with a soilless potting substrate composed of composted pine bark (HappiGro) and a commercial substrate (Sungro Metro-Mix 900) (1:1 by vol) amended with 1 lb/yd^3 dolomitic lime. A conventional controlled-release fertilizer (Osmocote Plus 15-9-12) was incorporated at 14.5 lb/yd^3. Pots were placed on a 4- × 4-ft spacing and irrigated as needed with micro irrigation. Each plant was surrounded by a 5 ft tall × 26 inch diameter tomato cage to support growth. The terminal growing point of each plant was pinched once at potting to encourage lateral branching. Fan leaves were removed throughout the growing season to improve airflow and reduce disease occurrence.

On October 16, plant height (ht) was measured from the container substrate surface to the terminal growing shoot. Width was measured at the widest part of the plant (w1), and perpendicular to the widest part (w2). A growth index (GI) was calculated as GI = (ht + w1 + w2)/3. The plants were cut at the substrate surface and hung to dry in a ventilated storage building. After 1 week, colas were cut from representative plants for cannabinoid analysis. Colas and remaining leaves were removed from the stems and a biomass weight was obtained.

The experimental design was a randomized complete block design with four replications. Data were analyzed using ANOVA and means separated with Fisher's Protected LSD.

Results and Discussion

The date of potting and placing plants (in 7-gal pots) into the high tunnel influenced all the growth parameters measured. The amount of biomass harvested from the plants was greatest from plants potted in May (698 grams) and June (572 grams) (Table 1). Plants from both months produced over 1 pound of biomass. As expected, plants potted in August had the least amount of biomass (288 grams). The three varieties produced similar biomass yield within a potting month. While plants potted in May produced more biomass, the ultimate size of those plants created other problems. May plants, with more growing season, had longer branches and ultimately had several branches that broke under their own weight or were easily broken during the harvesting process. They also experienced more pest issues (mites) and were more labor intensive to maintain and harvest. None of those issues were observed in the June, July, or August potted plants. Additionally, the harvested colas from June, July, and August plants appeared to be of higher quality.

Growth index, which is a measure of overall plant volume, was influenced by potting date and plant variety (Table 2). Plants that were potted in May were generally larger, whereas those potted in June, July, and August were similar within a variety (Figure 1). The exception was Cherry which displayed little difference in GI at the four potting

dates. Cherry is a more compact variety with shorter internodes than the other varieties. This likely explains why their final volumes at harvest were relatively similar. Plants potted in June and July had similar GI. Otto II Stout had the largest GI, followed by The Wife, and Cherry.

Cannabinoid analysis (Table 2) determined that all three varieties produced commercially acceptable quantities of CBD. Unfortunately, they were all determined to be noncompliant and subsequently destroyed under the supervision of the Kansas Department of Agriculture.

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Table 1. Biomass (grams) and cannabinoid content (% dry weight) of three CBD hemp varieties potted in May, June, July, or August and harvested on the same day (October 16, 2020)

Variety	May	June	July	August	CBD (%)	THC (%)
Cherry	535.7	518.5	511.0	253.8	11.78	0.57
The Wife	747.5	625.8	510.8	312.5	12.53	0.59
Otto II Stout	810.5	---	501.8	298.0	9.32	0.35
Mean[z]	697.9 a	572.2 ab	507.9b	288.1 c	11.2	0.51

CBD = Cannabidiol. THC = tetrahydrocannabinol.

[z]Values within the row followed by the same letter are not statistically different.

Table 2. Growth index of three CBD hemp varieties potted in May, June, July, or August and harvested on the same day (October 16, 2020)

Variety	May	June	July	August	Mean[y]
Cherry	92.3	99.8	105.6	80.8	98.1 c
The Wife	129.5	110.8	114.4	107.5	116.8 b
Otto II Stout	157.4	--	125.0	75.0	132.6 a
Mean[z]	133.5 a	108.2 bc	115.5 b	100.9 c	

CBD = Cannabidiol.

[y]Values in the column followed by the same letter are not statistically different ($P < 0.05$).

[z]Values within the row followed by the same letter are not statistically different ($P < 0.05$).

Figure 1. The cannabidiol (CBD) industrial hemp plants potted in May, June, July, or August and harvested on October 16, 2020. A: Cherry, B: The Wife, C: Otto II Stout (no June planting). Representative plants are shown in order from left to right: May, June, July, and August).