

Hemp and its regulation: the small background of THC in CBD hemp

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Rules cripple the CBD industry

Hemp for CBD is a potential valuable product for Oregon. The draft rules will push Oregon out of the CBD market. The draft rules will cause the complete loss of many CBD hemp related investments in the Pacific Northwest. The draft rules assure that efficient CBD production will be forced overseas. The potentially detrimental USDA policies can easily be averted by the following: 1. For hemp flowers with greater than 6% CBD, edit the 0.30 % total THC rule to permit hemp flowers grown for CBD that have a ratio of 20:1 or more of total CBD to total THC, regardless of the THC content. 2. Allow growers six weeks to harvest their crops after approved sampling for potency.

Introduction: regulatory risk to Oregon's CBD hemp industry

Growing hemp for medicinal cannabinoids is an important enterprise for human health and the US economy. The Oregon hemp industry needs US rules that foster safe, efficient, and competitive CBD production. The USDA has a draft rule that limits total THC in hemp to 0.30

percent. The rules also confine growers to narrow harvest intervals. In the short description that follows we describe the small amounts of THC that routinely occur in hemp grown for CBD, why the 0.30 percent total THC rule is highly detrimental, and how the total THC should be efficiently regulated while simultaneously keeping the CBD industry safe and competitive.

Abstract

In 2019 we grew thousands of genetically different CBD hemp (*Cannabis sativa*) plants as part of our breeding and selection program to create and identify lines of hemp beneficial for growers. Plants were grown in Ontario, Oregon. Between September 23 and 29 we sampled flowers from 273 unique hemp plants. All the germplasm tested had been designed to provide CBD. The 273 samples were submitted to laboratory analysis along with 5 check samples from the same field with known cannabinoid content. The 278 samples were analyzed for cannabinoids by Integrity Labs, LLC, 2747 Pacific Ave SE B21, Olympia, WA 98501 (WA State I502 Certification #09). The results were used to evaluate the amounts of CBD, THC, and other cannabinoids that can be expected in CBD hemp. Repeated weekly flower samples were taken from 28 clones, submitted to Integrity Labs, and data from one clone is presented to show the trends over time of total CBD, total THC, and the ratio of total CBD to total THC.

Data handling procedures

Laboratory data were reported for diverse flower cannabinoids. Only the data related to flower THC and CBD are reported here. All of the laboratory data was utilized without editing the data or omitting any samples. The laboratory data for the flower CBDa and THCa were converted to CBD and THC by multiplying by the factor of 0.877. The ratio of total CBD to total THC was calculated by dividing the total CBD concentration by the total THC concentration. The amounts of flower total CBD was compared to both the amounts of Delta 9 THC and total THC. The Delta 9 THC has psychoactive properties. The ratio of total CBD to total THC was evaluated graphically. The extent that the 0.30 percent total THC restriction would hamper local CBD production was evaluated graphically and is discussed.

Results

No Delta 9 THC was detected in any of the 278 flower samples (Figure 1). A low background of THC was detected in all of the flower samples. The background THC concentration increased with the CBD concentration (Figure 2). Comparing the observed total THC concentration with the 0.30 percent THC limit eliminates the use of all of the productive CBD germplasm (Figure 3).

The ratios of total CBD to total THC ranged from 22.4:1 to 32.1:1 among this set of germplasm (Figure 4). The ratio of total CBD to total THC was not enhanced by early harvests (Table 1).

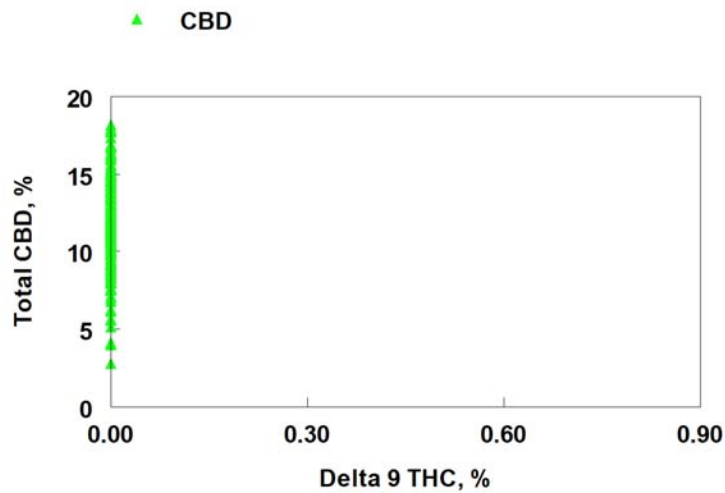


Figure 1. The concentrations of total CBD compared with the concentrations of Delta 9 THC observed in 278 hemp samples grown in Ontario, Oregon for CBD production, Medicinal Botanical Seeds, LLC, Ontario, Oregon, 2019. Delta 9 THC was not detected in any of the samples.

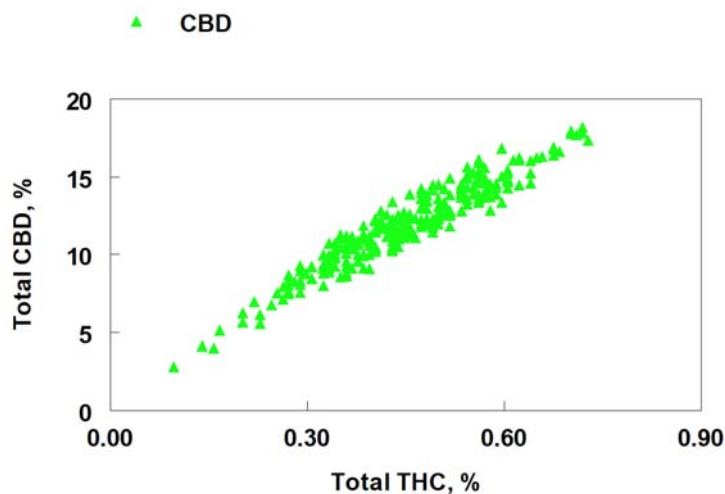


Figure 2. The concentrations of total CBD compared to total THC observed in 278 hemp samples grown at Ontario, Oregon for CBD production, Medicinal Botanical Seeds, LLC, Ontario, Oregon, 2019.

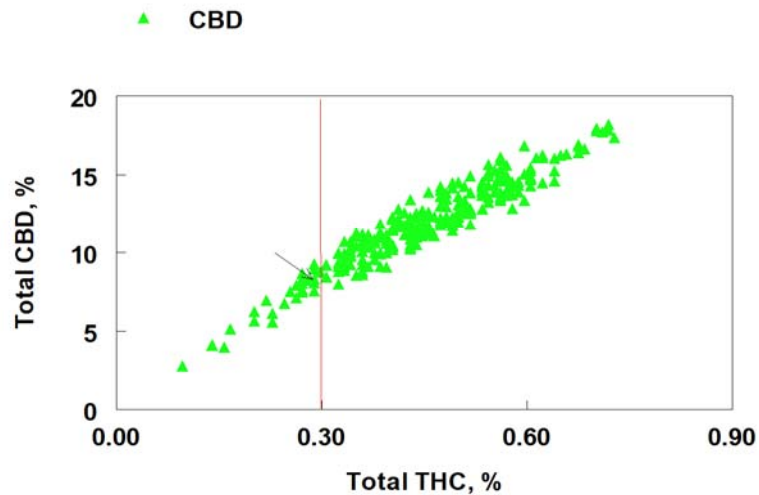


Figure 3. The concentrations of total CBD compared to total THC observed in 278 hemp samples grown at Ontario, Oregon for CBD production. Restriction of harvested samples to 0.30 total THC would eliminate more than half the potential CBD productivity. Medicinal Botanical Seeds, LLC, Ontario, Oregon, 2019.

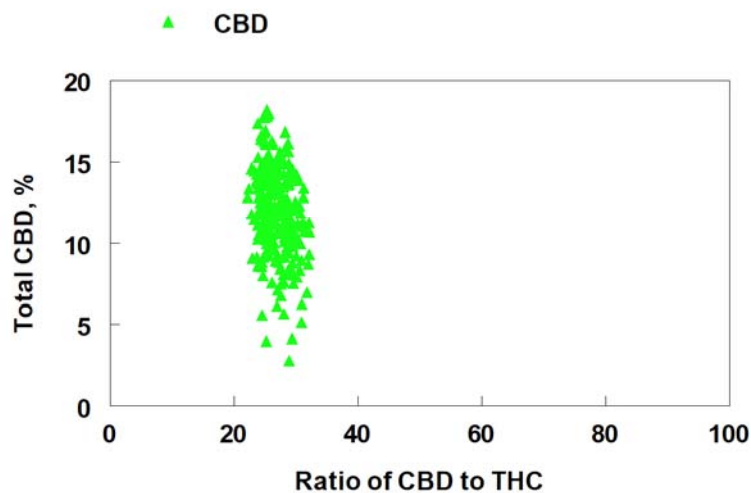


Figure 4. The relationship of total CBD to the ratio of CBD to THC remained between 22:1 and 33:1 over the entire range of total CBD in 278 hemp samples grown in Ontario, Oregon for CBD production, Medicinal Botanical Seeds, LLC, Ontario, Oregon, 2019.

Table 1. Weekly flower harvests, flower maturity, and CBD and THC relationships over time for CBD hemp in a selected clone, Medicinal Botanical Seed LLC, Ontario, Oregon. Delta 9 THC was not detected.

Sampling date	Flower maturity, 0 to 10	Delta 9 THC	Total CBD, %	Total THC, %	Ratio of CBD/THC
9-Sep	3.5	nd	1.66	0.08	21.0:1
18-Sep	4.5	nd	7.57	0.32	24.0:1
23-Sep	5.5	nd	11.41	0.43	26.5:1
1-Oct	7	nd	15.01	0.64	23.5:1
7-Oct	7	nd	18.19	0.68	26.6:1
14-Oct	9.5	nd	13.42	0.50	26.9:1

Discussion

The regulation of no more than 0.30 percent THC appears to work well for CBD hemp with less than 6% total CBD (Figure 3) typical of multipurpose hemp typically grown in Kentucky, Tennessee, and elsewhere. The regulation breaks down when applied to hemp designed for efficient CBD production. An appropriate regulatory caveat for CBD hemp with flowers with 6 % or more total CBD would be that the ratio of total CBD to total THC should be greater than 20:1.

A counter argument has been made that growers should harvest their CBD hemp early prior to reaching 0.30 % total THC. We repeatedly sampled 28 clones during the 2019 season. An example of this sampling data for a single clone is presented in Table 1. As the crop matures and accumulates biomass, both total CBD and total THC increase. The clone depicted in Table 1 had essentially no CBD at the beginning of September and no flowers. But it would have to be harvested before September 18 to avoid reaching 0.3 % total THC. On September 18, it had less than half of its ultimate CBD content. Most of the flower biomass would be sacrificed by such an early harvest in addition to the loss of its CBD content. CBD productivity losses in excess of 75% would be expected due to the combined negative effects of reduced flower yield and reduced CBD concentration without any proportional decrease in THC. The argument for early harvests is not economically viable or biologically sound. Early harvests are also unsound from a total THC perspective. To generate a given amount of CBD to treat human health problems through inefficient early harvests on a greater number of acres would end up generating as much total THC as efficient full season production. Administratively imposed inefficient CBD production would waste many other natural resources related to growing the crop, including water, nutrients, and fuel.

Due to the relative stability of the ratio of total CBD to total THC over time, there is no point in restricting growers to a narrow harvest interval following potency testing. In addition, the proposed 15-day window for sampling and harvesting is totally unrealistic. There are timing difficulties in making a sampling appointment, having samplers get to the field, gather samples, get the sample tested through an approved lab, receive back test

results, and harvest the field. In some states testing officials show up 3 weeks after a harvest notice. The lab must tally, dry, and analyze the samples, commonly taking 10 days for growers to receive the results. Harvesting can take 7-21 days depending on harvest methods, and more with uncooperative weather. Field drying alone takes a minimum 5 days under perfectly dry weather conditions.

Conclusions

Hemp flowers grown for CBD production accumulate small amounts of THC. The ratios of CBD to THC are commonly in the range of 20:1 to 35:1. Harvesting early to meet THC restrictions had no benefit in the proportion ratio of CBD produced. Limiting total THC in hemp to 0.30 percent imposes unrealistic economical burdens to the CBD production sector of Oregon's economy without reducing the amount of THC produced per pound of final CBD product. With the current proposed regulations, CBD production can be expected to move overseas to a country with less arbitrary regulations. These unfortunate policies can be corrected by adopting the following regulatory caveats:

1. "The rule limiting hemp flowers to 0.30 % total THC applies to hemp flowers with less than 6 % total CBD."
2. "Hemp grown for CBD hemp with flowers with 6 % or more total CBD will have flowers with a ratio of total CBD to total THC greater than or equal to 20:1."
3. "Hemp grown for CBD production may be harvested within 6 weeks of approved potency testing."

