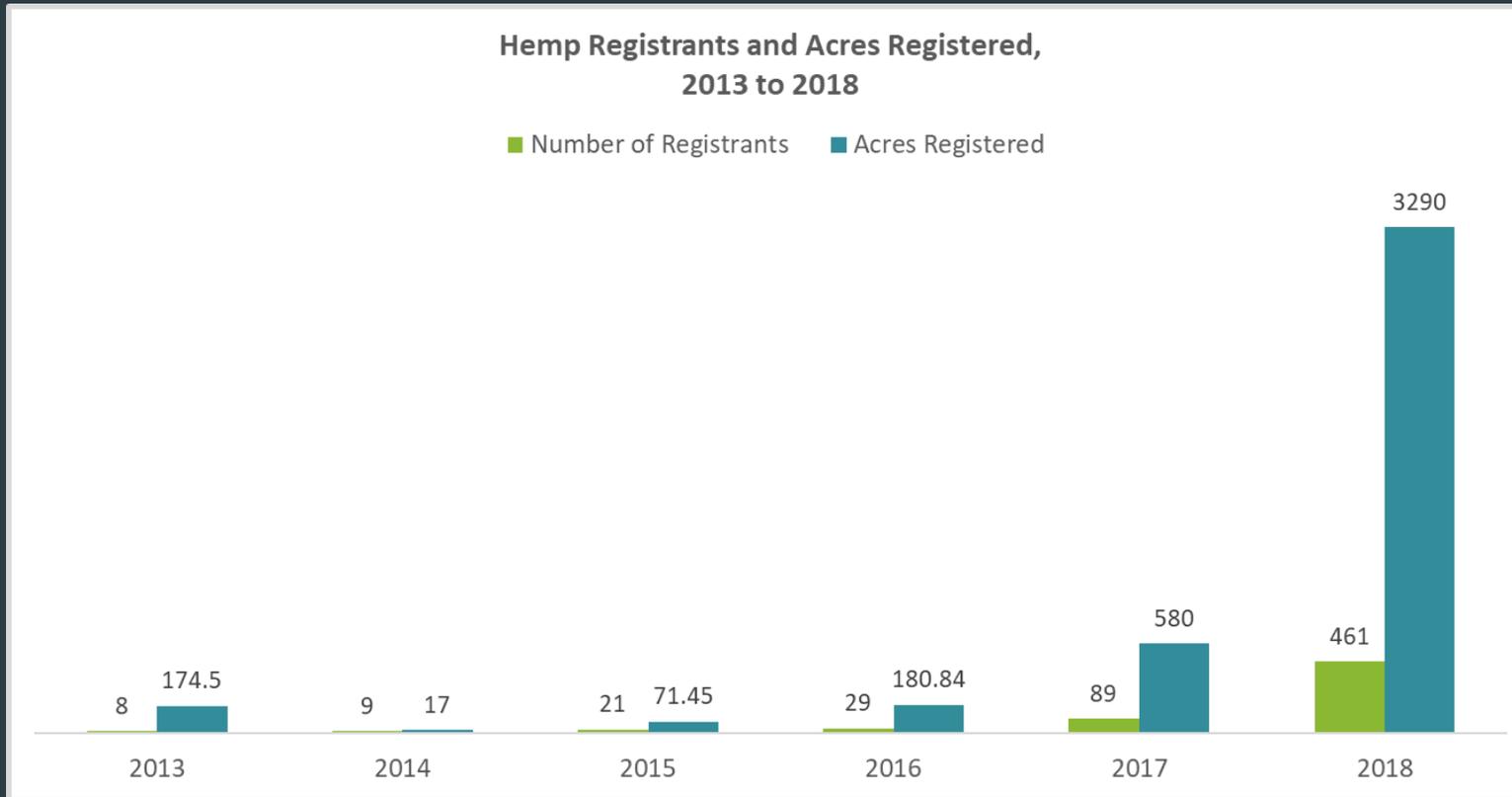


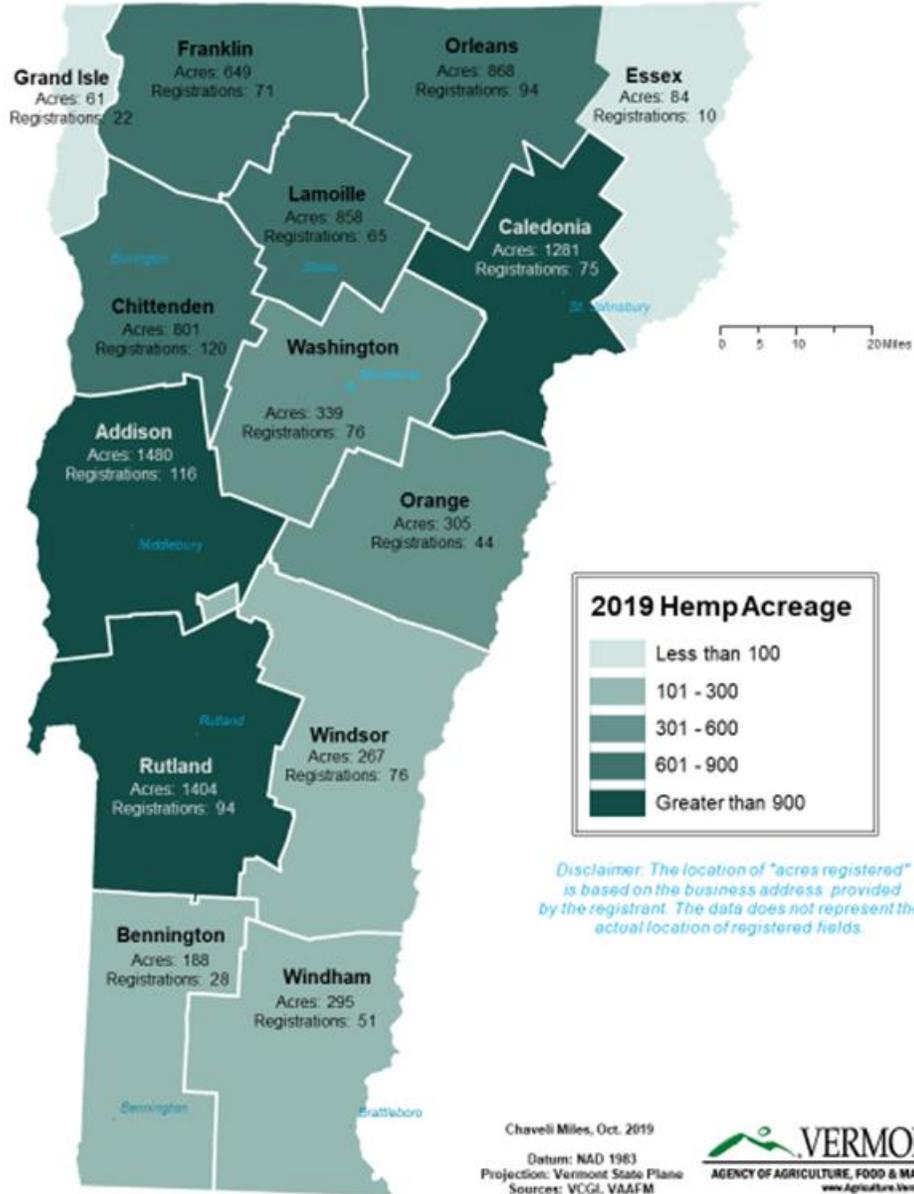


Vermont's Hemp Production Program

Vermont's Hemp Program



YTD Grower Registration and Acres Registered by County



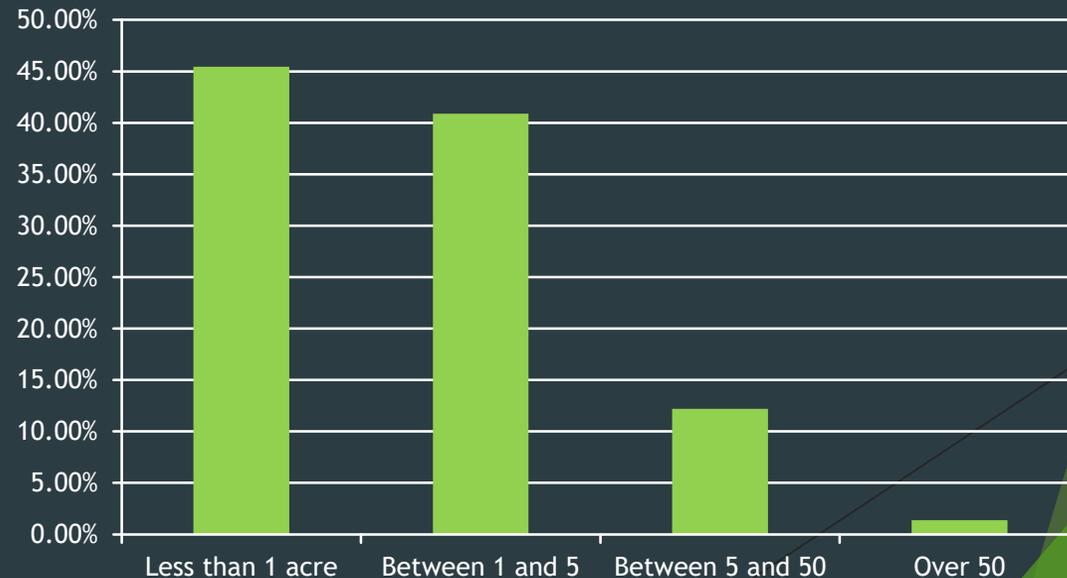
2019 Hemp production by Vermont County

- Just under 1,000 registered growers
- Just under 300 registered processors
- Over 9,000 acres registered

How many acres did you plant?

- ▶ 220 of 227 answered this question
- ▶ Of those that responded, 85% planted less than 5 acres

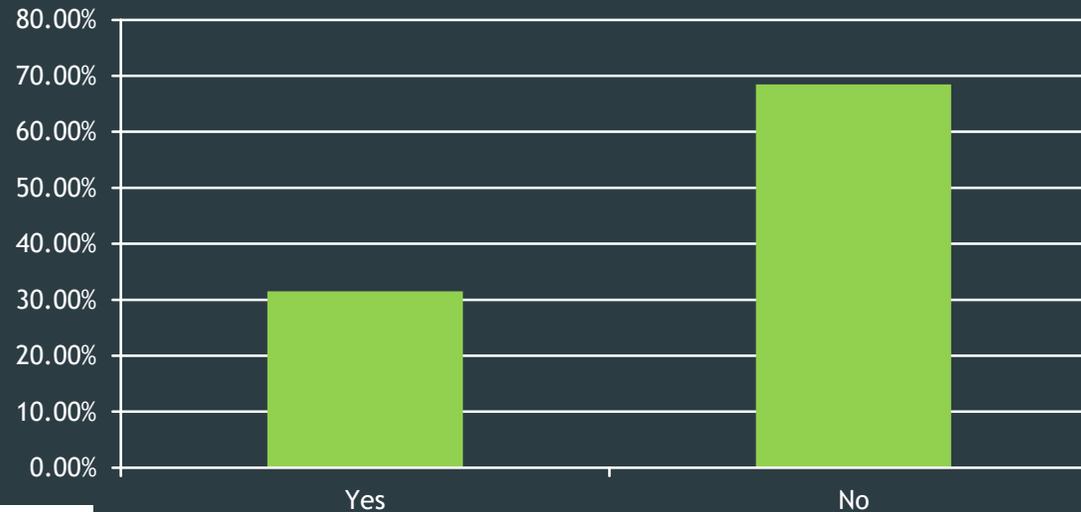
How Many Acres did you plant?



Did you have a buyer for your crop before you started growing?

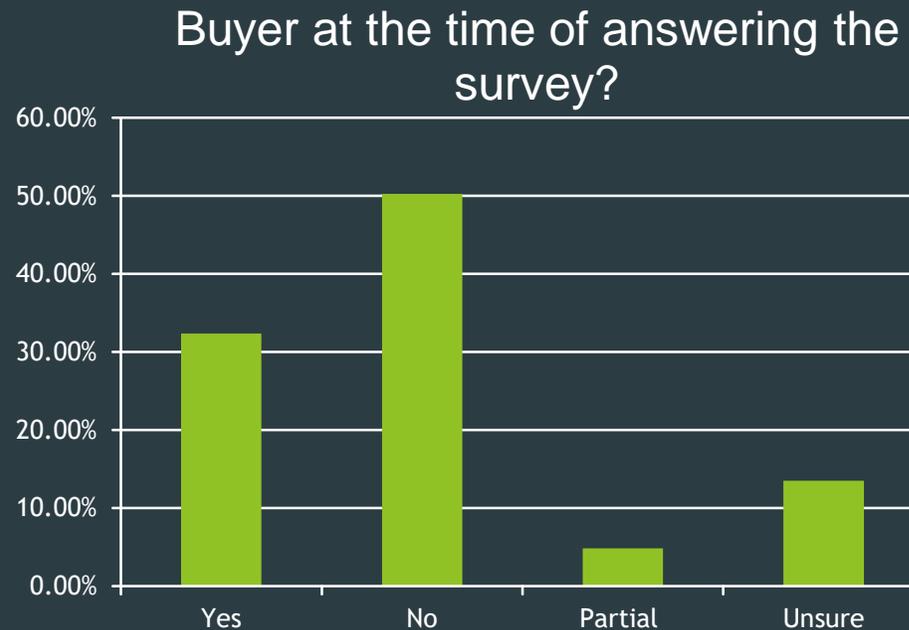
► 219 of 227 answered this (8 skipped)

Did you have a buyer for your crop before you started growing?



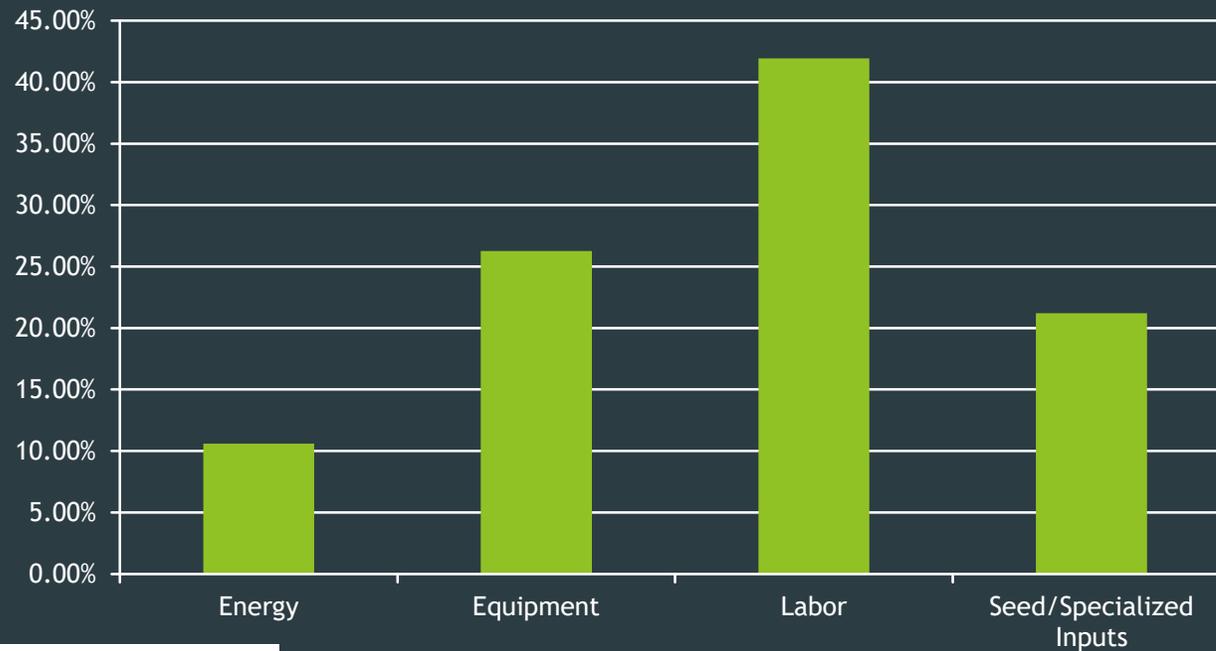
Do you have a buyer for your crop now (as of Nov 2019)?

► 207 of 227 answered this (20 skipped)



What is the greatest cost to your business?

► 217 of 227 answered this (10 skipped)



Vermont Hemp Program and Rules

- ▶ Standards and expectations
 - ▶ Consumer protection
 - ▶ Support the industry
- ▶ Communication with law enforcement
 - ▶ Testing, recordkeeping and reporting requirements
- ▶ Establish a common industry vocabulary



Vermont Hemp Program and Rules



- ▶ Establishing the requirements for the registration of growers, processors of hemp and hemp-infused products, certified labs
- ▶ Creating a Cannabis Quality Control Program
- ▶ Setting labelling guidelines

2020 New Registration Fees

- ▶ \$25 - For personal use grower registration.
- ▶ \$100 - for food oil, grain and fiber production regardless of acres planted
- ▶ \$100 - Less than 0.5 acres planted or less than 500 pounds processed
- ▶ \$500 - 0.5 to 9.9 acres planted or less than 10,000 pounds processed
- ▶ \$1,000 - 10 to 50 acres planted or less than 50,000 pounds processed
- ▶ \$3,000 - Greater than 50 acres or greater than 50,000 pounds

Indoor cultivation (bringing crops to flower under lights)

- ▶ \$1,000 - 500 Sq. ft or less
- ▶ \$2,000 - Greater than 500 Sq. ft.



Seed Crop

Who is a Processor?



- Trimming hemp that you grow for a finished product requires that you register as a processor.
- Drying a hemp crop that you did not grow requires that you register as a processor.

Existing Regulatory Programs

- ▶ Seed Dealer /Nursery Dealer Programs
- ▶ Fire Safety Division- Processing activities
- ▶ Pesticide Program
- ▶ Seed Dealer Registration Program, S. 194
- ▶ Water Quality Program- Required Agricultural Practices
- ▶ Vermont Agricultural and Environmental Lab
- ▶ Water and Wastewater, Dept. of Environmental Conservation



CBD Crop

Pre-Harvest Sampling for Potency Compliance



- ▶ Samples must be taken during flower and not more than 28 days before harvest
- ▶ Samples must be taken from the top 2 inches of side arm flowers
- ▶ See pre-harvest S.O.P. on table for more details



Female and Male Hemp Plants

What to Expect During an Inspection



- ▶ Inspector will take samples of hemp crops and hemp products for monitoring and research purposes
- ▶ Inspection of growing areas, facilities, machinery, equipment and records
- ▶ Registrants should have copy of their registration, certificates of analysis (CoA), and other records as required by Vermont hemp rules.

Testing Requirements

- ▶ FROM: Vermont Hemp Rule and the Cannabis QC Program (currently being drafted)
- ▶ Harvested crop- Potency (for THC, CBD, etc)
- ▶ Trim flower- potency, moisture content, microbiological
- ▶ Concentrated oils/ solids from extraction-
 - ▶ potency, microbiological, heavy metals, pesticides
- ▶ Consumer infused products- edibles, tinctures
 - ▶ Similar testing to concentrated products or verification of concentrate testing



Vermont Hemp Rules Cannabis Quality Control Program

- ▶ Testing for potency (including product labeling)
 - ▶ HPLC (most common test) - identifies acids
 - ▶ Ratio of CBD:THC
 - ▶ Total theoretical THC = (Delta-9 THC) + (THC-A x 0.877)
 - ▶ GC analysis will yield total values for CBD and THC
 - ▶ Genetic testing- researching with VAEL



Grinding Hemp Samples

Cannabis Potency Analysis using HPLC



Standard Compound List	
d9-THC	d9-Tetrahydrocannabinoid
d8-THC	d8-Tetrahydrocannabinoid
THCA	d9-Tetrahydrocannabinolic acid
THCV	Tetrahydrocannabivarin
CBD	Cannabidiol
CBDA	Cannabidiolic acid
CBDV	Cannabidivarin
CBG	Cannabigerol
CBGA	Cannabigerolic acid
CBN	Cannabinol
CBC	Cannabichromene

[Click to view the Cannabis Alkaloids](#)

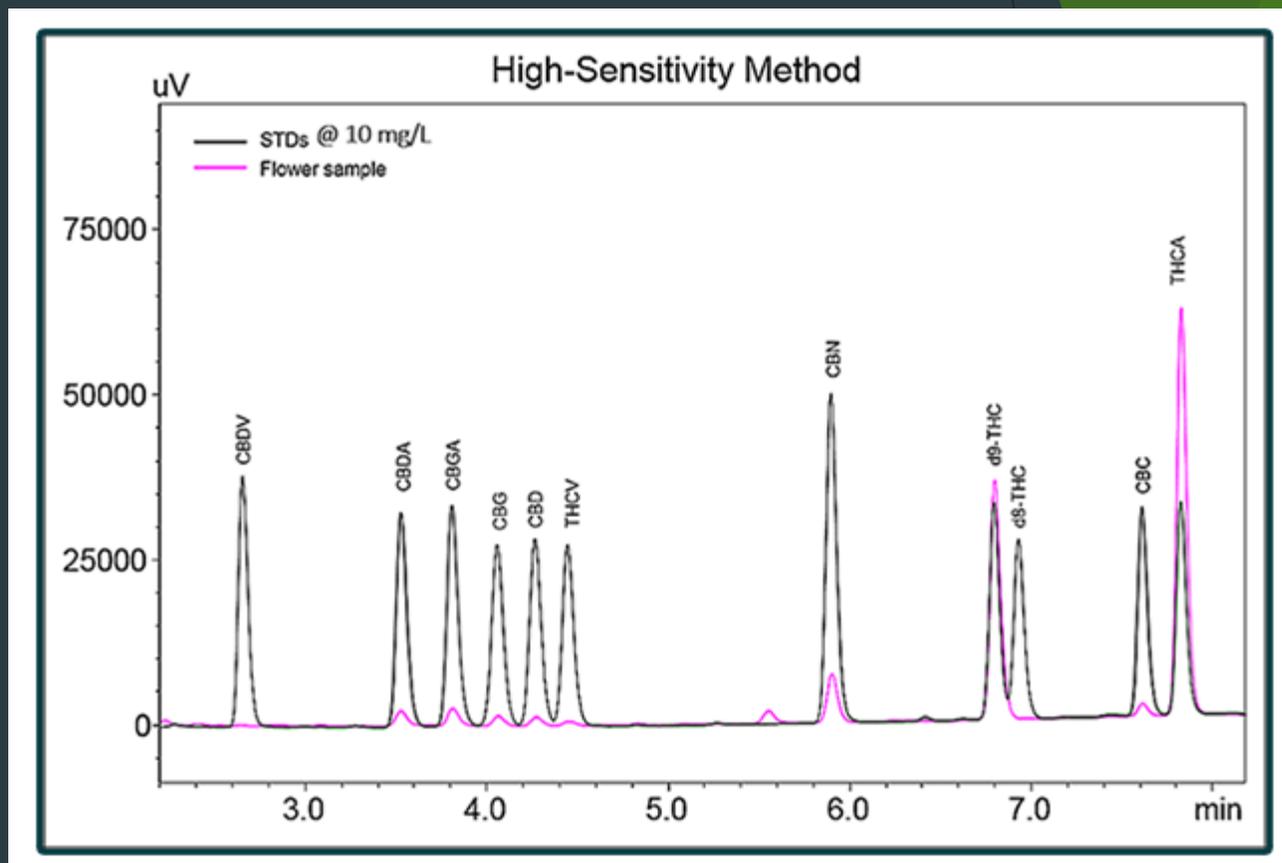
Cannabis Potency Analysis using HPLC

- ▶ Chromatogram

- ▶ Standard (in black)

- ▶ Cannabis sample (purple)

- ▶ UV detection



Certificate of Analysis (CoA) for Potency

Cannabinoids listed

Cannabinoid Profile	%	mg/g
Tetrahydrocannabinolic Acid (THCa)	0.561	5.61
Tetrahydrocannabinol (Δ 9-THC)	ND	ND
Tetrahydrocannabinol (Δ 8-THC)	ND	ND
Tetrahydrocannabivarin (THCv)	ND	ND
Cannabidiolic Acid (CBDa)	14.650	146.50
Cannabidiol (CBD)	0.196	1.96
Cannabidivarin (CBDv)	ND	ND
Cannabinol (CBN)	ND	ND
Cannabigerolic Acid (CBGa)	0.646	6.46
Cannabigerol (CBG)	ND	ND
Cannabichromene (CBC)	0.060	0.60
Total THC	0.492%	4.923 mg/g
Total CBD	13.044	130.443

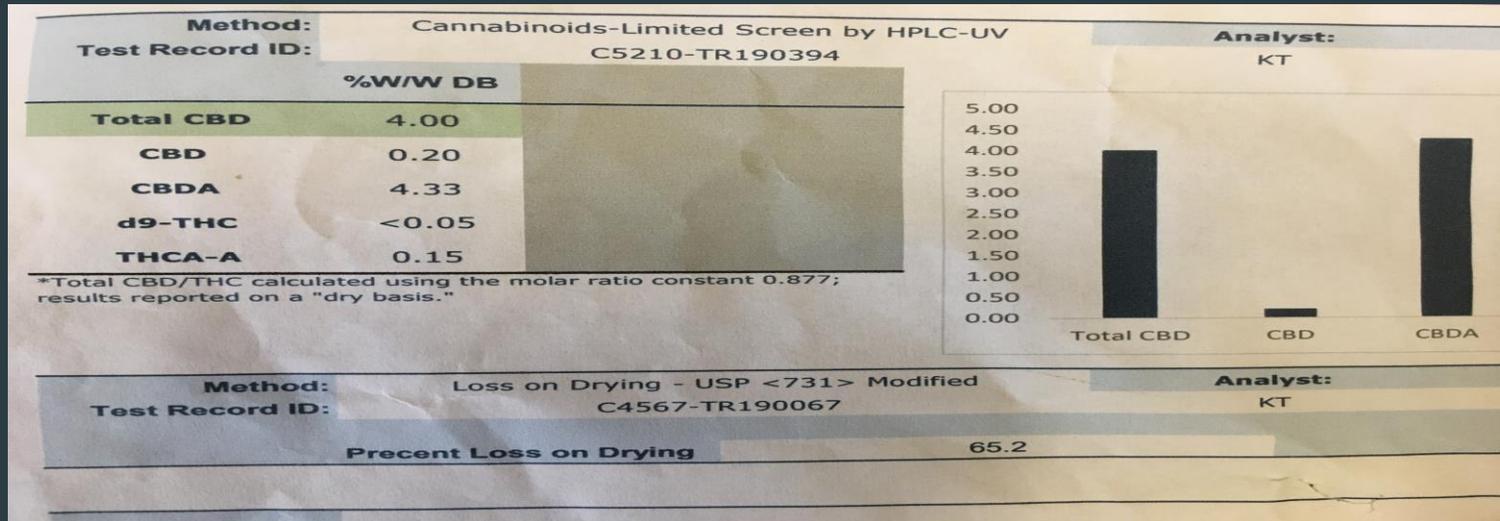
Total THC and CBD reported
(Hemp sample)

Formula for calculations

$$\begin{aligned} \text{Total THC} &= \text{THCa} * 0.877 + \Delta 9\text{-THC}; \\ \text{Total CBD} &= \text{CBDa} * 0.877 + \text{CBD} \end{aligned}$$

Vermont Hemp Rules Interpreting a COA

When total THC is not reported- calculating total THC



- ▶ $(<0.05\% \text{ or } 0\%) + (0.15\% \times 0.877) = 0.13\%$ Total theoretical THC
- ▶ This is a compliant hemp harvest lot. The delta-9 THC concentration is $< 0.05\%$ or $(< 0.3\%)$ and the total THC concentration is 0.13% $(< 1\%)$.
- ▶ Make sure the results are reported in dry weight!

Cannabis Extractions (Processing)





Vermont Hemp Rules Cannabis Quality Control Program

- ▶ Testing for contaminants
 - ▶ Microbial- mold, fungus, bacteria, mycotoxins
 - ▶ Heavy Metals- not Metallica!
 - ▶ Pesticides
 - ▶ Residual Solvents

The program is currently designing the criteria:

- ▶ When to test/ which tests/ parameters/ “action” levels

Hemp Plants Contaminated with Mold



- ▶ Hemp plants with obvious signs of mold must not enter commerce

Vermont Hemp Rules Cannabis Quality Control Program



- ▶ Indoor growing environments can make crops more susceptible to mold and pest infestations. Visually inspect your plants before harvest.

Using a Certified Laboratory

- ▶ For a Certificate of Analysis (COA) to be official, it must be issued by a lab certified by the Vermont AAFM Hemp Program
- ▶ All other Certificates or Lab Reports are only reports. These reports are good for :
 - ▶ Monitoring crop CBD and THC levels
 - ▶ Estimation of potency or contaminant levels

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