

EIGHTH REVOLUTION

MONTHLY PLAYBOOK

CANNABIS & HEMP

PLATINUM



MARCH 2021

TABLE OF CONTENTS

MARCH 2021

CRIB NOTES 1

LETTER FROM THE TEAM 2

CHAPTER 1

REGULATIONS 4

 US States & Regulations 4

 International Regulations 5

 State Review: Virginia 6

 Who’s Legal & Who’s Not 7

CHAPTER 2

ECONOMIC CLIMATE 8

 Cannabinoid Search Trends Across the US 8

 Hemp Wholesale Pricing 9

 Emerging Cannabinoid Analysis 12

 Florida Cannabis Market Analysis 13

 Sector Market Analysis 14

CHAPTER 3

INDUSTRY 15

 Key Players Analysis 15

 Brand Focus: Saint Jane 16

CHAPTER 4

INFORMATION 17

 Hot in the News 17

 The ABCs of Cannabinoid Manufacturing 18





NOTICE

The information contained in this document is intended for the sole confidential use of the designated recipients and contains confidential information. This information can not be shared. If you have received this information in error, any review, dissemination, distribution or copying of this information is strictly prohibited. If you have received this information in error, please notify us immediately by telephone or email. Thank you.

**FOR QUESTIONS OR
MORE INFORMATION,
PLEASE CONTACT**

info@8threv.com

(516) 653-2006

www.eighthrevolution.com

DEAR READER,

We want to thank you for your trust, and most importantly, your time. With the endless amount of resources at your disposal, we appreciate you leaning on us as your guide through the muddy waters of this industry's limitless news and intelligence.

We at Eighth Revolution initially created this document to help our partners understand how their short-term decisions were having long-term effects on the success of their businesses. In an industry that changes as aggressively as ours, we can't stress the importance of effective decision making enough. Though the information in the report is never meant to dictate specific actions or guarantee certain outcomes, we hope that we're able to provide another voice in the room, one that illuminates, simplifies, and supports when the obstacles get harder to identify and infinitely more time consuming.

If you find one area more helpful than others and want us to expand on it, please never hesitate to reach out. For any suggestions or questions, we can be reached directly at bryan@8threv.com.

Welcome to the revolution.

Bryan Fields

CEO, CO-FOUNDER



Kellan Finney

CSO, CO-FOUNDER



MARCH 2020

A NOTE FROM YOUR PARTNERS

Though the trail may not be easy, we feel that the most rewarding endeavors are often the most difficult, and the cannabinoid space is the embodiment of that motto. This industry continues to move forward at a blistering pace, and M&As are becoming all the rage. We expect to see these types of deals throughout the end of Q1 and into Q2 this year as Curaleaf (CURLF) continues to keep an eye out for a strategic partner in California. We also anticipate seeing Delta-8 sales acting as a lifeboat for CBD companies looking to decrease inventory and generate alternative revenue streams. We believe that, if you're interested in expanding your revenue stream into the minor cannabinoid realm, you should do your due diligence and match the desire to expand with a well thought out five year plan. As always, if you're interested in entering the market, please feel free to reach out to our team for guidance.

— Kellan Finney

Education and patience will be key in a space that's likely to disrupt every major market. The cannabis stigma will slowly be lessened as society becomes educated on the various possibilities of the plant, especially once a cannabinoid product replaces your after-work glass of wine or a CBD/CBG tablet blend replaces your Advil. The recent progress in the space has helped those in the industry become reinvigorated from it's renewed potential, and in these moments, it's critical to realize how far we've come. We still have a long, winding path to navigate, but I know we're going to get there.

— Bryan Fields



“ THE NET IMPACT
OF THE
280E REMOVAL
WILL BE
SIGNIFICANT ”¹

- JEFF SCHULTZ
PARTNER AT FEUERSTEIN KULICK



CRIB NOTES

MARCH 2021 TAKEAWAY:

“The net impact of the 280E removal will be significant.”

- JEFF SCHULTZ
PARTNER AT FEUERSTEIN KULICK

New Jersey gets it done and signs the bill to legalize.

Virginia will become the 16th state to legalize cannabis and the 3rd state to do it through the legislative process.

Jamaica has a shortage of cannabis flower. 2021 is keeping us on our toes with its never-ending surprises.

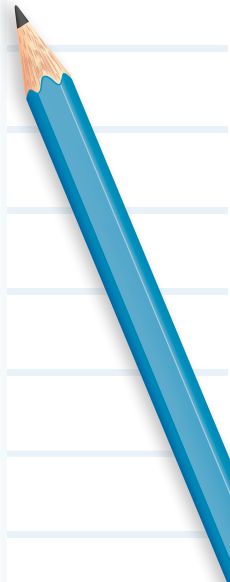
M&As heat up as Jazz Pharmaceuticals announces their plans to buy GW Pharmaceuticals for \$7.2 billion.

Chris Webber and Jason Wild Launch \$100 million equity cannabis fund.

Is Clubhouse going to replace industry trade shows? Cannabis has some really valuable “rooms.”

Did you know?

Google search interest for “weed stocks” is at its highest point in the last five years, with Delaware coming in at number one by total number of searches. Does this have any correlation with its cannabis-friendly tax laws?



LETTER FROM THE TEAM

The pandemic continues on, and so does the society’s lack of knowledge regarding the cannabinoid industry. Despite the fact that the cannabis sector is one of the hottest growing industries in the world, there’s a distinct shortage of understanding regarding the basics of cannabinoids and the major players in this industry. In an effort to shed some light upon the complexities of the space, an online group called the #MSOGang has taken it upon themselves to educate the public by discussing the major players currently dominating the industry, the differences between them, and the strategy behind their decisions.²

surge of M&As, companies expanding their reach both domestically and internationally, and the tentative curiosity of outside brands (think Budweiser and Johnson & Johnson).



[A]n online group called the #MSOGang has taken it upon themselves to educate the public

What you may not have recognized is that there’s a massive difference between these companies and the roles they play, though they’ve all come to meet in the middle in the cannabinoid market. Each company’s distinct positioning means that everything they do, from operations to strategy to valuations, is unique. While this is inarguably the result of a variety of different factors like cash flow and vertical integration, a large part of it stem from simple geography.

Unless you’ve been living under a rock, you’ve heard about the massive growth in the cannabis sector; there’s been a

Canadian LPs and US MSOs operate very differently, and though the cannabis



industry is often viewed as one large entity, it's actually a fractured set of micro-industries all operating under the same moniker. While Canada officially legalized the plant and its subsequent products in 2018 federal legalization in the US is still operating on an indeterminate timeline, with some states still actively arresting people for cannabis related offenses.³ Knowing this, it's always perplexing to see prominent networks like CNBC invite US leadership to comment on the state of the industry while posting tickers from Canadian LPs.



Jim Cramer  @jimcramer · Feb 11

Look there are about a dozen cannabis companies that just doubled or tripled. Move on to something else.

 494

 247

 3.7K



Jason Wild  @JasonGWild · Feb 11

I'm a big fan of William O'Neal (IBD) and his research indicates that the stocks that have the best relative strength, are the best ones to buy going forward.(as long as fundamentals are good) To IBD doubling or tripling is a qualifier not a disqualifier. Bottom of the 1st here!

 4

 4

 66



Though this may not seem like a monumental offense, this blatant disconnect demonstrates a lack of understanding from those outside the industry. Canadian LPs not only have limited exposure to US markets, but also a smaller total addressable market.⁴ Additionally, these companies are traded on major exchanges whereas their US counterparts are restricted to OTC trading. The main difference, however, is the inability of institutional investors to invest in OTC companies.⁵ While this is likely a short-lived issue as the US MSOs are in the process of uplisting, the news networks' flawed understanding of the

intricacies of the global cannabinoid market only serves to further confuse the general public. Internet groups like the #MSOGang have been key to correcting these errors and spreading accurate, actionable information.

The cannabinoid industry is still in its early stages, and as Jason Wild, Chairman of TerrAscend, wrote, we're in the "[b]ottom of the 1st here!" As we continue on this long path toward federal legalization and mass adoption, it's vital that we keep pushing for education so that we may, as a society, unlock the true potential of the plant.

Tweet retrieved from the Twitter of Jason Wild. Please see reference 6 at the end of the report for a direct link.



DOMESTIC NEWS



Marijuana Delivery Services Added To New York Governor's Revised Legalization Proposal

"The governor of New York on Tuesday revealed details of [an amended budget plan to legalize marijuana](#), with new provisions to allow cannabis delivery services and a refined approach to penalties for unlawful sales."

Delaware doubles number of medical cannabis licensees

"Delaware [increased the number of medical cannabis business licensees from three to six](#), a reflection on medical cannabis card registrations soaring nearly 40% last year over 2019."

Virginia Lawmakers Pass Marijuana Legalization Bills

"Virginia's General Assembly voted Friday to [legalize marijuana in the state](#), with a plan in place to open dispensaries beginning in 2024."



INTERNATIONAL *REGULATIONS*

JAMAICA



“Heavy rains followed by an extended drought, an increase in local consumption and a drop in the number of marijuana farmers have caused a shortage in the island’s famed but largely illegal market that experts say is the worst they’ve seen. “It’s a cultural...”

SWITZERLAND



“A model project for the legal distribution of cannabis will start in Switzerland in 2022. Adults aged 18 and over should be able to buy cannabis in pharmacies from next year. The Federal Office of Public Health enables several corresponding projects in Zurich...”

FRANCE

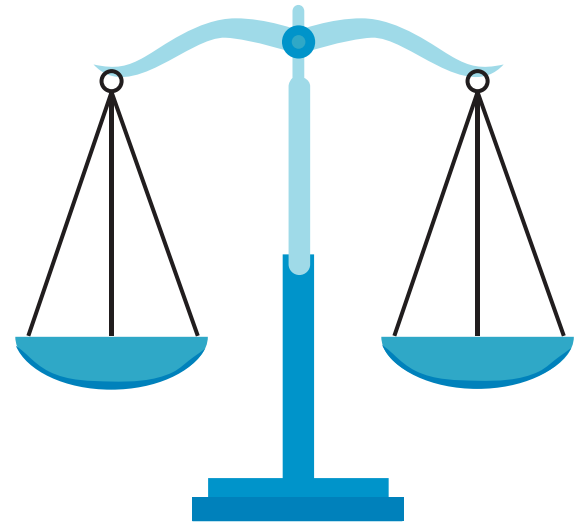


“France has bowed to the inevitable. After several years of promises about normalizing the discussion and failing to do so, and further in direct contrast to its German, Dutch, Danish, and even Swiss and Spanish neighbours, the country has finally caved in...”



VIRGINIA CANNABIS LAW

On Friday, Feb. 5, 2021, both the Virginia House of Delegates and the Senate of Virginia passed legislation that would allow the sale of recreational cannabis within the state. While the two entities passed separate bills, each of them created an oversight committee, proposed the automatic expungement of misdemeanor cannabis offenses from criminal records on July 1, 2021 and stipulated that legal cannabis sales would not start until Jan. 1, 2024. In order to move forward with the legalization process, both chambers have to review and vote on the same bill. If it passes, it then heads to Gov. Ralph Northam's desk where he will sign it into law.⁷ It's important to note that localities could decide not to allow the sale of recreational cannabis even if the bill passes in the Virginia Senate.⁸ In other words, while cannabis will eventually be legal state wide, individual localities can opt out of selling it if they so choose.



“

Our commonwealth's prohibition on cannabis has clearly failed... We've had hundreds of thousands of Virginians branded as criminals and disadvantaged in various ways, and **the war on marijuana has disproportionately targeted and impacted Virginia's communities of color.**⁹

- SEN. ADAM EBBIN (D-ALEXANDRIA)

SPONSOR OF THE BILL IN THE SENATE WITH SEN. LOUISE LUCAS (D-PORTSMOUTH)

THE MEANING

According to a report released by the Joint Legislative Audit & Review Commission, the legal cannabis industry in Virginia is expected to draw in about \$300 million in tax revenue within five years. They also claim that this industry could create more than 11,000 jobs and reduce arrests in the state by 84%.¹⁰ Some Senators, like Sen. Adam Ebbin, believe that the passage of a legalization bill will begin the process of reforming the criminal justice system, and begin the complicated process of unravelling the issues that have been caused by prohibition.¹¹

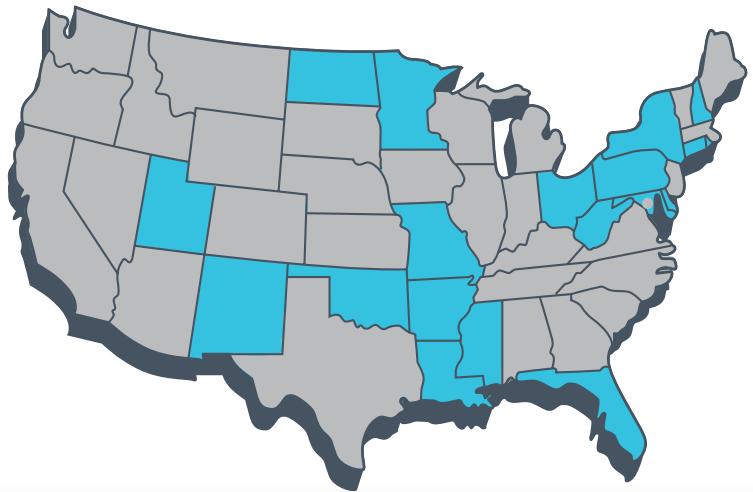
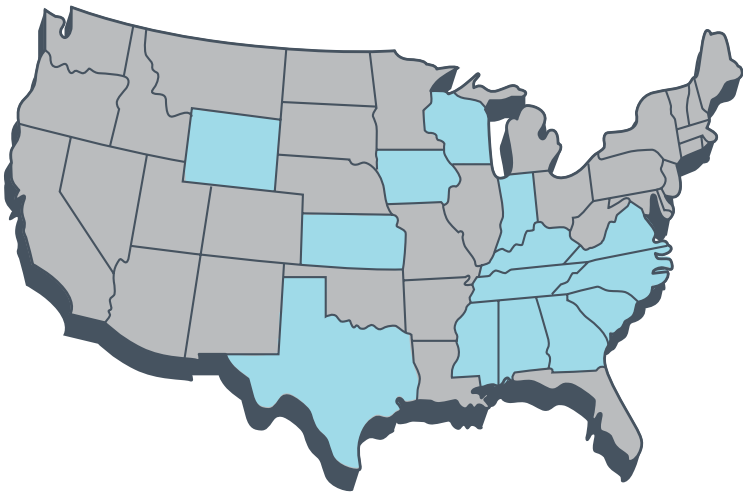
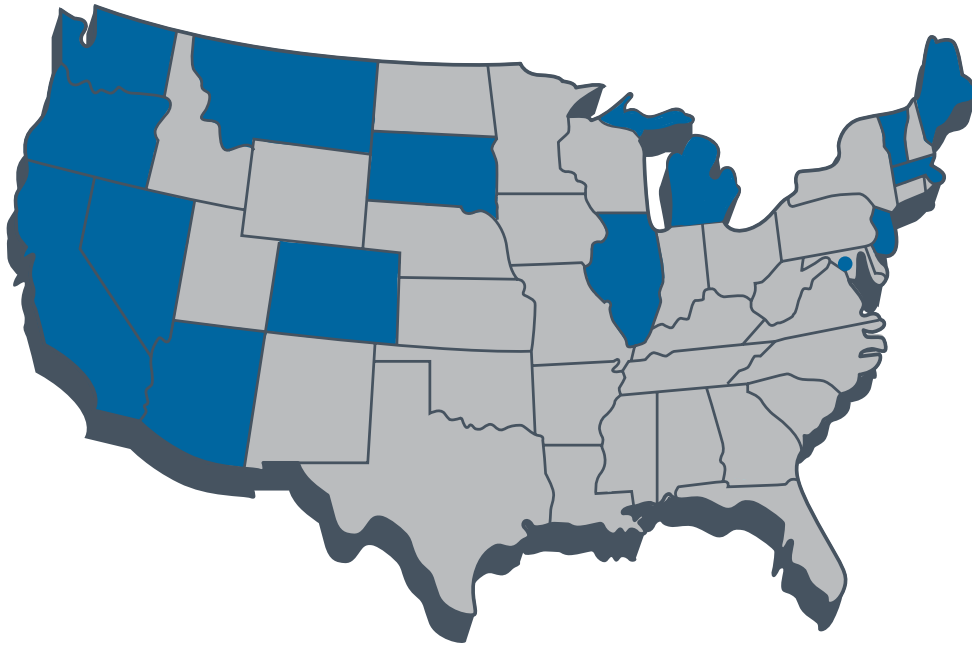


LEGALITY OF CANNABIS *IN THE UNITED STATES*



DID YOU NOTICE?

We've added some new brothers and sisters to our growing family!



RECREATIONAL



MEDICALLY LEGAL
WITH LIMITED THC



MEDICALLY LEGAL

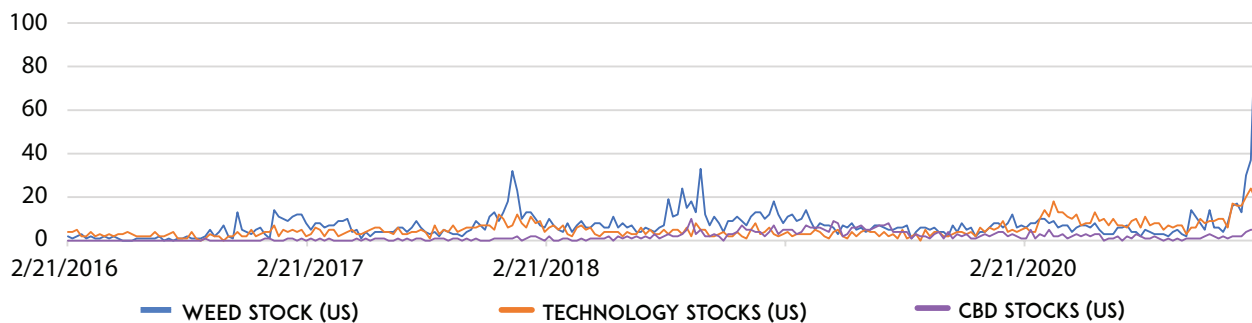


CANNABINOID SEARCH TRENDS ACROSS THE US

SEARCH POPULARITY OF STOCKS

The technology sector has dominated American economics for the last ten years. As Big Tech continues to expand its footprint, we wanted to compare the general public’s interest in cannabis stocks to their interest in technology stocks. The trend observed below is signaling a cultural shift in American society, as many Americans are now actively searching for cannabis/weed companies to invest in at a significantly higher rate than technology stocks.

INVESTING CATEGORIES IN THE PAST 5 YEARS

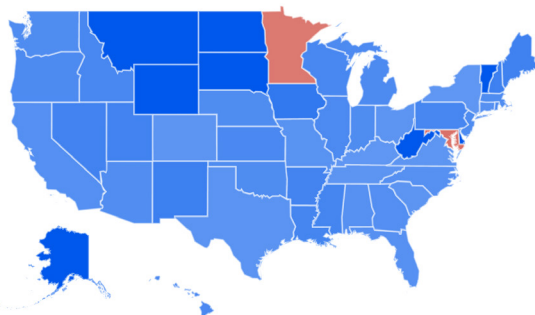


NOTE:
 Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there was not enough data for this term.

The surprising factor from the data above illuminates the general public’s lack of understanding that most CBD companies are grouped into the same category as cannabis companies from a listing standpoint.¹² Additionally, most major multi-state operators (MSOs) in the cannabis industry have robust hemp (CBD) footprints.

SEARCH INTEREST FOR WEED STOCKS IN THE PAST YEARS

NOTE:
 Color intensity represents percentage of searches



INTEREST FOR WEED STOCKS

- 1 Delaware
- 2 Alaska
- 3 North Dakota
- 4 Vermont

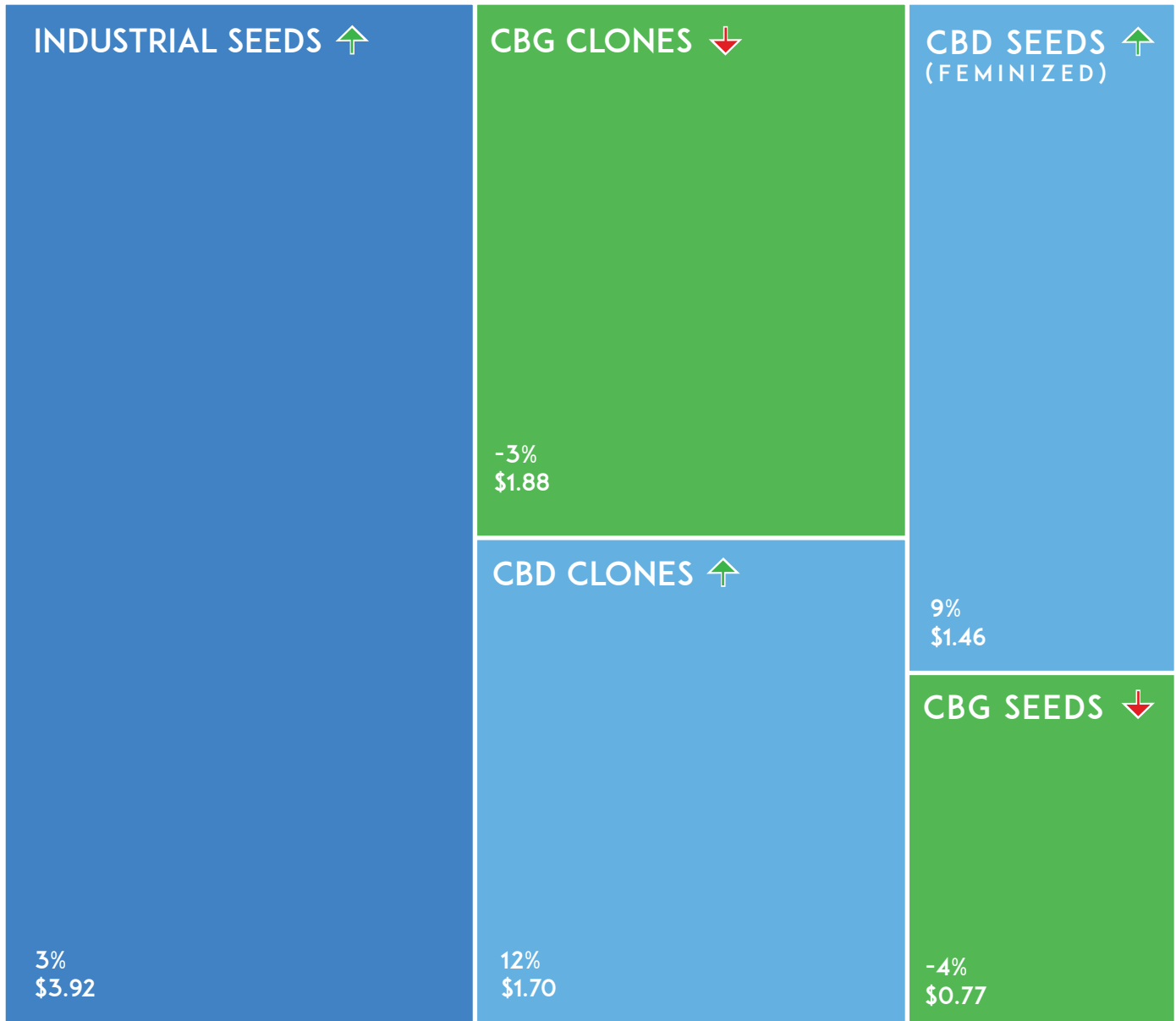
● Weed stocks ● Technology stocks ● CBD stocks

Take Curaleaf for example: they have Select, which is a multi-state cannabis brand, and they also operate Select CBD. Because these brands use hemp as the starting material instead of cannabis, they both utilize the same IP. According to Google Trends, the people of Delaware seem to have the most interest in finding cannabis/weed companies to invest in.¹²



WHOLESALE DATA

WHOLESALE HEMP GENETICS PRICING



NOTE:

The percentage refers to the specified product's price change from the last month.
The dollar amount refers to the price of the product in \$ / unit.

CBG seeds and clones were the only products from the genetics category that decreased from last month.¹³ Industrial seeds continue to gain interest from traditional agricultural sectors which is indicated by the 3.0% price increase. Jumps in CBD seeds and clones are expected as planting season approaches.



WHOLESALE HEMP BIOMASS PRICING

<p>CBG BIOMASS (AGGREGATE) ↓</p> <p>-0.23% \$1.19</p>	<p>CBD BIOMASS (AGGREGATE)</p> <p>0% \$0.53</p>	<p>CBD BIOMASS ↓ (25K - 100K LBS)</p> <p>-0.02% \$0.50</p>
<p>CBD BIOMASS ↓ (0 - 25K LBS)</p> <p>-0.01% \$0.70</p>	<p>CBD BIOMASS ↓ (100K - 1M LBS)</p> <p>-0.11% \$0.32</p>	<p>CBD BIOMASS ↓ (1M+ LBS)</p> <p>-0.09% \$0.21</p>

NOTE:

The percentage refers to the specified product's price change from the last month.
The dollar amount refers to the price of the product in \$ / % CBD / pound.

Every product in the biomass category experienced a slight decrease in price with larger lots seeing the largest dip.¹³ Lots over 100K lbs. and over 1M lbs. saw 11% and 9% price drops, respectively, from last month. However, these large percent decreases can be misleading, as these products only dropped \$0.04 and \$0.02 per % CBD / lbs. We continue to advise our clients to enter into agreements for larger lots while the low prices persist.



WHOLESALE HEMP DERIVATIVE PRICING

<p>CBG ISOLATE ↓</p> <p>-9% \$1,846</p>	<p>DISTILLATE ↓ (THC FREE)</p> <p>-7% \$1,252</p>	<p>CBD ISOLATE ↓</p> <p>-22% \$547</p>
<p>CBG DISTILLATE ↓</p> <p>-2% \$1,383</p>	<p>REFINED HEMP OIL ↓ (AGGREGATE)</p> <p>-7% \$894</p>	<p>DISTILLATE ↓ (FULL SPECTRUM)</p> <p>-10% \$525</p>
	<p>DISTILLATE ↓ (BROAD SPECTRUM)</p> <p>-7% \$822</p>	<p>CRUDE HEMP OIL ↓</p> <p>-12% \$198</p>

NOTE:
 The percentage refers to the specified product's price change from the last month.
 The dollar amount refers to the price of the product in \$ / kilo.

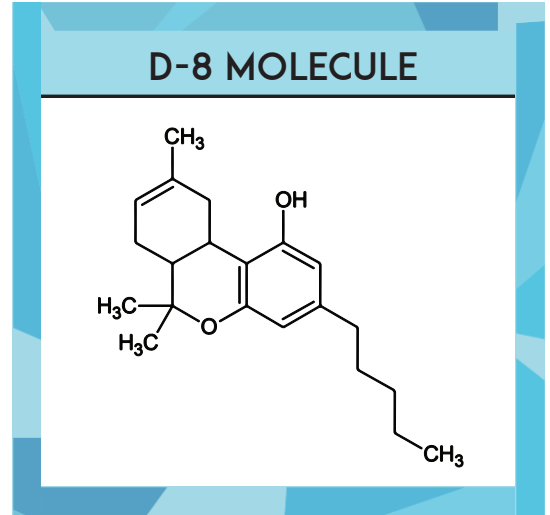
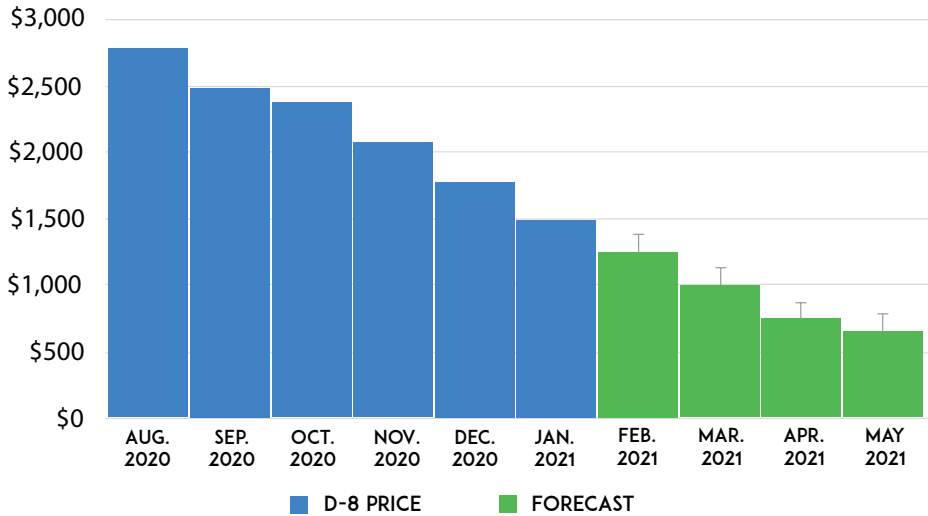
The derivative market saw the largest change from last month. Every product in the category decreased in price with CBD isolate experiencing a 22% price decrease from February.¹³ The other important trend we've been observing is the steady decline in CBG prices from distillate to isolate. They still continue to be the highest value products from the derivative market, which has experienced an 84% price drop since January of 2020 when the average price per kilo was ~\$10,000 compared to the ~\$1,400 it is today.



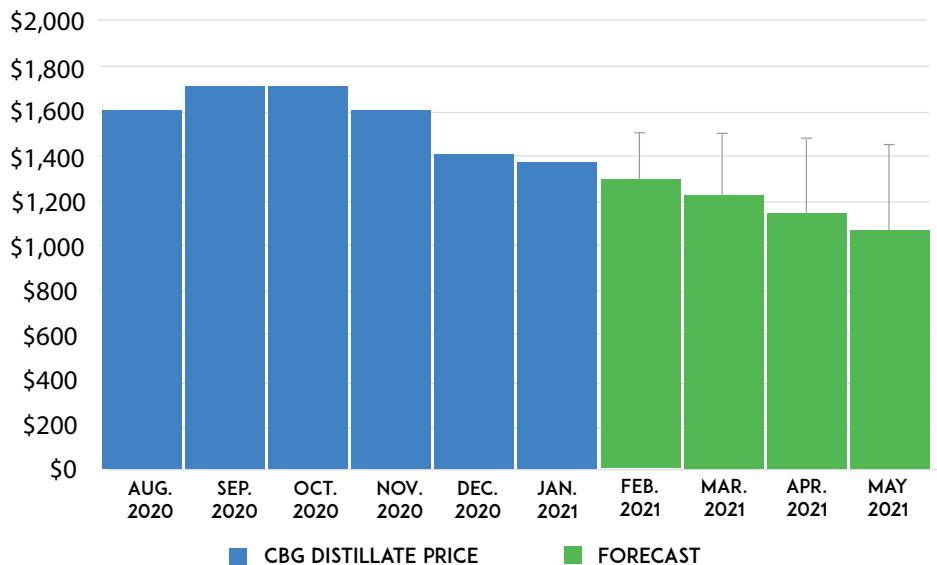
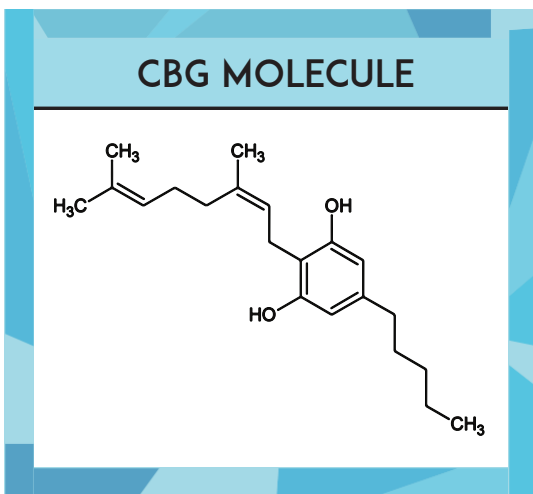
DELTA-8 VS CBG

WHICH CANNABINOID SHOULD YOU FOCUS ON?

Delta-8-THC has burst onto the scene over the past 6 months, much like CBG did from 2019 into 2020 and CBD did from 2018 to 2019. There's been significant concern regarding the legality and safety of the Delta-8 products currently available on the market.



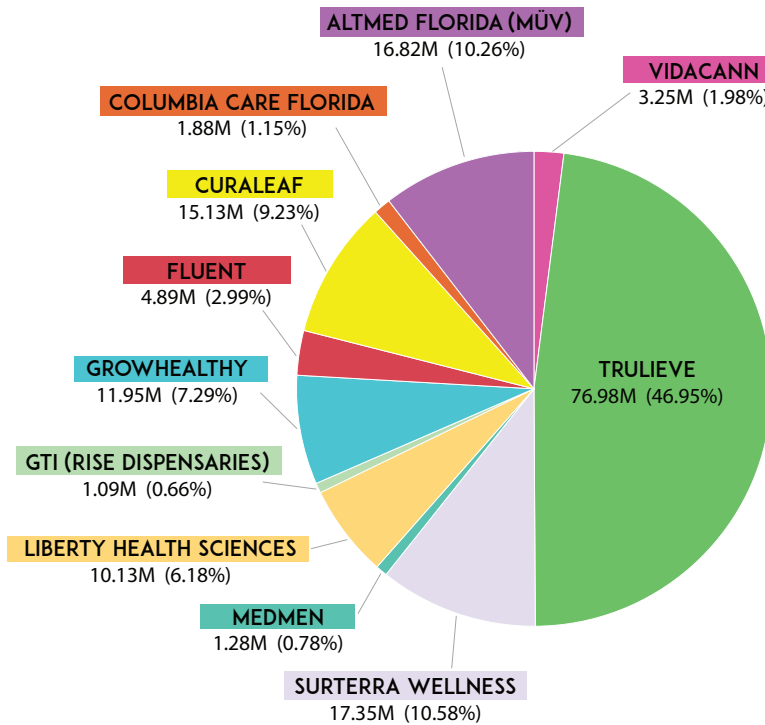
Regardless of the safety issues, this has been one of the fastest growing product sectors and continues to generate much needed sales for struggling manufactures. Below is a comparison of CBG distillate pricing and Delta-8 distillate pricing, both of which are currently hovering around \$1500/kilo.¹³ Based on our models, we believe that investing in CBG biomass will be a better long-term decision than investing in the new equipment and intellectual property needed to enter the Delta-8 market. Historical data around CBG pricing also suggests that the CBG market is stabilizing.



FLORIDA CANNABIS MARKET AT A GLANCE

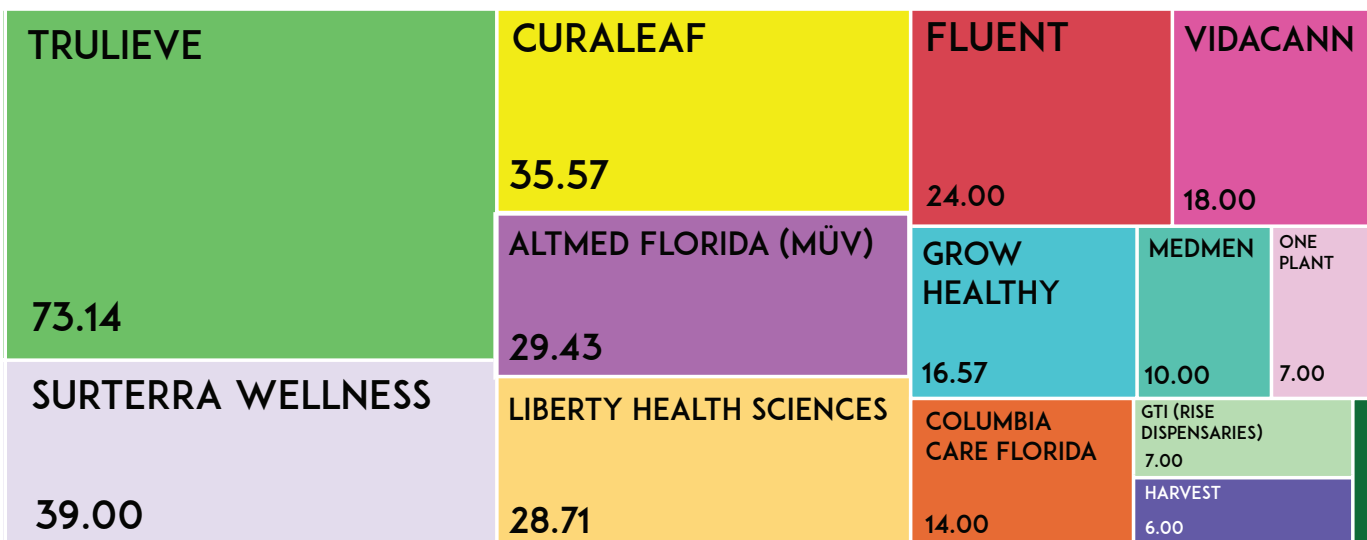
Cannabis and hemp industries continue to parallel each other on many fronts, which is why we believe it's important to be aware of the stronger cannabis markets as they could be the best areas for growth for CBD processors. This month, we wanted to highlight Florida.

INVENTORY OF MG OF THC FROM EACH LICENSE HOLDER



Florida has the third largest population of any state with ~20 million people, a number that's said to be increasing by 1,000 every day, and financial institutes are rushing to set up shop in this very lucrative state.¹⁴ From the cannabinoid market stance, multiple MSOs have entered the state this year alone. Currently, the state is dominated by Trulieve who holds around 50% of the total available inventory based on OMMU data.¹⁴ Furthermore, they have twice as many retail dispensaries than the next largest competitor. Additional players in Florida include Surterra Wellness, Curaleaf, and AltMed Florida, each with ~10% of the market.

AVERAGE NUMBER OF DISPENSARIES BY LICENSE HOLDER



SECTOR ANALYSIS*

INDICES	3 MONTH	6 MONTH
S&P 500	14.70%	19.12%
DOW JONES	4.17%	12.22%
NASDAQ	8.99%	20.70%
GLOBAL CANNABIS INDEX	110.60%	122.60%
AMERICAN CANNABIS STOCK INDEX	112.98%	156.64%



EIGHTH TAKE

“ Institutional investors are waking up to the great American cannabis growth story¹⁵

- BEN KOVLER

FOUNDER AND CEO OF GREEN THUMB INDUSTRIES

*This text expresses the opinion solely of the writer. The thoughts expressed are independently formed and the writer is not compensated by any third party.

SECTOR	3 MONTH	6 MONTH
HEALTHCARE	15.80%	13.17%
TECHNOLOGY	24.07%	36.85%
INDUSTRIALS	15.05%	29.15%
FINANCIALS	21.28%	33.10%
CONSUMER CYCLICAL	26.40%	46.44%
CONSUMER NON-CYCLICAL	3.04%	12.45%
BASIC MATERIALS	21.86%	32.88%
ENERGY	41.76%	41.64%
UTILITIES	-0.86%	9.11%
ALTERNATIVE HARVEST ETF (MJ)	80.84%	97.90%
MULTI- STATE OPERATORS (MSOS)	68.70%	107.10%

*Information retrieved from NCV and E*trade.



KEY PLAYERS & STOCKS



“U.S. companies are overlooked by many investors. But any state and federal legalization favors them over Canadian rivals, fund managers say.”¹⁶

1. TERRASCEND



TRSSF

TerrAscend finished out Q4 strong, reporting net sales of \$65 million and a 152% increase in year-over-year sales.¹⁷ 2021 is projected to be just as successful as the company continues their expansion into New Jersey and Maryland. As more and more states come online (we’re looking at you, New York), TerrAscend will have advantageously positioned themselves as the tidal wave of newcomers and profit-hungry industry veterans fight for a piece of the new market share.

2. GREEN THUMBS INDUSTRIES INC.



GTBIF

Green Thumbs Industries is getting ready to make some strategic purchases, evidenced by their decision to sell 1.6 million of their subordinate voting shares at \$35.50 a share.¹⁸ Citing investor demand as the chief motivator for their February 23rd sale (one that comes on the heels of its February 9th sale), Green Thumbs is optimistic for US cannabis reform and is actively awaiting the moment where US companies can trade on US exchanges.

3. RED WHITE & BLOOM BRANDS INC.



RWBYF

Red White & Bloom’s (RWB) subsidiary, Platinum Vape (Platinum), has officially received regulatory approval for their expansion into Arizona.¹⁹ Striving to become a household name, RWB has announced its intention to use Platinum as a way to further its reach into a number of widespread markets across the US, all while continuing to deepen and strengthen their vertical expansion.



BRAND SPOTLIGHT: SAINT JANE



While many have tried to market their CBD products as mainstream goods, sometimes, over accessibility can have a negative effect on consumers' perception of your brand. Think of a Hershey bar; not only can you find it in hotels or Target, but also in every gas station, bodega, and rest stop in America. Its widespread availability and affordable price has unquestionably contributed to its massive success, but it's also made it an unexciting, bland option for many customers.

Now, think of Godiva chocolate, a brand that's still accessible but much more limited in their in-store distribution. While it won't garner the sheer number of sales that Hershey does, the people purchasing it will most likely be entirely different types of consumers. Rather than a bored buyer looking to quickly and cheaply satisfy his sweet tooth, the Godiva customer is a loyal purchaser that's dedicated to quality.

Don't skimp on the product experience.

If you're going to go the route of quality over quantity (which we suggest you do), entice the user by creating luxe packaging and boxing. If your price point is already over \$100, it's doubtful that the consumer will be deterred by an extra \$5 to \$10 that can be used to elevate your product's look which will, in turn, spur more sales. Saint Jane Beauty has leaned into the image of luxury by using matte bottling with a chic, metal label. While reportedly providing excellent results, the company's darkly feminine imagery present in their branding and products have made them a shoo-in to be featured in publications like The New York Times, Forbes, Popsugar, and Allure.



This situation is exactly how the cannabinoid space has and will continue to work. Though there are industry titans that continue to set the standard for what is acceptable, soon enough, these conglomerates will become the Hershey of the industry; safe, but utterly boring. Smaller, elite brands like Saint Jane Beauty will successfully operate in the gaps left by these giants, and as the market continues to stabilize, more and more consumers will turn toward these smaller, luxury businesses.

Visit Saint Jane at saintjanebeauty.com





HOT IN THE NEWS

A HEXO Corp. to
acquire Zenabis

Global Inc.

B NEW JERSEY
LEGALIZES CANNABIS
AFTER YEARS OF
FAILED EFFORTS
AND TOXIC
NEGOTIATIONS

C GOVERNOR CUOMO ANNOUNCES
THE NEW YORK STATE DEPARTMENT
OF HEALTH'S CANNABINOID HEMP
PROGRAM NOW ACCEPTING
LICENSE APPLICATIONS

D CHEWING GUM BILLIONAIRE
BEAU WRIGLEY TO TAKE
CANNABIS COMPANY
PUBLIC THROUGH
SPAC DEAL

E Chris Webber and JW Asset
Management
Team Up to Launch
\$100 Million Cannabis
Impact Fund

G "Jazz Pharmaceuticals' planned
\$7.2 billion takeover of United
Kingdom-based GW Pharmaceuticals
could kick off a wave of
deal-making between pharma and
medical cannabis companies,
analysts and industry
sources say."

F TENNESSEE BILL WOULD
FORM MEDICAL
CANNABIS
COMMISSION IF FEDERAL
REFORMS ENACTED

The



of cannabinoid manufacturing

In the world of manufacturing, things move quickly. The manufacturer's goal is to manufacture their product with the target quality in the proper quantity with as little waste possible. Many manufacturing outlets will do their quality control before a process starts and after the process ends, but *what about while something is being created?*

Welcome to The *ABCs* of cannabinoid manufacturing

Provided to you by
Helma[®]

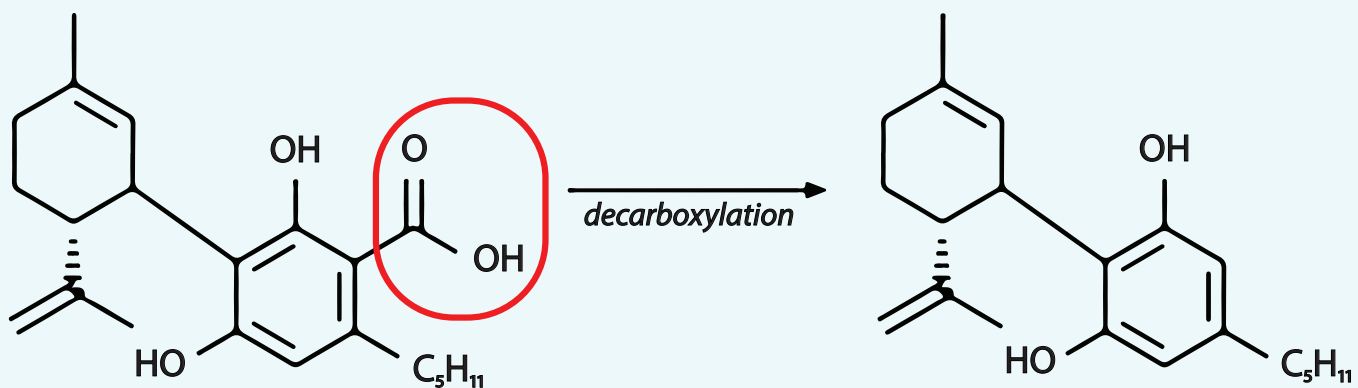
CANNABIS MANUFACTURING FOR THE 21ST CENTURY

Part 4: Chemical Difficulties of Cannabis

The general product types used to be bud, oil and tinctures. Today, they are further separated into flower, extract, ingestible, tinctures, edibles, sublinguals, and topicals. Flower is still the most-used format although extracts are expected to have the most growth over the next decade. Currently, cannabis is defined by the two most common active ingredients: tetrahydrocannabinol (THC, psychoactive) and cannabidiol (CBD, non-psychoactive). However, there is a plethora of other cannabinoids, the chemical compounds in cannabis, not to mention terpenes as well as flavinoids.

FIGURE 1

THE DECARBOXYLATION OF CBDA TO CBA[4]



Note: The Carboxyl group being removed is circled.

Problems can begin to arise since the science of understanding how the diverse array of cannabinoids interact, individually and in concert, with the body is still in its fledgling stages. As research continues to explode in this area, growers and manufacturers are looking for new ways to improve the efficiency of their processes while being able to control the various cannabinoids in the proper concentrations.

The cannabis plant has over 400 chemical molecules and at least 60 of those are cannabinoids, chemicals unique to the plant. [1] [2] [3]. In the plant, cannabinoids are synthesized (made) and stored as cannabinoid acids. When dried, stored, and heated, the acid group (-COOH) comes off and we get the compounds that we are used to thinking about: CBD and THC. (see Figure 1)

While drying and storing allows partial decarboxylation, heating allows full conversion rates. However, the cannabinoids and the terpenes begin to break down over 300°F, which can be avoided if a lower heat is applied over time. Thus, most conversion happens over time in temperatures just over 200°F. A list of several known major cannabinoids is shown on the next page. [5]



CANNABIS MANUFACTURING FOR THE 21ST CENTURY

Part 4: Chemical Difficulties of Cannabis (continued)

- Tetrahydrocannabinol (THC)
 - o Delta-8-tetrahydrocannabinol Δ^8 -THC (or d-8-THC)
 - o Delta-9-tetrahydrocannabinol Δ^9 -THC (or d-9-THC) (most common)
- Cannabidiol (CBD)
- Cannabigerol (CBG)
- Cannabichromene (CBC)
- Cannibonol (CBN)
- Cannabinodiol (CBDL)
- Cannabidivarin (CBDV)
- Tetrahydrocannabivarin (THCV)
- Cannabigerivarin (CBGV)
- Cannabichromevarin (CBCV)

There are also over 100 known naturally occurring non-cannabinoid terpenes, the aromatic components, in cannabis. [1] [2] [3]. Research has shown that cannabinoids and terpenes work together, though the mechanism is still not fully understood. Common terpenes in cannabis include myrcene (mango), limonene (lemon), pinene (pine tree), linalool (lavender), caryophyllene (black pepper and cinnamon), humulene (hops, basil, clove). Myrcene is the primary terpene in cannabis plants and responsible for its distinctive aroma. [3]. However, pot-smelling canines are trained to detect β -caryophyllene. For many growers, they cultivate certain strains with known concentrations of various terpenes to create unique odors for their products. Many manufacturers buy custom blends made from botanically derived terpenes. [8]

By extracting and separating the various compounds, especially the CBD and THC, the manufacturers can use analytical methods, such as spectroscopy, to quantitatively measure their compounds and control the actual concentrations of the active compounds in their products, and the manufacturers can precisely control the concentrations of their products including oils, edibles, etc. Difficulty arises in spectroscopy as many of the compounds are similar and thus will give similar spectra. As mentioned previously, statistical models are used to help differentiate the compounds to help enable real-time spectroscopic monitoring of the compounds of interest.

MISSED PART THREE?

CATCH UP

An expanded version of this article installment is available upon request.

Hellma USA, Inc has been serving the U.S. markets in spectroscopic accessories for over 50 years. They specialize in quartz manufacturing for the lab and probes for the process. Dr. Carrier earned her Ph.D. from University of Wisconsin – Madison in Physical Chemistry specializing in Spectroscopic techniques to monitor chemical reactions.



REFERENCES

1. Schultz, Jeff. Interview with Todd Harrison. Cannabis Confidential Interview. Clubhouse, February 18, 2021. <https://www.joinclubhouse.com/event/PG2ZdXzv>.
2. Kary, Tiffany. "Cannabis CEOs, Targeted by Reddit, Push Back in Tweet Storm." Bloomberg. Last modified February 12, 2021. <https://www.bloomberg.com/news/articles/2021-02-12/cannabis-execs-targeted-by-reddit-push-back-in-tweet-storm>.
3. Simon, Darran, and Nicole Chavez. "Canada just legalized recreational pot. Here's what you need to know." CNN Health. Last modified October 17, 2018. <https://www.cnn.com/2018/10/17/health/canada-legalizes-recreational-marijuana/index.html>.
4. Burton, James. "How well can Canadian LPs capture U.S. pot market?." Wealth Professional. Last modified October 26, 2020. <https://www.wealthprofessional.ca/investments/etfs/how-well-can-canadian-lps-capture-u.s.-pot-market/334556>.
5. Picardo, Elvis. "Who Actually Trades or Invests in Penny Stocks?." Investopedia. Last modified June 25, 2019. <https://www.investopedia.com/articles/active-trading/083115/who-actually-trades-or-invests-penny-stocks.asp>.
6. Wild, Jason. Twitter Post. February 11, 2021, 5:38 PM. <https://twitter.com/JasonGWild/status/1359995209979998210>
7. Kennett, Lindsey. "What happens now that marijuana is almost legal in Virginia." WSLs 10 News. Last modified February 8, 2021. <https://www.wsls.com/news/local/2021/02/09/what-happens-now-that-marijuana-is-almost-legal-in-virginia/>.
8. McComsey, Hannah. "Lawmakers debate whether Va. localities could opt out of legal marijuana sales." WSET ABC13News. Last modified February 10, 2021. <https://wset.com/news/local/virginia-house-senate-discuss-details-of-marijuana-legalization>.
9. Oliver, Ned. "Virginia lawmakers vote to legalize marijuana, but House and Senate still have to agree on details." NBC12 . Last modified February 8, 2021. <https://www.nbc12.com/2021/02/08/virginia-lawmakers-vote-legalize-marijuana-house-senate-still-have-agree-details/>.
10. Iannelli, Nick. "Legalizing pot could bring Virginia \$300 million in tax revenue." WTOP News. Last modified November 17, 2020. <https://wtop.com/virginia/2020/11/legalizing-pot-could-bring-va-300-million-in-tax-revenue/>.



11. Jaeger, Kyle. "Virginia Legislature Approves Marijuana Legalization Bills On Key Mid-Session Deadline." Marijuana Moment. Last modified February 5, 2021. <https://www.marijuanamoment.net/virginia-house-approves-marijuana-legalization-bill-with-senate-vote-coming-soon/>.
12. "Data source: Google Trends ("https://trends.google.com/trends/explore?date=2016-02-21%202021-02-22&geo=US&q=Weed%20stocks,Technology%20Stocks,CBD%20Stocks).
13. U.S Wholesale Hemp Price Benchmarks - January 2020. PDF file. December 5, 2020. www.hempbenchmarks.com
14. The Florida Department of Health Office of Medical Marijuana Use (OMMU). <https://knowthefactsmmj.com/>.
15. Green Thumb Industries. "Green Thumb Industries Announces Initial Public Offering in the U.S. to Raise US\$100,000,000." Yahoo Finance. Last modified February 9, 2021. <https://finance.yahoo.com/news/green-thumb-industries-announces-initial-120000400.html>.
16. van Doorn, Philip. "If you want to get rich with marijuana stocks, you need to know the crucial difference between U.S. and Canadian companies." MarketWatch. Last modified February 23, 2021. <https://www.marketwatch.com/story/if-you-want-to-get-rich-with-marijuana-stocks-you-need-to-know-the-crucial-difference-between-u-s-and-canadian-companies-11613658205>.
17. Waddell, Nick. "Buy TerrAscend for US cannabis exposure, says Clarus Securities." Cantech Letter. Last modified February 21, 2021. <https://www.cantechletter.com/2021/02/buy-terrascent-for-us-cannabis-exposure-says-clarus-securities/>.
18. Linnane, Ciara. "Cannabis company Green Thumb Industries raises \$56 million by selling 1.6 million shares." MarketWatch. Last modified February 23, 2021. <https://www.marketwatch.com/story/cannabis-company-green-thumb-industries-raises-56-million-by-selling-16-million-shares-2021-02-23>.
19. Red White & Bloom Brands Inc. "Red White & Bloom's Platinum Gets Nod for Launch in Arizona." Yahoo Finance. Last modified February 19, 2021. <https://finance.yahoo.com/news/red-white-bloom-platinum-gets-120000309.html>.



REFERENCES

The *ABCs* of cannabinoid manufacturing

1. Z. Atakan, "Cannibis, a complex plant: different compounds and different effect on individuals," Therapeutic Advanced in Psychopharmacology, vol. 2, no. 6, pp. 241-254, December 2012.
2. National Cannabis Prevention and Information Centre, "Cannabinoids," Alcohol Drug & Abuse Center / University of Washington, 2013.
3. M. Jacobs, "The Difference Between Cannaboids and Terpenes," February 2020 2019. [Online]. Available: <https://www.analyticalcannabis.com/articles/the-difference-between-cannabinoids-and-terpenes-311502>.
4. A. Beadle, "CBDA Vs CBD: What are the Differences?," 18 October 2019. [Online]. Available: <https://www.analyticalcannabis.com/articles/cbda-vs-cbd-what-are-the-differences-312019#:~:text=Once%20CBDA%20has%20been%20formed,lose%20its%20acidic%20carboxyl%20group>.
5. Way of Leaf, "top 10 Cannabinoids: What Are They and What Do They Do," Way of Leaf, 28 January 2020. [Online]. Available: <https://wayofleaf.com/education/top-cannabinoids-and-what-they-do>.
6. K. Holland, "CBD vs. THC: What's the Difference?," 20 July 2020. [Online]. Available: <https://www.healthline.com/health/cbd-vs-thc#medical-benefits>.
7. M. Dingman, "Neuroscientifically Challenged," 7 July 2017. [Online]. Available: <https://www.neuroscientificallychallenged.com/>.
8. E. Friedmann, Interviewee, Internal Company Cannabis Discussions. [Interview]. 8 September 2020.





DISCLAIMER

The information contained in this document should not be relied on as the basis for any decision or action. It is general advice only and you should exercise your own independent skill and judgement. In some cases, the material in this document may incorporate or summarize information or recommendations of third parties or comprise materials contributed by third parties (*'third party material'*). Such third party material is assembled in good faith, but does not necessarily reflect the considered views of Eighth Revolution or indicate a commitment to a particular course of action.

We make every effort to ensure that links included in this document are kept up-to-date. The accuracy of the links is dependent upon the owners of those sites letting us know of any changes. If you find a link that does not work, please contact us by emailing info@8threv.com.

To the extent permitted by law, Eighth Revolution and its employees and agents are not liable for any loss or damage arising from the use of, or reliance on, the material contained in this document whether or not caused by a negligent act or omission.

You obtain access to this document at your own risk, and Eighth Revolution accepts no responsibility for any interference, loss, damage, or disruption to your own computer system which arises in connection with your use of the document or any linked website. You must take your own precautions to ensure that the process which you employ to obtain access to this document does not expose you to the risk of viruses, malicious computer code, or other forms of interference which may damage your own computer system.

info@8threv.com
(516) 653-2006
www.eighthrevolution.com