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If marijuana were alcohol, most Michigan customers are drinking moonshine

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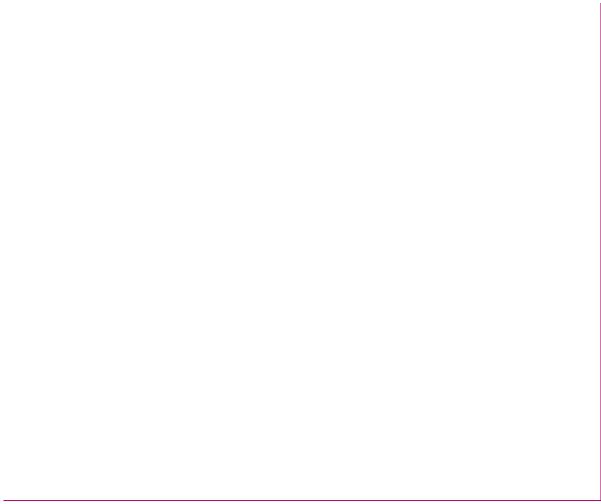
By **Gus Burns | fburns@mlive.com**

Alcohol connoisseurs develop vast, specific preferences. Some like IPA beers, others Merlot wines or Irish whiskey.

If current retail marijuana preferences were analogized to alcohol, the most sought after-strains would always be Everclear, chosen solely for THC potency, said David Egerton, a chemist who runs a Michigan lab that tests cannabis products.

THC content is one of the main factors in wholesale and retail demand and pricing, however, marijuana safety lab directors, growers and regular customers tell MLive that's not the best basis for making a purchase.

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The cannabis plant is extremely complex, with thousands of compounds that affect a user's experience and the high they feel.

As the market matures and evolves, there's a push within the industry to present more data to customers, especially regarding the hundreds, if not thousands of other of cannabinoids and terpenes that impact the experience.

"There's always been a drive to push that THC number as high as possible," said Egerton, who manages Infinite Chemical Analysis Labs in Jackson. "Certainly, THC is the psychoactive ingredient present within cannabis, but it's not the whole story."



Butane levels are shown on a computer screen inside the gas chromatography room at Infinite Chemical Analysis Labs in Jackson, on Wednesday, April 14, 2021. (Mike Mulholland | MLive.com) Mike Mulholland | MLive.com

THC

Most customers don't want a cigarette butt, the tip of a Latex glove or a Band-Aid in their marijuana. Nor do they want to inhale or ingest potentially harmful, even deadly metals, pesticides, mold, yeast or fungi.

That's the main purpose of Michigan's marijuana safety compliance labs. Their tests, based on state Marijuana Regulatory Agency standards, are the hurdles every marijuana product must clear before hitting the shelves in both medical and recreational retail stores.

But there's one test result that seems to matter more than all others once it's already on the shelf: THC.

Every purchase of marijuana flower comes with a label containing state-mandated information: retailer name, a unique package ID number, grower or processor name, the lab that tested it, date it was tested, date it was harvested, the strain name and THC potency.

Michigan also requires a disclaimer informing customers that the actual THC and CBD values may vary from the reported value by as much as 10%.

The standard deviation of THC potency is potentially huge.

"It's not my favorite part of this, but there's a very high emphasis on potency," said Lev Spivak-Birndorf, the chief science officer for Ann Arbor's PSI Labs. "In most cases, it's the higher, the better ...

"It's still very intriguing for people to have something to quantify, kind of bragging rights, and it makes sense, but it will be interesting to see if that diversifies into things like terpenes that are starting to gain more attention."

"Typically, on the low end, it's something like 10%, up to 32%, maybe 33% on the high end is a maximum," said Lev Spivak-Birndorf, the chief science officer for Ann Arbor's PSI Labs.

Often, the THC level ranges between 17% and 20%, so a 10% swing could mean that average potency marijuana is in reality very low or extremely high."

Spivak-Birndorf said when strains test on the extremely high side of the spectrum, something that growers desire, since that number is permanently attached to hundreds of pounds of marijuana as it competes for shelf space, it often draws scrutiny from the state licensing body, which has access to all test results through its tracking system.

Every test result obtained by one of the state's dozen licensed recreational marijuana safety labs is uploaded to a statewide system named METRC and becomes subject to scrutiny by state regulators.

One example is a strain called GMO by Jackson-based True North Collective. The THC potency on an eighth of an ounce purchased at the Dispo in Bay City, according to its label, is 29.2%.

“We consistently get requests from (the Marijuana Regulatory Agency) to double check that,” said Spivak-Birndorf, whose lab tested the THC level of a GMO batch harvested in February. “That’s one of those strains that’s showed up in the last few years and really gained a lot of popularity because of its potency. It has a very distinctive garlicky smell. GMO is consistently super potent.”

Similarly, Egerton at Infinite Chemical Analysis Labs said his staff will usually retest marijuana to ensure the machinery hasn’t analyzed flower incorrectly if it registers in the 28% or higher range.



A chocolate edible is weighed and ready to ground into a powder before being tested for solvent levels Infinite Chemical Analysis Labs in Jackson, on Wednesday, April 14, 2021. (Mike Mulholland | MLive.com) Mike Mulholland | MLive.com

Behind the scenes

There’s a plethora of information about each sample of any marijuana product that is tested, but customers don’t often see it.

“We have to test for over 60 different pesticides, we have to test for seven different metals, we have to test for different microbes, including aspergillus, E. coli, salmonella, total yeast and mold, total coliform,” said Todd Welch, a former Michigan

State Police forensic investigator who now operates Viridis Laboratories with locations in Bay City and Lansing. “We have to test for the potency and cannabinoid profile.

“And let’s not forget foreign matter. You may find some bugs, plastics, fibers, trellis netting, we’ve found twist-ties. we’ve also found pieces of Latex glove.”

Welch said all of the information his company collects is included in what is called a certificate of analysis, the document that is produced by the testing lab and that follows the marijuana all the way to store shelves.

The presence of any amount of certain potentially deadly or harmful contaminants, such as aspergillus, E. coli, salmonella, automatically fails product, but if there is presence of other microbes, molds and yeasts, it’s not automatically disqualified for sale, so long as it’s below certain thresholds.

Viridis looks at its main function as safety, but realizes factors such as THC, cannabinoid and terpene content are what drive sales.

[Example of marijuana lab test certificate of analysis from Infinite Chemical Analysis Labs by Fergus Burns on Scribd](#)



Certificate of Analysis

1 of 4

ICAL ID: MI20073003-005
Sample: test
Strain: test
Category: Plant

test Lic. # 4400 Ann Arbor Road Jackson, MI 49202 Lic. #

Batch#: Test Batch ID
Primary Size: Total/Batch Size: 759
Collected: 07/30/2020; Received: 07/30/2020
Completed: 04/30/2021

METRC Sample: 1A40501000009yyyyyy82612; METRC Batch: 1A40501000009xxxxx82612

Moisture 10.0% Water Activity 0.510 aw	Total THC 17.15%	Total CBD 0.52%	Total Cannabinoids 21.03%	Total Terpenes 1.10848%
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Summary	SOP Used	Date Tested	Pass
Batch	SOP:Edib-003	09/01/2020	Complete
Cannabinoids		07/30/2020	10.0%
Moisture		07/30/2020	Pass - 0.510 aw
Water Activity	SOP:Edib-002	09/01/2020	Complete
Terpenes	SOP:Edib-003	07/30/2020	Pass
Residual Solvents	SOP: qp or one & CFUg	07/30/2020	Pass
Microbials	PEST.002 Edible	09/01/2020	Pass
Pesticides	SOP:HM001	07/30/2020	Pass
Heavy Metals			Pass
Foreign Matter			Not Tested
Homogeneity			N/A
Average THC			N/A
Average CBD			N/A
THC % SD			N/A



Scan to see results

Cannabinoid Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
THCa	0.00	0.00	19.29	192.9	CBDV	0.00	0.00	0.19	1.9
Δ9-THC	0.00	0.00	0.24	2.4	CBN	0.00	0.00	0.09	0.9
Δ8-THC	0.00	0.00	ND	ND	CBGa	0.00	0.00	0.22	2.2
THCV	0.00	0.00	0.13	1.3	CBG	0.00	0.00	0.07	0.7
CBDa	0.00	0.00	0.57	5.7	CBC	0.00	0.00	0.22	2.2
CBD	0.00	0.00	0.02	0.2	Total THC			17.15	171.5
					Total CBD			0.52	5.2
					Total			21.03	210.3

Total THC=THCa * 0.877 + Δ9-THC; Total CBD = CBDa * 0.877 + CBD; NR= Not Reported, ND= Not Detected, *Reported by Dry Mass*; *analytical instrumentation used Cannabinoids:UHPLC DAD, Moisture:Mass by Drying, Water Activity:Water Activity Meter, Foreign Material:Microscope*

Terpene Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
β-Myrcene	0.00040	0.00010	0.30352	3.0352	cis-Ocimene	0.00020	0.00006	0.00900	0.900
β-Caryophyllene	0.00030	0.00010	0.19738	1.9738	Eucalyptol	0.00070	0.00020	0.00394	0.394
β-Pinene	0.00030	0.00009	0.14000	1.4000	p-Cymene	0.00040	0.00010	0.00339	0.339
δ-Limonene	0.00050	0.00020	0.13865	1.3865	Caryophyllene Oxide	0.00050	0.00020	0.00283	0.283
α-Pinene	0.00040	0.00010	0.12000	1.2000	Camphene	0.00020	0.00007	0.00246	0.246
α-Bisabolol	0.00060	0.00020	0.05061	0.5061	γ-Terpinene	0.00010	0.00004	0.00138	0.138
Linalool	0.00020	0.00007	0.03189	0.3189	α-Terpinene	0.00020	0.00006	0.00135	0.135
(-)-Guaio	0.00040	0.00010	0.02884	0.2884	cis-Nerolidol	0.00020	0.00007	ND	ND
α-Humulene	0.00040	0.00010	0.02672	0.2672	Geraniol	0.00070	0.00020	ND	ND
Terpinolene	0.00020	0.00005	0.01752	0.1752	(-)-Isopulegol	0.00030	0.00010	ND	ND
trans-Ocimene	0.00020	0.00005	0.01500	0.1500	trans-Nerolidol	0.00040	0.00010	ND	ND
δ-3-Carene	0.00010	0.00004	0.01400	0.1400	Total			1.10848	11.0848

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less than the Limit of Quantification (LOQ), *analytical instrumentation used:HS-GC-MS*



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Certificate of analysis

All the information isn't on the label, but Egerton of Infinite Chemical Analysis Labs said it's something customers should ask about.

"I encourage every consumer to ask for the (certificate of analysis)," he said. "Really, the provisioning center should have that on file and available to the customer.

"Whoever pays for the data owns the data, but I certainly think if I was a dispensary owner, I would want a (certificate of analysis) for every product on my shelf."

Mlive inspected multiple certificates of analysis produced by Infinite Chemical Analysis, a company that tests up to 500 samples per week.

There's a great deal of information that's not included on product labels, including photos of the test sample, the percentage of CBD, another cannabis compound that's believed to hold therapeutic value, total cannabinoids and what's called the terpene

profile.

As marijuana tastes evolve, its the terpene profile that most believe will set marijuana strains apart, more than THC content.

Terpene Profile

Analyte	LOQ	LOD	%	mg/g		Analyte	LOQ	LOD	%	mg/g	
δ-Limonene	0.00030	0.00010	0.30311	3.0311		Terpinolene	0.00020	0.00006	0.00340	0.0340	
β-Caryophyllene	0.00100	0.00030	0.25448	2.5448		Eucalyptol	0.00060	0.00020	0.00290	0.0290	
Linalool	0.00040	0.00010	0.21224	2.1224		γ-Terpinene	0.00020	0.00006	0.00121	0.0121	
β-Myrcene	0.00050	0.00020	0.11686	1.1686		α-Terpinene	0.00020	0.00005	0.00085	0.0085	
α-Humulene	0.00030	0.00010	0.08436	0.8436		cis-Ocimene	0.00030	0.00009	0.00084	0.0084	
β-Pinene	0.00020	0.00008	0.06059	0.6059		cis-Nerolidol	0.00050	0.00010	ND	ND	
α-Pinene	0.00050	0.00020	0.04901	0.4901		δ-3-Carene	0.00020	0.00006	ND	ND	
α-Bisabolol	0.00080	0.00030	0.01349	0.1349		(-)-Guaiol	0.00040	0.00010	ND	ND	
Camphene	0.00030	0.00009	0.00859	0.0859		(-)-Isopulegol	0.00040	0.00010	ND	ND	
trans-Ocimene	0.00020	0.00005	0.00859	0.0859		p-Cymene	0.00040	0.00010	ND	ND	
Caryophyllene Oxide	0.00030	0.00010	0.00526	0.0526		trans-Nerolidol	0.00040	0.00010	ND	ND	
Geraniol	0.00030	0.00008	0.00456	0.0456		Total			1.13034	11.3034	

Examples of terpene profile on certificate of analysis

The terpene factor

Classic Roots Farm, a grow facility and processor located in Kalkaska, is among one of the early and growing number of companies that include terpene profiles on their packaging.

Terpenes are compounds found throughout nature. They're what gives pine trees, lavender flowers, citrus fruits and marijuana buds their distinct smell.

“Some of the best cannabis in the world isn't necessarily the most potent,” said Rich Southwell, a manager with Classic Roots Farm. “To me, it's in the flavor and smell. To (some), all they know is that if it's 30% (THC), it must be good. If it's 17% it could be very good but it's a crapshoot. It could be very subpar at 17%, too. That's why we like to test for terpenes and put it in the labeling.”

Southwell compared the effects of terpenes to aromatherapy.

“I would say the average strain may have less than 1% of total of terpenes when tested by a laboratory,” he said. “Some strains have terpene levels that exceed 4%. I would say from personal experience that anything over 2% is very high terpenes.”

The terpenes play a role not only in the taste and smell of marijuana, but its effects, the high, according to Southwell.

“Certain terpenes have certain known effects on the human body,” he said. “Maybe a particular strain has a high level of a terpene that is associated with relaxation or anti-anxiety. Maybe it’s high in a terpene that does something else. Every strain is a mixture of a lot of things that influence the effect.

“The main terpenes that we see in cannabis are myrcene, limonene, linalool, caryophyllene, alpha-pinene, beta-pinene and many, many more.”

Spivak-Birndorf believes it’s the terpene nuance that will elevate marijuana consumer tastes to something similar to the way people scrutinize alcohol, often by more than just the alcohol content.

“So you can start to learn more about terpene profiles, so you know whether you’re going to like the taste of that strain and the effects of that strain,” he said. “We’re starting to develop more and more ability to deliver that information not just about strength but more the actual characteristics that make it unique.”

Some day, Spivak-Birndorf said, a strain’s terpene profile may be added to required information on labeling, similar to ingredients on food products.

“To me, it’s all about the smell and flavor of a strain,” Southwell said. “I find an 18% THC tester that tests at 4% terpenes to be a more enjoyable experience than a 32% THC tester that has less than 1% terpenes.”

For now, Southwell said, THC “completely dictates the market value of the product.”

He estimates a strain focused on terpenes is valued up to 40% less in the wholesale market than a competitor with high THC.

“I think it has something to do with (COVID-19) and that many dispensaries are curbside service or delivery-only, in which case the consumer only has the numbers on the menu to help make their choice on what to get,” Southwell said. “They know that if a strain is 30%-plus, it must be ‘good stuff’.

“Since people can’t see and smell a product before buying, they rely solely on the THC level to judge the quality.”

Egerton said western medicine generally “tends to approach things one ingredient at a time.”

“It’s the easiest way to understand something,” he said, “but when we’re dealing with plant material like cannabis, we’re dealing with all of these ingredients that in combination have an impact in the end.”

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