HAWAI'I MEDICAL CANNABIS
NEWSLETTER

The Science
What are terpenes?

Terpenes are the parts of plants that give them their smell and might have health benefits or side effects. So far, scientists have found hundreds of terpenes in cannabis. Here are some major ones:

Linalool
Aroma: Floral
Found in lavender, bergamont

Humulene
Aroma: Earthy, woody
Found in hops, coriander

Ocimene
Aroma: Floral, herbaceous
Found in basil, mint

beta- Caryophyllene
Aroma: Peppery
Found in black pepper
The only known terpene that binds to the CB2 receptor

Myrcene
Aroma: Musky, hints of citrus
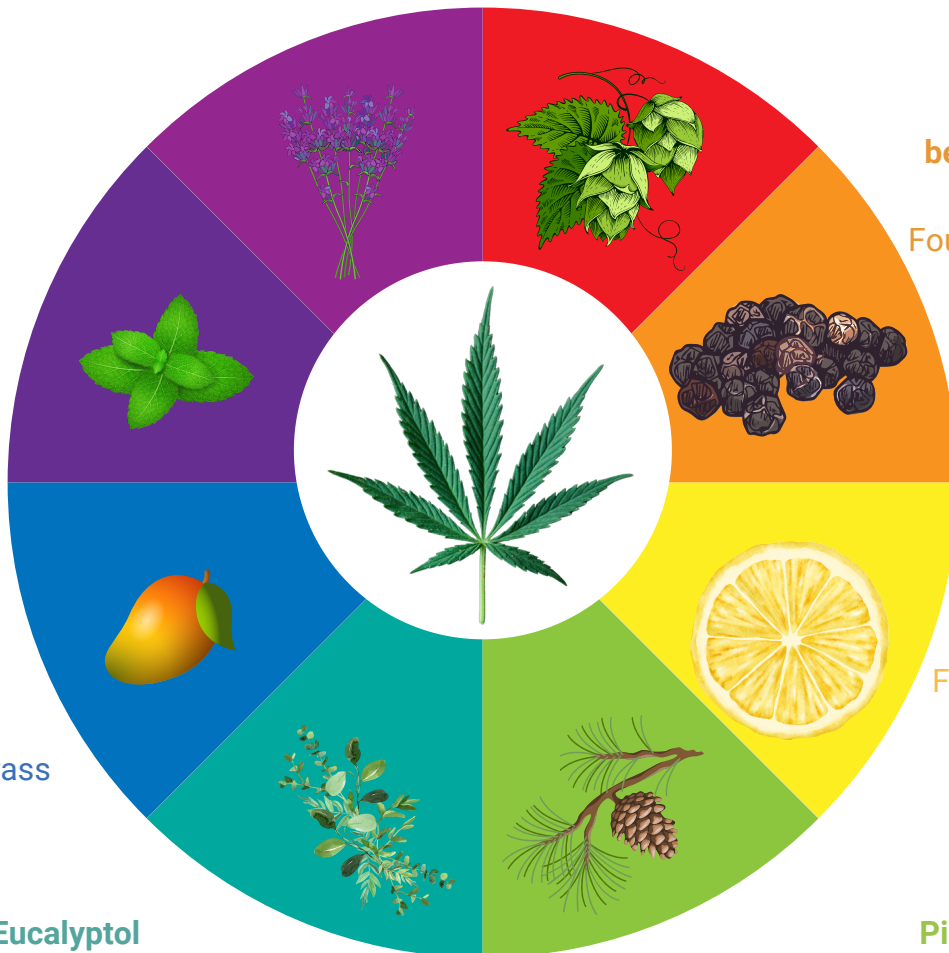Found in mango, bay leaf, lemongrass

Limonene
Aroma: Citrus
Found in citrus rinds

Eucalyptol
Aroma: Minty
Found in eucalyptus tree

Pinene
Aroma: Piney
Found in conifers, rosemary, parsley

Have questions about cannabis in Hawai'i ? Please email us at medicalcannabis@DOH.Hawaii.gov

What is the entourage effect?

The "entourage effect" is the idea that different compounds of the cannabis plant work better together than alone. When these compounds are taken together, they can create unique medicinal effects. This can be "synergistic," meaning they make each other stronger, or "antagonistic," meaning they make each other weaker. These combinations can be between different cannabinoids like CBD and THC, or between cannabinoids, terpenes, and other compounds.[1]

Researchers are at the beginning of understanding the entourage effect. Several laboratory studies show how different cannabis terpenes and cannabinoids activate the receptors of our endocannabinoid system. Here are two new studies:

Study 1 - Terpenes synergize with THC

THC works by activating receptors in our bodies called CB1 and CB2 receptors. A study in 2023 looked at how THC activates CB1 receptors in cells and what happens when terpenes are added.

They compared three things: THC alone, terpenes alone, and THC mixed with terpenes. They used amounts of THC and terpenes that are usually found in the cannabis plant. They tested 16 different terpenes with THC.

They discovered that terpenes could turn on CB1 receptors by themselves. They also found that when 12 of those terpenes were mixed with THC, the CB1 receptors worked better. This supports the idea of the "synergistic" entourage effect, which means that THC and terpenes together had a stronger effect.[2]

Study name: Selected cannabis terpenes synergize with THC to produce increased CB1 receptor activation

Study 2 - Limonene reduces anxiety caused by THC

THC is a compound in cannabis that can cause anxiety, especially in strong products. D-limonene is a terpene found in the cannabis plant. Scientists at Johns Hopkins University wanted to see if D-limonene could help reduce anxiety caused by THC. This supported the idea of the "antagonistic" entourage effect.

They studied 20 healthy people who came to the lab up to ten times. Each time, the scientists gave them one of four things: THC with D-limonene, THC alone, D-limonene alone, or a placebo (a substance with no real effect). The scientists then checked how the people felt, their mood, vital signs, and thinking abilities after taking the substances.

The results showed that when THC was mixed with D-limonene, people felt less anxious than when they took THC alone. The more D-limonene mixed with THC, the less anxious they felt. The best mix was 2 parts THC to 1 part D-limonene. Adding D-limonene to THC did not change how people thought or have other effects.[3]

Study name: Vaporized D-limonene selectively mitigates the acute anxiogenic effects of Δ9-tetrahydrocannabinol in healthy adults who intermittently use cannabis

Hawaii Medical Cannabis
Understand how to read a Certificate of Analysis (CoA)

A CoA is a certified lab report that shows test results for a cannabis product. Lab testing aims to yield safer products and minimize contaminants. Also, a CoA may help a patient decide if a product has the cannabinoids and terpenes that may help meet their medicinal needs.

Product name ●
Name of strain or chemovar

Total THC ●
Includes D8-THC, D9-THC, THCA-A Total THC levels can vary a lot within the same cannabis chemovar (strain)

Total CBD ●
Includes cannabinoids CBDA and CBD
*Not a required test

Total cannabinoids ●
Lists all cannabinoids tested, along with their concentrations
"ND" means not detected.

Foreign matter ●
Testing includes, but not be limited to, mold, hair, insects, metal, and plastic

Microbials ●
Microbials are tiny living things like bacteria, fungi, and other microorganisms. Contaminants must not be detected in one gram of cannabis or manufactured cannabis product

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spectra Analytical Lab

Certificate of Analysis

Janes Dispensary
4200 Sunflower drive
Honolulu, HI 96819
Lic#M04

Sample: 5607GDD9452.3624
Strain: Nalu Breeze
Batch#: 0000 0000 0000 8965
Sample received: 05/21/2024; Report created: 05/23/2024
External lot ID: 0000 0000 0000 6298

Nalu Breeze ●

Terpenes ●

Pine	Sweet	Hops

Analyte	LOD mg/g	LOQ mg/g	Mass mg/g	Mass %
α-Pinene	0.00068	0.00207	0.23	0.023
Camphene	0.00058	0.00175	0.06	0.006
β-Myrcene	0.00060	0.00180	2.56	0.256
β-Pinene	0.00061	0.00185	0.38	0.038
3-Carene	0.00080	0.00244	ND	ND
p-isopropyltoluene	0.00050	0.00151	ND	ND
Limonene	0.00074	0.00225	1.75	0.175
α-Terpinene	0.00054	0.00165	ND	ND
γ-Terpinene	0.00045	0.00138	0.01	0.001
Terpinolene	0.00045	0.00138	0.02	0.002
Linalool	0.00045	0.00137	1.10	0.110
Isopulegol	0.00052	0.00158	ND	ND
Geraniol	0.00010	0.00295	0.01	0.001
β-Caryophyllene	0.00043	0.00130	0.97	0.097
α-Humulene	0.00046	0.00140	0.29	0.029
Ocimene	0.00032	0.00096	0.04	0.004
Nerolidol	0.00043	0.00130	ND	ND
Guaiol	0.00041	0.00124	0.05	0.005
α-Bisabolol	0.00046	0.00141	0.07	0.007
Eucalyptol	0.00049	0.00147	ND	ND
Caryophyllene Oxide	0.00051	0.00154	ND	ND
Total			7.54	0.754

Instrument: GCMS; Method: HI-SOP-037
Notes:

Cannabinoids   Complete

● 26.26% 262.6 mg/g Total THC	● 0.07% 0.71 mg/g Total CBD	● 31.88% 318.81 mg/g Total Cannabinoids

Analyte	LOD mg/g	LOQ mg/g	Mass %	Mass mg/g
Δ9-THCa	0.0025	0.0074	29.065	290.654
Δ9-THC	0.0012	0.0035	0.771	7.714
Δ8-THC	0.0013	0.0040	ND	ND
THCVa	0.0016	0.0050	0.147	1.469
THCV	0.0015	0.0044	ND	ND
CBDa	0.0015	0.0046	0.081	0.810
CBD	0.0012	0.0037	ND	ND
CBDVa	0.0016	0.0048	ND	ND
CBDV	0.0014	0.0042	ND	ND
CBN	0.0016	0.0049	ND	ND
CBGa	0.0015	0.0044	1.601	16.007
CBG	0.0014	0.0046	0.215	2.153
CBC	0.0028	0.0085	ND	ND
Δ10-THC	0.0020	0.0068	ND	ND
Total			31.88	318.81

Total THC = Δ9-THC + Δ8-THC +(THCA * 0.877). Total CBD = CBDa * 0.877 + CBD.
Instrument: UHPLC ; Method: HI-SOP-024

Complete Limit:% Moisture	● Pass Foreign Matter

Microbials ●   Pass

Analyte	LOD CFU/g	LOQ CFU/g	Limit CFU/g	Mass CFU/g	Status
Aerobic Bacteria	1			NR	NT
Aspergillus flavus	1	ND	Not Detected in 1g		Pass
Aspergillus fumigatus	1	ND	Not Detected in 1g		Pass
Aspergillus niger	1	ND	Not Detected in 1g		Pass
Aspergillus terreus	1	ND	Not Detected in 1g		Pass
Bile-Tolerant Gram-Negative Bacteria	1			NR	NT
Coliforms	1			NR	NT
E. Coli	1	1		ND	Pass
Salmonella	1	ND	Not Detected in 1g		Pass
Yeast & Mold	1			NR	NT

Instrument: PathogenDx, TEMPO; Method: HI-SOP-008, HI-SOP-007

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ND=Not Detected, LOD=Limit of Detection, LOQ=Limit of Quantitation. This product has been tested by Spectra Analytical Lab, using valid testing methodologies and a quality system as required by state law. Values reported relate only to the product tested and batched under the batch number identified above. Spectra Analytical Lab makes no claims as to the efficacy, safety, or other risks associated with any detected or non-detected level of any compounds reported herein. This Certificate must not be altered, and shall not be reproduced except in full.

Terpenes ●
Lists all terpenes tested, along with their concentrations. Refer to the terpene wheel for the different aromas found in cannabis
*Not a required test. "ND" means not detected.

● Overall Batch Summary: Pass

Pass	Pass	Pass	Pass	Pass	Not Tested	Complete 10.1%	● Pass 0.53 aw
Pesticides	Microbials	Mycotoxins	Metals	Foreign Matter	Solvents	Moisture	Water Activity

Overall Batch Summary ●
Shows which testing results were done, not tested, and passed

Water Activity ●
Shall not exceed 0.65 aw, safe moisture levels help to prevent undesirable microorganisms from growing

Mycotoxins ●   Pass

Analyte	LOD PPB	LOQ PPB	Limit PPB	Mass PPB	Status
B1	0.30	0.40		ND	Tested
B2	0.30	0.40		ND	Tested
G1	0.30	0.40		ND	Tested
G2	0.30	0.40		ND	Tested
Ochratoxin A	0.30	0.40	20.00	ND	Pass
Total Aflatoxins			20.00	ND	Pass

Instrument: LCMS; Method: HI-SOP-025

Mycotoxins ●
Are toxic compounds produced by certain types of molds

Heavy Metals ●   Pass

Analyte	LOD PPM	LOQ PPM	Limit PPM	Mass PPM	Status
Arsenic	0.1	1.3	10.0	ND	Pass
Cadmium	0.1	1.3	4.0	ND	Pass
Lead	0.1	1.3	6.0	ND	Pass
Mercury	0.1	1.3	2.0	ND	Pass

Instrument: Atomic Absorption Spectroscopy (AAS); Method: HI-SOP-015

Heavy Metals ●
Cannabis is unique in that it easily absorbs and retains contaminants from the soil (bioaccumulation). Above certain levels, heavy metals can cause serious illness and damage organs. Heavy metal contaminants must fall below state limits

Pesticides ●   Pass

Analyte	LOD PPM	LOQ PPM	Limit PPM	Mass PPM	Status	Analyte	LOD PPM	LOQ PPM	Limit PPM	Mass PPM	Status
Abamectin B1a	0.025	0.077	1.000	ND	Pass	Imazalil	0.005	0.015	1.000	ND	Pass
Acephate	0.007	0.022	1.000	ND	Pass	Imidacloprid	0.007	0.022	1.000	ND	Pass
Acequinocyl	0.000	0.100	1.000	ND	Pass	Kresoxim Methyl	0.007	0.021	1.000	ND	Pass
Acetamiprid	0.012	0.037	1.000	ND	Pass	Malathion	0.006	0.019	1.000	ND	Pass
Aldicarb	0.004	0.012	1.000	ND	Pass	Metalaxyl	0.006	0.018	1.000	ND	Pass
Azoxystrobin	0.009	0.028	1.000	ND	Pass	Methiocarb	0.010	0.031	1.000	ND	Pass
Bifenazate	0.011	0.032	1.000	ND	Pass	Methomyl	0.004	0.012	1.000	ND	Pass
Bifenthrin	0.021	0.063	1.000	ND	Pass	MGK-264	0.025	0.075	1.000	ND	Pass
Boscalid	0.022	0.066	1.000	ND	Pass	Myclobutanil	0.006	0.019	1.000	ND	Pass
Carbaryl	0.004	0.013	1.000	ND	Pass	Naled	0.006	0.017	1.000	ND	Pass
Carbofuran	0.003	0.009	1.000	ND	Pass	Oxamyl	0.004	0.012	1.000	ND	Pass
Chlorantraniliprole	0.009	0.028	1.000	ND	Pass	Paclobutrazol	0.004	0.012	1.000	ND	Pass
Chlorfenapyr	0.004	0.012	1.000	ND	Pass	Parathion Methyl	0.015	0.046	1.000	ND	Pass
Chlorpyrifos	0.009	0.027	1.000	ND	Pass	Permethrins	0.027	0.082	1.000	ND	Pass
Clofentezine	0.017	0.051	1.000	ND	Pass	Phosmet	0.014	0.043	1.000	ND	Pass
Cyfluthrin	0.042	0.100	1.000	ND	Pass	Piperonyl Butoxide	0.005	0.014	1.000	0.076	Pass
Cypermethrin	0.027	0.081	1.000	ND	Pass	Prallethrin	0.008	0.025	1.000	ND	Pass
Diazinon	0.004	0.011	1.000	ND	Pass	Propiconazole	0.009	0.026	1.000	ND	Pass
Dichlorvos	0.018	0.054	1.000	ND	Pass	Propoxur	0.003	0.009	1.000	ND	Pass
Dimethoate	0.005	0.015	1.000	ND	Pass	Pyrethrins	0.005	0.014	1.000	ND	Pass
Ethoprophos	0.009	0.029	1.000	ND	Pass	Pyridaben	0.021	0.064	1.000	ND	Pass
Etofenprox	0.024	0.074	1.000	ND	Pass	Spinosad	0.005	0.014	1.000	ND	Pass
Etoxazole	0.005	0.015	1.000	ND	Pass	Spiromesifen	0.006	0.019	1.000	ND	Pass
Fenpyroximate	0.000	0.001	1.000	ND	Pass	Spirotetramat	0.005	0.016	1.000	ND	Pass
Fipronil	0.011	0.034	1.000	ND	Pass	Tebuconazole	0.008	0.025	1.000	ND	Pass
Flonicamid	0.010	0.029	1.000	ND	Pass	Thiacloprid	0.006	0.019	1.000	ND	Pass
Fludioxonil	0.006	0.019	1.000	ND	Pass	Thiamethoxam	0.004	0.013	1.000	ND	Pass
Hexythiazox	0.022	0.067	1.000	ND	Pass	Trifloxystrobin	0.004	0.012	1.000	ND	Pass

Pesticides ●
All pesticides that are tested are listed. For testing rules and regulations, see Hawai'i administrative rules 11-850-135

*SPECTRA is currently the only DOH-certified cannabis testing lab in the state. If you are using a product and the CoA comes from another lab the product is NOT a Hawai'i-licensed product.

We encourage you to ask your dispensary for the current CoA. **Talk with your medical provider to find out what cannabis products may be right for you.**

Have questions about cannabis in Hawai'i ? Please email us at medicalcannabis@DOH.Hawaii.gov

HAWAI'I MEDICAL CANNABIS NEWSLETTER

SAFE STORAGE

https://stashlogix.co/

The most common reason people go to the emergency room for problems caused by cannabis is because keiki and kupuna accidentally eating and drinking products with cannabis in them.

- How to protect others from accidentally using cannabis:
  - Keep products clearly labeled
  - Keep out of reach and sight from keiki, kupuna and pets
  - Consider lockable storage containers. These can be found online or at your local head shop or dispensary

- How to keep your medicine in good condition:
  - Protect your products from light, air, and moisture
  - Store in an airtight container in a cool, dark place with a humidity pack to maintain moisture levels

References

1. Russo EB. Taming THC: potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. Br J Pharmacol 2011; 163(7): 1344-64.
2. Raz N, Eyal AM, Zeitouni DB, et al. Selected cannabis terpenes synergize with THC to produce increased CB1 receptor activation. Biochem Pharmacol 2023; 212: 115548.
3. Spindle TR, Zamarripa CA, Russo E, et al. Vaporized D-limonene selectively mitigates the acute anxiogenic effects of Δ9-tetrahydrocannabinol in healthy adults who intermittently use cannabis. Drug and Alcohol Dependence 2024; 257: 111267.

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