

# Cannabis Sativa, Terpenes, Fatty Acids, & The ECS



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# History of Cannabis Sativa

- **28 Million Years Old:** Studies on ancient pollen suggest that Cannabis (Cannabaceae family, including Hops) evolved some three kilometres above sea level on a Tibetan Plateau. This plant and specifically cannabinoids has evolved alongside humans since the great-ape period.
- **8,000+ BCE:** Cannabis has been used as hemp cord and smoked as part of ritual and/ or religious activities in western China.
- **1619:** Early Jamestown ordered all farmers to grow hemp, and as more colonies arose, hemp cultivation laws became mandatory. Cannabis Sativa/ Hemp quickly became legal tender in most of the early settler days of 1631 into the early 1800s.
- **1850:** Cannabis is added to The U.S. Pharmacopoeia.
- **1936:** The American propaganda film Reefer Madness was anti Mexican/ Anti African American and made to scare American youth and woman away from using Cannabis. In 1937, the U.S. Congress passed the Marijuana Tax Act which criminalized the plant.
- **1976:** U.S. FDA continues to list marijuana as Schedule I Drug that has: "A high potential for abuse with no accepted medical value."
- **1998:** US Government files a patent on cannabinoids, listing them as a neuro-protectants & cardio-protectants!
- **1997/ Today:** Social Media begins to change our lives - today, cell phones become a communication and information game changer. We are again, a government of the people, by the people, and for the people - let's take back our rightful use of this amazing plant.

大麻

"Great Hemp"

*"Hemp is of first necessity to the wealth & protection of the country." - Thomas Jefferson*

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# History of Cannabis Sativa

28 Million Years Ago



The Qinghai-Tibet Plateau is thought to be the birthplace of Cannabis.  
©Getty Images

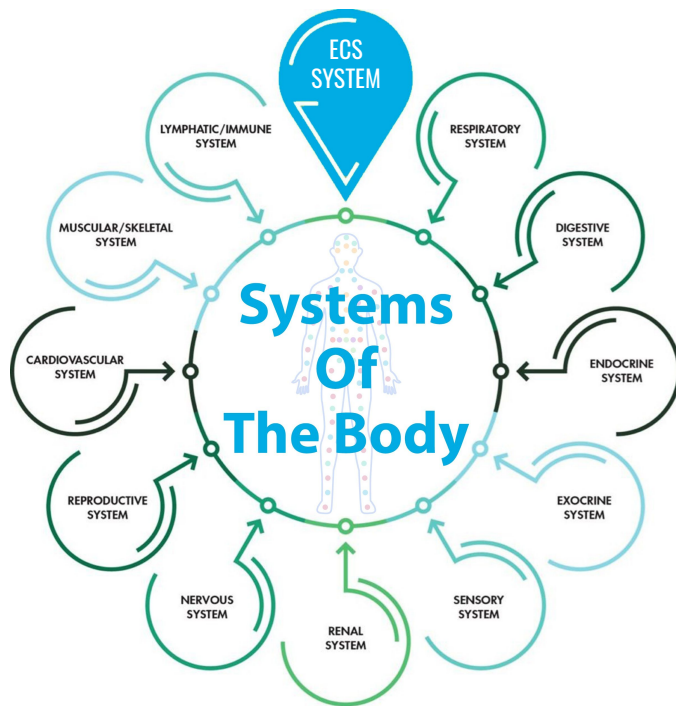
2,800 Years Ago



Wooden braziers were used to burn cannabis at funerals in ancient China.  
©iStock Photo

# What is the ECS System?

## Human Biological Systems



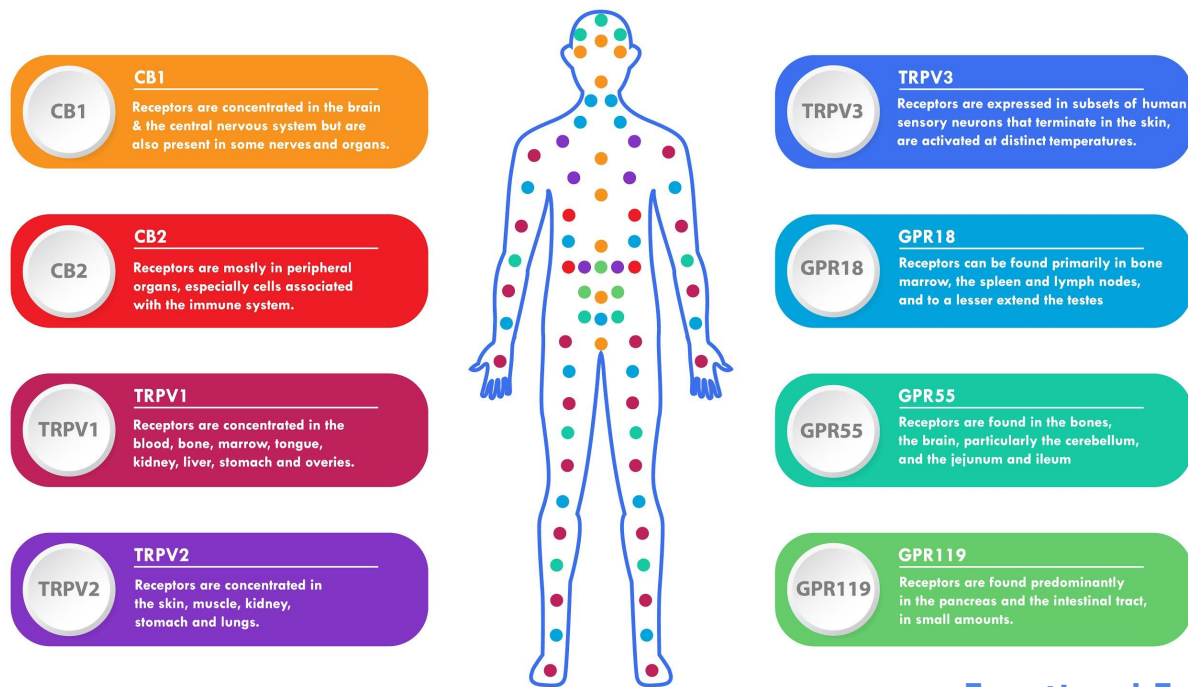
# ECS Defined

## Endocannabinoid System

- The endocannabinoid system (ECS) is a complex biological system that was discovered in the 1990's - it is composed of **Endocannabinoids**, which are endogenous lipid-based neurotransmitters that bind to various **Receptors** (CB1, CB2, GPR55, GPR119, TRPV1, etc.) that are expressed throughout the central nervous system (including the brain) and peripheral nervous system. **Enzymes** also play an important role in breaking down cannabinoids.
- CB1 receptors, are mostly found in the central nervous system (hormonal and neurotransmitter release, reducing anxiety, lowering inflammation,) and CB2 receptors, are mostly found in your peripheral nervous system, activating immune cells and modulating pain.
- The endocannabinoid system is involved in almost every biological function in the body, including sleep, mood, immunity, fertility, appetite, pain, memory and much more.
- The ECS system aids in the regulation of overall physiological homeostasis, or WELLNESS by modulating ALL other systems.

# Cannabinoid Receptors

## Human Cannabinoid Receptors



# Cannabinoids



## Endocannabinoids

The endocannabinoid system (ECS) is a biological system composed of endocannabinoids, which are endogenous lipid-based retrograde neurotransmitters that bind to cannabinoid receptors, and cannabinoid receptor proteins that are expressed throughout the vertebrate central nervous system (including the brain) and peripheral nervous system. The endocannabinoid system remains under preliminary research, but may be involved in regulating physiological and cognitive processes, including fertility, pregnancy, during pre- and postnatal development, appetite, pain-sensation, mood, and memory, and in mediating the pharmacological effects of cannabis.

Two primary endocannabinoid receptors have been identified CB1 and CB2, CB1 receptors are found predominantly in the brain and nervous system, as well as in peripheral organs and tissues, and are the main molecular target of the endocannabinoid ligand (binding molecule), anandamide, as well as its mimetic phytocannabinoid, THC. One other main endocannabinoid is 2-arachidonoylglycerol (2-AG) which is active at both cannabinoid receptors, along with its own mimetic phytocannabinoid, CBD. 2-AG and CBD are involved in the regulation of appetite, immune system functions and pain management.



Anandamide



2-Arachidonoylglycerol

## Phytocannabinoids



The cannabis plant and other plants produce cannabinoids, which interact with our body's receptors. These plant cannabinoids are known as phyto-cannabinoids. Phyto is a prefix that means "pertaining to derived from plants". They are categorized as any plant-derived natural product with the capability to directly interact with the body's cannabinoid receptors or share chemical similarity with cannabinoids.

Furthermore, phytocannabinoids from cannabis have significantly influenced research on the endocannabinoid system. So far, they have become widely known for their medicinal properties in recent years. In particular, the cannabis plant contains over 400 chemical entities, and more than 60 of them are cannabinoid compounds, which have varying effects.



Cannabidiol



Cannabidivarin



Cannabigerol



tetrahydrocannabinol



Tetrahydrocannabivarin



Cannabidiolic acid



Cannabichromene



Cannabinol



Tetrahydrocannabinolic acid



Delta-9 tetrahydrocannabinol

### *Additional Endocannabinoids Being Researched:*

Docosatetraenoyl ethanolamide (DEA) | 2-AGE, Noladin ether | Homo-gamma-linolenoyl ethanolamide (HGLE)

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# Receptor Agonists

## Plant-Based Cannabinoids & Receptor Agonists w Cannabimimetic Effects



**Cacao**



**Saffron**



**Nutmeg**



**Japanese  
Liverwort**



**Echinacea  
Purpurea**



**Long Pepper  
(Guineesine)**



**Black Truffle**



**White Peony**



**Magnolia**



**Ginger Root**



**Electric Daisy**



**Red Ginseng**

\*Anandamide (AEA - the "Bliss" molecule) is an Endocannabinoid (fatty acid neurotransmitter) that is only found in two foods: Theobroma Cacao and Black Truffle.



# Terpenes

## Theory of Terpenes

















- Terpenes are a widely diverse class of organic compounds, produced by a variety of plants - we believe that terpenes began for adaptive purposes, they often have a strong odor used to repel predators and lure pollinators.
- Cannabis terpenes are synthesized in secretory cells inside glandular trichomes, and production is increased with light exposure. Terpenes are mostly found in high concentrations in female cannabis/ hemp flowers.
- Terpene profiles are thought to play a key role not only in the scent or “flavor” of a strain, but also in that strain’s ability to effect a need-state outcome (sleep, energy, pain, libido, anxiety, relaxed, etc.).



# Terpenes

## Common Terpenes

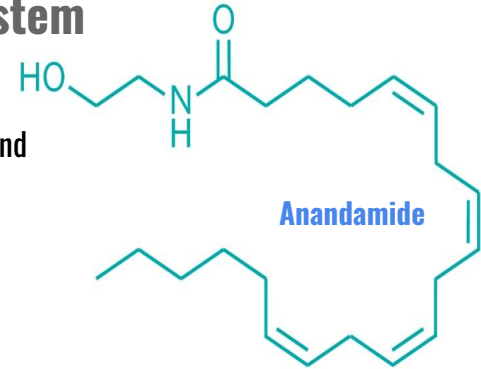
~140 Different Terpenes Have Been Identified in the Cannabis/ Hemp Plant.

 <p><b>Bisabolol</b> floral</p> <p><b>Properties</b> anti-inflammatory anti-irritant anti-microbial</p> <p><b>Common Uses</b> cancer, skin lesion</p>	 <p><b>Borneol</b> mint</p> <p><b>Properties</b> anti-bacterial anti-inflammatory antispasmodic</p> <p><b>Common Uses</b> eyesight, pain relief</p>	 <p><b>Camphene</b> fir needles, musky earth</p> <p><b>Properties</b> anti-oxidant skin lesion</p> <p><b>Common Uses</b> cardiovascular diseases</p>	 <p><b>Caryophyllene</b> spicy</p> <p><b>Properties</b> anti-bacterial anti-inflammatory anti-fungal</p> <p><b>Common Uses</b> insomnia, muscle spasms pain relief</p>	 <p><b>Delta 3 Carene</b> pine, rosemary</p> <p><b>Properties</b> anti-inflammatory bone stimulant</p> <p><b>Common Uses</b> memory</p>	 <p><b>Eucalyptol</b> mint</p> <p><b>Properties</b> anti-bacterial anti-fungal</p> <p><b>Common Uses</b> alzheimer's pain Relief</p>	 <p><b>Geraniol</b> peach, rose grass</p> <p><b>Properties</b> anti-cancer anti-oxidant neuroprotectant</p> <p><b>Common Uses</b> cancer, pain relief</p>	 <p><b>Humulene</b> earthy</p> <p><b>Properties</b> anti-bacterial anti-inflammatory anti-tumor effects</p> <p><b>Common Uses</b> cancer, infections appetite suppression</p>
 <p><b>Limonene</b> bitter citrus</p> <p><b>Properties</b> anti-anxiety anti-cancer digestion, gallstones</p> <p><b>Common Uses</b> liver detoxification weight loss, sleep aid</p>	 <p><b>Linalool</b> floral</p> <p><b>Properties</b> anti-anxiety anti-epileptic anti-psychotic pain killing</p> <p><b>Common Uses</b> depression, convulsions insomnia, pain relief</p>	 <p><b>Myrcene</b> citrus, cloves</p> <p><b>Properties</b> relaxing sedating</p> <p><b>Common Uses</b> inflammation, insomnia spasms, pain</p>	 <p><b>Pinene</b> pine</p> <p><b>Properties</b> anti-depressant anti-inflammatory anti-microbial</p> <p><b>Common Uses</b> asthma, bronchitis cancer, depression memory, mental alertness</p>	 <p><b>Phytol</b> balsamic, floral</p> <p><b>Properties</b> anti-insomnia immunosuppressant</p> <p><b>Common Uses</b> reduce itching sleep aid wound healing</p>	 <p><b>Terpinolene</b> smoky, woody</p> <p><b>Properties</b> anti-bacterial anti-fungal anti-insomnia antiseptic</p> <p><b>Common Uses</b> cancer heart disease sleep aid</p>	 <p><b>Trans-nerolidol</b> citrus, rose</p> <p><b>Properties</b> anti-cancer anti-microbial anti-oxidant anti-parasitic</p> <p><b>Common Uses</b> relaxing skin lesion</p>	 <p><b>Valencene</b> sweet citrus</p> <p><b>Properties</b> anti-inflammatory anti-melanogenesis antiallergic</p> <p><b>Common Uses</b> memory skin lesion</p>

# Fatty Acids

## Fatty Acid Modulation of the Endocannabinoid System

- Essential fatty acids were discovered in 1929 by Burr & Burr.
- Key fatty acids that are known to be essential for humans: alpha-linolenic acid (an omega-3 fatty acid) and linoleic acid (an omega-6 fatty acid).
- The consumption of fatty acids can shift the balance towards higher levels of endocannabinoids.
- Plant-based oils that are high in Omega-3 | Omega-6 fatty acids:
  - High Linoleic Safflower
  - Black Cumin Seed
  - Prickly Pear
  - Algal DHA
  - Hemp Seed Oil
- Endocannabinoids (Anandamide (AEA) and 2-arachidonoyl glycerol (2-AG) are endogenously synthesized from omega-6 and omega-3 polyunsaturated fatty acids (PUFAs).



# Hemp Extraction

**Whole Plant = Fats, Waxes, Chlorophyll, Cannabinoids, Terpenes, Etc.**

- **Ethanol** - solvent-based extraction
- **CO2** - supercritical fluid extraction
- **Winterized** - ethanol freezing
- **Distilled** - post processing refinement
- **Pressed Oils** - whole plant pressed



*Blissful Extraction Methods:*

CO2 Supercritical Fluid Extraction | Whole Plant

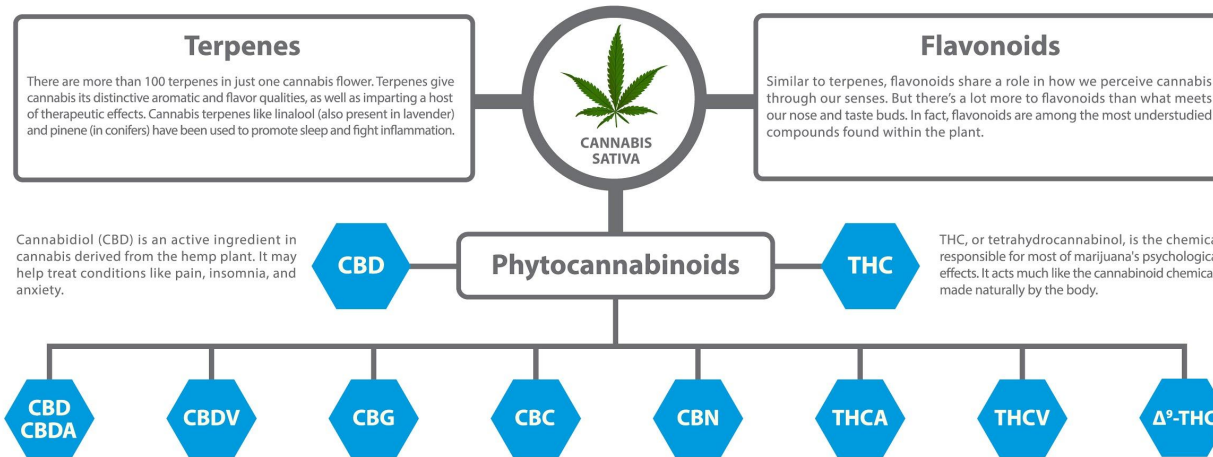
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# The “Entourage” Effect

## The Benefits Of Whole Plant

THE ENTOURAGE EFFECT IS A PROPOSED MECHANISM BY WHICH CANNABIS COMPOUNDS ACT SYNERGISTICALLY TO MODULATE THE OVERALL PSYCHOACTIVE EFFECTS OF THE PLANT, PRIMARILY BY THE ACTION OF CBD AND THC.



Phytocannabinoids, or exogenous cannabinoids, are plant-derived cannabinoids produced by glandular trichomes covering the surface of the cannabis plant. Trichomes are responsible for producing all of the plant's desirable compounds. More than 100 cannabinoids have been discovered in the cannabis plant. Phytocannabinoids interact with our body's receptors to produce numerous psychotropic and therapeutic effects. Both plants and animals produce their own cannabinoids, those produced inside the mammalian body are called endocannabinoids. Phytocannabinoids demonstrate above are Cannabidiolic acid (CBDA), Cannabidivarin (CBDV), Cannabigerol (CBG), Cannabichromene (CBC), Cannabinol (CBN), Tetrahydrocannabinolic acid (THCA), Tetrahydrocannabivarin (THCV), Delta-9-tetrahydrocannabinol (Δ<sup>9</sup>-THC).

### *Aristotle's Book of Metaphysics:*

The “plurality of parts are not merely a complete aggregate but instead, some kind of a whole BEYOND its parts”.

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# Processing Advantages

## Current Trends

### Nano Sized Particles

- Particles that are less than 100 nanometers. Nanoemulsions (nano-cannabinoids) can provide high bioavailability and therapeutic effect, and are absorbed by the body, either orally or through the skin, more rapidly.

### Liposomes

- A spherical-shaped vesicle that is composed of one or more phospholipid bilayer. Liposomes can improve absorption of cannabinoids into the body by transporting it through the intestinal membrane, safely into targeted tissues.

### Water Soluble

- Products that will homogenize with water or a water based product (ie:vegetable glycerin. Benefits: Bioavailability, speed-to-action, easy integration into RTD beverages.

### Patented Processes

- Virun Esolv<sup>®</sup> Emulsification Technology, Lexaria Hemp DeHydraTECH<sup>®</sup>, etc.

### Yeast

- Turning sugar into cannabinoids via enzymatically processing yeast.

# Botanical Flavoring

## Directional Flavoring™

- We use extracts and oils to “Flavor” our products.
- We believe our botanical extracts should drive core flavor profiles, as we stay TRUE to the plant.
- These oils also have enormous medicinal value.
- Thoughtful botanical blending can achieve a balance of flavor and functionality.
- We use a lightly processed crude Hemp Extract that has all of the flavors of the Whole-Plant.



Hemp Chocolate Bar



Whole Plant  
Oil Blend



Other  
Oil Blends

# We Know Our Farmers



***Farm Grow Partner***

Iverson Farms | FSOil - Oregon

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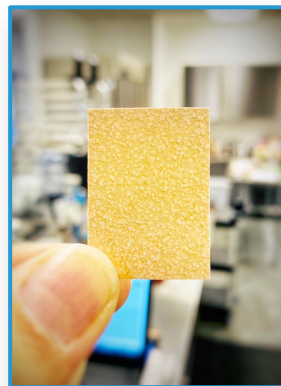


# We Are Innovators

## Capabilities

- Oil Tinctures
- Functional-Foods
- RTD Beverages
- Chocolate Bars
- Protein Bars
- Dissolvable Strips
- Gummies
- Soft Chews
- Topicals
- Beauty
- Powders

## Functional-Food Innovation Lab™



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# We Manufacture

## Product Development Standards

- cGMP Processing Standards
- FDA Compliance
- Organically Grown | US Hemp Authority | Etc.
- Quality System - HACCP
- Process Documents | SOPs | Recall Plan | Training
- Temperature | Humidity Control Systems
- Inbound & Outbound Testing
- Historical Records | Retention Records & Samples
- Secondary Facility Audits
- 3rd Party Testing - Heavy Metals | Cannabinoids  
Yeast & Mold | Micros | Residual Solvents





**Thank You For Your Trust**

Functional Food Innovation Lab™