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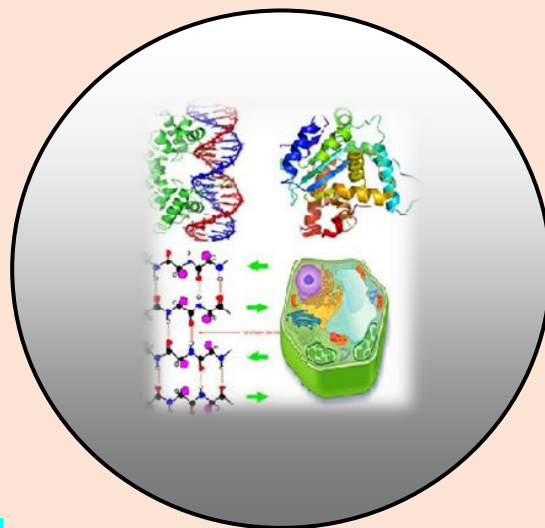
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REVIEW ARTICLE

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An Overview of Genus Cannabis and Medical Significance

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ABSTRACT

Cannabis is a genus of flowering plants belongs to the family Cannabinaceae. The number of species within the genus is disputed. Three species are well recognized: Cannabis sativa, Cannabis indica, and Cannabis ruderalis. All the three may be treated as subspecies of C. sativa. In this study, we show that Cannabis genus used for the production of cannabinoids is dioecious, with the maximal accumulation of these compounds on the unfertilized female inflorescence. The synthesis and accumulation of the cannabinoids occurs in trichomes on the surfaces of leaves and inflorescences. It is medically analgesic and psycho-active in properties. The possible mechanism of action of this plant is described here. Data presented in this review paper provide scientific information that might be used for isolation of potentially active compounds for future research. However, there are several medical conditions for which patients can use medical marijuana, which can vary by state law: Amyotrophic lateral sclerosis, Cancer, Glaucoma, HIV/AIDS, Huntington's disease, ,, Multiple sclerosis, Muscle spasms, Neuropathy, Parkinson's disease, Post Traumatic Stress Disorder (PTSD), Severe nausea, Spinal cord injury with spasticity.

Key words: Cannabis sativa, Analgesic and Psycho-active Properties, Parkinson's disease and Cannabinoid.

INTRODUCTION

Cannabis sativa is one annual herbaceous flowering plant indigenous to eastern Asia but now of cosmopolitan distribution due to widespread cultivations. The *Cannabis* was formerly placed in the nettle (Urticaceae) or mulberry (Moraceae) family, and later, along with the genus *Humulus* (hops), in a separate family, hemp family (Cannabinaceae). Recent phylogenetic studies based on DNA restriction site analysis gene sequencing strongly suggest that the Cannabinaceae arose from within the former family Celtidaceae, and that two families should be merged to form a single monophyletic family, the Cannabinaceae (Anderson, 1974).



Figure 1. Hemp plant.

A flowering male and B seed-bearing female plant, actual size; 1 male flower, enlarged detail; 2 and 3 pollen sac of same from various angles; 4 pollen grain of same; 5 female flower with cover petal; 6 female flower, cover petal removed; 7 female fruit cluster, longitudinal section; 8 fruit with cover petal; 9 same without cover petal; 10 same; 11 same in cross-section; 12 same in longitudinal section; 13 seed without hull. Although the main psychoactive constituent of *Cannabis* is tetrahydrocannabinol (THC), the plant is known to contain more than 500 compounds, among them at least 113 cannabinoids; however, most of these "minor" cannabinoids are only produced in trace amounts (Hillig and Mahlberg, 2004). Besides THC, another cannabinoid produced in high concentrations by some plants is cannabidiol (CBD), which is not psychoactive but has recently been shown to block the effect of THC in the nervous system. Differences in the chemical composition of *Cannabis* varieties may produce different effects in humans. Synthetic THC, called dronabinol, does not contain cannabidiol (CBD), cannabinol (CBN), or other cannabinoids, which is one reason why its pharmacological effects may differ significantly from those of natural *Cannabis* preparations.

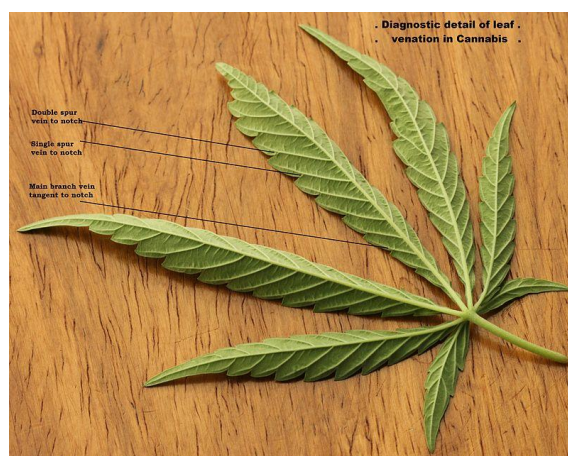


Figure 2. Underside of *Cannabis sativa* leaf, showing diagnostic venation.

Cultivar: there are three main cultivar groups of cannabis that are cultivated today:

- Cultivars primarily cultivated for their fibre, characterized in long stems and little branching.
- Cultivars grown for seed which can eat entirely raw or from which hemp oil is extract.
- Cultivars grown for medicinal or recreational purposes. A nominal if not legal distinction is often made between industrial hemp, concentrations of psychoactive compounds far also low to be useful for that purpose, and marijuana.

Study of Terpenoid content and composition in medical cannabis plant

The most common uses for medical cannabis include for severe or long-term pain, nausea and vomiting due to chemotherapy (cancer treatments), and painful muscle spasms. A detailed analysis of the terpenoid and cannabinoid content of commercially generated medical *Cannabis*floral samples was conducted. The aim of this analysis show that compare/contrast the terpenoid composition of samples among the various strains cannabis. The growth conditions of the plant, the harvest in samples and their curing process was all under the purview of the producer. The strain names for these samples are provided in the supporting information table 1, but we have somewhat limited confidence in the provenance of the strain name. However, the chemical composition of this material used medicinally in New Mexico has been accurately determined.

Table 1. Comparison and dependence of chemical material of cannabis.

| Amino acid Profile | Concentration (g/100g protein) | | | *Houlihan <i>et al.</i> |
|-----------------------|--------------------------------|------|-------|-------------------------|
| | LEAF | STEM | SEEDS | |
| Lysine | 3.84 | 0.86 | 1.24 | NG |
| Histidine | 2.21 | 1.01 | 0.69 | 2.22 * |
| Arginine | 4.32 | 2.59 | 3.11 | 5.82 * |
| Aspartic acid | 8.25 | 2.11 | 1.55 | NG |
| Threonine | 2.26 | 1.99 | 1.71 | 4.55 * |
| Serine | 3.15 | 0.49 | 0.33 | NG |
| Glutamic acid | 10.00 | 4.24 | 7.73 | NG |
| Proline | 2.85 | 0.61 | 0.51 | NG |
| Glycine | 2.79 | 1.10 | 0.38 | NG |
| Alanine | 4.03 | 1.06 | 3.49 | NG |
| Cystine | 0.79 | 0.52 | 0.40 | NG |
| Valine | 3.91 | 0.75 | 1.10 | 5.65 * |
| Methionine | 0.89 | 0.55 | 0.31 | 3.54 * |
| Isoleucine | 3.23 | 1.01 | 0.57 | 4.05 * |
| Leucine | 7.10 | 3.00 | 2.13 | 7.35 * |
| Norleucine | NA | NA | NA | NG |
| Tyrosine | 3.02 | 0.95 | 1.27 | 7.80 * |
| Phenlyalanine | 3.94 | 2.06 | 0.86 | 7.80 * |

NA= Not determined; NG= Not given

Difference between *Cannabis sativa* and *Cannabis indica*

Human has produced variation within the species and authorities only recognize one species in the genus that divergent selective pressure to either produce plants with more fiber or plants with greater THC content.^[1] Large variability exists within either species, and there is an expanding discussion whether the existing paradigm used to differentiate species adequately represents the variability found within the genus *Cannabis*. There are five chemotaxonomic types of *Cannabis*: one with high levels of THC, one which is more fibrous and has higher levels of CBD, one is an intermediate between the two, another one with high levels cannabigerol (CBG), and the last one almost without cannabinoids (Mandolino et al., 1989).

The confusion actually starts with the fact that the very botany of the *Cannabis* genus is still controversial. Indeed, despite being one the world's oldest crops (hemp was already harvested in China 8500 years ago), whether the genus *Cannabis* is monotypic (one species, as argued by Small) or polytypic has been uncertain since Linnaeus described a single species and Lamarck proposed two species. This is in part due to the plant's ancient origin, to its extremely long evolutionary and domestication history (including artificial selection) that is responsible for the probable disappearance of wild populations, and to its widespread geographic dispersal. Since prohibition has long prevented most scientific enquiries, both the taxonomic separation of the putative taxa *C. sativa* and *C. indica* and the plant's phylogeny have remained highly controversial until now, so much that a more modern taxonomic treatment of *Cannabis* originally devised by Karl Hillig was recently further developed by Robert Clarke and Mark Merlin who argue that the "present-day genetic distinction is essentially "dope versus rope" or narrow-leaf drug (NLD) and broad-leaf drug (BLD) biotypes (both *indica*) versus a narrow-leaf hemp (NLH) biotype (a *sativa*).

RESULTS AND DISCUSSION

The effects experienced by the cannabis (marijuana) user are variable and will depend upon the dose, method of administration, prior experience, any concurrent drug use, personal expectations, mood state and the social environment in which the drug is used.

Effects of cannabis (marijuana) include:

- an altered state of consciousness. The user may feel "high", very happy, euphoric, relaxed, sociable and uninhibited.
- distorted perceptions of time and space. The user may feel more sensitive to things around them, and may also experience a more vivid sense of taste, sight, smell and hearing.
- increased pulse and heart rate, bloodshot eyes, dilated pupils, and often increased appetite ("the munchies").
- impaired coordination and concentration, making activities such as driving a car or operating machinery difficult and dangerous.
- negative experiences, such as anxiousness, panic, self-consciousness and paranoid thoughts.

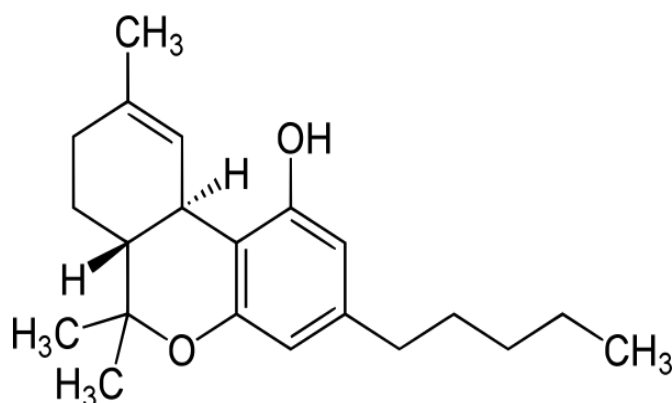


Figure 3. Comparison of cannabinoid in leaf and floral samples.

The cannabinoids present in leaf and floral samples of 16 different medicinal marijuana plants were determined. The levels of six different cannabinoids in floral samples and the levels in leaf was studied. In all studied the levels are reported as percent of dry weight of the respective organ, these organs were collected from plants at 50 to 65 d post-light induction. As expected the levels of cannabinoids are variable between strains, and the levels in floral tissues are much higher than in leaf tissues. Δ^9 -THC levels in floral tissues range from 21% in strain Holy Power, to 3% in Juanita. Δ^9 -THC levels in leaf tissues were generally at least ten fold lower and range from 2.7% in Crystal Cookies to 0.3% in Love Lace.



Figure 4. Cultivation of cannabis in world.

People who use large quantities of cannabis may become sedated or disoriented and may experience toxic psychosis -- not knowing who they are, where they are, or what time it is. High doses may also cause fluctuating emotions, fragmentary thoughts, paranoia, panic attacks, hallucinations and feelings of unreality.

Various concentrations of THC, cannabidiol (CBD), or hybrid products exist in products found cannabis dispensaries in states that have legalized recreational marijuana use.

In fine we report a simple, robust and reliable method for the chemical characterization of two classes of bioactive compounds in medical *Cannabis*, terpenoids and cannabinoids. Given the myriad of health conditions treated, and complete compositional analyses are essential to determine the efficacy of this material for those conditions, and the optimal strain for specific conditions. The opportunity to predict high CBD floral samples analyses on vegetative leave should be explored further as a way to help producer increase the availability of medically important cannabinoid.

Long term effects of heavy use can include:

- irritation to the lungs, risk of developing chronic bronchitis and an increased risk of developing cancer of the respiratory tract (more likely to do with smoking).
- exacerbation of pre-existing cardiovascular disease, as cannabis use significantly raises the heart rate.
- decreased concentration levels, reduced short-term memory and difficulties with thinking and learning (resolved if cannabis use stops).
- decreased sex drive in some people. Chronic use can lower sperm count in males and lead to irregular periods in females (resolved if cannabis use stops).
- dependence on cannabis -- compulsive need to use the drug, coupled with problems associated with chronic drug use
- cannabinoid hyperemesis syndrome (Anderson, 1980)

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