

## A Review on Mechanism, Therapeutic Uses and Pharmacological Activities of *Cannabis sativa*

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### Abstract

Bhanga (Indian hemp, pot, dope) is a Neurotoxic cerebral deliriant poison, obtained from *Cannabis sativa*. It is dioecious flowering herb, in which female plant contains more Cannabinoid than male. It produces a gummy, amorphous resin, cannabinone. It is enclosed under Narcotic drugs and psychotropic substances (NDPS) Act 1985. The various forms of *Cannabis sativa* are bhanga (sidhi, patti or sabji), majun, ganja and charas. It has many therapeutic uses; it acts as sedative and so many misuse of bhanga reported since ancient time. It is one of the most commonly used illicit drug since ages. It has been used for the treatment of several diseases and disorders by communities from all over the world. Studies shows that Cannabis sativa is having numerous pharmacological actions on human and animal trials. It is regulated by law in our country. Its management has been mentioned in various samhita and modern science.

**Keywords:** Bhanga; Ayurveda; *Cannabis sativa*; Neurotoxic

### Introduction

*Cannabis sativa* (marijuana/marihuana/hashish), a deliriant cerebral neurotic hemp plant which has several varieties: *Cannabis indica* (India), *Cannabis Mexicana* (Mexico) and *Cannabis americana* (US) [1]. In south and Central Africa, it identified as Dagga, whereas it is also known as Hashish in Egypt. The drug is recognized since more than 4000 years in the part of Central Asia and China. The Indian hemp plant is hardy, aromatic annual herb, female plant is taller, about 4-6m and has darker, more luxuriant foliage than male. The bioactive constituents derived from cannabis are known as Cannabis. By most of the studies, Cannabis remains the one of the

most commonly used illicit drug in the world [2]. The plant grows all over India, but its cultivation is restricted by law [3]. It holds 4th rank amongst psychotropic drug. The first three are caffeine, nicotine and alcohol. It is extensively cultivated for the purpose of fibre used to make rope and cloth. Oil is extracted from the seeds is also used for several purpose. The resin consist of around 60 cannabinoids, among them delta-9-tetrahydrocannabinol (THC) is one of the most potent and accountable for its psychoactive effects [4]. It is formally used in therapeutics for treating asthma, anorexia, and convulsions. It was also employed as an analgesic and sedative. Management of its poisoning according to Ayurveda is head bath

with cold water, Cow’s milk with sugar, Cow’s milk with shunthi and sandesada [5]. According to modern science Gastric lavage with warm water, strong tea/coffee, Artificial respiration, Saline purgatives, Diazepam, haloperidol.

**Synonyms**

Pot, grass, weed, rope, mull, dope, joint, mary jane, skunk, hash, chronic, reefer, cone or shit [6].

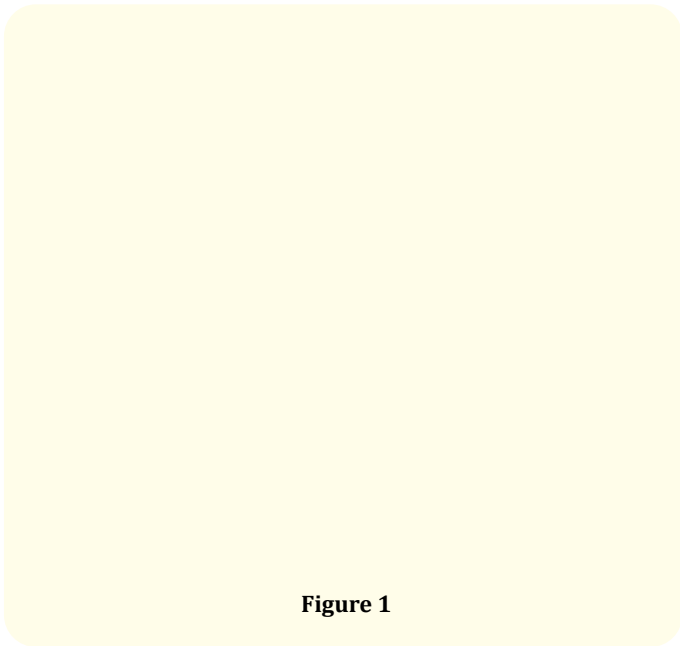


Figure 1

**According to Ayurveda**

- Guna- Laghu, Tikshna, Vyavayi.
- Rasa- Tikta.
- Vipaka- Katu.
- Veerya- Ushna.
- Karma- Kapha-Vata hara, Deepana, Pachana, Grahi [7].

**Metabolism**

An amount of 2 to 22 mg of THC dose in smoking is required in humans to produce pharmacological effects. It is solvable in lipids and gets quickly absorbed after inhalation. It is extremely protein bound and spreads easily from blood to other tissues after its absorption. About 2/3 of the drug is defaecated and the remaining 1/3 is thrown out through the kidney in the form of urine. Majority of the metabolites of THC are formed in liver. From

these compounds, in routine toxicology analyses 11-noncarboxy-THC which is having maximum concentration in urine, is usually screened. It can be detected in the urine for 2-3 days after casual use along with some other cannabinoids. In case of addicts or heavy users, this can be detected ever up to 4 weeks. Only 3-6% THC is absorbed through orally ingested marijuana which is much less than the smoked. (Even though most of these compounds are not having psychoactive properties, they can produce potential physiologic effects [8].

**Mechanism of action**

- Basal ganglia and cerebellum are having maximum density of receptors, resulting in its interference with motor coordination.
- Cortex, hippocampus and dentate gyrus are having transitional levels of binding effecting cognition and short-term memory.
- Brain stem shows low receptor density, which indicates its less fatality about cannabinoids.
- When given in combination with other drugs such as barbiturates, clomipramine, cocaine, ethanol, nicotine, opiates and phencyclidine etc, may alter the effects. Because of shared hepatic metabolic systems, ethanol and Phenobarbital can inhibit metabolism of THC [9].

**Preparation [10]**

Features	Bhanga	Ganja	Charas (hashish)
Source	Dried leaves and shoots	Flowering tops of female plant	Resinous exudates from leaves, flowers and stems
Colour	Brownish	Rusty green	Dark green or brown
Active principle	2-5% (least potent)	5-8%	10-20% (most potent)
Uses	Beverage	Mixed with tobacco and smoked in pipe/hukka	Mixed with tobacco and smoked in pipe/hukka

Table 1

**Majun**

It is a short of confection prepared from bhanga after treating it with sugar, flour, milk and butter. It has a sweet taste. It is also sold as small lozenge-shaped pieces. Sometimes, dhatura is mixed with 'majun' [11].

**Therapeutic use of Bhanga [12]**

- Vat shamak.
- Vednasthapan.
- Nidrajanan.
- Aakshephar.
- Dipan.
- Pachan.
- Rochan.
- Grahi.
- Pittasarak.
- Shoolprashaman.
- Swashar.
- Shukra stambhan.
- Garbhashaya sankochan.

**Use of Bhanga in Ayurvedic formulation [13,14]**

- Jatiphaladi churna.
- Vijayavatika.
- Madananandak modak.
- Jatiphaladi churna.
- Vijayavatika.
- Madananandak modak
- Pushpadhanwa ras
- Nidrodya ras
- Bahumutrantak ras
- Maha jwarankush ras
- Bhairava ras
- Bruhat jwarankush ras
- Bruhat chintamani ras
- Grahani Gajendra ras
- Indrabhasma vati

- Kaleshwara ras
- Kamdeva ras
- Krimikuthar ras
- Meghanand ras
- Rasendrachudamani ras
- Sinduradi vati

**Misuse of Bhanga**

- Most cases poisoning is accidental, particularly in young children, or due to overindulgence during recreational use. It is one of the commonly abused drugs in young and pregnant women in western societies. Unintentional ingestion by children has also been reported.
- Driving under the influence of cannabis: Driving is impaired if cannabis is ingested along with alcohol.
- Concomitant poisoning: Lead and mercury poisoning have been reported in marijuana abusers.
- Concentration after passive smoke inhalation is very low and usually not detected in the urine.
- Majun and charas are used by burglars to stupefy person for the purpose of robbery.
- Occasionally, it is consumed by criminals to strengthen nerves before committing a crime.
- Chocolates prepared from it cause strong desire among children for its euphoric effects [15].
- Commonly used by sadhus and pujaries [16].

**Cannabinoid hyperemesis syndrome**

- Cannabinoid hyperemesis syndrome (CHS) is due to the paradoxical effects of marijuana on the GIT and CNS (although anti-emetic properties are well known).
- Cannabinoid hyperemesis syndrome is usually characterized by chronic cannabis use, frequent nausea and vomiting, obsessive hot bathing.
- Prodromal, hyperemetic and recovery are the three distinct phases. In prodromal phase, the patient feels early morning nausea, a fear of vomiting and abdominal uneasiness. Next to it, the hyperemetic phase entails of devastating nausea and plentiful vomiting. Usually there is dehydration, mild

abdominal pain and weight loss. Patients feels better after taking hot showers/baths.

- Haloperidol is useful for acute CHS management, and long-term treatment is abstinence from cannabis [17].

### Run-Amok

An addict usually suffers from hallucination and delusion of persecution, presenting with a craving to extinguish life or commit homicide but there is no remembrance afterwards.

- Run-amok is a psychic commotion resulting from continued or sudden use of cannabis, categorized by a peculiar homicidal mania.
- After consumption, it produces depression, followed by excitation, confusion and a ferocious attempt to kill people.
- Criminal responsibility: The person usually not held responsible for his acts since 'run-amok' is considered a disorder of mind and not intoxication, unless before commission of the offence, he had taken it purposefully [18].

### Clinical features

#### Acute poisoning

Inhalation is associated with more noticeable effects than ingestion:

- Euphoria with drowsiness and disorientation. There is often increased loquacity and laughter, especially when smoked.
- Temporal and spatial disorientation with strengthening of sensation (and increased clarity of perception).
- Motor incoordination.
- Stimulation of appetite.
- Tachycardia, palpitations, hypotension (high doses)
- Conjunctival congestion, miosis.
- Large dose produces nausea, anxiety, confusion, delusions, and hallucinations.
- Typical burnt rope odour, after smoking.
- Intravenous use can cause headache, diplopia, vertigo, dyspnoea, hypotension and renal failure.

#### Chronic poisoning

- **A motivational syndrome:** Chronic abusers of cannabis gradually become lethargic, apathetic, and disinclined to work, with poor concentration.

- **Hashish insanity:** Chronic, heavy abuse of cannabis causes paranoid psychosis with violent behaviour, culminating in homicide (running amok).
- Increased susceptibility to pharyngitis, bronchitis, asthma and gynaecomastia (in male).
- Cannabis is sometimes contaminated with *Aspergillus* spores producing aspergillosis in immune-compromised individuals [18].

#### Fatal dose

There is no authentic reported case of death attributable to cannabis in the medical literature. Most deaths are attributed to multiple drug intoxication. However fatal dose as follows:

- Bhang: 10 g/kg body wt.
- Charas: 2g.
- Ganja: 8g.

#### Fatal period

About 12h.

#### Diagnosis

Serum and urine attentions of THC metabolites are useful for affirmative testing. Enzyme-multiplied immunoassay technique (EMIT) and radioimmunoassay (RIA) are useful; gas-chromatography-mass spectrometry (GC-MS) is the most specific (can detect up to 7 days post-exposure in urine). Duquenois-levine test: A plausible test for cannabis/marijuana. Two reagents and chloroform comprise this reaction. The three solutions are added to the sample being tested, which form multiple layers. If the chloroform layer develops a purple colour, marijuana may be present in the sample [20].

#### Treatment

##### According to Ayurveda

- Head bath with cold water.
- Cow's milk + sugar.
- Cow's curd + Sunthi + fresh root of sandesada – crushed in water and consumed [21].

##### According to modern science

Immediate management is supportive, including cardiovascular and neurological monitoring, and placement in a quiet room.

- Gastric lavage with warm water.
- Strong tea/coffee.
- Artificial respiration.
- Saline purgatives.
- 100 ml of 50% glucose or dextrose, 2 mg naloxone and 100 mg thiamine IV.
- Diazepam, 5-10 mg IV, if patient is violent and aggressive.
- Haloperidol to control psychotic manifestations [22].

### Ethnopharmacology of *Cannabis sativa*

*Cannabis sativa* is used by as medicine by mankind since ancient days. Several tribes and communities from different countries shows usage of this herb for the cure of various ailments. Extract of the inflorescence in warm water is taken orally in weakness, degenerative disease, in fever, to release fluxes, in rheumatism, septic conditions, and to stupefy and produce hallucinations. In China [23] in India, Hot water extract of the female inflorescence is taken orally as an abortifacient [24]. Leaf extract is used as an insect repellent [25]. Seeds of *Cannabis* are consumed in case of diabetes, hysteria in females, and insomnia [26]. Leaf Decoction is consumed as an anthelmintic [27]. Hot water extract of the plant is taken orally for asthma [28] induce abortion, labor, and to treatment for malaria [29] menstruation [30,31]. The seeds are consumed as an emmenagogue by certain communities [32]. It is also used in psychiatric disorders in combination with honey, nutmeg and sugar [33].

### Pharmacological activities

Several studies including clinical and animal trials conducted all over the world on *Cannabis sativa* shows Analgesic effect [34,35], Anti-arthritic effect [36], Anti-inflammatory activity [37], Antibacterial activity [38], Antifungal activity [39], Antiviral activity [40], Anticonvulsant activity [41], Antidiuretic activity [42], Anti-emetic activity [43], Anti-estrogenic effect [44], Antimalarial activity [45], Antispasmodic activity [46], Anti-spermatogenic effect [47], Antistress activity [48], Anxiolytic activity [49], Aphrodisiac activity [50], Anti-tumor activity [51], Anti-ulcer activity [52], Anti-androgenic effect [53] as pharmacological effects. More than 150 active principles from *Cannabis sativa* have numerous pharmacological actions and the research are still going on.

### Discussion

*Cannabis sativa* has been grown since years for several purposes, such as fiber, oil, or narcotics. Bhang obtained from *cannabis sativa*. It contains cannabinoid which is deliriant poison. It is rapidly absorbed after inhalation and effect the nervous system. It causes interference with motor neuron and cause effect on cognition, short term memory. It is used for making medicine and some people misuse it for smoking, stupefy person to facilitate robbery, driving under the influence of it, used in chocolate. For management of it poisoning Gastric lavage with warm water, Strong tea/coffee, Artificial respiration, Saline purgatives, diazepam, haloperidol should be given. According to Ayurveda head bath with cold water, Cow's milk + sugar, Cow's curd + Sunthi + fresh root of sandesada - crushed in water and consumed.

### Conclusion

Now a day *Cannabis* is being noticed by scientific and pharmaceutical communities because of its extensive pharmacological properties. Therefore, it is essential to bring forward the ample information on cannabis. More than 150 formulations containing bhang are reported to be available in Ayurvedic texts. Use and cultivation of cannabis is prohibited in India and any violation is covered by law. Apart from the therapeutic effects of cannabis, its illicit uses can also have negative effect on humans physical and mental health, when used for a long duration. This unpleasant situation requires a careful tackling with available medical intercession.

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