Introduction
INTRODUCTION:

The Narcotic Drugs and Psychotropic Substances Act, 1985 has been introduced by the Government of India "to consolidate and amend the law relating to narcotic drug, to make stringent provision for the control and regulation of operation relating to narcotic drugs and psychotropic substances, to provide for the forfeiture of properties derived from, or used in, illicit traffic in narcotic drug and psychotropic substances, to implement the provision of the international conventions on narcotic drugs and psychotropic substances and for matters connected therewith."

With the introduction of the act by the Government of India there has been a considerable increase in the number of substances newly brought under international control. This increase reflects a rapid diversification of drugs of abuse and the consequent increased regulatory efforts by number of substances put under control with more stringent national legislation and sentencing provisions. At the same time, the seized quantities of drugs under control, such as cannabis products, opium products heroin, cocaine, and related compounds have also shown an alarming and unprecedented increase in certain regions of the world.

The worldwide trend of increasing volume and frequency of seizures and the appearance of new psychotropic and narcotic drugs in the illicit traffic creates greater pressures on law enforcement agencies in their field operations. Moreover, new forms of the traditional drugs have in recent years appeared in the illicit traffic and Clandestine laboratories have produced new drugs. This new situation makes challenge not only to national law enforcement authorities, but also to the technical and scientific staff of Forensic laboratories.

During the last three to four years, traffickers have opened up new routes in the sub-continent for the trafficking of drugs. There has been a sharp increase of Heroin trafficking along the Indo-Srilanka route. Similarly certain seizures in the state of West Bengal give credence to the intelligence about trafficking of heroin from India to Bangladesh. These developments point to the fact that traffickers are likely to employ new global routes for illicit trafficking.
No country can fight the scourge of drugs on its own. Combating drug trafficking requires bilateral and multi-lateral cooperation and even more importantly, active regional cooperation. Now global intelligence community clearly find the link between drug trafficking and global security issues with a particular focus on the role played by Afghanistan in heroin trade. This speaks of a deadly, symbiotic relationship between the illicit drug trade, organized crime and international terrorism. The UN Security council in its resolution in year 2001, noted with concern, the close connection between international terrorism and transitional organized crime, illicit drugs, money laundering, illegal arms trafficking and weapon of mass destruction. The resolution emphasized the need to enhance coordination of efforts at the national, sub-regional, regional and international levels in order to strengthen the global response to this serious challenge and threat to international security.

The drug problem of India depends upon regional and domestic factors.

A. The geographic location because of its proximity to some of the world’s acknowledged drug producing regions, has rendered it vulnerable to the transit trafficking of both heroin and hashish.

B. Being a traditional producer of opium poppy, India has to counter the problem of diversion of opium from licit to illicit channels. The climate of the country is also conducive for the growth of cannabis, because of the good growth in temperate region. Spontaneous and wild growth of cannabis is reported from several parts of the country, which leads to significant trafficking of ganja and its derivatives.

C. India’s massive chemical industry also produce a wide range of precursor chemicals. All these open up opportunities for unscrupulous elements to divert them to illicit channels for the manufacturing of drugs as well as synthetic drugs like methaqualone.

D. Large and highly developed Pharmaceutical industry has similarly become a source for traffickers and medicinal preparations like painkillers, cough syrups, ayurvedic preparations and sedatives. These are trafficked within the country as well as to neighboring countries.
Towards west is the region comprising Afghanistan and Pakistan, which are internationally acknowledged source of opium and opium based drugs like heroin and brown sugar. In the east are Myanmar and Thailand, where a number of syndicates are engaged in illicit manufacture of synthetic drugs as well as heroin. Precursor Chemicals

**International Drug Trafficking in and around India.**

![Map of drug trafficking routes in and around India](map_url)

- Heroin
- Charas/Ganja/Mandrax
- Chemicals
- ATS
- Opium Illicit
- Opium Licit

like ephedrine, and psuedo-ephedrine have been known to be smuggled from India into this region and small quantities of synthetic drugs and heroin are smuggled from
Myanmar into India. Nepal in the north is a source of cannabis (ganja) of Nepalese origin, is trafficked in significant quantities into India. Recently, cannabis cultivation in Bhutan has also been recorded. It has been recently witnessed a spurt in the trafficking of heroin on Sri Lanka route in the Southern region.

**South East Asian Heroin Routes Transit Region**

Opium poppy has been traditionally cultivated under license in certain parts of Uttar Pradesh, Rajasthan and Madhya Pradesh under the strict supervision of Central Bureau of Narcotics. Despite that, each year, there have been cases when some farmers have surreptitiously diverted a part of their land to drug traffickers for the production
The manufacturing of narcotic and psychotropic substances in the states of J & K, Himachal Pradesh, Bihar, West Bengal, and Andhra Pradesh has also been observed. Domestic cultivation of cannabis has also been observed in the states like J & K, Himachal, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Kerala, and Manipur.

Climate conditions of the state of Chhattisgarh and surrounding regions are also conducive for the growth of cannabis and opium. Madhya Pradesh in the west and Uttar Pradesh in the north are traditionally opium poppy cultivating states. Towards the east, Orissa, and towards south, Andhra Pradesh are cannabis producing states. Spontaneous and wild growth of cannabis is reported from several parts of the state. Since Chhattisgarh is geographically surrounded by states, which produce both opium, and cannabis, hence it is vulnerable to the illicit trafficking of both.

United Nations development programmes, human development, report 1994, says that narcotic drugs have turned to be one of the major items of global trade, with the total volume of drug trafficking estimated at a whopping figure of five hundred billion dollars a year. The three principal drug areas of the world is Golden Crescent comprising Pakistan, Afghanistan, and Iran; The Golden triangle comprising Myanmar, Thailand, and Laos, and the cocaine producing areas of South America comprising Peru, Bolivia, and Columbia have been creating havoc with the health of millions of people by catering to the illicit global demands for narcotic drugs for abusive purposes.

Ganja and opium still remain as the main drugs of abuse in the villages; urban centres as well as in the industrial areas of the country. Heroin, Hashish, and Cannabis oil have become strong favourites of drug abusers.

In the state like Chhattisgarh, Ganja is the main drug of abuse. Opium and its products come next. But no case of cocaine has been reported during three years of present investigation. Since there are many angles to the drug problem of the country including Chhattisgarh state, the government has a multi-pronged anti-drug policy laid down in the NDPS Act, 1985 and PITNDPS Act 1988. The objectives of this policy is to regulate the production and supply of narcotic, drugs and psychotropic substances only for medical and scientific research purposes. It also ensures complete prohibition.
on consumption or use of such drugs and substances other than for the purposes mentioned above. It is also for prevention of illicit traffic of such drugs used for treatment, counseling, de-addiction and social rehabilitation of drug addicts in the larger interest of the society.

The characterization studies of drugs can provide useful information to the law enforcement authorities. A physical and chemical link between the samples seized by enforcement authorities can be established. The material from different seizures can be classified into group of alike samples. Detailed physical, chemical and botanical analysis of drug samples can measure relative concentrations of major, minor and trace compounds. The most useful information for law enforcement authorities is to trace specific link between the supplier and users. This will help in establishing drug distributions patterns, networks and geographic origin of drug sample.

It is required to explain in brief about drugs and standardize the names by which drugs are referred to, by law enforcement agencies while reporting seizures/interdictions, compiling statistics, classification and identifications of drugs and psychotropic substances.

A drug is a substance intended for use as a medicine for the alleviation of human and animal suffering. A drug when taken by a living organism modifies one or more of its functions. This would include not only medications meant for the treatment of the patients but also other pharmacologically active substances. In other words a drug is any substance that can cause a change in man's body or way of thinking and feeling.

Drug occurring in nature are called natural drugs. These are found stored in roots, barks, leaves, flowers, fruits, seeds, resins, milky exudations and other parts of the body of a plant. These are crude or raw natural drugs.

Man can process these crude drugs to isolate the active compound and convert them into more effective compounds or to reduce their ill effects on the body. Such drugs are called semi synthetic.

Drug which are made by man starting from elements like carbon, hydrogen,
nitrogen, phosphorous, sulphur etc. or from chemical synthesis of primary compounds are known as synthetic drugs. These drugs with similar properties like natural ones are produced in factories to make them available in greater quantities for medical use at a cheaper cost.

NARCOTIC DRUG:

There are many definitions of Narcotic drug. Some of the important definitions are: the drugs, which in therapeutic doses diminish awareness of sensory impulses especially pain generated by brain. In large doses it causes condition of insensitivity, coma or convulsions. The narcotic drugs are mainly plant-derived drugs. The drugs, which are covered under NDPS act 1985 under the head narcotic drugs, are called narcotic drugs.

These include:

1. Opium - The Opium plant, poppy straw, and opium alkaloids like morphine etc.
2. Coca - The Coca plant and alkaloids like cocaine.
3. Cannabis - The cannabis plant and narcotic preparation of cannabis reported as Ganja, Bhang, Charas (Hashish).

and their salts, preparations, admixture, extract and other substances containing any of these drugs.

1. OPium: Opium is the air-dried juice obtained by incision of the unripe capsules of the white poppy, Papaver somniferum. The white poppy belongs to family Papaveraceae, grown in India, Persia, Asia Minor, Turkey, China and Egypt also cultivated in England and other cold countries.

The incisions are made in the late afternoon.
A milky substance oozes out and turns to reddish brown upon contact with the air. The extruded substance is collected the next morning if it is destined for legitimate medical use; it is graded on its morphine content, which must be at least 9.5%. Thereafter the substance is further refined and the various alkaloids extracted if however, it is intended for illegal use, it is mixed with the glycerine and water to boil down to the consistency of heavy molasses. Evaporating the water, with the remaining glycerine keeping the opium pliable, processes the substance further. It is then further processed for smoking or ultimately to become illegal morphine or heroin.

Poppy capsules even when they are ripe and dry contain traces of opium and are used for sedative and narcotic action. Their warm decantation is used locally as a sedative and poultice.

Opium has a strong characteristic odor and bitter taste. When fresh, it is a plastic and internally moist, coarsely granular or nearly smooth and reddish or chestnut brown in colour. It becomes hard, brittle and dark brown on keeping. It is a highly complex substance, containing about forty-five alkaloids combined with organic acids like meconic and lactic, inorganic acids like sulphuric acid gums, pectins, waxes, proteins, free amino acids, fats, free fatty acids and resins. Out of these the most important alkaloid is Morphine, which occurs in combination with meconic acid. Next other important alkaloids are codeine, narcotine, papaverine and thebaine. The alkaloids Morphine, Codeine and Thebaines belong to phenanthrene group and Papaverine, Norcotine to Benzyl Isoquinoline group.

The word morphine has come from a Greek word Morpheus, the Greek God of dreams. Morphine is the principal alkaloid of opium. It was first isolated by F.W.A. Sertuner in 1806. The poisonous properties of opium are chiefly due to Morphine.
Morphine is a white powder or forms white shining crystals having a bitter taste and alkaline in nature. It is very sparingly soluble in cold water, but soluble in about 1:45 ratio of boiling water. It forms crystalline salts like morphine hydrochloride (white to dark brown in colour) morphine sulphate (white or pale in colour) and morphine acetate. Out of these first two are pharmacopoeia preparations whereas last one is a non-official preparation. These salts are bitter in taste, neutral and freely soluble in water. Morphine comes in three principal forms: powder, cubes and 1/8 to 1/2 grain tablets. The texture is light, very similar to that of chalk dust. Peddlers adulterate it with milk powder or sugar cutting the potency considerably. The drug is taken orally or intravenously. Morphine is known in the argot by names like “morph”, “White stuff”, “Miss Emma”, “Mary Ann” and others. In certain parts of South East Asia, it is sometimes called Heroin no-1.

Heroin is a semi-synthetic opiate synthesized from morphine. Heroin has certain street names like Aries, Chip, Stuff, Harry, Smack, Horse, Aunt Hazel, courage pills, ferry dust, stuff, Boy, Dort, Foolish powder, Isda, witch, Big bag, Dope, Girl, Junk etc. It is a crudely processed high-purity heroin mainly of Mexican origin. It is dark brown or black in colour. It has repulsive vinegar like odor, which is stronger and long lasting than that of powdered heroin. Its consistency may be sticky like roofing tar or hard like coal. It contains many contaminants such as plant byproducts and residual acetylation reagents like acetic anhydride. It has certain common street names like Ball Carga, Gum, Chiva Raw Heroin, Black Heroin, Chiclosa, Gumball, Tootsie Roll, Brown tar, Mexican tar, Bugger, Dog food, pedazo etc.

2. COCAINE: It is a narcotic drug, whose primary effect is to alter mood and behavior by acting on the central nervous system. It is most powerful natural stimulant. This drug is a principal active ingredient of the South American plant Erythroxylon coca
and Erythroxylon Novo granatense. The coca plant grows plentifully in tropical climates, 500-2000 meters above sea level as a bush or tree in countries like Bolivia, Chile, Colombia, Ecuador and Peru but now cultivated in the tea producing districts of India, Srilanka and Java. Coca plants are harvested from two to six times in a year up to 20 years. The green to yellow-greenish elliptical leaves of different erythroxylon species vary in size and appearance but characteristically have two lines parallel to the midrib on the underside of the leaf. The leaves, after hand plucking from the plant, are dried in the sun before shipment. After the harvest and drying process, the coca leaf is converted to coca paste, which thereafter is converted to cocaine hydrochloride in illicit laboratories. Cocaine is a white, odorless, crystalline powder resembling snow Epsom salt or camphor. An ester of benzoic acid and absconding nitrogen is synthetic cocaine and is usually inhaled, “snorted” intranasal or injected. Certain common street names of cocaine are Bazooka, candy, crack, lady, Star-dust Bazucos, C-dust, Flake, Rock, Big-C, Coco, Gin, Snow, coke, Blanche, Koks, Speed ball etc.

Cocaine obtained from cocaine hydrochloride is called Crack, which is suitable for smoking. It can be obtained by dissolving cocaine hydrochloride in water and adding baking soda or ammonia, heating and cooling the mixture and collecting the precipitated crystals through filtration. Crack is usually found in the form of white chips, chunks or rocks. It is either smoked in water pipe or sprinkled on tobacco or marijuana to be smoked as a cigarette.
3. **CANNABIS**: *Cannabis sativa* L., the hemp plant is a plant or bush of *utriculata* family, grow widely throughout the temperate and tropical zones of the world including India. In India its cultivation is a restricted monopoly of State Governments. The plant has been cultivated for centuries for the hemp fibers of the stem, the seeds that are used in feed mixtures and for the oil as an ingredient in paint as well as for the biologically active substance contained in its leaves and flowering tops. Cannabis is a general term used to describe different forms of the drug obtained from the cannabis plant. The principal psychoactive ingredient of cannabis is Tetrahydrocannabinol (THC).

The female plant is taller, about 5-6 M. and has more dark and luxuriant foliage than the male. It yields a sticky amorphous cannabinone, which consists chiefly of cannabinol, a tetrahydrocannabinol isomers.

*Cannabis* means any plant of the genus cannabis or any part of such plant exuding the resin, fiber from mature stalk or seeds or any part of plant of the genus, which contains one or more of the chemical identified as cannabinoids, which are the psychoactive constituents of cannabis. It is known as Hashish in middle East, Marijuana in America, Kifin in North Africa, Ghanna in South Africa, Maconha in South America and has several other names in different parts of the world. Historically it is mentioned in Atharvaved (2000-1400 BC) Susruta Samhita (AD 6th or 7th centuries), Panini (a grammarian) mention hemp (Bhanga) as a
The genus has numerous varieties, widely distributed throughout the world. According to de Candolle (1885) original habitat of the genus might have been some region east of the Caucasian. According to Dewey (1901) Cannabis is one of the earliest plants cultivated for fibre, originally probably somewhere in Central India.

The various forms in which *cannabis sativa* is used in India are:

**Bhang**: It is also called Siddhi, Patti or Sabji. This consists of the dried leaves and fruiting shoots. The leaves are used as an infusion in the form of a beverage, which produces intoxication of a sensuous character.

**Manjum**: This is sort of confection prepared from Bhang after treating it with sugar, flour, milk and butter. It has an agreeable odor and a sweet taste. Sometimes dhatura is mixed with manjum.

**Ganja**: This is rusty green coloured flowering and fruiting tops of the female plant coated with resin. The flowering tops of the plant are harvested, dried and sometimes pressed into "bricks," or twisted into sticks. It is similar in appearance to tobacco although greenish brown in colour. It has characteristic odor. First it is rubbed with a little water in the palm till it becomes sticky and then mixed with a little tobacco, and usually smoked in a pipe. The person feels heavy, lazy and indulges in pleasant reveries. The leaves and flowering tops of the American hemp plant (*Cannabis americana* or Marijuana) are rolled into cigarettes called "reefers or pot" and smoked. A good quality cigarette contains about 500 mg of marijuana. Some street names of cannabis plant are: Aunt Mary, can fry daddy, Joint sticks Mother, Red dirt, Hemp, Marihuana, Marijuana, Baby, Dope, Gash, Kaya, Nail, Salt and pepper, Marie-jeanne, bhang, earth, Herb, Kif, Panama Red Thirteen, Pot, Senscimilla, Bash Esra, Indian boy, light stuff, Queen-Ann’s lace zol, Buddha-sticks, Thaisticks etc.
Hashish / Charas: This is resinous secretion of the flowering tops of the cannabis plant. It is collected, dried and sometimes baked, then is either pressed into powdery blocks or mixed with wax to form rigid slabs. It varies from light brown to green, dark brown or black in colour. Its common street names are: Charas, Hash, Hashish, H, Khif, Pot, shit.
Morphology:

Following is a short description of the morphology of *Cannabis sativa*.

*Cannabis* is an erect, annual, smelling, scarcely branched herb. At maturity the plant develops a rigid, woody stem. The plant is of very variable height, but usually 1 to 1.5 m in feral state, growing to more than 5 m under cultivation (Olsen 2004). Young stem is succulent but it lignifies rapidly. At maturity the stem is obtusely hexagonal, more or less grooved or furrowed and rough. The branches are fragile and short. Female plants are generally shorter than the male plants but have more branches. On either side of a long petiole there is a free, straight, pointed, persistent stipule. Leaves are generally palmately compound, 5 – 15 cm long, 7 to 20 cm in diameter with long (4 – 6 cm) petioles. Lower leaves are usually opposite while the upper leaves are alternate, palmately nerved with serrate margin. Lower leaves 3 – 9 (rarely 11) are foliate, very unequal, upper leaves 3 – 1 are foliate (monophyllous) passing in to bracts. However, female plants are leafy on the top. Bracts convolute with oblique mouth, much longer than the ovary and its inverting hyaline perianth, accrescent, about 0.5 cm in fruit. Flowers are dioecious or some plants are monoecious. Male flowers are in a pendulous dichasium or panicle of dichasial cymes passing in to scorpioid cymes, epispels five, perianth petalous, sepals imbricate, anthers. A rudimentary ovary is sometimes found in the centre of the androecium. Male pistillate plants without perianth dry up fairly rapidly after flowering. Female flowers have contracted cymes or heads with large, crowded bracts rich in resin secreting glands. The whole structure gives a robust, bushy, compact appearance to the female plant. Ovary is bicarpellary, one celled with 2 large feathery style, which are sometimes pink in colour. Ovule is pendulous and campylotropous. Fruits are achene, compressed, crustaceous, decorated with webbing of varying fineness and colour. Seed flattened, albumen unilateral, fleshy. Embryo curved, cotyledon broad, thick, subequal, radicle upcurved incumbent, contains oil and aleurone.

The fruits of the hemp constitute the hemp-seed (*chênevis*), which can furnish 20 to 30 per cent of a siccative oil, formerly used chiefly for lighting and soap-making, and now in the manufacture of varnish and paint.
Cannabis is mono or polyploid has been a contentious issue for well over two centuries (Emden 1984, Schultes & Hofman 1976, Small & Cronquist 1976), Hillig & Mahalberg 2004). The changes, some of them considerable, which Cannabis undergoes in order to adapt itself to the very varying conditions of the districts into which it has been introduced, led to the mistaken belief that different species existed. (Bouquet J 1925)

Cultivation has resulted in the development of at least three distinct types, each further divided into varieties:

Type 1: Grown throughout Europe especially Italy as well as in Africa, Russia, central Asia including India, China, Japan and to a lesser degree in Brazil and the United States. specially for fibre.

Type 2: Cultivated for fruit, utilized as source of food and oil.

Type 3: Cannabis sativa var. indica, grown in India, Arabia and Northern Africa for medicinal and narcotic products.

Most of the reports from China indicate that only one species (Cannabis sativa L.) exists in China with two infra specific taxa (variously indicated either as sub species, varieties or forms) sativa and indica (Hong & Clarke, 1996). The fibre types, low in THC are classified as subspecies sativa and drug types with higher THC contents are classified as sub species indica.

With their taxonomic studies Schultes and Anderson (1994) concluded that sufficient evidence exists to support recognition of three species C. sativa L., C indica Lam., and C. ruderalis. According to their descriptions C. sativa is tall and laxy branched with relatively narrow leaflets. C. indica is shorter, conical in shape and has relatively wide leaflets, C. ruderalis is short, branchless and grows wild in central Asia. However, botanists admit only a single species, Cannabis sativa L., including the two (or three) following varieties ( League of Nations document 1542 r, p. 2)
1. The *vulgaris* variety (or *Cannabis sativa*, var. *typica*): annual herbaceous plant; five to seven folioles; female inflorescences not very thick and not much contracted. Greyish achene with tegument having a very fine white webbing. Height not more than 1.70 metres to 2 metres in temperate climates.

2. The *indica* variety: annual suffrutescence plant with five, seven, nine or sometimes eleven folioles; female inflorescences very thick, condensed and contracted. Achene small, the tegument having black spots and discs, on a yellowish ground. Very high stalk (up to approximately 4 metres) in plants grown in the plains or in hot, damp climates, but not over 1.50 metres in wild plants or those grown in high cold districts or hot but dry regions.

3. The *sinensis* variety, created by Delille and still accepted by certain botanists, should be rejected. Its characteristics make it akin to the *sativa* variety from which it only differs by its height: 4-6 metres. Introduced into France in 1827, it there rapidly acquired the characteristics of the *typica* variety.

It is true that, on the ground of slight morphological differences, a considerable number of varieties of *Cannabis* could easily be distinguished; but it should be remembered that the characteristics of hemp are very readily modified in cultivation, or by removal to different surroundings. The experiments of Christison and Hope (1847) in England, and of J. Bouquet (1912) in France, have shown that plants grown from seed brought from India become, after two or three generations, completely similar to indigenous plants. The converse also holds good.

In Egypt, when the Viceroy Mehemet Ali wished to create a navy, he got Cannabis seeds from Europe in order to obtain suitable fibre for cordage. New seed had to be brought periodically, because the hemp-plants obtained soon became incapable of producing good textile fibres. On the other hand, they began to secrete abundant quantities of the inebriating resin. Thus hemp tends to be similar or different from the characteristic type, according to the conditions in which it is grown.
Aberrant variety

In exceptional cases these changes may appear suddenly, although the causes are difficult to determine. That, for instance, is an explanation of the appearance in the Tunis plantations, in 1936, of the late aberrant variety reported by Dr. J. Bouquet. League of Nations document O.C. 1542 o.19

There are three fairly distinct types of hemp: that grown for fibre, that for birdseed and oil and that for drugs (The genus Cannabis: Taxonomy and Biochemistry).

The influences of light, drought and heat have a profound effect on its growth. Seeds from the same stock will produce, in the North of France, plants two metres high; in the alluvial plains of Piedmont, or in Virginia, the plants will grow to from three and a half to four metres; while in Northern Africa they are barely one and a half metres in height. Equally marked differences will be found in the formation of textile fibres and the production of resin. Schaffer (1921) has even noted that hemp sown in the winter and exposed to a weak light has its sexual characteristics disordered, many flowers becoming hermaphoditic. As early as 1855, reported that hemp grown by him at Patna had, in certain unfavourable conditions, become monoecious.

1. A recent study of genetic variation in Cannabis supports recognition of *C. sativa* and *C. indica* as separate species, although the existence of a third species, "C. ruderalis", is less certain. This study assigned hemp (fiber/seed) landraces and feral populations from Europe, central Asia, and Asia Minor to *C. sativa*. *Cannabis indica* includes both narrow-leaved and wide-leaved drug strains, as well as southern and eastern Asian hemp strains and feral Himalayan populations. Hillig, (2005).

Morphological and anatomical studies of herbarium specimens and living samples of Chinese Cannabis revealed that cultivated varieties have larger fruits than the wild populations. Size of the fruit is only a stable criterion of classification as to whether samples are cultivated or wild forms. Wild fruits generally have deeper and more irregularly dispersed pigmented areas (blotchy spots or stripes) than those of the cultivated ones. All other morphological and anatomical parameters were found to
vary widely due to environmental influences are not suitable to criteria for taxonomic and evolutionary studies.

Seed colour and pattern are affected naturally by the need for camouflage. Under cultivation this natural selection pressure would not be the same. In other words these are serious problems with these limited approach to categorizing species in cannabis. However, species should represent distinct groups within a genus and populations with intermediate characteristics should be the exception.

Other characteristics such as variation in wood anatomy and leaf form have been suggested for delimiting cannabis species. However, wood anatomy like stem anatomy can be seriously affected by selection for hemp in particular, but also by selection for marijuana and seed. Wood anatomy also depends on the portion of the stem examined and on the arrangement of leaves (phyllotaxy), which in turn is influenced by light and physiological development of the plant.

Any classification of species in cannabis based solely on morphological grounds will prove difficult to justify with our present knowledge of the plant. At this time it seems that all cannabis should be one species Cannabis sativa L. In the United States this argument was dismissed by the California court. The court upheld the argument that in the interest of law enforcement all cannabis are alike on morphological grounds, although it may be questionable botanically.

Environment has impact and can work on genes.

Males reach sexual maturity several weeks prior to females. Although genetics disposes a plant to become male, environmental factors, including the diurnal light cycle, can alter the sex. Natural hermaphrodites, with both male and female parts, are either sterile or fertile but artificially induced hermaphrodites can have fully functional reproductive organs. ‘Feminized’ seed sold by many commercial seed suppliers are derived from artificially hermaphrodytic females that lack the male gene or by treating the seeds with hormones or silver thiosulfate.
Cannabis is a C4 plant. Photoperiodically some are long day, some are short day while still others are day neutral as can flower under continuous illumination Clarke (2000) while according to Clarke himself and some others Cannabis is a short day plant.

ALKALOIDS:

Cannabis is the only plant genus in which the unique class of molecules known as cannabinoids are found. Cannabinoids are a family of chemically related 21 carbon alkaloids. Easily dissolve in fat but are water insoluble. The production of cannabinoids and their associated terpenes in Cannabis is subject to environmental influences as well as hereditary determinants (Pate 1994).

*C. sativa* contains more than 460 chemical compounds with more than 60 different cannabinoid alkaloids, but the chief, active ingredient of alkaloid group is delta-9-tetrahydro-cannabinol (THC). The next compound in abundance is the CBD (cannabidiol). THC is responsible for the psychoactive effect, CBD on the other hand has been shown to be antipsychoactive, blocks the effect of THC in the nervous system. The genus Cannabis: Taxonomy and Biochemistry. Cannabis high in THC and low in CBD is popularly known as marijuana while the type high in CBD and low in THC is called industrial hemp CBD has been shown to block the effect of THC in the nervous system. Hemp, it turns out, is not only not marijuana, it could be called antimarijuana.

Mono and sesquiterpenes are another major group of secreted compounds. Monoterpenes are more abundant of the two types. Terpenes contribute to the odour of the plant and are sticky in character. Different combination of terpenes in different strains contribute to odour differences.

THC in fruiting inflorescences, 0.02% - 4.38% of dry weight, may vary widely even among individual samples taken from the same inflorescence.

Seedless varieties derived from unpollinated female plants have high THC content and are traditionally known as sinsemilla (Spanish = without seed).
HAIRS

Hairs in cannabis are of two types:

1. Pre flowering
2. Post flowering

1. Pre flowering: These are again of two types

   a. Unicellular, long, thin, ending in a sharp point. Such hairs are rare up to the age of one month in tropical region but up to two months in temperate climate. They subsequently increase progressively and are particularly abundant on floriferous areas forming a silky down.

   b. Short hairs, swollen at base and set in the surrounding epidermis cells. Their extremities are blunt. They generally contain calcium carbonate cystoliths. They are to be found for the most part on the upper surface of the bracts and leaves and sometimes also on the lower surface of the limb.

2. Post flowering hairs: When the female plant is about to flower its tops, which already have large quantities of covering hairs become covered with multitude of glands.

RESIN GLANDS (GLANDULAR TRICHOMES)

Glands cover entire surface of the above ground portion of both pistillate and staminate plants but are most abundant on the bracts of female plants.

Resin glands are of three types:

1. Bulbous type: These are the smallest glands 15 - 30μm. 1 - 4 cells make up the foot and stalk and 1 - 4 cells make up the head. These hairs secrete resin (cannabinoids, oil and related compounds. Bulbous glands are found scattered about the surface of the above ground plant parts.
2. **Capitate type I**: Much larger of 25 – 100 m and more numerous than the bulbous type. These are called capitate type. On immature plants appear not to have a stalk and called capitate sessile. They actually have a stalk, one cell high, although may not be visible, beneath the globular head. Head consists usually of 8 cells but up to 16 cells may be found. These cells form a convex head.

3. **Capitate type II**: These are formed during flowering. Are of capitate type. They are formed on newly formed plant parts. Some glands, with the elongation of their stalk, are raised to a height of 150 – 500 m. Their stalk is composed mostly of adjacent epidermal tissue. These are found most over female flower bracts. Also highly concentrated on the small leaves that accompany the flowers of marijuana variety. These glands are found in high density along the veins of the lower leaf surface. Sometimes may be found on upper leaf surface on some varieties. Male flowers have stalked glands on the sepals but are smaller and less concentrated than on female. Male flowers form a row of very large capitate glands along the opposite sides of anthers. These glands are not visible until flower formation.

According to Mahalberg et al. Two types of glands are formed in female plants:

1. **Capitate sessile**: Most common gland type as it occurs on stems, leaves and bracts.

2. **Capitate stalked**: Develops only after flower formation occurs especially on the bracts subtending a flower and seed.

   Both types are present on the bracts subtending the seed, but some factor(s) that stimulate flowering also stimulate development of stalk related to this gland, thus, has evolved from sessile type. Capitate stalked glands contain more THC (and total cannabinoids) than capitate sessile glands.

   Glands on veins contain more THC than glands on non vein area.
Stalked glands contain more THC than sessile glands according to (Pate 1994). The major sites of cannabinoid production appear to be epidermal glands (Fairbrain 1972, Hammond and Mahalberg 1973, Lanyon et al. 1975) which exhibit a marked variation in size, shape and population density, depending on the anatomical examination.

Name: Tetrahydrocannabinols

Chemical Name: Tetrahydro-6,6,9-trimethyl-3-pentyl-6H-dibenzo[b,d]pyran-1-ol

Chemical Formula: C_{21}H_{26}O_2

Molecular Weight: 314.47

Boiling Point: 200°C (392°F)

LD₅₀: 1270 mg/kg (male rats), 730 mg/kg (female rats) oral in sesame oil

LD₅₀: 42 mg/kg (rats) inhalation

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Name: Cannabinol

Chemical Name: 6,6,9-Trimethyl-3-pentyl-6H-dibenzo[b,d]pyran-1-ol

Alternate Chemical Names: 3-Amyl-1-hydroxy-6,6,9-trimethyl-6H-dibenzo[b,d]pyran

Chemical Formula: C_{21}H_{26}O_2

Molecular Weight: 310.44

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There are three kinds of ganja:

1. Flat ganja. The cut stalks are tied together in bundles, the large leaves are eliminated, and only the inflorescences, which are stuck together by the exuded resin, are kept. The bundles of inflorescences are placed on the ground and trampled underfoot to flatten them. The bundles are then untied, and the product sorted and packed under the name of Large flat or Ewig-flat, according to the length and breadth of the stems.
2. *Round ganja*. Instead of being trampled underfoot, the tops are rolled in the hands until they have become rounded and tapered in shape. This kind of ganja is always packed in bundles (generally of twentyfour pieces).

3. *Chur-ganja, or Rora*. The tops, detached intentionally from the plants, or accidentally from the flat or round ganja, constitute what is known as Rora. This is generally delivered to the consumer in the form of a coarse powder.

**Etymology**

The name cannabis is thought to be of Scythian origin. Possibly it has an earlier origin in Semitic languages like Hebrew, in Exodus 30:23 God commands Moses to make a holy anointing oil of myrrh, sweet cinnamon, kaneh bosm, and kassia. Kaneh bosm (Hebrew kannabos or kannabus) “kan” in means “reed” or “hemp”, while “bosm” means “aromatic”. In the Greek translations of the old testament “kan” was rendered as “reed”, leading to English translations as “sweet calamus” (Exodus 30:23), sweet cane (Isaiah 43:24; Jeremiah 6:20) and “calamus” (Ezekiel 27:19; Song of Songs 4:14).

Sara Benetowa of the Institute of Anthropological Sciences in Warsaw is quoted in the Book of Grass as saying: “The astonishing resemblance between the Semitic ‘kanbos’ and the Scythian ‘cannabis’ leads to the assumption that the Scythian word was of Semitic origin. These etymological discussions run parallel to arguments drawn from history.

Comparing the English word *hemp* and the Greek word *kannabis* shows that the word came down from the Common Indo-European language. Words like kanapish for “hemp” occur in some Finno-Ugrian languages. It is likely that, soon after agriculture started, hemp as a cultivated plant spread widely, carrying its name with it.

*Cannabis indica* Lam. (sometimes classified *Cannabis sativa* spp. *indica*) is a putative species of *Cannabis*, although not all botanists agree that it should be treated as separate from *Cannabis sativa* L.