Chapter

13

Hallucinogens

Hallucinogens are a large and diverse class of psychoactive drugs that can produce altered states of consciousness characterized by major alterations in thought, mood, perception of reality and other changes. It changes a person's awareness of their surroundings. Some hallucinogens are human-made (synthetic), and some are naturally occurring compounds found in certain plants and fungi. At high doses, all compounds may cause a person to hallucinate, or hear or feel things that are not really there.

Mind-altering and psychoactive plants affect performance of brain and central and peripheral nervous systems by influencing signal transduction in neurons. At low concentrations, these compounds may be mind-altering or stimulating; the same compounds may be deadly poisons at higher concentrations.

Hallucinogens cause mild-to-intense psychoactive, or mind-altering effects. These effects vary from drug to drug, from person to person, from one drug-taking episode to the next, and can even change dramatically within one time of use. Effects can range from ecstasy to terror, from mild distortion of the senses to full hallucinations. They are available in different forms, ranging from chemicals such as d-lysergic acid diethylamide (LSD) to plants like peyote.

There is a wide variety of hallucinogenic mushrooms growing wild in many parts of the world. Many hallucinogens can have very unpleasant or toxic effects (e.g. jimsonweed, deadly nightshade).

Hallucinogenic plants include Opium poppy, Peyote (*Lophophora williamsii*), Cannabis (*Cannabis sativa*), Salvia (*Salvia divinorum*), Ayahuasca (*Banisteriopsis caapi*), Betel nut (*Areca catechu*), Tobacco (*Nicotiana tabacum*), Jimsonweed (*Datura stramonium*), Coca leaves (*Erythroxylum coca*), Psilocybin (Magic mushrooms), Hops (*Humulus lupulus*), Kava Kava (*Piper methysticum*), Iboga (*Tabernanthe iboga*), Ololiuqui (*Turbina corymbosa*), Ebena (*Virola theiodora*) and Deadly nightshade (*Atropa belladonna*).

OPIUM POPPY

Opium is the dried milky latex obtained by incision from the unripe capsules of *Papaver somniferum* L. (Family: Papaveraceae). It is also known as Afim, Poppy tears and Post.

Opium is cultivated in Turkey, Russia, Czechoslovakia, France, Holland, Hungary, Yugoslavia, Tasmania, India, Pakistan, Iran, Afghanistan, Myanmar, Thailand and Loas. In India, it is planted in Madhya Pradesh (Neemuch) and Uttar Pradesh. Afghanistan is the primary producer of the drug.

Opium occurs in round or flat mass, diameter 8–15 cm, weighing from 300 g to 3 kg. The external surface is pale or chocolate-brown, texture is uniform and slightly granular.

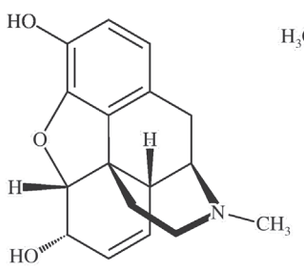
It is plastic-like when fresh and turns hard and brittle after some time, internal surface is coarsely granular, reddish brown, and lustrous; odour is characteristic, taste is bitter and distinct.

Opium poppy

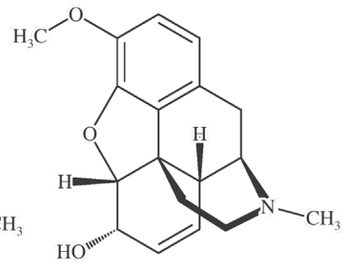
Opium plant

Chemical constituents: Opium contains about 25 alkaloids, the major alkaloid is morphine (10–16%). The other alkaloids isolated from opium are codeine, narcotine, thebaine, noscapine, narceine and papaverine. Morphine contains a phenanthrene nucleus. Morphine is converted to heroin which is almost twice as potent.

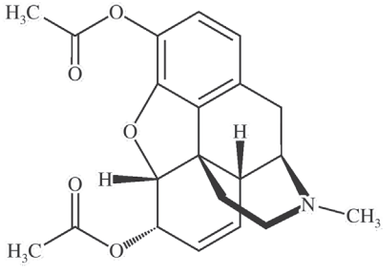
Morphine gives a dark violet colour with conc. sulphuric acid and formaldehyde. An aqueous extract of opium with ferric chloride gives a deep reddish-purple colour which persists on addition of hydrochloric acid.



Morphine



Codeine



Heroin

Therapeutic efficacy: Opium and morphine have narcotic, analgesic and sedative properties and are used to relieve pain, diarrhoea, dysentery and cough. Poppy capsules have anodyne, astringent, emollient, somniferous, soporific, sedative and narcotic effects. Generally, opium has anodyne, hypnotic, antispasmodic, diaphoretic, narcotic, myotic, intoxicant and cerebral depressant activities. Codeine is mild sedative and added in cough mixtures.

Opium may be smoked, eaten raw or as a pill, or made into a tincture for drinking. Short term effects of opium may include euphoria, relaxation, analgesia, slower breathing, lower heart rate, impaired reflexes, temporary constipation and loss of appetite.

This drug exerts its main effects on the brain and spinal cord. The principal action is to relieve pain, and anxiety; induces relaxation and sedation, and may impart a state of euphoria or another enhanced mood. Heroin is especially known for generating an intense excited state that spreads throughout the body as a warm glowing sensation. Chronic users develop a tolerance and require progressively larger doses to achieve the same effect. Heroin and morphine overdoses often result in death.

Opium is a depressant drug, which means it slows down the messages travelling between your brain and body. Opium, morphine and the diacetyl derivative heroin cause drug addiction. Abuse leads to habituation of addiction.

PEYOTE *(Lophophora williamsii)*

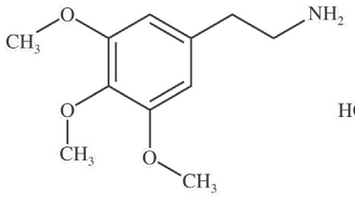
Peyote [*Lophophora williamsii* (Lam.) JM Coult., Family Cactaceae] is a small, spineless cactus which contains psychoactive alkaloids, mainly mescaline. Peyote is native to Mexico and southwestern Texas. It is found in the Sierra Madre Occidental, the Chihuahuan Desert and in the states of Nayarit, Coahuila, Nuevo Leon, Tamaulipas, and San Luis Potosi. It flowers from March to May, and sometimes as late as September.

The tops of the cactus can be dried to form 'mescal buttons,' which are known for their hallucinogenic effects. The hallucinatory effects vary greatly among individuals. Hallucinations are usually visual, less often auditory. Side effects include nausea and vomiting. Peyote is not considered to be addictive.

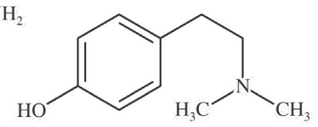
When used for its psychoactive properties, common doses of pure mescaline range from roughly 200–400 mg. The effects last about 10–12 hours.

Mescaline, melting point 35–36°C, is found as a white powder, while dried. Its IUPAC name is 3,4,5-trimethoxyphenethylamine, a ring-substituted amphetamine. It is moderately soluble in water; soluble in chloroform, and benzene, and practically insoluble in solvent ether, and petroleum ether. It is a naturally occurring member of the phenethylamine class of intoxicants. Ground peyote buttons can be found as capsules. It is usually swallowed, but can be chewed or smoked. Mescaline is a naturally occurring psychedelic substance. The effects of mescaline are similar to those of LSD.

Chemical constituents: Peyote contains mescaline (3,4,5-triethoxyphenethylamine) that is associated with poisoning. It also contains the alkaloid, hordenine (called peyocactin), isopellotine, anhalamine, tyramine, N-methylmescaline, N-acetylmescaline, pellotine, anhalonine, anhalidine, anhalonidine, and lophophorine.



Mescaline



Hordenine


Peyote

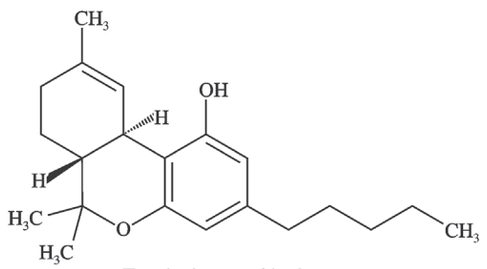
CANNABIS

Cannabis, known as Marijuana, refers to the dried leaves, flowers, stems, and seeds from the hemp plant, *Cannabis sativa* L. (Family: Cannabinaceae). Extracts can also be made from the cannabis plant. Marijuana is the most used illegal drug.

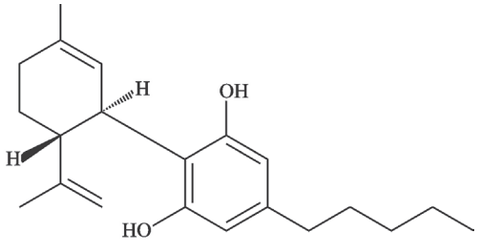
The plant is grown for fibres in Russia, Italy, France and America.

Cannabis is a dioicous, annual plant, flowering herb, resistant to climatic changes. It has a height of 1.6–6 meters. The leaves are palmately compound or digitate, with serrate leaflets. The first pair of leaves usually have a single leaflet.

Chemical constituents: *Cannabis sativa* contains 2–20.0% of the psychoactive component δ-9-tetrahydrocannabinol (THC) and cannabidiol (CBD) and other >60 compounds (cannabinoids). The main cannabinoids are δ-9-tetrahydrocannabinol, δ-8-tetrahydrocannabinol, cannabidiol, and cannabinol. Other cannabinoids present in the plant are cannabichromene, cannabiciclol, cannabigerol, cannabigerol monomethyl ether, cannabielsoin, cannabinodiol, cannabitriol, dehydrocannabifuran, tetrahydrocannabivarin, endocannabinoids and cannabicitran, that appear in variable amounts according to the *Cannabis* variety.



Tetrahydrocannabinol



Cannabidiol

Due to its higher THC content, Cannabis is the preferred choice by users. It is a complex plant with about 545 chemical entities, of which >60 are cannabinoid compounds.

People smoke marijuana in hand-rolled cigarettes (joints) or pipes or water pipes (bongs), in blunts—emptied cigars that have been partly or completely refilled with marijuana. To avoid inhaling smoke, some people are using vaporizers. These devices pull the active ingredients (including THC) from the marijuana and collect their vapour in a storage unit. A person then inhales the vapour, not the smoke. Some vaporizers use a liquid marijuana extract.

People can mix marijuana in food (*edibles*), such as brownies, cookies, or candy, or brew it as tea.

When a person smokes marijuana, THC quickly passes from the lungs into the bloodstream. The blood carries the chemical to the brain and other organs throughout the body. The body absorbs THC more slowly when the person eats or drinks it. In that case, they generally feel the effects after 30 minutes to 1 hour.

Marijuana over-activates parts of the brain that contain the highest number of these receptors. Other effects include altered senses, changes in mood, impaired body movement, difficulty with thinking and problem-solving, impaired memory, hallucinations (when taken in high doses), delusions (when taken in high doses) and psychosis.

When people begin using marijuana as teenagers, the drug may impair thinking, memory, and learning functions and affect how the brain builds connections between the areas necessary for these functions.

Marijuana smoke irritates the lungs and increases heart rate for up to 3 hours after smoking.

The therapeutic uses of isolated cannabinoids include the treatment of psychotic disorders, anorexia, cachexia, asthma, musculoskeletal disorders, tumoural pathology,

arthritis, neuralgias, inflammatory disorders of the gastrointestinal tract, neuropathy, dysmenorrhea, ulcerative colitis, and Crohn's disease.

SALVIA *(Salvia divinorum)*

Salvia divinorum Epling and Játiva (Family Lamiaceae) is a plant species with transient psychoactive properties when its leaves, or extracts made from the leaves, are administered by smoking, chewing, or drinking (as tea).

Salvia divinorum is endemic to Mexico at the Sierra Mazateca in the state of Oaxaca. It commonly grows in black soil along stream banks. Its other names are Diviner's Sage, Ska María Pastora, Seer's Sage, Sally-D, and Magic Mint.

Salvia divinorum has large green ovate, and dentate leaves, with a yellow undertone that reaches 10–30 cm long. The leaves have no hairs on either surface and little or no petiole. The plant grows over 1 metre in height, on hollow square stems. The plant roots readily at the nodes and internodes. The flowers grow in whorls on a 30-centimetre inflorescence, with about six flowers to each whorl from September to May. It produces few viable seeds.

Because *Salvia divinorum* seeds are difficult to obtain, the plant is propagated from cuttings. It is usually propagated through vegetative reproduction. Small cuttings, between 5 cm and 20 cm long, cut off of the mother plant just below a node. The roots grow from the cuttings in plain tap water within 2 or 3 weeks.

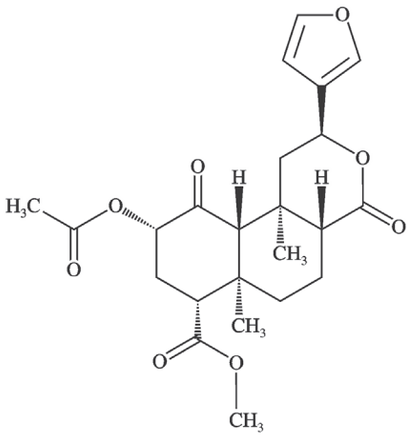
Chemical constituents: The active constituent of *Salvia divinorum* is a *trans*-neoclerodane diterpenoid known as salvinorin A (chemical formula $C_{23}H_{28}O_8$). This compound is present in the dried plant at about 0.18%. Salvinorin A is found in the resin secreted by special, hairy epidermal cells (trichomes), which are present abundantly on the leaves.

Other terpenoids have been isolated from *Salvia divinorum*, including other salvinorins and related compounds named divinatorins and salvinicins. None of these compounds has shown plant's psychoactivity. Salvinorins C-F have been isolated from the leaves of *S. divinorum*.

The dried leaves, leaf extracts and pure salvinorin A are stable at ambient temperature in the absence of light or air.

Salvinorin A, molecular weight: 432.47 g/mol, melting point of 242–244°C, occurs as colourless crystals. It is unstable in basic solutions and is soluble in conventional organic solvents, including acetone, acetonitrile, chloroform, dimethyl sulfoxide and methanol. It is insoluble in hexane and water.

Traditionally, the Mazatec Indians roll the fresh leaves of the plant into a cigar-like 'quid', which is then sucked or chewed while retaining the juice in the mouth to increase absorption of the active ingredient.



Salvinorin A

Alternatively, the fresh foliage is crushed by hand or ground on a milling stone which can be used for making a drinkable infusion. At least six fresh leaves are needed to achieve noticeable effects, which manifest after about 10 minutes and last for 45 minutes or longer.

The most common way of administration is smoking the crushed dried leaves from a pipe or water bong, providing short-lasting (15–20 minutes) hallucinations within a minute. Chewing the bitter leaves as a quid gives a longer lasting effect and the typical dosages to produce mild-to-medium effects are 10–30 grams of fresh leaves or 2–5 grams of dried leaves.

Sublingual application of aqueous ethanol tinctures made from leaves results in an onset taking 5–10 minutes and lasting up to 2 hours.

Drinking tea made by steeping the leaves in hot water is relatively ineffective because salvinorin A is readily degraded in the gastrointestinal tract.

The health risks of inhaling the vapours of pure salvinorin A are high because the inhaled amount cannot be controlled. This can lead to an 'overdose', in the form of psychotic disturbances. There is no approved medicinal use for *Salvia divinorum* or salvinorin A.

In humans, salvinorin A induces short-lived, profound hallucinations. Inhalation of doses equivalent to 200–500 micrograms of salvonorin A leads to loss of control over physical movements (incapacitation); uncontrollable laughter; vivid, colourful and often bizarre, dream-or film-like hallucinations.

The herb usually is not used in rolled cigarettes, or joints, because the dried leaves may not be potent enough to create any effect. More often, fresh leaves are used to create an extract. Pipes or water bongs may be used to smoke these extracts. The salvia extracts may also be infused in drinks or vaporizer pens. Fresh salvia leaves can be chewed, too. Fresh leaves are not considered very potent, but some people may experience a mild effect.

Some may ingest salvia in the form of a tincture. This is administered sublingually with the aid of a glass dropper. It may be taken diluted with water just before use, which may slightly reduce the intensity of its effects.

When taken as a tincture, the effects and duration are similar to other methods of oral ingestion, though they may be significantly more intense, depending on extract potency.

AYAHUASCA

Ayahuasca brew is made by boiling and mixing the broken stalks of the Ayahuasca vine, *Banisteriopsis caapi* CV Morton (Family Malpighiaceae) and leaves from the chacruna shrub, *Psychotria viridis* (Ruiz et Pav.: Rubiaceae). In some cases, it might also contain the leaves of the *Diplopterys cabrerana* plant. The plants are cleaned and smashed before being boiled in water to increase the extraction of its medicinal compounds. Once cooled, the brew is strained to remove impurities.

Ayahuasca is a plant-based psychedelic drug with hallucinogenic properties. The main ingredients of Ayahuasca, *Banisteriopsis caapi* and *Psychotria viridis*, both have hallucinogenic properties. It is usually brewed into a tea or a concentrated liquid to drink. It can also be smoked. Some users experience visions and sensations, while others claim that the potion has healing powers.

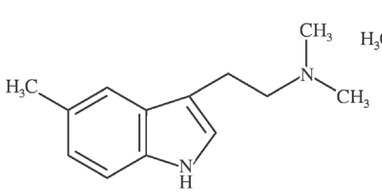
Traditionally, Ayahuasca has been used in Ecuador, Columbia, Peru, and Brazil.

The other names of Ayahuasca are Ayahuasca tea, Brew, Caapi, Daime, Hoasca, Huni, Kamarampi, Natema, Vine, Yaji and Yage. The word Ayahuasca means 'vine of the soul' in the Quechua language, an indigenous language spoken by the Quechua peoples, primarily living in the Peruvian Andes.

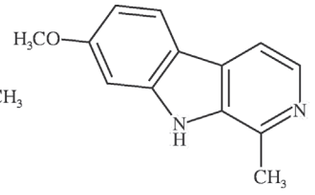
This drink is used as a sacred beverage by some religious communities in Brazil and North America.

Chemical constituents: *Psychotria viridis* contains N,N-dimethyltryptamine (DMT), a psychedelic substance that occurs naturally in the plant. DMT is a powerful hallucinogenic chemical. Sometimes, *Psychotria viridis* is substituted by other DMT containing plants such as *Diplopterys cabrerana* of the family Malpighiaceae.

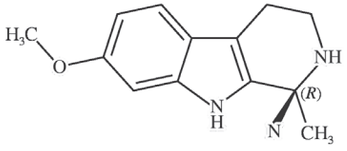
Banisteriopsis caapi contains β-carboline type alkaloids such as harmine, harmaline and tetrahydroharmine. Harmine alkaloid inhibits the breakdown in the digestive system of dimethyltryptamine, the psychoactive substance that the other plant supplies.



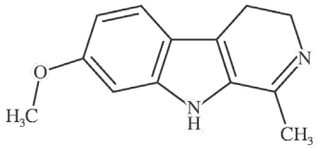
N,N-Dimethyltryptamine



Harmine



Tetrahydroharmine



Harmaline

Within 30–60 minutes of taking Ayahuasca, it can put a person in a dreamlike state. It may cause to have strong psychedelic reactions that can last 4–6 hours. The effects might peak 1–2 hours after its intake. The drug can cause physical, emotional, and mental effects that vary from person to person.

Mental and emotional effects include seeing vivid, colourful geometric patterns, feelings of euphoria, connection and unity, loss of touch with reality, cheerful or peaceful state of mind (euthymia), awareness of the sense of self, anxiety, panic and fear, and hearing sounds or seeing distorted images of things that are not there.

Physical effects of Ayahuasca may include nausea, vomiting, diarrhoea, high blood pressure and heart rate, increase in body temperature, and gastric ulcer. Its ingestion can also cause emotional and psychological distress. Depending on the dosage, the temporary non-entheogenic effects of Ayahuasca can include tremors, nausea, vomiting, diarrhoea, hyperthermia, sedation, sweating, motor function impairment, relaxation, vertigo, dizziness, and muscle spasms.

Ayahuasca can affect everyone differently. It will depend on size, weight, health, mental health, whether taken before and how much Ayahuasca is drunk. This may vary from batch to batch, and the environment in which the drug is taken.

BETEL NUT

Betel nut (*Areca catechu* L., Family Arecaceae) is the seed of the fruit of the areca palm. The seed is separated from the outer layer of the fruit and may be used fresh, dried, boiled, baked, roasted or cured. Areca nut is the fourth most popular psychoactive substance

in the world, right after caffeine, nicotine and alcohol. It is particularly famous in Asia. Betel chewing induces euphoria and it is addictive.

It grows in the tropical Pacific, Asia, and parts of East Africa. The palm is native to the Philippines and is also cultivated in Malaysia, Indonesia, Taiwan, Madagascar, Cambodia, Laos, Myanmar, Thailand, Vietnam, southern China, India, Bangladesh, Sri Lanka, and the West Indies.

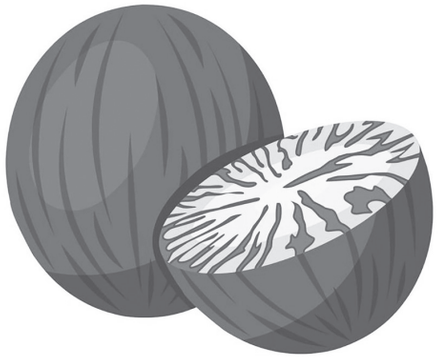
It is also known as areca nut, areca palm, areca nut palm, betel palm, betel nut palm, Indian nut, Pinang palm and catechu.

Areca catechu is a medium-sized palm tree, growing straight to 20 m tall, with a trunk 10–15 cm in diameter. The leaves are 1.5–2 m long, pinnate, with numerous, crowded leaflets.

Betel nut is a stimulant drug. It speeds up the messages' travelling between the brain and the body.

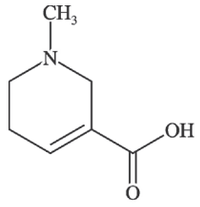
The most common method of using betel nut is to slice it into thin strips and roll it in a betel leaf with slaked lime powder (calcium oxide) or crushed seashells. This leaf package is known as a betel quid, betel nut chew, betel chew, betel pan or betel paan in India. The betel quid may also contain tobacco and other additives such as cloves, cardamom, nutmeg, aniseed, coconut, sugar, syrups and fruit extracts, to enhance the flavour. Sometimes areca nuts are rolled in leaves other than betel leaf, such as a leaf from the rubiaceous plant (*Mitrogyna speciosa*), nutmeg tree (*Myristica fragrans*), or the pepper plant used in kava (*Piper methysticum*).

Fresh Areca nuts

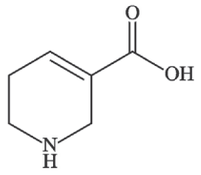


Areca nuts

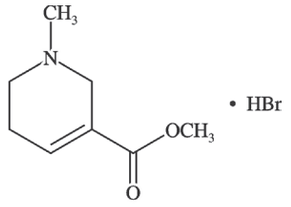
Chemical constituents: Areca nuts contain alkaloids such as arecaidine, guvacine, isoguacine, guacoline and arecoline, condensed tannins (procyanidins) called arecatannins, gallic acid, terpineol, and lignin. Several non-alkaloid compounds including benzenoids, terpenes, acids, aldehydes, alcohols, and esters were also identified.



Arecaidine



Guvacine



Arecoline HBr

Betel nut affects everyone differently, based on: size, weight and health, whether the person is used to taking it, whether other drugs are taken around the same time, the amount taken, and the strength of the drug (varies from batch to batch). However, people who have used the drug have reported effects such as relaxation, feeling happy and alert, fast heart rate and palpitations, high blood pressure, red face and feeling warm and sweating.

Regular, heavy use of betel nut may cause discolouration of teeth and gums, sometimes turning them reddish-brown, mouth ulcers, gum disease, oral cancers or sub-mucous fibrosis, stomach ulcer, heart disease, dependence on betel nut, and financial, work and social problems. Using betel nuts with other drugs like tobacco greatly increases the risk of developing oral cancers.

Betel nut has a stimulant effect, just like drugs such as khat, amphetamines, and cocaine, which might increase the amount of a chemical, known as serotonin, in the brain. Some medications used for depression also increase serotonin. Taking betel nuts with these medications used for depression might cause there to be too much serotonin.

Betel nut is used to treat rheumatism, constipation, glaucoma, headaches, itching, bad breath, boils, abscesses, pink eye, diarrhoea, dysentery, schizophrenia, scurvy and mastitis, and to aid in the menstruation process and digestive problems. In Chinese folk medicine, areca nut is taken to treat parasites, such as roundworms and tapeworms. In veterinary medicine, an extract of areca is used for expelling tapeworms in cattle, dogs, and horses; to empty animals' bowels; and for treating intestinal colic in horses.

Use of betel nut is known to cause increase in heart rate, blood pressure, sweating and body temperature, feelings of well-being and alertness, discoloured teeth and gums, mouth ulcers and gum disease, dependence on betel nut, oral precancerous lesions, including erythroplakia (a condition that affects the soft tissue lining of your mouth and throat) and leukoplakia (thickened, white patches form on the gums, the insides of cheeks, the bottom of mouth and, tongue), oral submucous fibrosis, oral cancers (predominantly of the lip, mouth, tongue, and pharynx), peptic ulcer, cardiovascular effects and increased risk of having a low birth-weight infant.

Some people use areca as a recreational drug because it speeds up the central nervous system (CNS). It is thought that areca affects chemicals in the brain and other parts of the central nervous system.

Possession of a betel nut or leaf is banned in the UAE and is a punishable offence.

TOBACCO

Tobacco consists of the cured leaves of *Nicotiana tabacum* L. and more than 70 species of tobacco (family: Solanaceae). The more potent variant *Nicotiana rustica* is also used in some countries. Tobacco leaves are dried and fermented before being put in tobacco products.

Tobacco is cultivated by scattering the seeds onto the soil or the seeds are sown in cold frames or hotbeds. Their germination is activated by light. After the plants are about 20 cm tall, they are transplanted into the fields. The entire plant is harvested at once by cutting off the stalk at the ground with a tobacco knife. It is then speared onto sticks, 4–6 plants a stick, and hung in a curing barn. All forms of tobacco use are harmful.

Tobacco contains the highly addictive stimulant alkaloid nicotine and harmala alkaloids. Tobacco use is a cause or risk factor for many deadly diseases affecting the heart, liver, and lungs, and many cancers. Tobacco use is the world's single greatest cause of death.

When ingested in larger doses, nicotine is a highly toxic poison that causes vomiting and nausea, headaches, stomach pains, convulsions, paralysis, and death. Tobacco use causes several health problems, including cancer and emphysema, and is responsible for more than five million deaths per year.

More than 4,000 different chemicals have been found in tobacco and tobacco smoke. Among these are >60 chemicals that are known to cause cancer.

Tobacco plant

Tobacco leaves

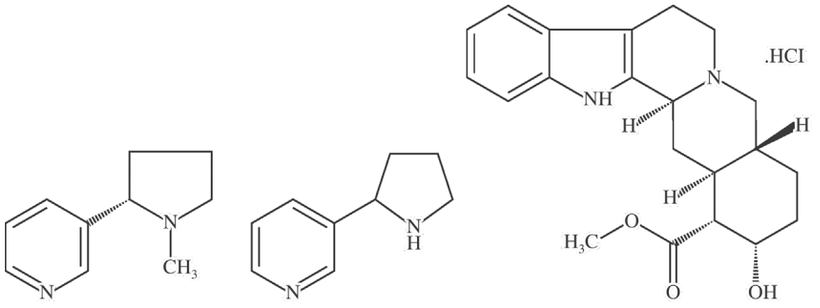
Chemical constituents: The leaves of *Nicotiana tabacum* contain the toxic alkaloid, nicotine (90–95%) as a major constituent and several other pyridine alkaloids as minor constituents. The other alkaloids of the leaves are nornicotine, anatabine, myosmine, β-nicotyrine, *N*′-isopropylnornicotine, cotinine, S-(–)-*N*-methylanabasine, anabasine, S-(–)-*N*-methylanatabine, nicotelline 2,3′-bipyridyl and anabasine. The *N*-demethylated alkaloid, nornicotine is the major alkaloid in 30–40% of *Nicotiana* species.

Indole alkaloids are also present in leaves and stems which includes yohimbine, harmine, harmaline and ajmalicine, yohimbine being highest.

The major constituents of the essential oil from fresh leaves of *Nicotiana tabacum* are 3,7,11,15-tetramethyl-2-hexadecen-1-ol, *p*-xylene, cyclohexane, farnesol isomer, and 1-naphthalenepropanol.

The tobacco leaves also contain cellulose, rutin, chlorogenic acid, and amino acids including glutamic acid, asparagine, glutamine, and γ-aminobutyric acid.

Tobacco also contains glucosides of tabacinine and tabacine, 2,3,6-trimethyl-1,4-naphthoquinone, 2-methyl quinone, 2-naphthylamine, propionic acid, anthaline, anethole, acrolein, cembrene, choline, nicotelline, nicotianine, and pyrene.



Nicotine Nornicotine Yohimbine

Tobacco smoking causes cancer, heart disease, stroke, lung diseases, diabetes, chronic obstructive pulmonary disease (COPD) and chronic bronchitis. Smoking also increases the risk for tuberculosis, certain eye diseases, and problems of the immune system, including rheumatoid arthritis.

Every year, >8 million people die from tobacco use. Most tobacco-related deaths occur in low- and middle-income countries, which are often targets of intensive tobacco industry interference and marketing.

Tobacco smoking can lead to lung cancer, chronic bronchitis, and emphysema. It increases the risk of heart disease. Smoking has also been linked to other cancers, leukaemia, cataracts, type 2 diabetes, and pneumonia. Smokeless tobacco increases the risk of cancer, especially mouth cancer.

Pregnant women who smoke cigarettes run an increased risk of miscarriage, stillborn or premature infants, or infants with low birth weight.

Dried tobacco leaves are mainly used for smoking and they can also be consumed as snuff, chewing tobacco, dipping tobacco, and moist powder snus. Smoked tobacco products include cigarettes, cigars, bidis, and kreteks. Some people also smoke loose tobacco in a pipe or hookah (water pipe). Chewed tobacco products include chewing tobacco, snuff, dip, and snus. Cigarette smoking is the most common form of tobacco use worldwide.

Bidis: Bidis are small, thin and hand-rolled cigarettes imported to the United States primarily from India and other Southeast Asian countries. They consist of tobacco wrapped in a tendu or temburni leaf. Bidi smoking may cause an increased risk for oral, lung, stomach, and oesophagal cancer, coronary heart disease and heart attacks, and risk for chronic bronchitis.

Cigarette: A cigarette is a combination of cured and finely cut tobacco, reconstituted tobacco and other additives rolled or stuffed into a paper-wrapped cylinder. Many cigarettes have a filter on one end. Smoking cigarettes causes cancers of the bladder, oral cavity, pharynx, larynx (voice box), oesophagus, cervix, kidney, lung, pancreas, and stomach, and causes acute myeloid leukaemia. It also causes heart disease and stroke.

Cigars: Most cigars are made up of a single type of air-cured or dried tobacco. Cigar tobacco leaves are first aged for about a year and then fermented in a multi-step process that can take from 3 to 5 months. Fermentation causes chemical and bacterial reactions that change the tobacco. Cigars contain higher levels of nicotine than cigarettes. For

those cigar smokers who inhale, the nicotine is absorbed through the lungs as quickly as it is with cigarettes. For those who do not inhale, the nicotine is absorbed more slowly through the lining of the mouth.

Dissolvable tobacco: This type of tobacco is finely processed to dissolve on the tongue or in the mouth. Varieties include strips, sticks, orbs and compressed tobacco lozenges. They are smoke and spit free, are held together by food-grade binders and look similar to a breath mint or candy. This product contains nicotine.

E-cigarette: E-cigarette is a nicotine delivery system. The e-cigarette is a battery-powered device that contains a cartridge filled with nicotine, flavour and other chemicals. The e-cigarette is not a tobacco product but a nicotine delivery system. The e-cigarette turns the nicotine and other chemicals into a vapor that is then inhaled by the user. The user will puff on it, similar to a cigarette, and receive a vaporized solution of propylene glycol/nicotine. There is no tobacco or burning of tobacco involved and the e-cigarette produces no smoke. It does produce a fine, heated mist. The e-cigarette often looks like a real cigarette and some have a glowing tip. Most electronic cigarettes are reusable. Re-fillable and replaceable cartridges are available with different nicotine levels and flavors such as menthol, cherry, chocolate, mint, and orange.

Hookah: Hookah is a pipe used to smoke Shisha, a combination of tobacco and fruit or vegetable that is heated and the smoke is filtrated through water. The Hookah consists of a head, body water bowl and hose. The tobacco or Shisha is heated in the hookah usually using charcoal. A typical one-hour session of hookah smoking exposes the user to 100 to 200 times the volume of smoke inhaled from a single cigarette. Even after passing through water, tobacco smoke still contains high levels of toxic compounds, including carbon monoxide, heavy metals and cancer-causing chemicals (carcinogens). Hookah smoking also delivers significant levels of nicotine, the addictive substance in tobacco. Hookah smoking has been associated with lung, mouth and other cancers, heart disease and respiratory infections.

Kreteks: They are sometimes referred to as clove cigarettes. Kreteks are imported from Indonesia. They contain a mixture consisting of tobacco, cloves, and other additives. Kreteks deliver more nicotine, carbon monoxide, and tar than conventional cigarettes. Kretek smoking is associated with an increased risk for acute lung disorders like asthma or respiratory infections.

Pipes: Pipes are often reusable and consist of a chamber or bowl, stem and mouthpiece. Tobacco is placed into the bowl and lit. The smoke is then drawn through the stem and mouthpiece and inhaled. Pipe smoking has been shown to cause gum disease, tooth loss, and cancer of the mouth, throat, larynx, lung, pancreas, kidney, bladder, colon, and cervix.

Smokeless tobacco: The two main types of smokeless tobacco are chewing tobacco and snuff. Chewing tobacco comes in the form of a loose leaf, plug, or twist. Snuff is finely ground tobacco that can be dry, moist, or in sachets (tea bag-like pouches). Although some forms of snuff can be used by sniffing or inhaling into the nose, most smokeless tobacco users place the product in their cheek or between their gum and cheek. Users then suck on the tobacco and spit out the tobacco juices, which is why smokeless tobacco is often referred to as spit or spitting tobacco. The nicotine in this tobacco is absorbed primarily through the skin in the mouth. Smokeless tobacco is a significant health risk

and is not a safe substitute for smoking cigarettes. Smokeless tobacco contains 28 cancer-causing agents (carcinogens). Using smokeless tobacco can lead to nicotine addiction and dependence and is not a safe alternative to smoking.

JIMSONWEED *(Datura stramonium)*

Jimsonweed consists of all parts of the plant, especially the leaves, flowers, and seeds of *Datura stramonium* L. (Family: Solanaceae).

It is also called Jamestown weed, mad apple, moonflower, sacred datura, stramonium, thorn apple, devil's snare, devil's trumpet, devil's weed, devil's cucumber, hell's bells, stinkweed, locoweed, prickly burr, and false castor oil plant.

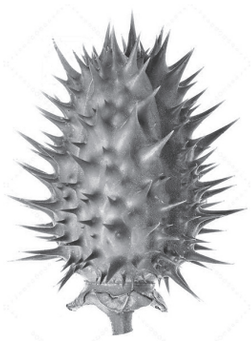
This plant is probably native to Eastern North America but is now found, along with other species of the genus Datura, in many countries around the world.

Jimsonweed is an annual, free branching, erect plant, 3–5 ft tall. Leaves are hairless, ovate, smooth, soft, up to 8 inches long, hairless, margins unevenly dentate. The root is long, thick, fibrous, and white. Stems smooth or coarse, stout, erect, often green or reddish-purple, have branches that are mostly forked. Crushed leaves emit an unpleasant odour. Flowers are large, white or violet trumpet-shaped. Fruits are large, oval, thorny capsules. When ripe, the pod opens into four separate sections, each with dozens of small seeds. Seeds are tiny, roughly 0.25 cm, brown to black, semicircular to kidney-shaped, and somewhat flattened. Under magnification, a wrinkled or pitted surface can be seen.

Jimsonweed often grows in the same fields as crops such as soybeans, linseed, and wheat and can contaminate crops during harvest.

Jimsonweed

Jimsonweed flower



Fruit

All parts of the plant, especially the leaves, flowers, and seeds, are highly toxic. Many teenagers have been killed trying to use the plant for its hallucinogenic properties.

The leaves can be dried and rolled to make cigarettes. The leaves and seeds are sometimes dried, pulverized, and ignited to breathe the fumes for the treatment of asthma. The leaves and seeds are decocted in water to make tea, but this practice is very dangerous.

Cigarettes made from this plant and other herbs are smoked to treat bronchial asthma. But there are risks of intoxication.

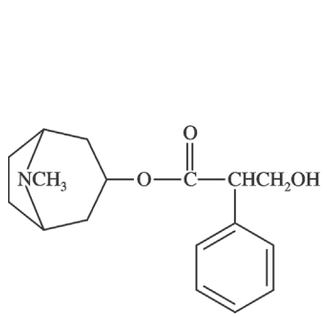
Various Datura species are used in the traditional healing practices in many countries, including China and Tibet, for the treatment of bronchial asthma, cough, flu, rheumatism, inflammation, and pain.

Jimsonweed has certain neurological effects including hallucinations, memory loss, anxiety, and its ingestion.

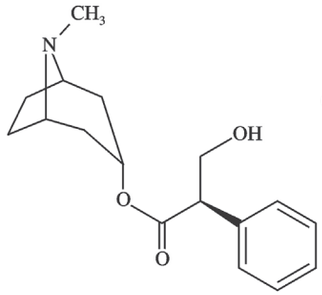
Instances of jimsonweed poisoning have been reported in humans and animals. Common symptoms include rapid pulse and breathing, dilated pupils, restlessness, nervousness, muscular twitching, diarrhoea, depression, hallucination, unusual behaviour, confusion, convulsion, loss of consciousness, dizziness, distorted vision, and weight loss. In fatal cases, the pulse remains rapid, yet weak, breathing becomes slow and irregular, body temperature becomes subnormal, urine may be retained and convulsions or coma precede death.

The leaves and seeds are used to make medicine and to cause hallucinations.

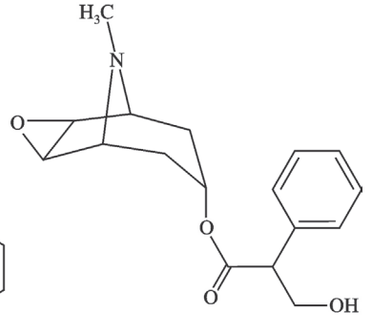
Chemical constituents: All parts of the plant contain tropane alkaloids, including atropine, hyoscyamine and scopolamine. These chemicals can cause serious adverse effects, including death. The alkaloids are relatively heat-stable, and after harvesting, processing, and food preparation, the toxins can still cause poisoning if ingested. Food contamination usually occurs when toxic plant parts are accidentally mixed with edible plants during harvest or processing.



Atropine



Hyoscyamine



Scopolamine

The tropane alkaloids are responsible for the psychoactive effects, may be severely toxic and cause hallucinations.

When taken by mouth, Jimson weed is unsafe. It is toxic causing dry mouth, extreme thirst, vision problems, nausea, vomiting, fast heart rate, hallucinations, seizures, confusion, loss of consciousness, breathing problems and death.

COCA LEAVES

Biological source: Coca leaves are the dried leaves of *Erythroxylum coca* Lam. (Huanaco coca) or of *Erythroxylum truxillense* Rushy (Truxillo coca).

Family: Erythroxylaceae.

Coca leaves are also known as Bolivian coca, Coca, Cuca, Cocaine, Folium cocae, Huanaco coca, Java coca, Peruvian coca, and Truxillo coca.

Coca is distributed in Argentina, Java, Sri Lanka, Bolivia, Brazil, Peru, Venezuela, Ecuador, Colombia, Indonesia and India.

It is a shrub or small tree, pyramidal in shape, 2–3 m high, with dark green, thin, ovate leaves, taper at the extremities. Coca plant is grown similarly to tea plantation. Seeds are sown from December to January in rich, light and well-drained soil at an altitude of 500–2000 meters.

Erythroxylum coca requires very acidic soil conditions. Soil acidity and water acidity need to be below pH 5.5. It prefers a humid atmosphere, rainfall not below 75–80 inches and temperature between 15ºC and 21ºC. It thrives best in well-drained moist loams rich in humus. The plant can be propagated by stem cuttings, but for raising plantation seedlings are raised in nurseries and transplanted. The flowers are small and disposed in clusters on short stalks. The flowers mature into red berries.

The first crop of leaves is gathered in 1–3 years after planting. Only the stiff ripe leaves, easily detached, are collected. The leaves are sometimes eaten by the larvae of the moth *Eloria noyesi*. The young leaves are rich in cinnamyl cocaine and this is replaced in the old leaves by cocaine or truxilline.

Coca leaves are adulterated with novocaine, boric acid, sodium carbonate, sodium bicarbonate, lime, chalk and starch. Lactose and quinine are also used as the adulterant.

Cultivation of Coca leaf is a controlled narcotic drug in India by the Narcotic Drug and Psychotropic Substances Act, 1985. While its scientific and medical purposes are permissible under law, including cultivation, possession, sale, consumption, transportation, import, and export.

Coca leaves

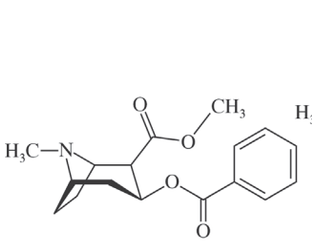
Chemical Constituents

Coca leaves contain 0.7–1.5% of alkaloids and cocaine is the main psychoactive alkaloid. Besides cocaine, there are several other alkaloids. The alkaloidal composition varies according to the variety of the plant and the stage of development of the leaves. Cocaine (0.23–0.96%), cinnamyl cocaine and α-truxilline (cocamine) are the most important alkaloids in coca leaves. The other constituents isolated from the leaves are simple alkaloids, e.g. methyl ecgonine cinnamate, benzoyl ecgonine, truxilline, hygrine, ecgonine, hydroxytropacocaine, tropacocaine, cuscohygrine, dihydrocuscohygrine, yellow crystalline glycosides, cocatannic acid and an essential oil.

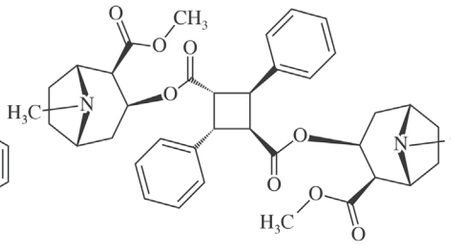
Cocaine is the methyl ester of benzoylecgonine. On hydrolysis, it yields ecgonine, benzoic acid and methyl alcohol. Cinnamyl cocaine on hydrolysis produces ecgonine, methyl alcohol and cinnamic acid. α-Truxilline forms ecgonine, methyl alcohol and α-truxillic acid.

Besides the alkaloids, coca leaves contain an essential oil (0.06–0.13%), the main component of the oil is methyl salicylate. A colouring matter, coca citrin, has been reported from the leaves.

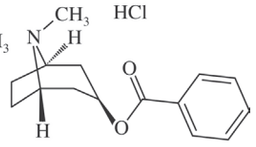
Diterpenic constituents of Coca include *ent*-labdane derivatives, dolarbrane-type derivatives, kaurene diterpenes, and devadarane-type diterpene compounds. The triterpenoids are lupenyl acetate, α-amyrin, β-amyrin and erythrodiol. The other compounds are 7β-acetoxy-6β-benzoyloxy-3α-hydroxytropane, erythrobezerrines A-F, and 7β-acetoxy-3β,6β-dibenzoyloxytropane. The flavonoids isolated from Coca leaves included kaempferol, ombuin (7,4′-dimethylquercetin), and quercetin. Phenolic derivatives and their glycosides were also obtained, which include two acetophenone diglycosides, neochlorogenic acid, scoparone (coumarin) and protocatechuic acid.



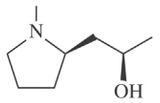
Cocaine



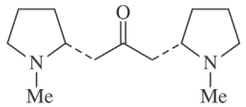
α-Truxilline



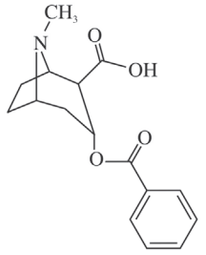
Tropococaine HCl



Hygroline



Cuscohygrin



Benzoyl ecgonine

Therapeutic efficacy: Coca leaves are astringent and stimulant. They are used to overcome asthma, fatigue, hunger, thirst, and altitude sickness. The leaves are also used as an anaesthetic and analgesic to alleviate the pain of headache, rheumatism, wounds, sores, broken bones, and childbirth.

Good samples of coca leaves have a strong tea-like odour. When chewed, they produce a sense of warmth in the mouth and have a pleasant, pungent taste.

Cocaine is a local anaesthetic, has stimulant action on the CNS and is used in dental anaesthetic and minor local surgery of ear, nose, throat and ophthalmic organs. When chewed, coca acts as a mild stimulant and suppresses hunger, thirst, pain, and fatigue. Coca is effective against altitude sickness, used as an anaesthetic and analgesic to alleviate headache, rheumatism, wounds and sores.

Because coca constricts blood vessels, it also serves to stop bleeding. Indigenous use of coca has also been reported as a treatment for malaria, ulcers, asthma, to improve digestion, as an aphrodisiac, and useful to improve longevity.

Coca is used in the cosmetics and food industries. A cocaine-free extract of coca leaf is one of the flavouring ingredients in Coca cola. Coca tea is produced industrially from coca leaves in South America by a number of companies.

It is a local anaesthetic, the leaves are chewed against toothache, throat pain and mouth sores, or as a tea for gastrointestinal complaints. It eases the pain of childbirth and hastens labour.