

## Plant-based drugs

The natural world contains many drug-producing plants. People in the West and other societies often use these drugs in social situations, for medicine, or as part of their cultural rituals. This article covers a variety of such naturally occurring drugs.

Many plants contain natural substances that affect the brain's chemistry, such as having a stimulating, sedating, or hallucinatory action. Once these properties are discovered, people living near these plants often use them recreationally, in medicine, or as part of their cultural rituals. In Western society, for example, there are several well-known legal and illegal drugs that are derived from plants-- alcohol is made by yeast in fermentation; the stimulant caffeine comes from the coffee bean; tetrahydrocannabinol (THC) in marijuana is found in the leaf of hemp; and the powerful pain-killer morphine is from the opium poppy. Millions of people use alcohol and caffeine every day, while marijuana is taken illegally, and morphine is an important analgesic for medicine.

Yet there are many more plant-based drugs that are not widely used in modern Western society, but were taken in the past or by other cultures. So many natural drugs exist because the chemical messengers in human brains sometimes happen to be similar to compounds that plants make--for example, nicotine in cigarettes is a potent natural poison, while alcohol is a by-product of anaerobic respiration in yeast. This article covers a selection of these drugs and the plants they come from, although many more psychoactive compounds can be found in the natural world.

### *Amanita muscaria* (Fly agaric mushroom)

*Amanita muscaria*, or more commonly fly agaric, is a brightly colored mushroom that contains several hallucinogenic substances and organic poisons. It has a distinctive look, being yellowy-orange with white spots and around six inches tall. The main psychoactive effects of eating *Amanita muscaria* are from muscimol, which is metabolized by the body from ibotenic acid in the mushroom. A typical dose of a few mushroom caps at first produces nausea, then a dreamy relaxed feeling, and finally hallucinations for several hours. However, some people also find the experience distressing. *Amanita muscaria* grows widely over the northern hemisphere and is legal to pick.

Several cultures use *Amanita muscaria* in their religious rituals, including Siberians, America Indians, and the Sami. In these rituals the hallucinogenic dreams are often interpreted as visions. The Western name fly agaric comes from a traditional use of the mushroom in flypaper.

### *Anadenanthera colubrina* (Yopo)

The seeds from the *Anadenanthera colubrina* tree contain a powerful psychoactive drug, which tribes in Colombia, Venezuela, and parts of Brazil use to make a hallucinogenic snuff called yopo. Typically, the seeds are dried, ground, and then snorted through a bamboo tube. The main active chemical in this snuff is called dimethyl tryptamine (DMT). A regular dose of around 30mg of DMT has a similar hallucinogenic effect to LSD but is stronger and wears off after only half an hour. Many plants containing DMT are legal to grow in the United States, although purifying the chemical is illegal.

Yopo is relatively unknown in Western civilization, but was popular among the native South Americans. For example, almost one in five Mayans regularly took yopo. Many tribes in South America also used similar plants to make other snuffs.

*Argyrea nervosa* (Hawaiian baby woodrose)

Seeds from the clambering vine *Argyrea nervosa*, or Hawaiian baby woodrose, contain several hallucinogenic chemicals called ergot alkaloids. Of these psychoactive alkaloids, the main active chemicals--chanoclavine, lysergol, ergotmetrine, and ergine--are all members of the lysergic acid amide (LSA) family of chemicals, which are closely related to LSD. Ergot alkaloids naturally occur in several plants--for example, *Claviceps purpurea* (ergot) and *Ipomoea violacea* (morning glory). Further, *Argyrea nervosa*, like many LSA-containing plants, is legal to grow in the United States.

The seeds of *Argyrea nervosa* were not traditionally used as a psychoactive drug, although in recent times they have become popular for their LSD-like effects.

*Artemisia absinthium* (Absinthe)

Wood from the *Artemisia absinthium* shrub, more commonly known as wormwood, is a main ingredient of the alcoholic beverage absinthe. Called green fairy, or *la féé verte* in French, this drink is also flavored with liquorices, fennel, and aniseed, and gets its distinctive green coloring from chlorophyll in the wood. Apart from absinthe being strongly alcoholic, its wormwood contains a psychoactive drug thujone that has a similar effect to the active chemical tetrahydrocannabinol (THC) in marijuana. The combination of thujone and alcohol can result in extreme intoxication, while excessive use is associated with addiction, hallucination, and mental deterioration. Absinthe is illegal to sell in the United States but legal to possess.

A French doctor named Pierre Ordinaire invented the recipe for absinthe in 1792. Soon after, the Swiss distiller Henri-Louis Pernod acquired this recipe and begun large-scale commercial production. Absinthe was a popular drink throughout the 19th century, and was often drunk to excess by artists such as Edouard Manet

(1832-1883), Vincent Van Gogh (1853-1890), and Pablo Picasso (1881-1973), who believed it helped their creativity. Because of worries about its adverse health effects, many countries banned absinthe at the beginning of the 20th century.

#### Claviceps purpurea (Ergot)

Claviceps purpurea, more commonly known as ergot, is a fungus that infects grains such as rye and some wild grasses. Because the fungus is both toxic and psychoactive it causes an unpleasant disease called ergotism in cattle and humans. Some symptoms of this condition include a burning sensation, convulsions, hallucinations, and black, gangrenous limbs, all of which originate from a large amount of ergot alkaloids in the fungus. The main chemicals ergotamine, ergotine, and ergotoxine are derivatives of lysergic acid and are collectively termed lysergic acid amides (LSA). Similarly to LSD these alkaloids induce hallucinations, while ergotamine constricts the body's blood vessels to cause gangrene.

In the European Middle Ages there were periodic plagues from ergot infestation of crops. Other than causing gangrene and hallucinations, ergotism is accompanied by a burning feeling, which led to its name *ignis sacer*, or holy fire. In modern times, ergot is used to treat migraines and is the main ingredient used to illegally manufacture LSD.

#### Ephedra equisetina (Ma Huang)

Ephedra, or Ma Huang, is a Chinese herb that has several pharmacological effects. The active chemicals in ephedra are ephedra alkaloids, of which the most important is ephedrine. Usually taken as an ingredient in traditional Oriental medicine, ephedra has a stimulating effect somewhat stronger than caffeine but weaker than amphetamines. Further, it also suppresses appetite and is a natural decongestant. Several states in the U.S. have recently banned ephedra because of its recreational use as a stimulant.

Oriental traditional medicine has used ephedra for over 5000 years to treat asthma and aid weight loss. In recent times ephedra has been sold as an ingredient in herbal ecstasy preparations, which have a similar recreational use as MDMA and amphetamines.

#### Ipomoea violacea (Morning Glory)

More commonly known as morning glory, the seeds of the Ipomoea violacea vine contain a powerful hallucinogen. The main psychoactive chemicals in ipomoea violacea are lysergic acid amides (LSA), which have a similar effect to LSD. Eating around 100 to 400 seeds produces vivid hallucinations that last for 6 to 10 hours. Although chemicals in the LSA family are schedule III

controlled substances in the United States, the morning glory seeds are legally sold in many garden stores.

The Aztec in Mexico used the *Ipomacoea violacea* seed, which they called *tlititzin*, in religious ceremonies where it was believed to help predict the future. Its use still continues today in some parts of southern Mexico.

#### Kola nut and Guarana

Both the kola nut and guarana are natural sources of the stimulant caffeine, and are used by some cultures in a similar way to coffee in the West. Kola nuts grow on the Kola vera tree, a North American member of the cocoa family; meanwhile, guarana seeds are from the guarana shrub, which is native to Brazil. Coffee beans typically contain one or two percent caffeine, while the kola nut has around two to three percent and guarana four to eight percent. Caffeine is a central nervous system stimulant that is used to stay alert, although too much can cause nervousness, irritability, and sleeplessness.

At one time the kola nut was an ingredient in American colas, although now it is replaced by synthetic flavorings that mimic its taste. Meanwhile, South American tribes have used guarana for thousands of years as a stimulant in many foods and drinks. Today guarana is used in many energy drinks, and is a main ingredient of guarana soda, a popular beverage in Brazil.

#### Mimosa (He huan hua)

The sweet-tasting flowers of the Chinese herb mimosa (*Albizzia julibrissin Durazz*), or He huan ha, are used in oriental traditional medicine for their calming effects. Commonly referred to as Chinese herbal Prozac, mimosa flowers are used as an anti-depressant, to relieve anxiety, and as an aid to sleeping. Although there is little research on the pharmacology of the flowers, their sedative action is thought to be from a drug quercitrin in the flowers. Another compound, tetracosanoic acid, is also present, but its effects are currently unknown.

#### Myristica fragrans (Nutmeg)

*Myristica fragrans* is a tree native to the Spice Islands, close to New Guinea, the seeds of which when dried and ground make nutmeg. When eaten, around 10 to 20 ounces of nutmeg produces an intense hallucinogenic effect that is often accompanied with vomiting, diarrhea, and an extremely dry mouth. Its effects start after a few hours, last for up to a day, and are usually described as very unpleasant. The main psychoactive chemical in nutmeg is myristicin, also called methoxysafrole. Nutmeg is legal to buy in the United States.

European and North American cooks have used Nutmeg as a spice since the 16th century, mainly as a garnish on cakes and in the Christmas beverage mulled wine. Meanwhile, its psychoactive effects have been well documented for most of its modern history. Some cultures also use nutmeg as a medicine--for example, the Hindu Pharmacopoeia mentions it as a treatment for fever, asthma, and heart disease.

#### *Phalaris arundinacea* (Reed canary grass)

*Phalaris arundinacea*, more commonly known as reed canary grass, is a tall, reddish-green grass that grows on marshy land and contains small amounts of the psychoactive chemical dimethyl tryptamine (DMT). This drug has a similar hallucinogenic effect to LSD but is stronger and wears off after only half an hour. Typically, the amount of DMT in the grass is too little to have a direct effect, although it can be easily chemically extracted and then snorted in its pure form. Pure DMT is illegal, but the plants are impossible to legislate against because they are common in many areas of the world.

Reed canary grass is sometimes used in traditional South American brews called ayahuasca, which are a variety of drinks with hallucinatory effects. In North America the plant is now also used as an easy source of illegally obtained DMT.

#### *Piper methysticum* (Kava kava)

The roots of the *Piper methysticum* shrub, a pepper plant from the islands of the South Pacific, are dried and ground to make the mood-altering herbal remedy kava kava. Typically, the powdered roots are boiled in water and taken as a drink, although kava kava can also be eaten in its natural form or as tablets. Its main pharmacologically active chemicals are kava lactones, which produce a feeling of relaxation and sharpen the senses. Some uses of kava kava include to relieve anxiety and as a muscle relaxant. Kava kava is one of the most popular herbs bought from health food stores in the United States.

Pacific islanders have grown kava kava for thousands of years, using it at social gatherings, religious ceremonies, and in many other parts of their lives. More recently, it has been sold in the West as a health food remedy for a variety of ailments. Kava kava is banned in some countries, such as the United Kingdom, because of concerns about its safety.

#### *Salvia divinorum* (Diviner's sage)

*Salvia divinorum*, or diviner's sage, is a shrub native to Southern Mexico whose leaves contain a powerful psychoactive chemical called salvinorin. This drug is traditionally imbibed by chewing pairs of leaves, although the plant can also be smoked. Salvinorin is a powerful hallucinogen, which when smoked lasts for around half an hour; when chewed, its effects last longer. Users do not become

tolerant to salvinorin, so smoking for longer can increase the effect. However, many people find the hallucinations unpleasant and choose not to repeat the experience. *Salvia divinorum* is currently legal in the United States.

It is likely that the native Central Americans took *Salvia divinorum* in religious rituals.