

A Constructive Approach on Lethal Plants for Medicinal Use

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Abstract

According to WHO, over 80% of World Population in developing countries, they rely on traditional medicine. Most prevalent are from plant sources like herbs which they use for their primary healthcare need. In Africa and India, the traditional medicine is widely used to manage chronic diseases especially in aged persons. India is known as epicentre of traditional medicine also known as indigenous system of medicine such as; Siddha, Ayurveda, Unani and Homeopathy. All these types of indigenous system of medicine uses plant sources as their treatment option. In Africa, traditional Medicine uses the same plants as form medicine. Herbalists in Africa have been known to quote ancient methods of managing diseases especially from Arabic, Indian and Chinese Medicine scriptures. In Egypt, Traditional African Medicine was used before Agrarian Revolution. In evidence of above knowledge, information concerning healthy, lethal and toxic plants has been core factor in determination of herbal drugs. Crude drug analysis is vital in ascertaining herbal drugs. This drives one to mark the poisonous and non-poisonous plant for a constructive approach towards plant sources of medicines. Pharmacognostic analysis of plants has led to ideal drug developments, especially plant source drugs.

Keywords: Poisonous plant; Toxicology; Therapeutic dose; Toxic Constituents

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Introduction

Medicinal plants have been in use in centuries. To date numerous cultures in world still rely on Traditional System of Medicines that use majority of plant as source of medicines. In Asia especially India and China as well as Africa has been to be using indigenous methods of medicines [1]. A wide number of phytochemicals like alkaloids, glycosides etc. are derived from plant sources which are of great use in treatment of ailments. These phytochemicals possess activities like anti-allergy, anti-inflammatory, purgatives, laxative as well as anti-migraines [2].

Statement by Father of Toxicology, Paracelsus; everything is poisonous, only the dose distinguishes them (Paracelsus 1493-1541). A poisonous plant when used in lower concentrations becomes a potential drug in treating diseases like diabetes, Cancer etc. [3].

In this Review article; we have pulled number of poisonous plants which are commonly available in our reach. They includes: *Cleistanthus collinus*, Datura plant, *Abrus precatorius*, *Nerium*

oleander, *Gloriosa superba*. They are indicated in their biological name, family, toxic part of the plant, toxic constituents, signs and symptoms and management.

Cleistanthus collinus (Family: Phyllanthaceae)

Cleistanthus collinus plant is known for its toxicity and frequently used for homicidal or suicidal purposefulness. *Cleistanthus collinus* (Karra) contains a plant poison also called oduvan (Tamil), Vadisaku (Telugu) and Oduku (Malayalam). Ingestion of its leaves or a decoction of its leaves causes hypokalemia (kaliuresis and cardiac arrhythmias), metabolic acidosis, hypotension and hypoxia probably due to distal renal tubular acidosis, ARDS and toxin induced vasodilatation respectively. Hypokalemia and acidosis probably also induces rhabdomyolysis resulting in myoglobinuric renal failure and neuromuscular weakness. Its effects are probably mediated by injury to the distal renal tubules, pulmonary epithelium and peripheral blood vessels due to glutathione depletion (animal studies have shown benefit with N-acetylcysteine).

Cleistanthus collinus plant constituents are classified into:



Figure 1 *Cleistanthus collinus* (Family: Phyllanthaceae).

Cleistanthin A and cleistanthin B are phytoconstituents of *C. collinus*. Cleistanthin A and cleistanthin B are aryl-naphthalide lignans. They have been reported to be toxic substances responsible for poisoning. Cleistanthin A is also present in *Phyllanthus taxodiifolius* (Figure 1).

Toxic Effect: Ingestion of its leaves or a decoction of its leaves causes hypokalaemia and cardiac arrhythmias, metabolic acidosis, hypotension and hypoxia, probably due to distal renal tubular acidosis and toxic induced vasodilatation. Hypokalaemia and acidosis probably also induce rhabdomyolysis resulting in myoglobin-uric-renal failure, neuromuscular weakness. Its effects are mediated by injury to the distal renal tubules [4].

Therapeutic: The plant have; antiseptic, antifungal, insecticidal and larvicidal property. The present study is designed to check the antimicrobial properties of *Cleistanthus collinus* leaf extract against the pathogens like Methicillin Resistant *Staphylococcus aureus* (MRSA), *Enterococcus* and *Candida spp.*. Mostly these pathogens are the causative agents for skin infections and urinary tract infection. However, the other research groups pointed out the therapeutic potentials like insecticidal, larvicidal, antimicrobial, antifungal and antiseptic, diuretic and anticancer properties of the same plant [5].

***Gloriosa superba* (Family: Colchicaceae)**

Gloriosa superba is a deciduous, summer-growing climber up to 1.5 m tall, with tuberous roots. Tubers sprout in spring, and a tuber sends up 1 to 6 stems. The leaves are shiny, bright green and are tipped in a tendril, which will cling to anything it touches.

It is a poisonous plant. Its poison is toxic enough to cause human and animal fatalities if ingested. The plant has been used to cause suicides and homicides too. In some animal orphanages, it has been used as a mercy killing plant to sickly animals. Every part of the plant is poisonous, especially the tuberous rhizomes. As with other members of the Colchicaceae, this plant contains high levels of colchines and gloriocine as lethal alkaloids (Figure 2).

Toxic effect: Within a few hours of ingestion of the toxic amount of the plant material a victim may experience nausea, vomiting,



Figure 2 *Gloriosa superba* (Family: Colchicaceae).

numbness and tingling around the mouth, burning sensation in the throat, abdominal pain and bloody diarrhoea that leads to dehydration, acidosis and cell death. The toxic syndrome progresses leading to rhabdomyolysis, respiratory depression, hypotension, coagulopathy, haematuria, altered mental status, seizures, coma and ascending polyneuropathy. Long term effects include peeling the skin and prolonged vaginal bleeding in women [6].

Therapeutic Activity: It has Anti-cancer activity and as anti-proliferative agent. It's also used as a tonic, anti-periodic, anthelmintic, and laxative. The drug is sometimes used for promoting labor pains.

Applied externally, the tuber is used in the treatment of bruises, colic, chronic ulcers, haemorrhoids and cancer. It is put into poultices to relieve neuralgia, and used in topical applications to treat arthritic conditions, swellings of the joints, sprains and dislocations. It is claimed to have antidotal properties to snakebites. The macerated tuber is also taken against smallpox, leprosy, eczema, itch, and ringworm. A paste made from the tuber is applied externally to facilitate parturition. The juice of the tuber is used as ear drops to treat earache, and is also applied to the gums to treat painful teeth. The anthelmintic properties of the tuber, fruits and leaves are widely known and they are all used to treat infections of Guinea worms, schistosomes (causing bilharzia), roundworm, tapeworm, liver fluke and filarial.

Leaf juice, unripe fruits mixed with butter, and tuber macerate are frequently used to kill head lice. Colchicine is used in the treatment of gout and rheumatism. At present it is the drug of choice for acute gout. It reduces the inflammatory reaction to urate crystals deposited in the joints. Because of its highly toxic nature, colchicine should be used under supervision of a physician.

***Nerium oleander* (Family: Aponaceae)**

Nerium oleander is a highly toxic ornamental shrub widely cultivated in the Mediterranean. It has been grown since ancient times and features in many of the Roman wall paintings in Pompeii.



Figure 3 *Nerium oleander* (Family: Aponaceae).

Nerium oleander is a poisonous plant common across the globe. The stem and the leafy parts of the plant are considered to be lethal in nature. Historically, it has been considered a poisonous plant because some of its compounds may exhibit toxicity, especially to animals, when consumed in high amounts (**Figure 3**).

Toxic effect: Amongst the compounds; are oleandrin and oleandrogenin as cardiac glycosides, which acts on myocardium causing fibrillation and collapse. It also causes seizures and coma which can lead to death. Oleander can cause skin irritations, severe eye inflammation, irritations. It causes dermatitis with allergic reactions on the skin surface. Oleander is highly poisonous to humans, pets, livestock and birds due to the presence of cardiac glycosides, mainly oleandrin. Ingestion causes nausea, vomiting, cardiac arrhythmias, hypotension (low blood pressure) and death. Its sap has been used as rat poison. The leaves also show insecticidal activity against sugarcane mite and citrus leaf miner. Oleander is extremely toxic. Major toxicity includes disturbances in heart rhythm and death. Other signs of toxicity include pain in the oral cavity, nausea, emesis, abdominal pain, cramping, and diarrhea.

Therapeutic activity: It has cardio-tonic effects, anti-inflammatory and anti-leprosy effects. Oleandrin is used for treating cardiac conditions in patients who cannot tolerate digitalis. In traditional medicine, the leaves have been used for a variety of medicinal purposes, including the treatment of heart diseases, as a diuretic, antibacterial, and against snake-bite. The roots have been used externally in traditional medicine for treating cancer, ulcers and leprosy. More recently, research has focused on the anticancer effects of oleander and its constituent compounds. Oleandrin inhibits certain kinases, transcription factors, and inflammatory mediators, including tumor necrosis factor. This may provide a molecular basis for the ability of oleandrin to suppress inflammation and perhaps tumorigenesis. The authors of this in vitro study suggest that oleandrin may have applications for various diseases, including arthritis, but all require further investigation.

Abrus precatorius (Family: Fabraceae)

Abrus precatorius plants are seen growing wild throughout all tropical forests, and are propagated through seeds. Traditionally the seeds were used for decorative and gold-weighting purposes. The plant is used in traditional herbal formulations to treat many ailments, mainly scratches, sores, and wounds caused by dogs, cats, and mice. In addition, it is also used to treat leucoderma, tetanus, and rabies. The dry seeds are powdered and taken one teaspoonful once a day for 2 days to cure worm infections. Various African and Indian tribes use the powdered seeds as oral contraceptives. They have also been used against chronic eye diseases, and particularly against trachoma. As well as the seeds, the leaves and roots of the plants are also used for medicinal purposes (**Figure 4**).

Toxic effect: The toxicity of the plant was found to be due to the presence of a lectin poison called abrin, so toxic that, if swallowed or chewed, it will result in almost immediate death. Abrin is one of the most lethal known poisons, inducing severe vomiting, high fever, drooling, highly elevated levels of nervous tension, liver failure, bladder failure, bleeding from the eyes, and convulsive seizures. Abrin is a toxalbumen very similar to ricin found in castor seeds. It is a lectin composed of two polypeptide chains (A and B) connected by a disulfide bridge.

This basic structure of two peptide chains linked by a single disulfide chain is similar to that of botulinum toxin, tetanus toxin, cholera toxin, diphtheria toxin, and insulin. The usual fatal dose of *Ricinus communis* is reported to be just 2–3 seeds for an average adult. *Abrus* poisoning generally causes severe vomiting and abdominal pain, bloody diarrhea, convulsions, and alteration of sensorium with depression of central nervous system.

Therapeutic activity: The leaves and roots of this plant are used in South Africa to cure tuberculosis, bronchitis, whooping cough, chest complaints, and asthma. The leaves of the plants also are used as tea by Tanzanian traditional healers to treat epilepsy. In Zimbabwe, the plant is popularly used against schistosomiasis. The seeds of *Abrus precatorius* are used in Nigeria to treat diarrhoea.



Figure 4 *Abrus precatorius* (Family: Fabraceae).

A. precatorius L. seeds have been used for treating emesis in China. paste prepared from the seeds are used for baldness, vitiligo, pain, pruritus, and as an abortifacient. 30 Oral administration of agglutinins isolated from the seeds has been tried for the treatment of hepatitis and Acquired Immunodeficiency Syndrome (AIDS).

Nephroprotective activity: Aerial parts of aqueous extract were investigated to determine the recovery effect after administration of cisplatin and acetaminophen induced nephrotoxicity on HEK 293. The assay showed that *Abrus precatorius* had best recovery effect and can be used for the prevention or treatment of renal disorders.

Datura (Devil's Trumpets) (Family: Solanaceae)

Datura is an herbaceous perennial plant, which is grown in temperate and tropical region of the globe. All the species of Datura are poisonous in nature. Some are aphrodisiac too. The seeds and flowers are more poisonous in nature. Sometimes, datura is termed as witches weeds and shows properties like deadly nightshade and henbane. Datura use is known for feverish state and even death. However, in Ayurveda, it is used as medicine and ritual as well as prayers has also place this. Even being a poisonous plant, datura has been using since the ancient times by ayurveda physicians, spiritual purposes, holy men and its use in modern medicine drugs. They have different names region-wise like moonflowers, jimsonweed, devil's weed, hell's bells, thorn apple etc. The classic 'witches weed' most parts are toxic causing delirium and death. It has been used by witches to make lethal portions (Figure 5).

All species has Tropane alkaloids such as scopolamine and hyocinamine as well as atropine. Datura poison has been in use for decades, for both harmful and medicinal poisons. Ingestion of Datura poison is accidental via raw honey [7].

Toxic effect: Due to ingestion of datura which has high doses of atropine; it causes anticholinergic effects on the body. They



Figure 5 Datura (Devil's Trumpets) (Family: Solanaceae).

includes; delirium characterised by inability to differentiate reality from fantasy, hypothermia, tachycardia, bizarre and possibly violent behaviour, severe mydriasis with photophobia. At some cases; amnesia after ingestion has been reported.

Therapeutic activity: The growing datura plant acts like as insect repellent thereby protects other plants from insects. The juice of datura plant is applied over the scalp to treat hair fall, hair loss and dandruff. The leaves of datura are good to relieve headache. The vapour of datura leaves infusion is used to relieve arthritis such as rheumatism and gout. The burning leaf smoke of datura is good to treat asthma and bronchitis. The ethanol extract from datura leaves are used as acaricidal, repellent and oviposition deterrent properties against mites. The ethanol extract of datura is used as repellent against larva and mosquito.

The leaves of datura are used to treat heart problems like palpitations and hypertension.

Datura leaves juice is used to treat earache. Boils can also be overcome by applying datura leaves as poultice. Smoking blends of datura and cannabis are used as smoke because it is not ruthless and burns easier.

It has been used by the British soldiers to treat respiratory problems. Both scopolamine and atropine are used as sedatives and sometimes helps in curing of motion sickness, nausea and dizziness. Datura has been used in Ayurveda for asthma symptoms where jimson weed's leaves are smoked in cigarette or pipe. The Zuni once used it as analgesic for bone setting while the Chinese were used it as anaesthesia during surgery [8,9].

Hemlock- *Conium maculatum* (Family: Apiaceae)

Conium maculatum is a poisonous biennial herb that grows erect to an average height of 1 to 3 m. The larger stems of maturing plants contain numerous purple spots that are an identifying characteristic. First year-growth plants have fine, light-green, fernlike leaves and usually grow no taller than 46 cm.

Poison hemlock has a long white taproot that is solid and parsnip-like. Plants generally persist in localized stands because the seeds drop near the parent plant. Occasionally seeds are spread by water, birds, or rodents.

Poison hemlock was introduced into the United States from Europe as an ornamental plant. It has become widespread and frequently grows in waste places, along roadsides, ditch banks, fence rows, and in uncultivated areas or anywhere adequate moisture is available. Its distribution is nationwide. It's a highly poisonous biennial herbaceous flowering plant. It's capable of living in different geographical regions. It contains the piperidine alkaloids; coniine, N-methylconiine, conhydrine and pseudoconhydrine. Coniine has pharmacological activity similar to Nicotine (Figure 6).

Toxic effect: Hemlock is the famous plant that killed Socrates and Phocion.

Coniine disrupts the work of Central Nervous system through inhibitory action on nicotinic acetylcholine receptors. It blocks



Figure 6 Hemlock- *Conium maculatum* (Family: Apiaceae).

the neuromuscular junction in similar way as Curare. It causes tubular necrosis and presence of rhabdomyolysis in kidneys [10].

Pharmacological uses: Hemlock is a very poisonous plant that has a long history of medicinal use, though it is very rarely used in modern herbalism. It is a narcotic plant that sedates and relieves pain. The plant contains coniine, an extremely toxic substance that can also cause congenital defects. The whole plant is analgesic, antispasmodic, emetic, galactofuge and sedative. It is a traditional folk treatment for cancer and was formerly widely used internally in very small doses to treat a variety of complaints including tumours, epilepsy, whooping cough, rabies and as an antidote to strychnine poisoning. It is still used externally, usually in ointments and oils, in the treatment of mastitis, malignant tumours (especially breast cancer) anal fissure and haemorrhoids. The leaves and stems should be harvested when the first fruits are forming, since they

are then at their most active medicinally. The fruits are gathered either when fully ripe, or before they turn from green to yellow, and are then dried. Because of the extremely toxic nature of this herb, it is seldom employed nowadays. Use with extreme caution and only under the guidance of a qualified practitioner. See also the notes above on toxicity. A homeopathic remedy is prepared from a tincture of the fresh plant, harvested when in flower. It is used for treating complaints such as dizziness, coughs, insomnia, exhaustion, arteriosclerosis and prostate problems [11].

Conclusion

Poisonous activity of plants are due to the presence of toxic substances namely; tannins, alkaloids, saponins, glycosides, proteins and amino acids, resins, and amides. Information on poisonous plants is significant as most of them are used as medication when used in right doses.

Traditional system of medicines has vast applications of these plants; hence the knowledge about poisonous plant is vital to avoid poisoning accidents. The knowledge about these plants is helpful for the traditional methods of Medicine to be safe while in managing several ailments in Human life. In this situation we conclude that toxic plants have some medicinal value. By creating this awareness about toxic plants constituents can be source of new therapeutic entity for treatment of various diseases of Humanity.

Even if these plants have poisonous parts like leaves, roots and stem, their constituents have proven to be very useful to human herbal medicine. The knowledge about them is vital to having a more vast utilization of Traditional Medicine.

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