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Identification of Toxin Classes in Selected Plants: Datura, Oleander, and Calotropis

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Abstract: India has a very high rate of poisoning, creating a significant public health crisis with considerable illness and death. The nature of plant poisoning varies from region to region, but some plants are found almost everywhere. Among these, Yellow Oleander, Datura, and Calotropis are common examples.

These plants can be found in nearly all parts of India. Datura is a wild shrub that grows along roadsides and in the countryside. Oleander is a garden plant often seen in many homes. Calotropis is also prevalent in the Indian subcontinent, and all parts of this plant are toxic. Poisoning from these plants is not uncommon and may occur due to accidental exposure or intentional ingestion of their toxic parts.

Keywords: *Datura, Oleander, Calotropis, Plant Poisoning, Forensic Toxicology.*

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I. INTRODUCTION

Poisonous plants, despite their toxic nature have played a crucial role in medicine for centuries. In ancient times, the primitive human beings come across poisonous plants and learn to distinguish between toxic and non-toxic plants species by poison is defined as a substance, which has the capacity of acting harmful on human health, the poisonous plants have been used for suicide, murder and hallucination. An ideal poison should be cheap, easily available, colourless, odorless, tasteless, highly toxic and capable of painless death.

Plants like datura, oleander and calotropis are highly toxic plants commonly found in India and other tropical regions known for their potent chemical compounds that can cause severe poisoning or death upon injection, inhalation or skin contact.

Sushruta Samita has elaborated several modes of poisoning and explained how the poisons were mixed with food, drink, Honey, sprinkled over clothes, shoes, jewelry, beds, garlands and settle of horses, etc. Nowadays naturally occurring poisons are frequently used for robbery of traveler's murder, suicide. In forensic work it can be used as a truth inducing substance.

Indian traditional toxic plants and their chemical ingredients commonly used by the criminals to commit different crimes.

The review article has the basic details research as botanical names, common names, sign and symptoms of toxicity and used in traditional Indian system of medicine.

➢ *There are Several Toxic Plants as Follows:*

- Datura
- Calotropis
- Parthenium
- Ricinus/castor bean
- Rosary pea
- Plumeria
- Oleander

II. DATURA

Datura is a genus of nine species of vespertine flowering plants in the Solanaceae family. They are known as "Angel's Trumpets", a name that is sometimes shared with the closely related genus Brugmansia. Its height ranges between 3 and 5 feet, with its dark green, sharp-tipped oval leaves and large tubular (shaped like a trumpet) flowers, which can be either

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white (alba) or purple (niger). Its fruit pod is spherical and spiny, while its fruits range in number from 150 to 200 and are dark brown to black in color, resembling chilly seeds.

All parts of the plant, especially the seeds, are poisonous. Medicinal plants present a wide range of bioactive substances known for their pharmacological activities. In fact, the majority of conventional medicines rely on plant products. One such plant species is *Datura* spp., a flowering medicinal herb that pertains to the *Solanaceae* family primarily used as an intoxicant and hallucinogen. It is widely cultivated in Europe, Asia, America, South Africa, and other tropical and subtropical regions. *Datura* can be well-grown in average soils, but it prefers nutrient-rich and moist soil or alkaline soil. Although the plant acts as a narcotic, it has distinct effects on human health, provide incredibly beneficial as medicine. The fact that it possesses antimicrobial, antidiabetic, anti-asthmatic, anti-inflammatory, antioxidant, analgesic, insecticidal, cytotoxic, wound healing, and neurological activities. The *Datura* plant is also known for its larvicidal effects against red flour beetle (*Tribolium castaneum*) and mosquito repellent activities. In addition, *Datura* spp. has also been used against animal bites such as snake bites, which helps relieve pain. *D. stramonium*, the well-known species of this family, is utilized for mystic and religious purposes along with its use as herbal medicine.

➢ *Sign and Symptoms*

The Signs and Symptoms of Datura poisoning are best remembered as a series of D' s:

- Dryness of mouth, thirst, slurred speech
- Dysphagia
- Dilated pupils (with no reaction to light or accommodation)
- Diplopia
- Dry hot skin, with ushing, hyperpyrexia
- Drunken gait (ataxia), convulsions
- Delirium with hallucinations, agitation, amnesia, incoherence
- Dysuria, urinary retention, bladder distension
- Death, preceded by tachycardia, arrhythmias, coma, and respiratory depression, Sinus tachycardia and hyper.

➢ *Poisoning by Accident Can Arise Due to Any of the Following Reasons:*

- Accidental confusion of the capsicum seed.
- Foraging kids in rural areas eating the seeds (or other plant components).
- Medicinal mishaps.

Table 1 Important Species of *Datura with* Common Names and Key Characteristics

Botanical Name	Common Names	Key Characteristics/Notes
Datura stramonium L.	Jimsonweed, Thorn Apple, Devil's Snare, Jamestown Weed, Stinkweed, Angel's Tears, Apple of Peru, White/Purple Thorn Apple	Very common. Erect spiny fruit.
Datura metel L.	Devil's Trumpet, Angel Trumpet, Downy Thorn-Apple, Hindu Datura, Horn of Plenty, Purple Thorn-Apple, Yangjinhua (China)	Drooping fruit, velvety leaves.
Datura innoxia Mill.	Downy Thorn Apple, Pricklyburr, Recurved Thorn-apple, Moonflower, Toloache	Often confused with *D. meteloides*.
Datura wrightii	Sacred Datura, Sacred Thorn-Apple, Tolguacha, Angel's Trumpet	Similar to *D. innoxia*.
Datura ferox L.	Fierce Thorn Apple, Chamico	Large spiny capsules.
Datura discolor	Desert Thorn Apple, Moonflower	Found in Southwestern USA/Mexico.

III. USE IN TRADITIONAL INDIAN SYSTEM

Datura (*Dhatura metel*/*stramonium*), known as a potent, sacred herb in Ayurveda, is used to treat asthma, cough, skin diseases, pain, and neurological disorders. Known for its antispasmodic and sedative actions, it is rarely taken orally, instead used externally as oils, plasters, or smoked, always requiring rigorous purification (*shodhana*) due to its toxicity.

➢ *Traditional Uses in Ayurveda:*

- Respiratory Disorders: Used for asthma, cough, and bronchitis. It is historically smoked or used as an inhalant to alleviate bronchospasm.
- Pain Management: Poultices of leaves are applied to treat lumbago, sciatica, and painful neuralgic swellings.
- Skin and Skin-related Conditions: Leaf juice is applied to skin diseases and to treat lice.
- Other Uses: Used in traditional treatments for fever, epilepsy (with black pepper), and abdominal pain

➢ *Purification and Safety (Shodhana):*

- Toxicity: Datura contains poisonous alkaloids like daturine (atropine, hyoscine).
- Processing: Before use, seeds are purified, often in a *Dola Yantra* (hanging apparatus), by soaking them in cow's milk, cow's urine, or herbal decoctions to reduce toxicity.
- Caution: Internal use is dangerous and only recommended under strict Ayurvedic supervision, particularly due to its high toxicity.

➢ *Cultural Significance:*

- It is considered a holy plant, with its flowers and fruits frequently offered to Lord Shiva, representing the eradication of negative traits.

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Fig 1 Datura & Seeds

➢ *Oleander*

Cascabela thevetia, which is also known as Thevetia peruviana is a type of plant that's bad for you if you eat it. This plant is part of the dogbane family called Apocynaceae. You can find Cascabela thevetia in Mexico and Central America where it grows naturally. People also grow Cascabela thevetia in places because it looks nice.

Its flowers are yellow. People, in India use them for things they believe in. For example Hindu people use the flowers of Cascabela thevetia when they worship. Yellow Oleander is an evergreen shrub but a poisonous found throughout India, known for its bright yellow, trumpet-shaped flowers. It is important to note that all parts of this plant are highly toxic to humans and animals.

➢ *Sign and Symptoms*

The plant has chemicals called cardiac glycosides, like thevetin and neriifolin. If you eat any part of this plant it can be very bad for your heart and even fatal.

- Gastrointestinal Effects: You might feel a burning sensation, in your mouth feel vomit severely have stomach pain and diarrhea.
- Cardiac Effects: Your heartbeat can become irregular slow down a lot your blood pressure can drop and you might have a heart block.
- Neurological Effects: You could feel dizzy get headaches feel confused, sleepy and really lethargic.
- Severe Poisoning: This can cause your electrolytes to get out of balance with high potassium levels lead to seizures, coma and even heart failure

Table 2 Important Species of *Oleander with* Common Names and Key Characteristics

Category	Names
Botanical Name	*Cascabela thevetia* (L.) Lippold
Common Synonyms	*Thevetia peruviana* (Pers.) K. Schum., *Thevetia neriifolia* Juss. ex A. DC., *Cerbera thevetia* L.
Common English Names	Yellow Oleander, Lucky Nut, Be-Still Tree, Mexican Oleander, Exile Tree, Trumpet Flower
Hindi Names	Pili Kaner (पीली कनेर), Kaner

IV. USE IN TRADITIONAL INDIAN SYSTEM

➢ *The Indian System has some Medicinal Uses for this Plant.*

- For skin diseases people make a paste, from the leaves, bark or roots. Use it on the skin to help with leprosy, scaly skin, ringworm, acne and wounds.

➢ *The Plant is Also Used for Healing.*

- The bark of the plant is used to clean out the body it helps to throw up. It is used to treat sores, ulcers and leprosy.

➢ *When People Have a Fever, they Use the Plant to Help Feel Better.*

- A decoction of the bark or leaves is used to treat fevers that come and go.

➢ *The Plant is Also Used for Hemorrhoids and Tumors.*

- People make pastes and plasters from the root. Use them on hemorrhoids and skin tumors.

➢ *Sometimes the Plant is Used for Rheumatism.*

- The seeds and roots are used to make things that help with pain.

➢ *The Plant has Been used to Help Women with Their Care.*

- Traditionally the plant is used to help increase flow and sometimes to end a pregnancy.

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Fig 2 Yellow Oleander (Cascabela Thevetia)

V. CALOTROPIS

The Calotropis gigantea plant is part of the Asclepiadaceae family and the sub family Apocynaceae. It is also known as Madar in Hindi. This plant has been used for a long time in traditional medicines. The Calotropis gigantea is a kind of shrub that produces a milky liquid, which is why it is also called the milkweed. People over the world use Calotropis as a traditional medicinal plant.

The Calotropis gigantea plant has chemical constituents like cardenolides, flavonoids, terpenes and nonprotein amino acid in different amounts. The root bark of the Calotropis gigantea plant has things like α-amyrin β-amyrin, taraxasterol and some other things. The root of the Calotropis gigantea plant also has a property that helps with memory.

The latex, leaves, flowers and bark of the Calotropis gigantea plant are used for things. They are used to remove body hair to make people cough up things that're bad for them and to help with worm infections. They are also used to help with leprosy, ulcers, coughs, scabies, ringworm, piles, swellings on the body asthma, spleen problems, liver problems and joint pain. The Calotropis gigantea leaf is also used to see if it can help with anxiety and if it has a calming effect.

The methanolic extract of the Calotropis gigantea root is used to help with memory. This information gives us an idea about the activity and phytochemistry of the Calotropis gigantea plant. The Calotropis gigantea plant is very useful. Has many good things about it. The Calotropis gigantea plant is used in ways and it is good, for many things. All the parts of this plant is toxic.

VI. MORPHOLOGY

The Root of the plant is pretty simple. It is. Woody at the base. The bark is covered with an corky layer. The branches are somewhat delicious and thickly covered with tomentose.

The Leaves of the plant are opposite-decussate and straightforward. They are subsessile and exstipulate. The edge of the leaves is oval to obovate. They are 5-30 cm long. 2.5-15.5 Cm wide.

The Fruit of the plant is a follicle. It is plump and swelled. The Fruit is subglobose to ovoid. It can be up to 10 cm or more in diameter.

The Seeds of the plant are many and small. They are flat and obovate. The Seeds are 6 × 5 mm in size. They are compacted with white pappus. The pappus is 3 cm or more long.

The Flowers of the plant are bracteate and complete. They are sexually unbiased and actinomorphic. The Flowers are pentamerous and hypogynous. They are pedicellate. The pedicel is 1-3 cm long.

The Calyx of the plant has five sepals. The sepals are polysepalous and five-lobed. They are joined at the base. The sepals are glabrescent. Have quincuncial aestivation.

The Androecium of the plant has five stamens. The stamens are gynandrous. The anther is dithecous.

The Inflorescence of the plant is an multi-bloomed umbellate cyme. It is. Emerges from the hubs. It seems axillary or terminal.

The Gynoecium of the plant is bicarpellary and apocarpous. The styles are joined at their peak. The Gynoecium has a stigma with five parallel stigmatic surfaces. The anthers are adnate, to the stigma forming a gynostegium. The Gynoecium of the plant is a part of the Flowers of the plant.

➢ *Sign and Symptoms*

Applied to the skin it causes redness and blisters.

- When taken by mouth the juice tastes very bitter. Causes a burning pain in the throat and stomach.
- It also causes salivation, mouth sores, vomiting, diarrhea, dilated pupils, muscle spasms and even death.
- The time it takes to be fatal is, between 6 to 12 hours.
- To treat it a stomach wash, soothing medicines and treating the symptoms are recommended.

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Table 3 Important Species of *Calotropis with* Common Names and Key Characteristics

Botanical Name	Common Names	Flower Color
Calotropis gigantea (L.) Dryand.	Giant Milkweed, Crown Flower, Giant Indian Milkweed, Swallow-wort, Ivory Plant, Akanda (Bengali)	Light purple, white, or lilac
Calotropis procera (Aiton) Dryand.	Apple of Sodom, Rubber Bush, Calotrope, Indian Milkweed, Wild Cotton, Aak (Hindi)	White with purple-tipped petals

➢ *Use in Traditional Indian System*

- Skin and Wounds: Latex is applied to treat ringworm, leprosy, and various sores, while leaves are used to reduce swelling.
- Respiratory Illnesses: Leaves and roots are used in remedies for asthma, coughs, and bronchitis.
- Joint Pain/Rheumatism: Warmed leaves (often with mustard oil) are applied directly to joints to alleviate pain and inflammation.
- Digestive Disorders: Root powder is used for treating intestinal worms and digestive issues.
- Dental Care: The latex is traditionally used to treat toothaches.
- Other Uses: The plant is used for treating jaundice, epilepsy, and even in treating snake bites in traditional remedies

Fig 3 Calotropis Gigantea

VII. FORENSIC SIGNIFICANCE OF THESE TOXIC PLANTS

Calotropis gigantea is primarily categorized as a gastrointestinal irritant and a potent abortifacient; its latex is historically linked to infanticide and the creation of artificial bruises in malingering cases.

In contrast, Yellow Oleander (*Thevetia peruviana*) acts as a powerful cardiac poison, frequently used in suicidal ingestions due to its digitalis-like effect on the heart, leading to fatal arrhythmias.

Datura stands apart as a "stupefying agent," notoriously used by criminals to incapacitate victims for robbery or kidnapping by inducing a state of "mindless" disorientation and physical helplessness.

VIII. CONCLUSION

From the above discussion, Datura, Yellow Oleander (Cascabela thevetia), and Calotropis gigantea serve as an important source of medicines as well as are highly poisonous. Such plants are abundantly available all-around India; thus, cases of accidental as well as deliberate poisoning can be expected at any time.

The plants have specific constituents that are responsible for making them toxic; Datura having tropane alkaloids, Oleander having cardiac glycosides, and Calotropis having cardenolides and latex toxins. Their toxicity and traditional uses make them important in the field of forensic toxicology due to the severity of their consequences.

Forensic significance of these plants is linked to the fact that such plants play a vital role in cases of suicides, homicides, and other crimes such as stupefaction or robbery. Therefore, identification and detailed information regarding the toxicity of these plants along with the clinical presentation of patients should be known to forensic scientists.

Thus, it becomes highly necessary to be aware of these toxic plants and their safe use.

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