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***Medico Legal Significance, Forensic Pitfalls, and Regulatory Dilemmas Surrounding Toxic Botanicals Employed in India's Traditional Healing Systems: A Critical Synthesis of Historical Usage, Contemporary Practice, and Jurisprudential Precedents***

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**ABSTRACT**

*India's vast pharmacopeia of traditional medicinal plants includes numerous species that are inherently toxic in specific doses or preparations. While these botanicals hold therapeutic importance in Āyurveda, Siddha, and folk systems, their misuse—intentional or accidental—often leads to medico legal complications. This critical review explores the dualistic nature of toxic plants such as Aconitum, Datura, Abrus, and Strychnos, focusing on their clinical manifestations, toxicodynamics, and forensic evidence profiles. It also examines legal precedents, diagnostic challenges, and enforcement gaps within the current Indian regulatory framework. By synthesizing historical texts, forensic case data, and policy analysis, this paper aims to highlight the urgent need for regulatory harmonization and improved forensic capacity. The findings advocate for a multidisciplinary approach that respects cultural practices while safeguarding public health and justice.*

**KEYWORDS:** *Toxic Plants in Traditional Medicine, Medicolegal Toxicology, Forensic Botany in India, Poisonous Herbs and Regulation, Herbal Poisons and Criminal Liability*

## INTRODUCTION

The dual character of many Indian medicinal plants—curative at low doses, lethal at higher concentrations—places them at the intersection of pharmacology and law. *Aconitum*, *Datura*, *Abrus*, *Semecarpus*, and *Strychnos* are written into classical Āyurvedic treatises as both remedies and poisons. Their continued availability in domestic gardens and rural bazaars ties modern medicolegal experts to centuries-old toxicological knowledge while exposing fresh liabilities. This review surveys key species, evaluates toxicodynamics, tracks litigated poisonings, and interrogates the adequacy of India’s regulatory controls. Word limits constrain exhaustive enumeration, yet the intent is to spark interdisciplinary dialogue between clinicians, botanists, and jurists.

## LITERATURE REVIEW AND METHOD

### Scope of Sources

The literature review was carried out using a wide spectrum of multidisciplinary databases and archival repositories to ensure a holistic understanding of toxic plant usage in traditional Indian medicine and their medicolegal implications. Indexed scientific journals and review articles were sourced primarily from PubMed, IndMED, and SCC Online, covering the period from 1980 to 2025. These databases were selected for their focus on biomedical science, Indian medical publications, and legal case documentation respectively. In addition, ethnographic and historical botanical records predating 1900—especially colonial-era toxicology manuals and Ayurveda compendia—were consulted to frame the cultural and historical foundations of toxic plant usage. These sources provide insight into traditional preparation methods, ritualistic contexts, and early documentation of poisoning cases, which are vital for understanding current legal and clinical interpretations.

### Inclusion Criteria

To ensure relevance and quality, strict inclusion criteria were applied during the review. Only documents that met at least one of the following conditions were retained:

- Studies reporting clinical or forensic cases of human poisoning due to medicinal plants;
- Research on the toxicodynamics and detection methods of plant-based poisons relevant to Indian flora;
- Judicial case summaries or medico-legal judgments involving alleged plant poisonings;

- Articles evaluating the regulatory framework surrounding toxic herbs in Indian traditional medicine systems;
- Ethnobotanical records that described cultural uses of toxic plants with documented health or legal outcomes.

Case reports and observational studies were prioritized for their direct relevance to real-world medicolegal interpretation. Grey literature, personal blog entries, and anecdotal texts were excluded unless corroborated by at least one academic source.

### Critical Appraisal

Each source was subjected to a multi-dimensional appraisal framework to assess its academic value and contribution to this study. The following three evaluation criteria were used:

- **Toxicological Detail:** Whether the paper accurately identified the plant species, the specific toxic compound, and provided mechanistic insight into the symptoms and treatment. High-quality papers included dose-response relationships and analytical methods like HPLC, LC-MS, or ELISA.
- **Legal Clarity:** The extent to which the source linked the toxicological information to forensic relevance or legal implications. This included whether it described chain-of-custody procedures, court outcomes, or prosecutorial challenges.
- **Cultural Nuance:** The degree to which the text acknowledged or engaged with the indigenous, ritual, or traditional contexts of plant use. This was particularly important for balancing scientific critique with respect for cultural practices.

Papers that scored high on all three axes were considered core references and integrated into the main discussion. Others with gaps or methodological weaknesses were still used to highlight existing voids in research, particularly where traditional use diverges from legal regulation or where forensic data remain ambiguous.

This triangulated methodology was essential for capturing the interdisciplinary essence of toxic plants in Indian traditional medicine—where science, tradition, and law intersect, often with unresolved contradictions.

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## Historical Context and Cultural Perceptions

### Colonial Toxicology Treatises

During the British colonial era, particularly in the 19th century, British surgeons and medical officers stationed in India—most notably those from the Bengal Medical Service—took a keen interest in what they referred to as “native poisons.” Their motivation was not merely scientific curiosity but also administrative necessity, as poisoning using plant-based substances was perceived as a common tool for both crime and traditional medicine in Indian society. These medical officers compiled extensive medico-juridical manuals to guide British courts and coroners in identifying symptoms, cause of death, and responsibility in suspected poisoning cases.

However, a key flaw in many of these treatises was the misinterpretation of ritualistic or spiritual uses of plants. For example, plants like *Datura stramonium*, often used in Tantric and Shaivite rituals for inducing trance states, were frequently described in these colonial documents purely as “stupefying agents” or “criminal poisons.” This lack of cultural literacy often led to the criminalization of traditional healers and indigenous practices, and contributed to the shaping of early legal precedents that viewed all toxic plant use with suspicion—even in controlled, therapeutic contexts. These biases still echo in some contemporary judicial interpretations of plant-based poisonings.

### Āyurvedic Doctrines of Doṣa and Vīrya

Classical Āyurvedic texts such as the *Caraka Saṃhitā*, *Suśruta Saṃhitā*, and *Aṣṭāṅga Hṛdaya* offer detailed descriptions of thousands of herbal substances, including many with known toxic properties. Rather than labeling these as inherently “dangerous,” the texts embed them within the broader concepts of doṣa (humoral imbalance), vīrya (potency), vipāka (post-digestive effect), and prabhāva (specific action).

Plants like *Vatsanabha* (*Aconitum ferox*), *Bhallataka* (*Semecarpus anacardium*), and *Kuchila* (*Strychnos nux-vomica*) were not prohibited, but used with precise processing techniques, such as shodhana (purification), to neutralize their toxic effects. The inclusion of these herbs in classical medicine underscores an implicit recognition of dose-dependent toxicity—a concept modern pharmacology embraces as the basis of therapeutic index. This shows that

ancient Indian physicians did not treat toxicity as an aberration, but rather as a manageable property that required skill, precision, and context.

### **Folk Heuristics**

Beyond codified classical knowledge, folk medicine traditions in India have long relied on empirical rules and cultural logic to handle toxic plants. Healers in tribal and rural regions often refer to a category called “shada-aushadhi” (six potent or dangerous herbs) that require careful handling. These include species like *Gunja* (*Abrus precatorius*) and *Dhattura* (*Datura metel*). Their identification and safe use are often guided by oral transmission, taste tests, smell, and even behavioral reactions from animals or the healer themselves.

Moreover, ritual antidotes, such as using ghee (clarified butter), milk, or specific mantra chanting, form part of the administration process—reflecting a holistic view of healing that intertwines body, mind, and spirit. While such methods may not always meet modern scientific standards, they continue to influence extrajudicial conflict resolution in rural areas where formal medical or legal systems are distant. In some communities, plant poisoning disputes are mediated by elders or community shamans rather than reported to law enforcement.

This persistence of traditional epistemology has both advantages and risks: while it preserves indigenous knowledge, it can also lead to misdiagnosis, underreporting, or misuse—especially when younger, untrained individuals attempt to replicate practices without full understanding. For the forensic or legal expert, this cultural layer cannot be ignored; it informs everything **from** witness testimony to the interpretation of motive or intent in poisoning cases.

## **TOXIC PLANTS OF FOREMOST MEDICOLEGAL CONCERN**

### ***Aconitum* spp. (Ativisha / Vatsanabha)**

Several Himalayan species—*Aconitum ferox*, *A. napellus*, and *A. heterophyllum*—contain the C19-diterpenoid alkaloids aconitine, mesaconitine, and hypaconitine. These highly lipophilic toxins bind fast sodium channels in the myocardium and peripheral nerves, precipitating intractable ventricular tachyarrhythmia, burning paresthesia, and sudden hypotension within 10–30 minutes of ingestion. Classical Āyurveda prescribes elaborate *śodhana* (purification)

with cow urine, lime water, and milk to reduce alkaloid content, yet folk healers sometimes bypass these steps, dramatically amplifying risk.

**Medicolegal pitfalls:** First-aid protocols in rural clinics often include prompt gastric lavage with tannic acid or activated charcoal, a measure that removes most free alkaloid from the **stomach and upper gut**. By the time an autopsy is contemplated, little parent compound remains in viscera, leading to false-negative toxicology reports. Trace analysis now relies on hair-shaft LC-MS or solid-phase micro-extraction from cardiac tissue, but these techniques are available in only a handful of Indian FSLs (Forensic Science Laboratories). Consequently, homicide may be misclassified as natural sudden cardiac death, or vice-versa, depending on the presence or absence of circumstantial evidence such as leftover decoction.

### **Datura stramonium (Dhattura)**

Seeds, leaves, and flowers of *D. stramonium* and allied species (*D. metel*, *D. innoxia*) are rich in tropane alkaloids—atropine, l-hyoscyamine, and scopolamine. These cause anticholinergic **toxidrome**: mydriasis (“blind as a bat”), dry mucosa (“dry as a bone”), hyperthermia, tachycardia, urinary retention, and vivid visual hallucinations. In Tantric rites the plant is revered for its trance-inducing capacity; roadside thieves have weaponized the same property by spiking food or country liquor (“dhattura chaaval” scams). *Medicolegal dilemma:* Hospitals frequently label delirious patients as acute psychosis or alcohol withdrawal, delaying toxicology sampling past the window when serum tropanes fall below  $0.1 \text{ ng mL}^{-1}$ . When charges reach court, defence counsel may argue therapeutic use for asthma (dried Datura leaf “pills” are a folk bronchodilator), muddying intent. Proving forcible administration demands synchronized evidence: alkaloid quantification, witness testimony, and demonstration that the victim lacked voluntary control.

### **Abrus precatorius (Ratti / Gunja)**

The glossy red-and-black seeds of *A. precatorius* contain abrin—a Type II ribosome-inactivating protein approximately 75 times more potent than ricin. Three crushed seeds (~0.5 mg abrin) can fatally inhibit protein synthesis, causing delayed gastro-intestinal erosion, hypovolemia, and multi-organ failure over 36–72 hours.

**Cultural camouflage:** Because the seeds are strung into prayer necklaces and children's toys, defendants often plead accidental ingestion. Prosecutors must therefore show deliberate crushing or decoction—whole seeds typically traverse the gut harmlessly due to their hard testa.

**Forensic advances:** ELISA kits for abrin in gastric lavage or renal tissue have improved detection down to  $2 \text{ ng mL}^{-1}$ , yet thermal degradation during cremation or embalming eliminates evidence, making timely sample preservation critical.

### **Semecarpus anacardium (Bhallataka / Marking Nut)**

The pericarp of the nut exudes a black, viscous oleoresin rich in phenolic compounds bhilawanol, anacardic acid, and cardol. Traditionally used in Ayurveda for chronic inflammatory disorders after purification, the raw resin produces severe vesicating dermatitis within hours of skin contact.

**Criminal use:** Historically, the resin was smeared on the skin of slaves or adversaries to simulate flogging injuries, or mixed with chilli powder in “revenge attacks.” Present-day fraudsters apply diluted resin on themselves to fabricate assault or workplace injury claims. *Forensic approach:* Dermatologists distinguish bhallataka burns from allergic contact dermatitis by noting linear or droplet patterns, the absence of satellite lesions, and the presence of dark necrotic crusts. Gas chromatography with flame-ionization detection (GC-FID) of swabbed clothing can confirm residue, but the defence may contest chain of custody when sampling is delayed.

### **Strychnos nux-vomica (Kuchila)**

The seeds of *S. nux-vomica* harbor strychnine and brucine, indole alkaloids that antagonize glycine and GABA receptors in the spinal cord, unleashing unchecked reflex arcs and classic “saw-horse” convulsions. Rigor alternates with relaxation until death from respiratory tetany or exhaustion.

**Post-mortem degradation:** Strychnine undergoes alkaline hydrolysis and bacterial decarboxylation during putrefaction, diminishing detectability after 48 hours—especially in India's tropical climate. Refrigeration delays or heavy funerary embalming compound the issue. In some judicial districts, forensic pathologists therefore prioritize urine

GC-MS (relatively stable) or preservation of bile in saturated sodium chloride to inhibit enzymatic decay.

**Case law significance:** Multiple convictions have hinged on circumstantial motives—inheritance disputes or romantic jealousy—because chemical proof faltered. Conversely, documented therapeutic use as a veterinary tonic or in Unani aphrodisiac pills has occasionally secured acquittals, illustrating how strychnine’s dual identity complicates juridical reasoning.

**Table 1: Major Toxic Plants in Traditional Indian Medicine with Toxins and Symptoms**

Botanical Name	Common Name	Toxic Compound	Primary Toxic Effect	Lethal Dose (Approx.)
<i>Aconitum ferox</i>	Vatsanabha	Aconitine	Ventricular arrhythmia, paresthesia	1–2 mg of aconitine
<i>Datura stramonium</i>	Dhattura	Atropine, Scopolamine	Delirium, dry mouth, hallucinations	15–20 seeds
<i>Abrus precatorius</i>	Ratti / Gunja	Abrin	Vomiting, multiorgan failure	1–3 crushed seeds
<i>Semecarpus anacardium</i>	Bhallataka	Bhilawanol, Anacardic acid	Severe skin blisters, chemical burns	Topical—varies by exposure
<i>Strychnos nux-vomica</i>	Kuchila	Strychnine	Tonic seizures, respiratory arrest	30–100 mg in adults

**Clinical Manifestations and Forensic Diagnostics**

**Symptomatic Overlap**Cardiotoxic plants mimic myocardial infarction; neurotoxins replicate epileptic fits. Misdiagnosis may erase vital toxicology sampling windows. Analytical AdvancesHigh-performance liquid chromatography–mass spectrometry (HPLC-MS) now detects nanogram levels of aconitine in hair, extending detection up to one month post-exposure.

Post-mortem Artefacts pH shifts after death degrade alkaloids; embedding hair shafts in paraffin before sectioning limits loss. Standard operating procedures, however, vary between state laboratories, breeding legal challenges.

**Table 2: Clinical Features versus Forensic Challenges in Plant Poisoning Cases**

<b>Plant</b>	<b>Clinical Symptoms</b>	<b>Forensic Limitation</b>	<b>Standard Test Method</b>
Aconitum ferox	Hypotension, arrhythmia	Alkaloid degradation post-mortem	HPLC–MS on blood/hair
Datura stramonium	Dryness, delirium, dilated pupils	Tropanes mimic psychiatric disorders	GC–MS or TLC
Abrus precatorius	GI bleeding, convulsions	Bright seeds confuse accidental vs. homicidal use	ELISA for abrin
Semecarpus anacardium	Contact dermatitis, blisters	Intentional vs. allergic exposure difficult to prove	Skin biopsy + patch test
Strychnos nux-vomica	Muscle rigidity, convulsions	Strychnine decays rapidly after death	Urine GC–MS within 6 hrs

**Legislative and Regulatory Landscape**

Drugs and Cosmetics Act, 1940 Schedules E1 and E2 list poisonous herbs requiring prescription-only sale, yet enforcement is fragmentary because Ayurveda, Siddha, and Unani pharmacies fall under separate Boards. Poison Act, 1919 Notification of a substance as “poison” remains provincial; Datura is scheduled in Tamil Nadu but not uniformly across states, enabling trafficking across porous borders.

**Case-Law Trend** From Queen-Empress v. Totaram (1895) to State of Rajasthan v. Kushal (2022), convictions often pivot on circumstantial evidence due to chemical detection failure, highlighting the science-law disjunct.

**Table 3: Comparative State-Wise Regulatory Status of Key Toxic Plants in India**

Plant Name	Tamil Nadu	Maharashtra	Uttar Pradesh	Kerala
Datura	Scheduled Poison	Not Scheduled	Scheduled Poison	Scheduled
Semecarpus anacardium	Not Regulated	Not Regulated	Restricted Usage	Scheduled
Abrus precatorius	Not Scheduled	Not Scheduled	Not Scheduled	Not Scheduled

**CASE STUDIES ILLUSTRATING JURISPRUDENTIAL CHALLENGES**

**Bhilwara, 2018: Fatal Aconite Infusion in Ritual Feast**

Investigators initially dismissed foul play, assuming allergy; exhumation and LC-MS hair analysis nine weeks later altered the charge sheet from accidental death to homicide, yet evidentiary delay weakened prosecution.

**Kochi, 2021: Datura-Laced Alcohol in Sexual Assault**

Defence argued consensual recreational use; prosecution’s reliance on blood atropine levels faltered because decomposition artefacts confounded baseline. Verdict: acquittal for lack of mens rea proof.

**Table 4: Select Legal Cases Involving Toxic Plants in India**

Case Name	Year	Plant Involved	Outcome	Key Legal Issue
Queen Empress v. Totaram	1895	Datura	Conviction	Proof of administration
State of Rajasthan v. Kushal	2022	Abrus	Acquittal due to lack of toxicology	Chain of custody and delay in analysis
State v. Narsimhan (Kerala)	2019	Semecarpus	Conviction	Use of botanical evidence in assault claim

**Discussion: Gaps and Critical Observations**

Regulatory Fragmentation Parallel governance of AYUSH and allopathic supply chains permits online sale of raw seeds without toxicology warnings, undermining consumer safety. Forensic Capacity Deficit Less than half of India’s district laboratories possess LC-MS

systems; manual color tests for tropanes remain common despite high false-negative rates. Cultural Sensitivity Versus Public Safety Total bans risk erasing traditional therapeutic knowledge, yet laissez-faire access fuels clandestine poisonings. Balancing respect for heritage with harm reduction demands nuanced legislation.

### **Policy Recommendations and Strategic Framework**

**Unified Scheduling** Adopt a national positive list of toxic botanicals under the Poisons Act, superseding state disparities.

**Licensing of Raw Drug Vendors** Issue digital track-and-trace barcodes for Schedule-E herbs, mirroring narcotic-psychotropic supply chains.

**Forensic Protocol Harmonization** Mandate hair and nail sampling in all suspected plant-toxin deaths; circulate SOPs through National Medico Legal Curricula. **Community Outreach** Partner with folk practitioners to develop illustrated safety manuals in regional scripts; embed QR codes linking to emergency treatment algorithms.

### **CONCLUSION**

Toxic plants used in India's traditional medical systems occupy a complex terrain—respected by practitioners for their potent curative effects yet feared for their potential lethality. As documented, substances like *Datura* and *Aconitum* have repeatedly appeared in forensic casework, where their detection is complicated by rapid decomposition and overlapping symptoms with other illnesses. The fragmented regulatory system, coupled with outdated forensic infrastructure in many Indian states, exacerbates the difficulty in prosecuting poison-related crimes effectively.

More than a legal or clinical issue alone, this is a multidisciplinary challenge. It demands a holistic policy that unites the wisdom of ancient pharmacopeias with the rigor of modern toxicology, the precision of forensic science, and the clarity of legislative frameworks. Educational outreach to rural healers, digitized herbal supply chains, and standardized forensic protocols are essential steps toward this vision. Only through such integrative strategies can India hope to preserve its rich medicinal heritage while mitigating its toxicological and legal hazards.

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