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Review Article

Datura stramonium L. (Solanaceae): a medico religious plant

Vikas Tailor[1], Jaswinder Kaur[2], Debangshu Agrahari[3], Subodh Kumar Kandari[4], Nibedita Jena[5] and Maofungsar Basumatary[6*]

[1]Department of Biology, Swami Vivekanand Government Model School, Block Asind, Bhilwara, Rajasthan, India

[2]Department of Botany, Government Degree College, Sirathu, Kaushambi, Uttar Pradesh, India

[3]Department of Dravyaguna Vijnana, Jeevak Ayurved Medical College and Hospital Research Centre, Chandauli, Uttar Pradesh, India

[4]Department of Botany, Omkarananda Sarashwati Government Degree College, Devprayag Tehri Garhwal, Uttarakhand, India

[5]Ambika Prasad Research Foundation, Odisha, India

[6]Hemvati Nandan Bahuguna Garhwal University, Srinagar, Uttarakhand, India

[*]Email-Id: maofungsarb32@gmail.com

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Abstract: *Datura stramonium* L., a member of the Solanaceae family, is a prominent medico-religious plant recognized for its medicinal, pharmacological and cultural significance. It is widely distributed in tropical and subtropical regions and has been traditionally used in respiratory, neurological, inflammatory and dermatological disorders. Beyond its therapeutic properties, the plant holds deep religious and mythological importance, particularly in Hindu traditions, where it is associated with Lord Shiva and various ritual practices. Present review comprehensively summarizes the botany, morphology, geographical distribution, medicinal and pharmacological activities and mythological significance of *D. stramonium*. The current study highlights its dual nature as a valuable therapeutic agent and a culturally revered plant, emphasizing the importance of cautious use due to its potent toxicity.

Keywords: Dermatology, ethnobotany, mythology, neurology, pharmacology

Introduction

Plants have played a vital role in human civilization since ancient times, serving not only as sources of food and medicine but also as important elements in religious, spiritual and cultural practices (Dwivedi, 2017; Eshete and Molla, 2021; Rosso, 2024; Menaka et al., 2025; Padhi, 2025). Across different civilizations, numerous plants have been revered as sacred and have been traditionally used in rituals, worship and mythological narratives (Nath and Mukherjee, 2015). Such plants often possess medicinal properties, leading to an intrinsic link between religion, traditional medicine and ethnobotanical knowledge (Singh, 2025). Present study of medico-religious plants therefore provides valuable information into the historical integration of healthcare, belief systems and natural resources. Among these sacred plants, *Datura stramonium* L., belonging to the family Solanaceae, holds a unique and prominent position (Juan et al., 2023). It is widely recognized for its strong association with religious rituals, particularly in South Asian traditions, where it is considered sacred and frequently offered in the worship of Lord Shiva (Sharma et al., 2021). Beyond its religious significance, *D. stramonium* has long been utilized in various traditional medicinal systems for the treatment of ailments such as asthma, pain, inflammation and nervous disorders (Srivastava and Srivastava, 2020). The plant is known for its potent bioactive compounds, which contribute to both its therapeutic effects and its well-documented toxicity (Sharma et al., 2021).

Botanically, *D. stramonium* is an annual herb characterized by its distinctive morphology, including large toothed leaves, trumpet-shaped white or purple flowers and spiny seed capsules (Torres-Montufar and Martinez, 2025). It is widely distributed across tropical and subtropical regions of the world and thrives in disturbed soils, roadsides and wastelands. Due to its broad geographical distribution and adaptability, the plant has been incorporated into diverse cultural and medicinal traditions across continents (Juan et al., 2023). Phytochemical and pharmacological studies have revealed that *D. stramonium* contains important alkaloids such as atropine, scopolamine and hyoscyamine, which are responsible for its medicinal as well as toxic properties (Sharma et al., 2021). These compounds have been extensively studied for their analgesic, anti-inflammatory and antispasmodic activities. However, improper use of the plant can lead to severe toxic effects, highlighting the importance of understanding traditional knowledge within a scientific framework. In addition to its medicinal relevance, *D. stramonium* occupies a significant place in mythology, folklore and religious symbolism (Soni et al., 2012). The plant is often associated with divine power, trance and transformation and its use in rituals reflects ancient beliefs about healing, protection and spiritual connection. Such mythological associations have contributed to its continued reverence and use in religious practices despite known risks (Dwivedi, 2017). Present review paper aims to present a comprehensive account of *D. stramonium* L. as a medico-religious plant by compiling information on its botany, morphology, geographical distribution, traditional medicinal uses, pharmacological properties and mythological significance. The incorporation of traditional knowledge with modern scientific findings, current study seeks to highlight the cultural importance and therapeutic potential of *D. stramonium*.

Methodology

The present review is based on a systematic literature survey conducted to compile information on the medico-religious importance of *D. stramonium* L. Relevant literature was collected from scientific databases such as Google Scholar, PubMed, ScienceDirect, Scopus and SpringerLink using keywords including *D. stramonium*, medicinal uses, pharmacological activities, ethnobotany, and religious significance. Data were extracted, categorized, and critically analysed under thematic headings such as botany, morphology, medicinal and pharmacological values and mythological significance (Kumar, 2025). The collected information was synthesized in a narrative format to provide a comprehensive overview of *D. stramonium* as a medico-religious plant.

Results and discussion

Datura stramonium L. is an erect, annual, herbaceous plant belonging to the family Solanaceae. The plant typically grows to a height of 0.5–1.5 m and emits a characteristic unpleasant odour when crushed. It exhibits vigorous growth and completes its life cycle within a single growing season. The root system is well developed and consists of a thick, branched taproot with numerous lateral roots. The stem is erect, cylindrical, hollow, green to purplish and glabrous or sparsely pubescent. The stem is succulent when young and turns slightly woody at the base as the plant ages. Leaves are simple, alternate and petiolate. The leaf blade is ovate to broadly ovate with an irregularly toothed or lobed margin and an acute to acuminate apex. Flowers are solitary, axillary, large, showy and trumpet-shaped, measuring 6-10 cm in length. The fruit is a globose to ovoid capsule, measuring 3-5 cm in diameter and is densely covered with sharp spines. Seeds are numerous, flattened, kidney-shaped and brown to black in color. The seed coat is hard and rough, aiding in dormancy and dispersal (Saxena and Brahmam, 1995; Srivastava and Srivastava, 2020)

Pharmacological values

The pharmacological significance of *Datura stramonium* L. is primarily attributed to the presence of biologically active secondary metabolites, especially tropane alkaloids such as atropine, scopolamine (hyoscine) and hyoscyamine. These compounds exert marked effects on the central and peripheral nervous systems and have been extensively studied for their therapeutic potential.

Bronchodilatory and Antiasthmatic effects: Alkaloids present in *D. stramonium* exhibit bronchodilatory effects by relaxing bronchial smooth muscles. This pharmacological activity supports its historical use in the management of asthma and other obstructive respiratory conditions. The antispasmodic action helps relieve bronchoconstriction and improves airflow (Soni et al., 2012).

Analgesic and Antispasmodic properties: The plant demonstrates analgesic and antispasmodic activities, which contribute to pain relief and reduction of muscle spasms. These effects are particularly relevant in conditions involving visceral pain, smooth muscle cramps and neuralgia. The inhibition of parasympathetic nerve impulses plays a key role in these actions (Chandan et al., 2021).

Central Nervous system affects: Certain alkaloids of *D. stramonium* affect the central nervous system (CNS), producing sedative, hypnotic and anti-motion sickness effects at controlled levels. Scopolamine, in particular, has been associated with CNS depressant activity and has been studied for its role in managing nausea, vomiting and neurological disorders (Soni et al., 2012; Sharma et al., 2021).

Anti-inflammatory activity: Experimental studies have demonstrated that extracts of *D. stramonium* possess anti-inflammatory properties, potentially through the suppression of inflammatory mediators. This activity supports its traditional use in treating inflammatory conditions such as arthritis, joint pain and swelling (Nasir et al., 2022).

Antimicrobial activity: Pharmacological investigations have reported antibacterial and antifungal activities in various extracts of *D. stramonium*. These effects are attributed to the combined action of alkaloids, flavonoids and phenolic compounds, suggesting potential applications in controlling microbial infections (Soni et al., 2012; Damergi et al., 2023).

Antioxidant potential: The presence of phenolic compounds and flavonoids contributes to the plant's antioxidant activity, which helps neutralize free radicals and reduce oxidative stress. This property may play a supportive role in preventing cellular damage and inflammation-related disorders (Melaku and Amare, 2020; Damergi et al., 2023).

Toxicological considerations: While *D. stramonium* exhibits significant pharmacological potential, its alkaloids are known for dose-dependent toxicity. Excessive exposure can result in severe anticholinergic symptoms affecting both the CNS and peripheral systems. This dual nature highlights the importance of controlled pharmacological use and careful scientific evaluation (Soni et al., 2012; Tranca et al., 2017).

Mythological and religious significance

Datura stramonium L. occupies an important place in mythology, particularly in South Asian cultures. Many plants used in religious rituals are believed to possess divine energy and healing power and *D. stramonium* is regarded as one such sacred plant due to its strong symbolic associations and ritualistic importance (Soni et al., 2012). In Hindu mythology, *Datura* is closely associated with Lord Shiva, one of the principal deities of the Hindu pantheon (Figure 1).

According to traditional beliefs, *Datura* is considered dear to Lord Shiva (Figure 2) and is commonly offered during worship, especially on auspicious occasions such as Maha Shivaratri and Shravan month rituals (Dwivedi, 2017). Mythological narratives suggest that *Datura* emerged during the churning of the cosmic ocean (Samudra Manthan), alongside poison, which was consumed by Lord Shiva to save the universe (Eshete and Molla, 2021; Rosso, 2024; Menaka et al., 2025).



Figure 1: Datura fruits are used to worship and different Hindu rituals



Figure 2: Author offering Datura fruits to lord Shiva

The offering of *Datura* symbolizes devotion, sacrifice, and the balance between destructive and healing forces. Lord Shiva is often depicted as a yogi residing in cremation grounds and forests, environments where *Datura* naturally grows (Soni et al., 2012). This association reinforces the belief that the plant represents detachment from material desires and the pursuit of higher spiritual consciousness. The mythological symbolism of *Datura* often reflects duality representing both creation and destruction, healing and harm (Rosso, 2024; Menaka et al., 2025). This dual nature parallels the plant's pharmacological profile, where therapeutic potential exists alongside toxicity. As a result, *Datura* is frequently regarded with both reverence and caution in religious contexts. The mythological and religious significance of *D. stramonium* L. is deeply rooted in cultural beliefs, spiritual symbolism and ritual practices. Its sacred status has contributed to its continued use in religious ceremonies and traditional healing systems, reinforcing its identity as a medico-religious plant that bridges mythology, spirituality and ethnomedicine.

Conclusion

In conclusion, *Datura stramonium* L. stands as an important medico-religious plant that bridges ethnobotany, pharmacology, and mythology. Comprehensive documentation and scientific exploration of such plants not only preserve traditional knowledge but also open avenues for future research aimed at isolating safe and effective therapeutic agents. Continued interdisciplinary studies may contribute to the sustainable and responsible utilization of *D. stramonium* in modern medicine while honouring its cultural and spiritual heritage.

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