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A Comprehensive Pharmacognostical and Pharmacological Overview of Mimosa Pudica Linn

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ABSTRACT

Mimosa pudica Linn., commonly known as the "touch-me-not" plant, is a perennial creeping herb belonging to the family Fabaceae, noted for its rapid seismonastic movement upon tactile stimulation. It holds a significant place in traditional medical systems such as Ayurveda, Siddha, and Unani, where it is used for a wide range of ailments. The plant is widely distributed across tropical and subtropical regions. Pharmacognostically, it is distinguished by its bipinnate sensitive leaves, pink globose inflorescences, and prickly stems. Microscopic evaluation reveals diagnostic features such as paracytic stomata, unicellular trichomes, and prismatic calcium oxalate crystals. Phytochemical analyses have identified diverse bioactive constituents including alkaloids, flavonoids, tannins, glycosides, saponins, terpenoids, and phenolic compounds, which contribute to its pharmacological versatility.Modern pharmacological studies substantiate its wide therapeutic profile, demonstrating antimicrobial, anti-inflammatory, antidiabetic, antivenom, wound-healing, hepatoprotective, antioxidant, antiulcer, and antidepressant activities. Many of these effects correlate with its traditional uses, such as in treating wounds, urinary disorders, and inflammatory conditions. Furthermore, emerging experimental data suggest potential roles in neuroprotection and cancer chemoprevention, although clinical evidence remains limited.This review aims to integrate classical knowledge with contemporary pharmacological findings, providing a consolidated understanding of M. pudica. Special emphasis is placed on its botanical description, pharmacognostic parameters, phytochemical constituents, and experimentally validated pharmacological activities. Existing research gaps, particularly in the areas of compound isolation, clinical trials, and formulation standardization, are highlighted to guide future drug development.

Keywords: *Mimosa pudica Linn., pharmacognosy, phytochemistry, pharmacological activities, Ayurveda, touch-me-not plant*

1. INTRODUCTION

Medicinal plants have been integral to traditional healthcare systems for centuries, serving as primary therapeutic agents as well as precursors for numerous synthetic drugs. Globally, the World Health Organization (WHO) estimates that nearly 80% of the population in developing countries relies on plant-based medicines for primary healthcare needs. In India, the Ayurvedic system of medicine places significant emphasis on medicinal flora, with each plant described in terms of its pharmacognostical identity, pharmacodynamic attributes, and therapeutic actions. Among these botanicals, *Mimosa pudica* Linn., commonly known as "touch-me-not" or "sensitive plant," stands out due to its distinctive physiological behaviour — the rapid leaf-folding response to tactile stimuli, termed seismonasty — and its wide ethnomedicinal relevance [1].

In Ayurveda, *Mimosa pudica* is referred to as *Lajjalu* or *Namaskari*, signifying its shy or folding nature. It is classified under *Kashaya rasa* (astringent taste) with *Sheeta virya* (cold potency) and *Katu vipaka* (pungent post-digestive effect), and is considered *Tridoshaghna* — capable of balancing all three doshas, with particular efficacy in alleviating *Pitta* and *Kapha* disorders. Classical texts such as *Bhavaprakasha Nighantu* and *Dhanvantari Nighantu* detail its use in the management of wounds (*Vrana*), diarrhoea (*Atisara*), bleeding piles (*Rakta Arsha*), menorrhagia (*Rakta Pradara*), and urinary tract ailments (*Mutrakrichra*). These properties have positioned *M. pudica* as an important yet underexplored drug in the Ayurvedic materia medica.

Ethnobotanical surveys have documented its extensive use in rural and tribal medicine. In folk practices, the roots, leaves, and seeds are utilised in various formulations for haemostatic, anti-inflammatory, antimicrobial, and wound-healing purposes. Root decoctions are traditionally prescribed for diarrhoea, piles, and leucorrhoea, while leaf pastes are applied topically for cuts, wounds, and insect bites. Such widespread use has stimulated interest in understanding its phytochemistry and pharmacology.From a botanical perspective, *M. pudica* belongs to the family Fabaceae and is native to South and Central America, but now grows abundantly throughout tropical and subtropical regions, including India. It is an annual or perennial prostrate shrub with bipinnate leaves that fold upon mechanical, electrical, or thermal stimulation — a phenomenon resulting from turgor changes in the pulvinus cells. Pinkish-purple globose inflorescences and small leguminous pods bearing bristly hairs are its reproductive features, which also aid in taxonomic identification. Correct botanical authentication is essential to avoid adulteration and ensure pharmacological efficacy, a concern often overlooked in herbal drug trade.

Pharmacognostical studies have established microscopic and physicochemical parameters for *M. pudica*, including leaf surface micromorphology, root transverse sections, and powder characteristics. Phytochemical investigations reveal the presence of alkaloids, flavonoids, tannins, terpenoids, glycosides, and non-protein amino acids like mimosine. These constituents contribute to its broad spectrum of pharmacological activities, such as antimicrobial, anti-inflammatory, analgesic, antidiarrhoeal, wound-healing, antihyperglycaemic, hepatoprotective, and anxiolytic effects. Despite these promising attributes, *M. pudica* remains underutilised in mainstream phytomedicine, partly due to insufficient large-scale clinical validation, standardisation challenges, and limited integration into official pharmacopeias. Current research predominantly focuses on in vitro and animal models, leaving a gap in high-quality clinical trials that can substantiate its efficacy and safety in humans. Moreover, standardisation of plant material, development of optimised dosage forms, and elucidation of precise mechanisms of action are necessary steps for its acceptance in global herbal markets.

Given its rich ethnomedicinal heritage, Ayurvedic description, and emerging pharmacological evidence, *M. pudica* represents a promising candidate for drug development. This review aims to present a comprehensive, integrative overview of *Mimosa pudica*, encompassing its botanical identity, Ayurvedic pharmacodynamics, pharmacognostical features, phytochemistry, pharmacology, and therapeutic applications. The discussion bridges classical Ayurvedic concepts with modern scientific data, providing an evidence-based framework for further research and clinical utilization.

2. BOTANICAL DESCRIPTION

Taxonomical Classification [2]

- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Fabales
- **Family:** Fabaceae (Leguminosae)
- **Genus:** *Mimosa*
- **Species:** *Mimosa pudica* Linn.

Vernacular Names [3]

- Sanskrit: Lajjalu, Namaskari, Samanga
- Hindi: Chhui-mui
- English: Sensitive plant, Touch-me-not
- Tamil: Thottachchi
- Bengali: Lajwanti

3. MORPHOLOGY

Mimosa pudica is a small, diffuse, prickly perennial herb, often behaving as an annual **[Figure 1]**.

- **Stem:** Slender, trailing, and branched with scattered prickles.
- **Leaves:** Alternate, bipinnate with 1–2 pairs of pinnae, each with 10–26 small leaflets.
- **Flowers:** Pink, globose heads, axillary, solitary or in clusters.
- **Fruits:** Flat pods with bristly margins.
- **Seeds:** Ovoid, compressed, brown.

Figure 1: Mimosa pudica flower head

Distribution

Native to South America but now pantropically distributed, M. pudica thrives in moist, waste lands, roadside areas, and pastures across India, Sri Lanka, Africa, Australia, and Southeast Asia [4].

4. PHARMACOGNOSTICAL FEATURES

Macroscopic Characteristics

Leaves are small, sensitive to touch, fold inward rapidly, and reopen in minutes. Flowers are fragrant and pinkish purple. Roots are cylindrical, brown externally, and yellowish internally.

Microscopic Characteristics [5]

- **Leaf:** Epidermis with paracytic stomata; unicellular covering trichomes; palisade cells in a single layer; spongy parenchyma with intercellular spaces.
- **Stem:** Epidermis with cuticle; cortex with chlorenchyma and collenchyma; presence of prismatic calcium oxalate crystals; vascular bundles collateral.
- **Root:** Periderm with cork cells; secondary xylem well developed; medullary rays uni- to biseriate.

Powder Characteristics

Greenish-brown powder with fragments of epidermal cells, fibers, trichomes, and crystal deposits.

Organoleptic Features

Taste: Astringent and slightly bitter; Odor: Characteristic, mild.

5. PHYTOCHEMISTRY

The plant contains a wide array of phytoconstituents with diverse pharmacological potential [6–9].

- **Alkaloids:** Mimosine, tryptamine derivatives
- **Flavonoids:** Quercetin, kaempferol, isorhamnetin
- **Tannins:** Catechol tannins
- **Saponins:** Oleanolic acid derivatives
- **Glycosides:** C-glycosides, D-pinitol
- **Phenolic compounds:** Gallic acid, ellagic acid
- **Terpenoids:** Lupeol, β-sitosterol
- **Others:** Amino acids, reducing sugars, fatty acids

6. PHARMACOLOGICAL ACTIVITIES

Antimicrobial Activity

M. pudica extracts exhibit broad-spectrum antimicrobial effects against Gram-positive and Gram-negative bacteria, as well as fungi [10]. Ethanolic leaf extracts have shown significant inhibition against *Escherichia coli*, *Staphylococcus aureus*, and *Candida albicans*.

Anti-inflammatory and Analgesic Activity

Methanolic extracts reduce carrageenan-induced paw edema and acetic acid-induced writhing in mice, likely due to flavonoids and tannins [11].

Antidiabetic Activity

Studies in streptozotocin-induced diabetic rats have demonstrated significant reductions in fasting blood glucose and improvements in lipid profile [12].

Antioxidant Activity

DPPH radical scavenging and ferric reducing antioxidant power (FRAP) assays confirm its potent antioxidant potential, attributed to polyphenolic content [13].

Wound Healing

Topical application of *M. pudica* paste accelerates epithelialization and collagen deposition in excision and incision wound models [14].

Hepatoprotective Activity

Methanolic root extract protects against CCl_4-induced hepatic damage by reducing serum transaminases and bilirubin [15].

Antidepressant Activity

Animal models indicate CNS stimulatory and antidepressant effects possibly mediated via modulation of monoaminergic pathways [16].

Antiulcer Activity

Hydroalcoholic extracts show gastroprotective effects in pylorus-ligated and ethanol-induced ulcer models [17].

Antivenom Potential

Root extracts neutralize phospholipase and protease activity of snake venom in experimental models [18].

Pharmacological Activities of *Mimosa pudica* Linn.

Activity	Experimental Model / Target	Extract / Preparation	Key Findings
Antimicrobial	Gram-positive & Gram-negative bacteria (*E. coli*, *S. aureus*) and fungi (*C. albicans*)	Ethanolic leaf extract	Significant growth inhibition against test pathogens, indicating broad-spectrum antimicrobial potential.
Anti-inflammatory & Analgesic	Carrageenan-induced paw edema; acetic acid-induced writhing in mice	Methanolic extract	Marked reduction in edema and writhing, likely due to flavonoids and tannins.
Antidiabetic	Streptozotocin-induced diabetic rats	Whole plant extract	Reduced fasting blood glucose and improved lipid profile.
Antioxidant	DPPH radical scavenging; FRAP assay	Methanolic extract	High free radical scavenging and ferric reducing power attributed to polyphenols.
Wound Healing	Excision and incision wound models in rats	Fresh plant paste	Accelerated epithelialization, enhanced collagen deposition, and faster wound closure.
Hepatoprotective	CCl_4-induced liver damage in rats	Methanolic root extract	Decreased serum transaminases and bilirubin; improved hepatic histology.
Antidepressant	Behavioral models in rodents	Hydroalcoholic	CNS stimulatory and mood-elevating

Activity	Experimental Model / Target	Extract / Preparation	Key Findings
		extract	effects, possibly via monoaminergic modulation.
Antiulcer	Pylorus ligation and ethanol-induced ulcer in rats	Hydroalcoholic extract	Reduced ulcer index and gastric acidity; improved mucosal protection.
Antivenom Potential	Snake venom neutralization assays	Root extract	Inhibited phospholipase and protease activity of venom, reducing local and systemic toxicity.

7. THERAPEUTIC USES IN TRADITIONAL MEDICINE

Mimosa pudica Linn., commonly known as "Lajjalu" in Ayurveda, has been widely employed for centuries in the management of diverse ailments owing to its multifaceted pharmacological properties. Classical Ayurvedic texts describe its utility in Pradara roga (menorrhagia), Vrana (wounds), Atisara (diarrhoea), Arsha (haemorrhoids), Mutrakricchra (dysuria), and Raktapitta (bleeding disorders). The plant is valued for its Kashaya (astringent) and Tikta (bitter) rasa, Sheeta virya (cooling potency), and Katu vipaka (pungent post-digestive effect), which together contribute to haemostatic, wound-healing, and anti-inflammatory actions [19].

In traditional practice, M. pudica is administered in various dosage forms—decoctions, fresh leaf juice, powders, and pastes—either as a single drug or in combination with other herbs to enhance therapeutic efficacy. For menorrhagia and leucorrhoea, the root or whole plant decoction is often prescribed due to its uterotonic and haemostatic properties. Topical application of its paste is believed to accelerate wound healing by promoting granulation tissue formation and reducing infection risk. In diarrhoea and dysentery, its astringent and antimicrobial qualities help restore gut integrity and reduce excessive fluid loss. The seeds and roots are also used in urinary tract disorders to alleviate burning micturition and promote diuresis.

In folk medicine across tropical regions, the plant is employed for treating fevers, skin diseases, toothaches, and even as an antidote for certain snakebites. Its global ethnomedicinal relevance highlights its adaptability across different medical traditions, including Siddha, Unani, and tribal healthcare systems.

Safety and Toxicology

M. pudica is generally regarded as safe when administered within therapeutic limits, a view supported by animal studies indicating no mortality up to 2000 mg/kg body weight in acute toxicity experiments. Traditional usage patterns also suggest a low incidence of adverse effects when used in recommended doses and durations. However, phytochemical investigations have revealed the presence of mimosine, a non-protein amino acid that may exert toxic effects at high doses. In animals, chronic exposure to elevated mimosine levels has been associated with alopecia, reduced growth rates, and reproductive disturbances [20].

Prolonged or indiscriminate use, especially in concentrated extract form, warrants caution, as individual susceptibility and cumulative exposure may influence toxicity risk. Careful dose standardisation, patient monitoring, and adherence to classical guidelines can mitigate potential adverse effects. Furthermore, as M. pudica exhibits significant pharmacological activity, interactions with conventional drugs, such as anticoagulants or antihypertensives, cannot be ruled out.

8. DISCUSSION

Mimosa pudica Linn. represents a fascinating convergence of botanical uniqueness and therapeutic potential. Its characteristic seismonastic leaf movement, although primarily a survival adaptation against herbivory and environmental stress, has also contributed to its recognition and study in ethnobotanical traditions. In Ayurveda, its classification under *Kashaya rasa*, *Sheeta virya*, and *Katu vipaka*, along with *Tridoshaghna* action, aligns well with its observed clinical benefits in inflammatory, bleeding, and infective conditions.

The plant's wide-ranging traditional uses—ranging from wound healing and diarrhoea management to the treatment of gynaecological disorders and urinary ailments—reflect a broad spectrum of pharmacological activity. Contemporary studies have validated many of these uses, identifying antimicrobial, anti-inflammatory, antioxidant, antidiarrhoeal, and wound-healing properties. This bridge between traditional knowledge and modern pharmacology suggests that *M. pudica* could be developed into standardized phytopharmaceuticals or serve as a source for novel bioactive compounds.One of the key challenges in its wider application lies in the standardization of raw materials. Variations in phytochemical content due to geographic origin, soil conditions, harvesting time, and processing methods can affect efficacy and safety. Pharmacognostical

parameters such as microscopic identification, physicochemical constants, and chromatographic profiles are crucial for ensuring authenticity and quality control.

Toxicological evaluation is equally important, as the presence of certain alkaloids and other potent secondary metabolites necessitates careful dosage regulation. While traditional healers have long employed the plant in crude or semi-processed forms, modern formulations require rigorous safety profiling before clinical recommendation.

From a pharmacological standpoint, *M. pudica* holds potential for integrative healthcare. Its antioxidant and anti-inflammatory effects make it suitable for managing chronic inflammatory conditions, while its antimicrobial action supports its use in infectious diseases. However, the majority of contemporary evidence is derived from in-vitro and animal studies, with limited well-designed human clinical trials. Bridging this gap would be critical for its mainstream acceptance.

In the global context, increasing interest in plant-based medicines and natural therapeutics presents an opportunity for *M. pudica* to transition from a primarily folk remedy to a scientifically validated medicinal plant. Collaborative research integrating Ayurvedic principles, pharmacognostical authentication, and modern biomedical approaches can unlock its full therapeutic value. Moreover, sustainable cultivation and conservation strategies should be prioritized to prevent overharvesting from wild populations, ensuring ecological balance alongside medicinal utilization.

Overall, *M. pudica* exemplifies the untapped potential lying within traditional medicinal plants. By combining ancient knowledge with modern scientific validation, it is possible to transform this “sensitive plant” into a robust and reliable contributor to modern herbal medicine.

9. CONCLUSION

Mimosa pudica Linn., widely known as the “touch-me-not” plant, represents a unique convergence of traditional ethnomedicinal wisdom and contemporary pharmacological interest. Its extensive therapeutic spectrum—encompassing antimicrobial, anti-inflammatory, antioxidant, antidiabetic, hepatoprotective, wound-healing, and antihelminthic properties—underscores its significance as a multipurpose medicinal resource. Classical Ayurvedic and folk medicine practices have long harnessed its root, leaf, seed, and whole-plant preparations for ailments affecting the gastrointestinal, urinary, reproductive, and integumentary systems. Modern scientific studies increasingly validate these uses by identifying a rich phytochemical profile, including alkaloids, flavonoids, tannins, terpenoids, and glycosides, that contribute to its diverse pharmacodynamic actions.Despite this encouraging evidence, the translation of M. pudica’s pharmacological potential into standardized clinical applications remains limited due to variability in plant material, extraction methods, dosage forms, and paucity of large-scale human trials. Future research should emphasize rigorous clinical evaluation, quality standardization, safety profiling, and mechanistic studies to ensure reproducibility and therapeutic reliability. By integrating traditional ethnobotanical knowledge with evidence-based modern medicine, M. pudica could be strategically positioned as a cost-effective, plant-based therapeutic agent with global applicability in managing a range of chronic and infectious diseases.

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