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An Overview of *Mimosa pudica* Linn: Insights from Ayurveda and Modern Scientific Perspectives

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Abstract

Mimosa pudica Linn, commonly referred to as the sensitive plant, shame plant, touch-me-not, modest plant, sleepy plant, and in Ayurveda as Lajjalu or Namaskari, is a creeping annual or perennial herb of the Fabaceae family. Cultivated as an ornamental plant due to its thigmonastic and nyctinastic responses, it has also been widely used in traditional medicine. In Ayurveda, it is recommended for the treatment of dysentery, uterine and vaginal disorders, inflammations, burning sensations, asthma, skin ailments, wounds, and hematological conditions. Phytochemical investigations have identified a wide range of bioactive constituents, including alkaloids, the non-protein amino acid mimosine, flavonoids, tannins, glycosides, sterols, terpenoids, mucilage, and fatty acids. Modern pharmacological studies have reported its antibacterial, antivenom, antinociceptive, antihyperglycemic, antifertility, antihepatotoxic, anticonvulsant, antidepressant, immunomodulatory, aphrodisiac, wound-healing, and diuretic properties. Pharmacological research has validated the therapeutic potential of this plant. This review highlights the Ayurvedic significance, phytochemical profile, pharmacological potential, and medicinal applications of *Mimosa pudica*, while emphasizing the need for further research to confirm its safety and clinical efficacy.

Keywords: *Mimosa pudica*, Lajjalu, pharmacological, phytochemical, Traditional uses.

Introduction

Herbal therapies are used worldwide to minimize adverse drug reactions, enhance patient compliance, and improve quality of life, while also providing potential avenues for future research in treating various medical conditions. Medicinal plants, in particular, are widely utilized by traditional practitioners in their daily practice to manage and cure numerous diseases.

Within legume family *Fabaceae*, *Mimosa* constitutes one of the largest genera, encompassing more than 500 species. *Mimosa pudica L.*, a prostrate or semi-erect creeping annual or perennial herb, referred to as *touch me not, shame plant, live and die,* sensitive plant, sleepy plant, action plant, sleeping grass, *and humble plant,* is native to the tropical regions of North and South America and Australia. In India, the species is recognized for its delicate, grey-green leaves that fold and droop at night or upon being touched, chilled, or stimulated hence it is known as a sensitive plant. Recurved thorns are commonly present along the stem. Its unique leaf-folding behavior has earned it the nickname "curiosity plant."

The nomenclature derives from Latin, with *Mimosa* signifying "to mimic" and *pudica* meaning "bashful," together reflecting its characteristic sensitivity [1]. Morphologically, the plant is shrubby, with bipinnate leaves, glandular hairs, spiny stipules, campanulate calyces, and lilac-pink axillary inflorescences. The stems are erect and well branched [1] Flowering and fruiting in Indian conditions generally occur between August and October.

Mimosa pudica is frequently cultivated as an ornamental species due to its thigmonastic and nyctinastic movements. These rapid leaf-folding responses are governed by endogenous circadian rhythms, categorizing them as nyctinastic in nature [2].

Mimosa pudica has been traditionally employed for centuries in the management of diverse ailments, including urogenital disorders, piles, dysentery, sinusitis, and wound healing. In Ayurveda, the herb is described as beneficial for the treatment of dysentery, vaginal and uterine disorders, inflammatory conditions, burning sensations, asthma, skin diseases, and blood-related disorders. Within the Unani system of medicine, its root is regarded as a resolvent and alternative, effective in conditions associated with blood impurities and bile, including bilious fevers, piles, jaundice, and leprosy. The leaves are reported to be useful in hydrocele, fistula, scrofula, conjunctivitis, wound healing, and blood coagulation. The whole plant has been used internally for vesical calculi and

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externally for edema, rheumatism, myalgia, and uterine tumors [3].

Furthermore, the plant has been documented in traditional medicine for the treatment of diarrhea (*atisāra*), amoebic dysentery (*raktātisāra*), bleeding piles, and for arresting hemorrhage [4]. Pharmacological investigations have demonstrated a wide spectrum of bioactivities, including antinociceptive, hypoglycemic, antivenom, immunomodulatory, anticonvulsant, antihepatotoxic, antifertility, diuretic, and wound-healing properties [5]. Phytochemical investigations further support its therapeutic potential, revealing the presence of diverse bioactive compounds such as alkaloids, flavonoids, glycosides, phenolics, tannins, and fixed oils [6].

In light of these findings, the present study seeks to consolidate information on the Ayurvedic perspective, traditional applications, botanical characteristics, phytochemical constituents, and pharmacological importance of *Mimosa pudica*.

Ayurvedic Aspect

Vernacular Names: [7-14]

Sanskrit: Lajjalu, Samanga, Varakranta, Namaskari,
English: Sensitive plant, Humble Plant
Hindi: Lajjavanti, Lajvanti, Chhuimui,
Assamese: Lajubilata, Adamalati
Bengali: Lajaka, Lajjavanti
English: Touch-me-not
Gujrati: Risamani, Lajavanti, Lajamani
Hindi: Chhuimui, Lajauni
Kannada: Muttidasenui, Machikegida, Lajjavati, Nacikegida, Kashmiri
Malayalam: ThottaVati, Tottalvati, Tintarmani
Marathi: Lajalu
Oriya: Lajakuri
Punjabi: Lajan
Tamil: Thottavadi, Tottalchurungi
Telugu: Mudugudamara
Urdu: Chhuimui

Rasapanchaka [8]

Rasa – Kashay, Tikta
Vipak – Katu
Veerya - Sheet
Doshghnata – Kapha, Pittashamak (alleviates Kapha and Pitta)
Parts used: Whole plant, leaves, roots

Synonyms [9]**:**

Ayurveda: Lajjalu, Namaskari, Samanagaa, samokchhini, and shamipatraa
Siddha: Thottalchuningi

Gana and Varga –

Charak Samhita – Sandhaniy, Purishsangrahaniy [9]
Sushrut Samhita – Priyangavadi, Ambavshthadi [9]
Vagbhat Samhita – Priyangavadi [10]
Rajnighantu – ParpatadiVarga [11]
Kaiyadev Nighantu- Oushadhi Varga [12]
Bhavaprakash Nighantu – Guduchyadi Varga [13]
Nighantu Adarsh – BabbuladiVarga [9]

Variety [11]

Lajjalu: *Mimosa pudica*
Viparit Lajjalu: *Briophytum sensitive*

Therapeutic Uses

Raktapitta (bleeding disorders), atisara (diarrhoea), yoniroga (gynaecological disorders), shopha (inflammation), daha (burning sensation), shwasa (asthma), vrana (wound), and Kustha (skin disorders) [14].

Formulations [14]

Samagandi Churna, Kutajavaleha, Pushyanuga, Bruhat Gangadhara Churna.
Dose - 10-20 g of the drug for decoction [14]

Modern Aspect:

Biological Source:

Mimosa pudica Linn. A diffuse prickly undershrub belonging to the Family: *Mimosaceae*

Propagation

By seeds and vegetative methods.

Scientific Classification [7]

Kingdom: *Plantae*
Order: *Fabales*
Family: *Fabaceae*
Subfamily: *Caesalpiniodeae*
Genus: *Mimosa*
Species: *Mimosa pudica*

Description

Semi-prostrate, prickly course herb or subshrub up to 0.5-m tall [15]. It can grow up to 0.5 m in height and 0.3 m in width.

Geographical Distribution [9]

Mimosa pudica is native to tropical Central and South America and is now widely distributed across pan-tropical regions. It is naturalized in northern and eastern Australia, including the Northern Territory, Queensland, and parts of New South Wales, as well as on Christmas Island. In tropical and subtropical climates, it is commonly considered a weed, occurring in wastelands, roadsides, plantation crops, disturbed sites, pastures, parks, lawns, and gardens.

Morphology [14]

a) Macroscopic

Root: Cylindrical, tapering, rependant, with secondary and tertiary branches, varying in length, up to 2 cm thick, surface more or less rough or longitudinally wrinkled; greyish brown to brown, cut surface of pieces pale yellow; fracture hard, woody, bark fibrous; odour, distinct; taste, slightly astringent.
Stem: Cylindrical, up to 2.5 cm in diameter; sparsely prickly, covered with long, week bristles longitudinally grooved, external surface light brown, internal cut surface grey, and bark fibrous; easily separable from wood.
Leaf: Digitately compound with one or two pairs of sessile, hairy pinnae; alternate, petiolate, stipulate, and linear-lanceolate. Each pinna bears 10–20 pairs of sessile leaflets measuring 0.6–1.2 cm in length and 0.3–0.4 cm in width. Leaflets are obliquely narrow or linear-oblong, with an obliquely rounded base, acute apex, nearly glabrous surface, and a yellowish-green color.
Flower: Pink, in globose head, peduncles prickly; calyx very small; corolla pink, lobes 4, ovate oblong; stamens 4, much exserted; ovary sessile; ovules numerous.
Fruit: Lomentum, simple, dry, 1-1.6 cm long, 0.4-0.5 cm broad with indehiscent segments and persistent sutures having 2-5 seeds with yellowish, spreading bristle at sutures, 0.3 cm long, glabrous, straw coloured.
Seed: Compressed, oval-elliptic, brown to grey, 0.3 long, 2.5 mm broad has a central ring on each face.

b) Microscopic

Root: Mature root shows cork 5-12 layered, tangentially elongated cells, a few outer layers crushed or exfoliated; secondary cortex consisting of 6-10 layered, tangentially elongated thin-walled cells; Secondary phloem consists of sieve elements, fibres, crystal fibres, and phloem parenchyma, all traversed by phloem rays. The phloem fibres occur singly or in groups and are arranged in tangential bands. Crystal fibres are thick-walled and 3–25-chambered, with each chamber containing one or two to four prismatic crystals of calcium oxalate. Phloem rays are uni- to multiseriate, most commonly 2–3-seriate.; secondary xylem consists of usual elements traversed by xylem rays; vessels scattered throughout secondary xylem having bordered pits and reticulate thickenings; crystal fibres containing one or rarely 2-4 prismatic crystals of calcium oxalate in each chamber; parenchyma, thick-walled, scattered throughout secondary xylem; xylem rays uni to bi-seriate, rarely multiseriate, wider towards secondary phloem and narrower towards centre; starch grains, prismatic crystals of calcium oxalate and tannin present in secondary cortex, phloem and xylem rays and parenchyma; starch grains both simple and compound having 2-3 components, rounded to oval measuring 6-20 µ and 16-28 µ in dia. respectively.

Stem: The mature stem exhibits 4–8 layers of exfoliated cork composed of tangentially elongated cells filled with reddish-brown contents. The secondary cortex is broad, consisting of large, moderately thick-walled, tangentially elongated to oval parenchymatous cells containing reddish-brown materials; a few cells possess prismatic crystals of calcium oxalate. Numerous lignified fibres, occurring singly or in groups, are scattered throughout the cortex. The secondary phloem is composed of the usual elements, with 2–5 transversely arranged fibre bands alternating with narrow strips of sieve elements and parenchyma. Crystal fibres are elongated and thick-walled, each chamber containing a single calcium oxalate crystal. Phloem rays are thick-walled and radially elongated.; secondary xylem composed of usual elements traversed by xylem rays; vessels drum-shaped with spiral thickenings, tracheids pitted with pointed ends, fibres of two types, shorter with wide lumen and longer with narrow lumen; xylem rays radially elongated, thick-walled, 1-6 cells wide and 3-30 cells high; pith consisting of polygonal, parenchymatous cells with intercellular spaces.

Leaf Petiole: The petiole has a single-layered epidermis covered with a thick cuticle. The cortex is 4–7 layers thick, consisting of thin-walled parenchymatous cells. The pericycle is arranged in a ring. Four central vascular bundles are present, with two smaller vascular bundles positioned laterally, one in each wing.

Midrib: Shows single layered epidermis, covered with thin-cuticle; upper epidermis followed by a single layered palisade, spongy parenchyma single layered, pericycle same as in petiole; vascular bundle single.

Lamina: Shows epidermis on both surfaces, palisade single layered; spongy parenchyma, 3-5 layers consisting of circular cells; rosette crystals and a few veins present in spongy parenchyma.

Fruit: The fruit possesses a single-layered epidermis bearing a few non-glandular, branched, shaggy hairs. The mesocarp consists of 5–6 layers of thin-walled parenchymatous cells, with some amphicribral vascular bundles scattered throughout. The endocarp is composed of thick-walled, lignified cells, followed internally by a single layer of thin-walled parenchymatous cells.

Seed: Shows single layered radially elongated cells; followed by 5-6 layered angular cells filled with dark brown contents; endosperm consists of angular or elongated cells, a few containing prismatic crystals of calcium oxalate; cotyledons consists of thin-walled cells, a few cells containing rosette crystals of calcium oxalate; embryo straight with short and thick radicle.

Powder: Reddish-brown; shows, reticulate, pitted vessels, prismatic and rosette crystals of calcium oxalate, fibres, crystal fibres, yellow or brown parenchymatous cells, palisade cells non glandular, branched, shaggy hairs, single and compound starch grains, measuring 6-25 µ in diameter.

Identity, Purity and Strength [14]

Foreign Matter: Not more than 2 per cent
Total Ash: Not more than 10 per cent
Acid-insoluble Ash: Not more than 5 per cent
Alcohol-soluble Extractive: Not less than 9 per cent
Water-soluble Extractive: Not less than 9 per cent

Bending movement of *M. pudica*

Mimosa pudica possesses a distinctive motor organ, known as the pulvinus, which can also exhibit epinastic movement. Both types of movement involve an increased rate of membrane water transport, a process facilitated by aquaporins, as demonstrated in multiple studies. Localization of aquaporins in the tonoplast and plasma membrane plays a key role in regulating seismonastic leaf movements in M. pudica [16].

The bending of the pulvinus results from rapid volumetric changes in the abaxial motor cells in response to various environmental stimuli. Experimental studies have shown that this bending is delayed when plants are treated with actin-disrupting agents or calcium channel inhibitors. Filaments of actin in the motor cells undergo fragmentation upon electrical stimulation, and the observed increase in intracellular calcium levels is attributed to depolymerization of the actin cytoskeleton within pulvinus motor cells in response to these electrical signals [17].

Classical/Traditional Uses

Charak and Sushruta recommended a decoction containing *Samangaa* as a key ingredient for the treatment of menorrhagia, piles, diarrhea, and persistent dysentery. When incorporated into an ointment, the herb was applied externally to manage piles, ulcers, and wounds. By the 16th century, *Lajjalu* had gained prominence as a popular remedy for piles and disorders of the female genital tract. Today, *Samangaadi churna* is commercially available over the counter and is commonly prescribed internally for the management of bleeding piles [18]. The touch-me-not plant (*Mimosa pudica*) has traditionally been employed as a remedy for snake and scorpion bites. The roots are often chewed, and a paste prepared from them is applied as a poultice to the bite site. For scorpion stings, treatments may also involve applying a paste made from the whole plant or using steam and leaves to the affected area [14].

The root of *Mimosa pudica* is described in Ayurveda as bitter, cooling, vulnerary, acrid, and alexipharmic, and is traditionally used to treat a wide range of ailments, including leprosy, dysentery, and inflammation [19, 20]. In the Unani system of medicine, the root is employed to manage disorders arising from blood impurities and bile, bilious fevers, piles, and jaundice. Additionally, a decoction of the root with water is used to alleviate toothache, arrest bleeding, and fasten

wound healing. It is also incorporated in herbal preparations for gynecological disorders [20].

Mimosa pudica has been reported to be effective in managing diarrhea, amoebic dysentery, and several skin diseases. Studies further indicate its potential in the treatment of neurological disorders [21]. Various parts of the plant-including flowers, roots, stems, leaves, and fruits—have been extensively used in traditional healthcare systems in India for the treatment of a wide range of ailments. Research suggests that the plant can promote mental relaxation, alleviate depression, mental distress, irritability, and amnesia, enhance mood, improve blood circulation, support healthy cell growth, and prevent hair loss. In Western medicine, the root has historically been used to treat insomnia, irritability, premenstrual syndrome, hemorrhoids, and whooping cough [22].

Therapeutic Uses:

Mimosa pudica is traditionally valued for a variety of medicinal benefits:

- **Migraine:** A paste made from the plant, known as Lajvanti paste, can be applied to the forehead to help relieve migraine symptoms by balancing the *pitta* dosha [23, 24].
- **High Blood Pressure:** Juice prepared by crushing the leaves, taken about 15 ml twice a day, is traditionally used to help regulate blood pressure [25].
- **Piles:** The plant is thought to help manage piles by balancing *pitta* and *kapha* doshas. Common preparations include an oral root decoction or the powdered root mixed with milk [26].
- **Hypolipidemic Properties:** Chloroform extracts of *Mimosa pudica* have shown cholesterol-lowering effects, attributed to naturally occurring glycosides, flavonoids, and alkaloids [26].
- **Antipyretic:** Leaf extracts help lower fever, an effect linked to the presence of terpenoids, flavonoids, and alkaloids [27].
- **Toothache:** Gargling with a decoction of the roots supports oral hygiene and helps relieve toothache. Additionally, a paste of roots fried in ghee applied directly to the affected tooth offers quick relief [28].
- **Contraceptive:** The plant shows natural spermicidal properties and may lower testosterone levels. Fresh juice or aqueous root powder extracts are traditionally used for contraceptive purposes.
- **Premature Ejaculation:** A traditional remedy suggests mixing *Mimosa pudica* seeds with sugar and consuming two tablespoons of the mixture with milk at night to help manage premature ejaculation.
- **Depression:** Aqueous extracts from the dried leaves have demonstrated antidepressant effects by boosting serotonin levels and reducing stress, fatigue, and tiredness.
- **Alopecia:** By balancing the *pitta* dosha and encouraging new hair cell growth, *Mimosa pudica* can help prevent hair loss. Herbal shampoos formulated with its extracts are commonly used for managing alopecia [29].
- **Snake Bite:** Root extracts can neutralize snake venom by inhibiting its toxic activity, functioning as natural antivenom.
- **Breast Firmness:** Traditionally, a paste made from *Mimosa pudica* combined with ashwagandha roots is applied to help firm and uplift breasts without surgical intervention.
- **Cough and Asthma:** Consuming the plant's juice twice a day is a traditional remedy for whooping cough, asthma, and chronic respiratory disorders [30].
- **Insect Bites:** A paste of crushed leaves and stems, applied twice a day, helps soothe and relieve irritation from insect bites.
- **Kidney Stones:** Decoctions prepared from the roots are traditionally taken to relieve renal stones and other urinary issues [31].
- **Antidiabetic:** Ethanolic extracts of the leaves exhibit antidiabetic activity by regulating carbohydrate-metabolizing enzymes and supporting insulin secretion [32].
- **Minor Cuts and Wounds:** Applying a root paste to minor cuts aids healing by reducing bleeding and inflammation. Crushed leaves or plant paste mixed with sesame oil can also act as a natural antiseptic for fresh wounds. In Western medicine, the plant's root has been used to help treat haemorrhage and urinary infections [33].

Phytochemicals

Preliminary phytochemical analysis of *Mimosa pudica* leaf extract showed that it contains a variety of bioactive compounds, such as terpenoids, flavonoids, glycosides, alkaloids, quinones, phenols, tannins, saponins, and coumarins [34–36].

Notably, the alkaloid mimosine exhibits pronounced antiproliferative and apoptotic activities.

Table 4: Chemical constituents of *Mimosa pudica* [37]

Parts	Chemical Constituent
Leaves	nor-epinephrine, d-pinitol, b-sitosterol, alkaloids-mimosine, terpenoids, flavonoids, glycosides, alkaloids
Seed	D-xylose, D-glucoronic acid 4-O(3,5-dihydroxybenzoicacid)-b-Diglucuronide, Tubulin, C Glycosylflavones, phenolic ketone, buffadienolide
Root	flavonoids, phytosterol, alkaloids, amino acids, tannins, glycoside, and fatty acids [26], ascorbic acid, crocetin, D-glucoronic acid, linoleic acid.
Plant	c-tetrahydroxyl-6-C-[alpha-l'rhamnopyranosyl--b-D-trihydroxyl8-C-[a-l-rhamnopyranosyl--b-Dglucopyranosyl flavo-tetrahydroxyl6-C-[a-l-rhamnopyranosyl-- b-Dglucopyranosyl flavone
Stem	m-[N-(3-hydroxypyridone-4)]-aminopropionic acid [27], 5-MeODMT [2], mimosine
Aerial Part	O-glycosyl flavonoids named isoquercitrin, avicularin and apigenin-7-O-D-glucoside, and also four C-glycosyl flavonoids, cassia occidental in B, orientin and isoorientin from the aerial part of the plant

Pharmacological activities

Analgesic Activity: Jain *et al*. (2012) assessed the analgesic activity of the ethanolic extract of *Mimosa pudica* leaves through hot plate method and the acetic acid–induced writhing model. The extract was administered at doses of 200, 400, and 500 mg/kg, with the 500 mg/kg dose showing the highest analgesic activity, significantly reducing acetic acid–induced writhing. This effect was mainly attributed to the flavonoid content present in the leaf extract [38].

Anti-Inflammatory Activity: Goli *et al*. (2011) investigated the anti-inflammatory effects of *Mimosa pudica* using petroleum ether, ethanol, and aqueous extracts in male albino rats. The study employed carrageenan-induced paw edema and cotton pellet granuloma models. The extracts were given

orally at 50, 100, and 200 mg/kg, with Indomethacin (10 mg/kg) used as the standard. The findings indicated that the extracts possess significant anti-inflammatory activity, supporting their potential use as safe anti-inflammatory agents [39].

Wound Healing Activity: Volkov (2008) evaluated the wound healing potential of an ointment containing 2% (w/w) methanolic extract and 2% (w/w) total aqueous extract of *Mimosa pudica*. The study demonstrated that both extracts showed significant ($P < 0.001$) wound healing activity. Analysis of total phenol content, expressed as gallic acid equivalents, revealed 11% (w/w) in the methanolic extract and 17% (w/w) in the aqueous extract. Interestingly, the methanolic extract showed superior wound healing activity compared to the aqueous extract, likely due to the specific phenolic constituents present [40].

Anti-malarial Activity: Aarthi and Murugan (2011) evaluated the antimalarial potential of the ethanolic extract of *Mimosa pudica* leaves using Plasmodium berghei–infected mice models. The study exhibited significant antiplasmodial activity of the leaf extract across all tested models. Phytochemical analysis identified the presence of key anti-plasmodial compounds, including terpenoids, flavonoids, and alkaloids, which are likely responsible for its observed antimalarial effects [41].

Anti-depressant Activity: Kirk *et al*. (2003) investigated the effects of aqueous extracts of *Mimosa pudica* dried leaves on behavioral parameters in rats. The extract was administered at doses of 2, 4, 6, and 8 mg/kg and evaluated using the elevated plus-maze and DRL-72s tests. Diazepam (1.3 mg/kg) was used as the standard drug. The study reported significant anti-anxiety and antidepressant activity of the leaf extract [42].

Anti-convulsant Activity: Bum *et al*. (2004) assessed the anticonvulsant potential of *Mimosa pudica* leaf decoction in mice using pentylenetetrazol- and strychnine-induced seizure models. The decoction was administered intraperitoneally at 1000–4000 mg/kg. It provided significant protection against strychnine-induced seizures compared to picrotoxin-induced seizures and also antagonized N-methyl-D-aspartate (NMDA)-induced turning behavior. These findings suggest that the decoction may serve as a promising anticonvulsant agent [43].

Anti-helmintic Activity: Vikram *et al*. (2012) investigated the anthelmintic activity of *Mimosa pudica* seed extracts—including petroleum ether, ethanol, and aqueous extracts-using *Pheretima posthuma* as the test organism. The extracts were tested at concentrations of 100, 200, and 500 mg/kg, with Albendazole as the standard drug. Both the ethanol and aqueous extracts induced paralysis and death of the worms in a dose-dependent manner, whereas the petroleum ether extract exhibited weak anthelmintic activity [38].

Anti-diarrhoeal Activity: The ethanolic leaf extract of *Mimosa pudica* was assessed for anti-diarrhoeal activity in castor oil–induced diarrhoea in Wistar albino rats. The extract was administered at a dose of 200 and 400 mg/kg and it significantly inhibited diarrhoea, reduced PGE2-induced enter polling, and decreased gastrointestinal motility following charcoal meal administration. The observed anti-diarrhoeal effects are likely due to the presence of tannins and flavonoids in the leaves [44].

Anti-asthmatic Activity: Williams *et al*. (1995) investigated the anti-asthmatic potential of the aqueous extract of *Mimosa pudica* using both *in vitro* and *in vivo* models, including histamine-induced contractions in isolated goat tracheal chains**.** The extract significantly **(**$P<0.05$**)** inhibited histamine-induced contractions in a dose-dependent manner. Treatment protected up to 74% of mast cells from degranulation compared to controls and provided excellent protection against histamine-induced bronchospasm in guinea pigs. These findings suggest that M. pudica acts as an effective antihistaminic agent and mast cell stabilizer, highlighting its potential in asthma management [45].

Anti-oxidant Activity: Muthukumaran *et al*. (2011) evaluated the antioxidant activity of the methanolic crude extract of aerial parts of Mimosa pudica using various assays, including Nitric oxide scavenging, DPPH, ABTS, and hydrogen peroxide scavenging. Ascorbic acid was used as the standard. The extract showed an IC50 of 296.92 µg/ml overall, while the standard had an IC50 of 131.29 µg/ml. Specific assay results included:

- **Nitric oxide scavenging:** IC50 = 78.1 ± 1.75 µg/ml
- **DPPH assay:** IC50 = 35.00 ± 1.15 µg/ml
- **ABTS assay:** IC50 = 81.00 ± 3.85 µg/ml
- **Hydrogen peroxide scavenging:** IC50 = 449.60 ± 2.55 µg/ml

Additionally, treatment significantly increased levels of glutamate oxaloacetate transaminase, glutamate pyruvate transaminase, alkaline phosphatase, bilirubin, and total protein, indicating enhanced antioxidant defence and protection against oxidative stress [46].

Anti-microbial Activity: Tamilarasi and Ananthi (2012) assessed the antimicrobial activity of the methanolic leaf extract of *Mimosa pudica* at 50, 100, and 200 µg/ml against *Aspergillus fumigatus*, *Citrobacter divergens*, and *Klebsiella pneumoniae*. The extract exhibited strong antimicrobial effects, attributed to bioactive constituents such as terpenoids, flavonoids, glycosides, alkaloids, quinones, phenols, tannins, saponins, and coumarins [47]. Additionally, Gandhiraja *et al*. (2009) demonstrated the antifungal activity of methanolic and aqueous extracts against fungal pathogens including *Aspergillus fumigatus* via the well diffusion method [48].

Anti-ulcer Activity: Vinothapooshan and Sundar (2010) examined the anti-ulcer potential of ethanol, methanol, chloroform, and diethyl ether extracts of M. pudica in albino rats using aspirin-, alcohol-, and pylorus ligation–induced ulcer models. Parameters assessed included ulcer protection, gastric ulcer inhibition, reduction in gastric juice volume, and overall ulcer severity. The extracts were administered orally at 100 and 200 mg/kg, with Ranitidine (20 mg/kg) as the standard drug. The 100 mg/kg dose exhibited the highest anti-ulcer activity, and the extract was found to be safe up to 2000 mg/kg [49].

Anti-hyperglycaemic Activity: Kirk *et al*. (2003) evaluated the chloroform extract of *Mimosa pudica* leaves for its antihyperglycemic potential in Wistar albino rats. The extract demonstrated significant blood glucose–lowering activity, which is likely attributed to its flavonoids, glycosides, and alkaloid content [42].

Anti-venom Activity: Sia *et al*. (2011) investigated the aqueous extract of dried M. pudica roots for antivenom activity at concentrations of 0.14 and 0.16 mg against *Najanaja* and *Bungarus caeruleus* venoms. The extract was tested for inhibition of lethality, phospholipase, and haemorrhagic activity of the venoms. Results showed that the extract completely neutralized the lethal effects and also inhibited hyaluronidase and protease activities in a dose-dependent manner [50].

Anti-hepatotoxic Activity: Nazeema and Brindha (2009) assessed the anti-hepatotoxic effects of the ethanolic extract

of *Mimosa pudica* in Wistar albino rats with CCl4-induced liver damage. The extract was administered at a dose of 200 mg/kg body weight, and its hepatoprotective activity was evaluated by measuring glutamate oxaloacetate transaminase, glutamate pyruvate transaminase, alkaline phosphatase, bilirubin, and total protein levels. The study demonstrated that the extract provided significant hepatoprotective effects in a dose-dependent manner [51].

Anti-fertility Activity: Kirk *et al*. (2003) evaluated the antifertility effects of air-dried methanolic root extracts of M. pudica in Swiss albino rats. Oral administration at 300 mg/kg body weight/day led to a significant prolongation of the estrous cycle, along with alterations in estradiol secretion and gonadotropin release. Furthermore, intragastric administration of root powder at 150 mg/kg in female *Rattus norvegicus* disrupted the estrous cycle and caused a reduction in the number of ova, demonstrating notable antifertility activity [42].

Aphrodisiac Property: Pande and Pathak (2009) studied the effect of the ethanolic root extract of *Mimosa pudica* on libido in sexually normal Swiss albino male mice. The extract was administered orally at 100, 250, and 500 mg/kg once daily for one week to groups of six mice. Female mice were hormonally prepared to be receptive for mating. Libido and potency were assessed and compared with the standard drug sildenafil citrate, while changes in testosterone levels were also measured. The extract significantly enhanced libido and testosterone levels, with the most pronounced effect observed at 500 mg/kg, demonstrating a sustained aphrodisiac activity without adverse effects [52].

Diuretic Activity: The diuretic effect of *Mimosa pudica* was first noted in the methanol fraction of its crude extract. Column chromatography yielded a diuretically active subfraction, which was nontoxic and showed dose-dependent activity, with a median effective dose (ED50) of ~1023.29 mg/kg body weight. Its activity was compared with crude ethanol and aqueous extracts, normal saline (negative control), and furosemide (positive control) [53].

Furthermore, leaf decoctions of M. pudica demonstrated diuretic activity at doses of 200, 500, 1000, and 2000 mg/kg in dogs and rats. Hydrochlorothiazide (2.5 mg/kg) served as the standard. There was significant reduction of Na+ and Cl- excretion without affecting K+ excretion, indicating a favourable diuretic profile [54].

Anti-mumps Virus Activity: The anti-mumps virus potential of *Mimosa pudica* was investigated using clinical isolates from suspected mumps cases. Virus identification involved IgM antibody assays, virus isolation, RT-PCR, and phylogenetic analysis, with viral load quantified via TCID50 assay. The anti-mumps effect was assessed using CPE reduction assays, and cytotoxicity was measured with the MTT assay. Phytochemical analysis was carried out using gas chromatography–mass spectrometry (GC-MS). RT-PCR and phylogenetic analysis of the SH gene confirmed the isolate as mumps virus genotype C. At a concentration of 150 µg/ml, M. pudica completely inhibited the virus, and the extract was non-toxic up to 2 mg/ml, demonstrating potent antiviral activity against mumps virus [55].

Estrogenic and Anti-estrogenic Activity: The oestrogenic and anti-oestrogenic effects of M. pudica root powder were evaluated in immature female rats. Oestrogenic activity was assessed via uterotrophic assays, while anti-oestrogenic activity was tested by its ability to inhibit uterine growth induced by estradiol monobenzoate. The root powder did not show oestrogenic effects, as it did not increase uterine weight. However, it exhibited anti-oestrogenic activity by blocking the uterine growth caused by administration of estradiol monobenzoate [56].

Hepato-protective Activity: The methanolic extract of *Mimosa pudica* was investigated for hepato-protective effects against carbon tetrachloride (CCl4)–induced liver toxicity in rats at a dose of 200 mg/kg body weight, orally. The extract significantly ($p < 0.05$) reduced serum levels of SGOT, SGPT, alkaline phosphatase (ALP), total bilirubin (TBL), and total cholesterol (CHL), while increasing total protein (TPTN) and albumin (ALB) levels. Histopathological analysis of liver sections confirmed these biochemical findings. The hepatoprotective effect was comparable to Silymarin (100 mg/kg, i.p.), suggesting that the methanolic extract of M. pudica possesses significant hepato-protective activity, justifying its traditional use as a liver-protective agent [57].

Anxiolytic Activity: Anxiety, characterized by nervousness, muscular tension, restlessness, and impaired concentration, can be either short-term or chronic [58, 59]. *Mimosa pudica* has been traditionally used in countries such as Cameroon for treating anxiety disorders [60]. In experimental studies using rats, the elevated plus maze (EPM) test demonstrated significant anxiolytic activity. Treated animals showed a decrease in the percentage of closed-arm entries and an increase in both the number of open-arm entries and time spent in open arms, indicating reduced anxiety-like behavior. The anxiolytic effect is likely because of certain bioactive components in the plant interacting with GABA (gamma-aminobutyric acid) receptors [61].

Hypo-lipidemic Activity: The hypo-lipidemic effects of *Mimosa pudica* have been evaluated using high-fat diet–induced hyper-lipidemia in rat models. Studies demonstrated that treatment with ethanolic extracts significantly improved lipid profiles by reducing serum triglycerides, LDL, VLDL, and total cholesterol while increasing HDL levels, comparable to the standard drug lovastatin. Phytochemical analysis revealed the presence of steroids, flavonoids, glycosides, alkaloids, and phenolic compounds, which are likely responsible for these effects [62].

In another study by Piyapong and Ampa, albino rats (150–200 g) were used, with diabetes induced via a single intraperitoneal injection of streptozotocin (65 mg/kg). Over eight weeks, rats treated with M. pudica extracts showed elevated HDL levels and reduced TG, TC, and LDL, supporting the plant's hypo-lipidemic potential [63].

Antinociceptive Activity: The methanolic extract of *Mimosa pudica* was evaluated for antinociceptive effects using the acetic acid–induced writhing model in rats. Chemical induction of pain via intraperitoneal acetic acid caused characteristic writhing, which was significantly inhibited by extract administration at 200 and 400 mg/kg, demonstrating analgesic activity. Additionally, dose-dependent increases in response latency period were observed in the hot plate test, confirming the extract's analgesic and antinociceptive properties [5].

Immunomodulatory Activity: Immunomodulation involves the nonspecific activation of immune components such as macrophages, granulocytes, complement proteins, natural killer cells, and lymphocytes, along with the production of effector molecules by these activated cells. These nonspecific effects help defend the body against bacterial, viral, and fungal pathogens. Proper immune function is essential for protecting the body against pathogens and cancer cells, but it can be impaired by malnutrition, aging, stress, or unhealthy lifestyles.

The alcoholic extract of various aerial parts of *Mimosa pudica*

has demonstrated significant immunomodulatory effects. Activity was evaluated using haematological and serological tests, as well as cell-mediated immune response (CMIR) via delayed-type hypersensitivity to sheep red blood cells (SRBC) and humoral immune response (HIR) via hemagglutination antibody titers. The extract enhanced both humoral and cell-mediated immune responses, indicating a strong immunomodulatory potential [64].

Depilatory Effect

The toxic alkaloid L-mimosine found in high concentrations in M. pudica leaves, has been reported to induce a depilatory effect in mice [47].

Neuro-protective Activity: The aqueous extract of *Mimosa pudica* leaves exhibited restorative and therapeutic effects against cadmium-induced neurotoxicity in rats, suggesting potential neuro-protective properties [65].

Effect on Uterine Bleeding

The aqueous extract of M. pudica root powder was evaluated in patients with dysfunctional uterine bleeding, demonstrating efficacy in managing abnormal uterine bleeding [54].

Spasmogenetic Activity: The ethanolic extract of the whole plant was tested for spasmogenetic potential using guinea pigs as the experimental model, indicating its ability to influence smooth muscle activity [54].

Sciatic Nerve Regeneration

Administration of M. pudica extract (1.6 mg/100 g, parenterally) to rats with experimentally induced sciatic nerve injury resulted in a 30–40% increase in nerve regeneration, highlighting its neuro-regenerative potential [54].

Carcinogenic Potential: Aqueous and alcoholic extracts of M. pudica seeds were tested against *Salmonella typhimurium* to evaluate potential carcinogenic activity [66].

Antifungal Activity: Methanolic and aqueous extracts at concentrations of 100, 200, and 500 mg were tested against Aspergillus fumigatus using a well diffusion assay, confirming antifungal activity [48].

Antiviral and Antimicrobial Activity: Among seven medicinal plants evaluated for antimicrobial activity against *Vibrio cholerae*—including *Ficus capensis*, *Mitragyna stipulosa*, *Entada africana*, *Piliostigma reticulatum*, *Terminalia avicennoides*, *Mimosa pudica*, and *Lannea acida*. M. pudica demonstrated significant antimicrobial and antiviral activity [67].

Toxicity Studies

Several studies have evaluated the safety profile of *Mimosa pudica* using various extracts and experimental models:

- **Acute Toxicity:** Oral administration of aqueous, chloroform, and methanolic extracts of M. pudica leaves at doses up to 2000 mg/kg in rats did not produce any toxic symptoms, behavioral changes, or mortality, indicating a high margin of safety [5, 68].
- **Sub-chronic Toxicity:** Sunday (2012) assessed hydroethanolic seed extracts in Wistar rats at doses of 100–400 mg/kg over a prolonged period. There were no alterations in creatinine, ALT, AST, or TBARS levels. Although GSH and CAT levels were reduced significantly as compared to the control group, no fatalities occurred even at doses up to 5000 mg/kg [69].
- **Haematological and Biochemical Safety:** Konsue *et al.* (2018) investigated the effects of aqueous and hydroalcoholic extracts on haematological parameters and fasting blood glucose in rats over 8 weeks. Parameters including WBC, RBC, haemoglobin, haematocrit, platelet count, MCV, MCH, MCHC, lymphocytes, monocytes, neutrophils, eosinophils, and fasting blood sugar showed no significant adverse changes, and no mortality was observed [70].
- **Subcutaneous Administration:** Aziz *et al.* [62] administered chloroform, methanol, and ethanol extracts subcutaneously in mice at doses of 500–2000 mg/kg. Observations over 14 days revealed no signs of toxicity or mortality, confirming the extracts' safety up to 2000 mg/kg.

Overall, these studies suggest that *Mimosa pudica* extracts are generally safe, exhibiting no significant acute or sub-chronic toxic effects at doses up to 2000 mg/kg.

Conclusion

Lajjalu (*Mimosa pudica*) has long been used in Ayurveda for managing urogenital disorders, including menorrhagia, dysentery, jaundice, skin disorder, wound and so on. Phytochemical analysis of *Mimosa pudica* has revealed a diverse range of bioactive compounds, such as alkaloids, the non-protein amino acid mimosine, flavonoid C-glycosides, sterols, terpenoids, tannins, and fatty acids. Owing to its economic accessibility, widespread availability, and rich reservoir of bioactive compounds, *Mimosa pudica* offers considerable therapeutic advantages. Its broad pharmacological potential has attracted significant global scientific attention, with studies demonstrating activities such as anti-diabetic, anti-toxin, hepato-protective, anti-oxidant, anti-convulsant, and wound-healing effects. The diverse medicinal properties and therapeutic applications of *Mimosa pudica*, along with its bioactive constituents, underscore its value as an important medicinal plant. Its pharmacological profile indicates that it is a promising herbal candidate for further research, with potential roles in the prevention and treatment of conditions such as cancer, diabetes, hepatitis, and urinary tract infections. However, the anticarcinogenic potential of mimosine and its large-scale extraction for clinical applications remain largely unexplored. Most research to date has been limited to laboratory studies, with few clinical trials conducted. Therefore, well-designed clinical studies are essential to fully realize and validate the medicinal potential of *Mimosa pudica*.

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