

# Therapeutic and Pharmacological Insights into *Mimosa pudica* Linn: A Comprehensive Review of a Sensitive Healer

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## Abstract:

*Mimosa pudica* Linn is a plant widely recognized in the traditional medicinal system, and got attention due to its rich phytochemical properties and diverse pharmacological potential. In ayurveda, it is named as lajjalu. It is called namaskari in sanskrit. It has been used in traditional medicines to cure several diseases which includes cancer, diabetes, constipation, ulcers, dyspepsia, fever and biliousness. Phytochemicals are also present in this plant. The pharmacological activity of *Mimosa pudica* includes anticancer, antioxidant, anti-inflammatory, antidiabetic neurological disorder and anti-bacterial. It is important to study more about active chemical constituents on anticancer activities of *Mimosa pudica* Linn. Additionally, the toxicity studies on this plant are limited, which are essential to ensure the safe or any side effect of *M. pudica* when it uses and its derived formulations in clinical and therapeutic applications.

**Keywords :** *Mimosa pudica*, Lajjalu, Namaskari, Phytochemicals, Pharmacological activity, Therapeutic application.

## Introduction:

The name "*Mimosa pudica*" comes from Latin, Mimosais related to the word mimic which means to allude or hint, and the word Pudica, which means to retire or shrink. This plant exhibits a characteristic thigmonastic response, wherein it folds its leaves upon tactile stimulation and gradually reopens them after a brief period of time [15]. The common name of *Mimosa pudica* Linn touch me not plant and it is a sensitive plant [2]. It is also known as a delicate plant, disgrace plant, humble plant [8]. It has played a major role in the traditional medicine system for centuries in many parts of the world [2]. It is a Neotropical plant [5]. In India, this plant is majorly found in Tamil Nadu, Kerala, Telangana, Karnataka, Andhra Pradesh and Orissa in large amounts [6].

## Habitat :

*M. pudica* is an ornamental plant and also serves as a herb [7]. *Mimosa pudica* is a herbaceous perennial legume plant and an invasive weed in many tropical and subtropical regions. *M. pudica* usually grows in places like parks, farms, cultivated lands, and gardens [15]. It is a serious problem for farmers and difficult to eliminate from crop fields by hand [13]. It is natively found in the south and central part of America, India, China, Africa and Korea [2]. It is a creeping annual or perennial herb [7]. It has thorny twigs.(8) It has water impermeable seeds [13].

**Physiology :**

Root : *Mimosa pudica* root branches ranging its length from 1 to 3 cm thick and also contain grayish brown hue in it [12].

Leaf : It has bipinnate leaves, pinnae 1- 2 pairs, linear and sensitive to touch(8) The leaves are arranged and complex [15].

Flower : The flowers have four lobes and are pink and spherical in shape(12). It has petals crenate towards base [8].

Stem : It has a cylindrical stem and thorny twigs around it. It has a half woody stem.(15) The length of the stem is about 3cm in diameter and 1m long [12]. The stem also contains glandular hairs and is sparingly prickly deflexed [15].

Fruit : The fruit of this plant is simply dried and measures 1 to 1.6 cm wide [12].

Seed : The seeds of this plant are round and brown in colour. The length of this seed measures up to 0.6cm and 4.8 mm in width. This seed does not germinate which includes a covering [12].

Pods : Pod size is about 1.5 to 2.5 cm long [8].

Figure showing leaves of *M. pudica*



Figure showing flowers of *M. pudica*



Figure showing roots of *M. pudica*



Figure showing fruits of *M. pudica*

**Taxonomical classification:**

**KINGDOM :** Plantae

**DIVISION :** Magnoliophyta

**CLASS :** Magnoliopsida

**ORDER :** Fabales

**FAMILY :** Mimosoideae

**GENUS :** Mimosa

**SPECIES :** *M.pudica* [8]

**Ethnomedical uses:**

*M. pudica* is well known as a healing plant. In ethnomedicine, *M. pudica* is used as Unani and ayurveda in India. It is also used to treat leucorrhea, antispasmodic, nephrolithiasis, blood purifying activity and menorrhagia [8].It is also used in the treatment of jaundice, asthma piles, leprosy, diarrhea, wound healing, small pox, vaginal and urinary complaints, cutaneous diseases, hepatitis, ringworm infection, gastrointestinal

disorders, HIV and piles. It is a traditional medicine [9]. This is also used to treat sinus piles, wound healing and urogenital disorder [6]. This plant may reduce depression and also cure anxiety [13].

### **Phytochemical activity:**

*Mimosa pudica* contains several phytochemicals. Under the phytochemical investigation, it resulted in the identification of 40 kinds of chemical constituents. It includes the presence of steroids, flavonoids, alkaloids, saponins, coumarins, tannin and terpenoids in large amounts. Leaves of *M. pudica* contain terpenoids, glycosides phenol, flavonoids, alkaloids, quinines, saponins and a less amount of coumarin subsidiaries. Leaves, roots and stems contain alkaloids by showing positive results for the test. In studies, a large amount of tannins present in medicine about 10% are found. The ethanol extract of *M. pudica* leaves consist of alkaloids (9.05%), flavonoids (6.23%), steroids (2.49%), saponins (8.15%), phenol (1.02%), tannins (0.083%), cyanogenic glucosides (0.122%) and anthocyanins (1.913%) [9]

### **Pharmacological effect**

#### **1. Anti inflammatory action :**

Patel and Bhutani reported the presence of some bioactive compounds such as gallic acid, L-mimosine, ethyl gallate, crocetin, crocin, caffeic acid and jasmonic acid is used to suppress the lipopolysaccharide (LP) induced pro-inflammatory mediators such as interleukin 1 beta, tumour necrosis factor alpha (TNF-a) and nitric oxide. This supports the ethnomedical uses of *M. pudica* for the treatment, and prevention of all kind of inflammatory related disorders [10],

#### **2. Antioxidant action:**

Free radicals, such as unpaired electrons for reactive oxygen species (ROS), cause damage which leads to multiple health disorders, including cancer. Antioxidants are molecules that help to protect air cells by donating electrons. The methanolic concentration of the dried stem of *Mimosa pudica* plant was the best among the other methods such as n-hexane and dichloromethane concentrates. This antioxidant activity of *Mimosa pudica* Linn is mainly due to the phenolic group which is present in the plant. This helps to reduce the oxidative stress by neutralizing harmful [8].

#### **3. Antinephrolithiatic action:**

The root portion of *Mimosa pudica* has been utilized by ayurvedic and it is mainly used to treat kidney stones, diuretic, nephrolithiasis and urolithiasis disease in ayurveda and antiquated therapeutic sources [8].

#### **4. Anticancer activity:**

Parman et al., investigated antiproliferative activity of the *M. pudica* plant using hydroalcoholic extract of the plant. The result showed the extract from *M. pudica* demonstrated a dose-dependent increase in percentage inhibition of growth proliferation of the lymphoma Daudi cells by cell death. It works as an anticancer agent [10].

#### **5. Antibacterial activity:**

Satish lal and Joshi et al method describes the antibacterial activity of *Mimosa pudica*. Ethyl acetate extract of *M. pudica* was determined by undergoing agar well diffusion method in Mueller Hinton agar. (MHA) medium: The ATCC culture of bacteria such as *S. aureus*, *K. pneumoniae*, *B. cereus* and *E. coli*, used as inoculants. At 200 mg/ml concentration, the extract showed good inhibition zones, it shows *M. pudica* kill or inhibit the growth of bacteria The Zone of inhibition (ZOI) was measured [3].

## 6. Activity against Hepatitis B :

In vitro effects of *Mimosa pudica* extract on Hepatitis B surface Antigen. (HBsAg) using ELISA and immunodiffusion techniques. The extract of *M. pudica* was found to lessen by over half percent of HBsAg present in the serum. By this strategy, it clearly shows that. *M. pudica* (Linn) extract can communicate with Hepatitis B surface antigen (HBsAg) and reduce its amount in patient's serum in vitro [8].

## 7. Effect on wound healing:

Root extract of *Mimosa pudica* Linn with n hexane followed by methanol fortified in a pharmaceutical formulation shows good wound healing efficiency compared to marketed povidone-iodine ointment. Therefore, traditional claims for the use of *Mimosa pudica* root as potential wound healing [8].

## 8. Anthelmintic activity:

For anthelmintic (anti-parasitic) effects of *Mimosa pudica* leaf extracts were studied. This study involved different concentrations-75%- 50%. and 25% prepared. This was given orally (by mouth) to animals which were infected by worms The parasitological taxation was done by unswerving smear, sedimentation, and inauguration techniques, emblematic methodology, egg count method to assess the plant's effectiveness against parasites [8].

## 9. Anticonvulsant activity:

*Mimosa pudica* extract in mice with four different doses of 20, 40, 80 and 160 mg / kg orally for seven days. A normal control group received distilled water, while a positive control group received sodium valproate (300 mg/Kg) intraperitoneally. One hour after the first treatment, epilepsy (status epilepsy) was triggered using pilocarpine (360 mg/kg) intraperitoneal. Then, after 23 hours, all groups were again given their respective treatments. After 60 sixty minutes, the mice were injected with picratoxin (1mg/Kg) to test if the plant extract 1 had any anticonvulsant effects [11].

## 10. Antidepressant activity:

The plant actually helps to treat anxiety and depression. There are some natural chemicals present in this plant that may help calm the brain by boosting the activity of GABA – that's a calming brain chemical that helps reduce stress and anxiety. In the test done on animals, *Mimosa pudica* works in a similar way to diazepam, a common anti-anxiety medicine. Not only that, it can balance mood by affecting important brain chemicals like serotonin and dopamine, which are responsible for feeling happy and emotionally stable. Whereas in plant tests, it is full of antioxidants. These help to reduce oxidative stress and this stress is often linked to depression. In animal studies, *Mimosa pudica* acted like imipramine, a medicine used for depression. These actions of this plant come from natural goodies like alkaloids, flavonoids, tannins, and steroids [13].

## 11. Antidiabetic activity:

Parasuraman et al., method describes that a single dose of 60 mg per kg of Streptozotocin can make them diabetic by causing high blood sugar levels just like what happens in human type 2 diabetes. Treatment with aqueous and ethanol extract of *Mimosa pudica* have shown to reduce the glycemic status in these rats, subsequently increasing the insulin sensitivity. Also, the phenolic compounds (a type of antioxidant chemical) in the plant are known to have anti-diabetic effects. Over 21 days of treatment, rats that got the plant extract showed an increase in their insulin levels too. The bioactive natural compounds in *Mimosa pudica* (like flavonoids and phenolics) could be boosting the body's ability to make insulin and helping the cells use it more effectively [14].

## 12. Antifungal activity :

The methanolic extract (extracted using methanol) and the watery extract of *Mimosa pudica* were tested at three different concentrations: 100µg, 200µg, and 500µg. These extracts were tested against several fungal pathogens, especially *Aspergillus sp.*, using a well diffusion test (a lab technique to check for antimicrobial activity). It was found that the antifungal effect happened at the concentration of 200 µg/ 200 ml. This means it created the largest clear zone, called the zone of inhibition, around the well where no fungus could grow, especially against a strain of *Aspergillus* [8].

## 13. Diuretic activity:

According to a study, the diuretic potential of petroleum ether, ethanolic, and aqueous extracts of *Mimosa pudica* was assessed using the Lipschitz test. The experimental animals exhibited increased urinary excretion of water and electrolytes, which was compared to a control group administered a high dose of urea. At dosages of 100 mg/kg and 200 mg/kg, the plant extracts significantly enhanced urine output and elevated the concentrations of sodium (Na<sup>+</sup>), potassium (K<sup>+</sup>), and chloride (Cl<sup>-</sup>) ions in the urine, indicating notable diuretic activity [15].

## 14. Immunomodulatory activity:

Immunomodulatory activity involves nonspecific mechanisms that enhance the body's defense against a variety of pathogens, including bacteria, fungi, and viruses. The proper functioning of the immune system is vital for maintaining health, as it plays a key role in protecting the body from infections and malignant cells. So, a group of researchers conducted a study which reported that the alcoholic extract obtained from various aerial parts of *Mimosa pudica* exhibited immunomodulatory properties. The immunological effects were assessed through a series of hematological and serological assays, indicating the extract's potential to modulate immune responses [15].

## 15. Antivenom activity:

The venom of monocled cobra is known to be highly lethal, however, polyphenolic compounds such as tannins found in *Mimosa pudica* have demonstrated the potential to neutralize its toxic effects. In experimental studies, mice exhibited sustained survival over a 24-hour period when the venom was preincubated with tannins extracted from *Mimosa pudica*. In contrast, no protective effect was observed in the group where venom was not preincubated with the extract. Furthermore, two-dimensional gel electrophoresis analysis of mice treated with the *Mimosa pudica* tannin preparation (MTP) revealed the absence of two specific protein spots, indicating the downregulation of venom-associated proteins. These molecular findings support the conclusion that *Mimosa pudica* possesses antivenom activity and holds therapeutic potential in the treatment of *Naja kaouthia* envenomation [15].

## 16. Effect on CNS:

The Open-Field Test (OFT) is widely employed to assess general locomotor activity as well as to evaluate behavioral indicators of anxiety and depression. Additionally, repeated exposure or prolonged testing sessions allow for the evaluation of habituation to an increasingly familiar environment. It has been proposed that two primary factors influence anxiety-like behaviors observed during the OFT: first, social isolation resulting from separation from cage mates during the test; and second, the psychological stress induced by the novelty of the testing environment. Using both the Open-Field Test and the Hole-Cross Test, studies have reported a significant reduction in the frequency of movements and the number of chamber crossings in a dose-dependent manner at oral dosages of 100 mg/kg and 200 mg/kg. These findings suggest a potential anxiolytic or depressant effect associated with the administered extract [8].

## Conclusion:

The uncultivated species *Mimosa pudica* Linn consist of therapeutic uses and pharmaceutical qualities. It also contains a rich reservoir of phytochemicals including tannins, flavonoids, alkaloids, saponins, terpenoids and glycosides, which are important for pharmacological effect. The pharmacological effect includes antioxidants. anti-inflammatory, antidiabetic, antibacterial, hypo -lipidemic, anticonvulsant and anthelmintic properties. Further research is essential to isolate, characterize and evaluate these compounds in pure form.

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