

Ethnopharmacological Perspectives on *Mimosa pudica* - A Review

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ABSTRACT

The *Mimosa* genus belongs to the *Fabaceae* family of legumes and consists of about 400 species distributed all over the world. The growth forms of plants belonging to the *Mimosa* genus range from herbs to trees. Several species of this genus play important roles in folk medicine. *Mimosa pudica* is a perennial herb and belongs to the family *Fabaceae*. Ecological studies have shown that *M. pudica* grows in all types of soil which can survive in soil with low nutrient concentration. It usually requires disturbed soil to establish itself. It is commonly seen in the wastelands and along roadsides, which is an ethnomedical plant that may be used in managing various types of disease. Epidemiological studies have revealed that *M. pudica* contains metabolites such as phenols and flavonoid compounds which possess pharmacological properties such as antidiabetic, antimicrobial, antiulcer, antidepressants and anti-inflammatory. Hence, in the current narrative review of literature we mainly aimed to describe and delineated on ethnopharmacological potential of *M. pudica*.

Keywords: *Mimosa pudica*, Traditional uses, Pharmacological potential, Antihyperglycemic, Antioxidant, Antivenom.

1. Introduction

The *Mimosa* genus belongs to the *Fabaceae* family of legumes (subfamily: Mimosoideae) and consists of almost 400 species of shrubs and herbs^[1]. Leaves of this genus may be bipinnate or binate, compound or branched, with one or two pairs of branchlets or much larger branched leaves. Some species have the ability to fold their leaves when touched, with *Mimosa pudica* being one common example. The flowers may be pink and globular in the form of clusters and with prickles or may be white and grouped in dense heads 3–6.5 mm long. The fruit are lance-shaped with 2–6 articulations. The fruit wall is compressed between the seeds. Huge amounts of starch and calcium oxalate crystals are present in the bark^[2]. Some species are prickly leguminous shrubs^[3]. The plants of this genus usually grow across roadsides, walkways, marshes, and hillsides, and on margins of rivers and lakes on wet soil, where several individuals can form dense aggregations^[4].

Various species of *Mimosa*, including *M. tenuiflora*, *M. pudica*, *M. pigra caesalpinifolia*, *M. hamata*, *M. rubicaulis*, *M. somnians*, *M. bimucronata*, *M. linguis*, *M. humilis invis*a, *M. arenosa*, *M. ophthalmocentra*, *M. verrucosa*, and *M. albida* have been reported to be used in traditional medicine for the treatment of various ailments (Figure 1). Due to their potential benefits in phytomedicines, all parts of this genus are used in traditional systems of medicine^[5]. Hence, in the current narrative review of literature we mainly aimed to describe and delineated on ethnopharmacological potential of *Mimosa pudica*.

2. Taxonomy and Distribution

M. pudica is also known as chuimui or lajwanti in Hindi because of its unique property to droop or collapse when touched and opens up a few minutes later. *M. pudica* is a creeping annual or perennial shrub with compound leaves, spiny stipules, and globose pinkish flower heads. It is native to Brazil and has been naturalized throughout the world. *M. pudica* is an annual or perennial shrub with erect stems in young plants which modifies to creeping with age. It attains a height of 1 to 2 m with compound bipinnate leaves having 1 to 2 pinnae pairs and each pinna contains 15 to 25 leaflets. The plant has red-colored prickly petioles and pink filaments. A fruit has 2 to 8 pods, which are 3 mm

broad and 1 to 1.5 cm long. Each pod has 2 to 5 segments in which brown seeds (2.5 mm long) are embedded (Figure 1) ^[6].



Fig 1. Showing *Mimosa pudica* plant

Scientific Classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Fabales

Family: Fabaceae

Subfamily: Mimosoideae

Genus: *Mimosa*

Species: *M. pudica*

3. Perspectives on Traditional Uses

Ayurveda has declared that roots of *M. pudica* is bitter, acrid, cooling, vulnerary, alexipharmic, and used in the treatment of leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, asthma, leucoderma, and fatigue and blood diseases. Unani Healthcare System its root is resolvent, alternative, and useful in the treatment of diseases arising from blood impurities and bile, bilious fevers, piles, jaundice, and leprosy etc... Decoction of root is used with water to gargle to reduce toothache. It is very useful in diarrhea (athisaara), amoebic dysentery (raktaatisaara), bleeding piles and urinary infections. It arrests bleeding and fastens the wound healing process. It is mainly used in herbal preparations for gynecological disorders. It has been said to have medicinal properties to cure skin diseases. It is also used in conditions like bronchitis, general weakness and impotence. It is also used to treat neurological problems. The content of *M. pudica* has a capacity of arresting bleeding and it fastens the process of healing of wounds. It is recommended in diarrhea, amoebic dysentery and bleeding piles. It is also used in herbal preparations of gynecological disorders. Its extract can cure skin diseases. Some herbal doctors recommend it for bronchitis, general weakness and impotence. All the five parts of the plant leaves, flowers, stems, roots, and fruits are used as medicines in the traditional healthcare systems. In India, different parts of the plant have been in popular use for treating various ailments since long. Recent researches show that the extract of this plant can be used for checking child birth. Some authors have reported that this herb can replace contraceptive pills if researches are done properly ^[7].

According to different researches done so far, *M. tenuiflora* bark is used to relax the mind, and relieve depression, mental distress, irritability, severe palpitations, and amnesia. It is a mood enhancer and improves circulation of the blood. Some believe *Mimosa* can reduce the onset of baldness. Due to its ability to promote healthy cell growth, Tepezcohuite is used in shampoos, creams, capsules, and soaps. In Ayurvedic and Unani medicine, *Mimosa pudica* root is used to treat bilious fevers, piles, jaundice, leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, fatigue, asthma, leucoderma, and blood diseases. In Western medicine, *Mimosa* root is used for treating insomnia, irritability, premenstrual syndrome (PMS), menorrhagia, hemorrhoids, skin wounds, and diarrhea. It is also used to treat whooping cough and fevers in children, and there is some evidence to suggest that *Mimosa* is effective in relieving the symptoms of rheumatoid arthritis. All parts of the *Mimosa* plant are reportedly toxic if taken directly. Its consumption is not recommended to pregnant or nursing ladies. Due to these reports, it seems to be best to consult a physician before using *Mimosa* internally. Researches regarding safety in young children or those with severe liver or kidney disease have not been found [7].

4. Perspectives on Pharmacological Potential of *M. pudica*

Analgesic and anti-inflammatory activity: The ethanolic extract of the leaves of *M. pudica* at the doses of 200 and 400 mg/kg was tested for anti-inflammatory and analgesic activity. The extract produced dose dependent and significant inhibition of carrageenan induced paw oedema. The analgesic activity was found to be more significant on the acetic acid induced writhing model than the tail flick model. The presence of flavonoids in the ethanolic extract may be contributory to its analgesic and anti-inflammatory activity [8].

Antihyperglycemic activity: Chloroform extract of *M. pudica* leaves has been screened for its hypolipidemic activity against atherogenic diet in wistar albino rats and serum levels of various biochemical parameters such as total cholesterol, triglycerides, high density lipoprotein (HDL), very low-density lipoprotein (VLDL) and low-density lipoprotein (LDL) cholesterol were determined. Atherogenic index shows the measure of the atherogenic potential of the drugs. Chloroform extract showed significant hyperlipidemic effect by lowering the serum levels of biochemical parameters such as significant reduction in the level of serum cholesterol, triglyceride, LDL, VLDL and increase in HDL level which was similar to the standard drug Atorvastatin. Chloroform extract exhibited significant atherogenic index and percentage protection against hyperlipidemia. The overall experimental results suggests that the biologically active phytoconstituents such as flavonoids, glycosides alkaloids present in the chloroform extract of *M. pudica* may be responsible for the significant hypolipidemic activity and the results justify the use of *M. pudica* as a significant hypolipidemic agent [9].

Anti-hepatotoxic activity: The ethanol extract of *M. pudica* leaves was evaluated for its hepatoprotective against carbon tetrachloride (CCl₄)-induced liver damage, in Wistar albino rats. The ethanol extract of *M. pudica* (Mimosaceae) leaves (200 mg/kg body weight, p.o.) was administered to the experimental rats for 14 days. The hepatoprotective activity was assessed using various serum biochemical parameters as glutamate oxaloacetate transaminase (SGOT), glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP), bilirubin, and total proteins. Malondialdehyde level as well as the activities of superoxide dismutase, reduced glutathione and catalase was determined to explain the possible mechanism of activity. The substantially elevated levels of serum SGOT, SGPT, ALP and total bilirubin, due to CCl₄ treatment, were restored towards near normal by *M. pudica*, in a dose. Reduced enzymatic and non-enzymatic antioxidant levels and elevated lipid peroxide levels were restored towards near normal, by administration of *M. pudica*. The ethanol extract of *M. pudica* afforded significant dose dependent hepatoprotective antioxidant effects in CCl₄-induced hepatic damage [10].

Antioxidant activity: The methanol crude extract of the aerial part of *M. pudica* was screened in vitro for antioxidant activity using the 1, 1-diphenyl-2-picrylhydrazyl-hydrate (DPPH) free radical

scavenging assay. The methanol crude extract of the aerial part showed moderate antioxidant activity (IC₅₀ 296.92 µg/ml) compared to ascorbic acid (IC₅₀ 131.29µg/ml) suggesting presence of biologically active constituents in the methanolic extract of *M. pudica* [11].

Anti-diarrhoeal activity: Diarrhea is the condition of having three or more loose or liquid bowel movements per day. The anti-diarrhoeal potential of the ethanolic extract of leaves of *M. pudica* has been evaluated using several experimental models in Wistar albino rats. The ethanolic extract inhibited castor oil induced diarrhoea and PGE2 induced enteropooling in rats and has also reduced gastrointestinal motility after charcoal meal administration. The ethanolic extract at 200 and 400 mg/kg was showed significantly inhibited diarrhoea. The anti-diarrhoeal property may be related to the tannin and flavonoids present in the extract [12].

Antimalarial activity: The ethanolic extract of *M. pudica* leaves was investigated for antimalarial activity against *Plasmodium berghei* infections in mice. The extract of *P. niruri* and *M. pudica* leaf demonstrated significant antiplasmodial activity in all the three models of the antimalarial evaluations. Phytochemical screening revealed the presence of some vital antiplasmodial constituents such as terpenoids, flavonoids and alkaloids. The leaf extract of *P. niruri* and *M. pudica* possesses antimalarial activity [13].

Antifertility activity: *M. pudica* root extract, when administered orally at a dose of 300 mg/kg body weight/day, prolonged the length of the estrous cycle with significant increase in the duration of the diestrous phase and reduced the number of litters in albino mice. The number of litters was increased in the posttreatment period. The analysis of the principal hormones (Luteinizing hormone, Follicle-stimulating hormone, prolactin, estradiol and progesterone) involved in the regulation of the estrous cycle showed that the root extract altered gonadotropin release and estradiol secretion [14].

Wound healing activity: The shoot and root extracts of *M. pudica* root showed very good wound healing activity [15]. The methanolic extract exhibited good wound healing activity probably due to presence of phenols constituents [16].

Antivenom activity: Aqueous extract of dried roots of *M. pudica* was tested for inhibitory activity on lethality, phospholipase activity, edema forming activity, fibrinolytic activity and hemorrhagic activity of *Naja naja* and *Bangarus caeruleus* venoms. The aqueous extract displayed a significant inhibitory effect on the lethality, phospholipase activity, edema forming activity, fibrinolytic activity and hemorrhagic activity. About 0.14 mg and 0.16 mg of *M. pudica* extracts were able to completely neutralize the lethal activity of 2LD₅₀ of *Naja naja* and *Bangarus caeruleus* venoms respectively [7].

Anthelmintic activity: The present study was undertaken to evaluate anthelmintic activity of different extracts of seeds of *M. pudica*. The different successive extracts namely petroleum ether, ethanol and water using *Pheretima posthuma* as a test worm to the different concentrations (100, 200, 500 mg/kg) were tested for bioassay which involved determination of paralysis and time of death of the worms. Crude alcoholic extract and aqueous extracts significantly demonstrated paralysis and also caused death of worms in dose dependent manner as compared to standard reference albendazole. While Pet. Ether extracts shows weak anthelmintic effect compared to standard, ethanol and aqueous extracts [17].

Antiulcer activity: Antiulcer potential of ethanolic extract of *M. pudica* leaves was evaluated by pylorus ligation, aspirin and ethanol induced ulcer models. The ethanolic extract of the leaves of *M. pudica* was given by oral route at a dose of 100 mg/kg b.w. Ethanolic extract of *M. pudica*, dose dependently reduce, the total acidity, ulcer index, and an increase in pH of gastric juice in pylorus ligated ulcer model [18].

5. Conclusions

In conclusion, among the plants of the family *Mimosaceae*, the versatile uncultivated species *M. pudica* has captivating much attention because of its intensive folk medicinal uses and pharmaceutical attributes since it is rich with different bioactive compounds that possess several pharmacological

properties. *M. pudica* commonly seen in the wastelands and along roadsides is an ethnomedical plant that may be used in managing various types of disease.

6. Future Perspectives

There is a resurgence to isolate functional bioactives responsible for Pharmacological attributes from the different parts of the *M. pudica*. Literature reports revealed that the *M. pudica* plant is rich in the alkaloid, mimosine, which has anticancer properties. Further efforts are required to elaborate the anticarcinogenic nature of mimosine and its isolation on a commercial scale for therapeutic applications in human beings. A large number of studies have been done for its antivenomic activity. Some studies concluded that the antivenomic potential of the *M. pudica* is due to tannins. However, tannins responsible for its antivenomic activity have still not been isolated in pure form. Lives could be saved by the separation of antivenomic phytochemicals from *M. pudica* to develop therapeutic formulation after evaluation. Extracts of various parts of the plant have exhibited significant antidiabetic, anti-inflammatory, and hypolipidemic activities, indicating the presence of functional secondary metabolites. Therefore, researchers must screen these compounds for the development of new and economical drugs. *M. pudica* has been extensively studied for its antimicrobial activities. Hence, efforts should be made to develop new antibiotics by isolating compounds from different parts of plant. The hydrogel glucuronoxylan from the seed coat of *M. pudica* has been evaluated for drug release. Further investigations are now demanding to study the cytotoxic effects of glucuronoxylan polysaccharide from *M. pudica* seeds for utilization in drug release studies ^[19]

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