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Pharmacology and Traditional Uses of *Mimosa pudica*

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ABSTRACT
Mimosa belongs to the taxonomic group Magnoliopsida and family *Mimosaseae*. In Latin it is called as *Mimosa pudica* Linn. Ayurveda has declared that its root is bitter, acrid, cooling, vulnerary, alexipharmic. It is used in the treatment of leprosy, dysentery, vaginal and uterine complaints, and inflammations, burning sensation, asthma, leucoderma, fatigue and blood diseases. Decoction of root is used as gargle to reduce toothache. It is very useful in diarrhea (athisaara), amoebic dysentery (raktaatisaara), bleeding piles and urinary infections. This review gives a brief compilation of its phytochemical and pharmacological activities.

Keywords: Antiulcer activity, Mimosine, Phytochemistry, *Mimosa pudica*.

INTRODUCTION

Nature has been a source of medicinal agents for thousands of years. Various medicinal plants have been used for years in daily life to treat disease all over the world. [1] Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. [2-3] The most important of these biologically active constituents of plants are alkaloids, flavonoids, tannins and phenolic compounds. [4] There are many herbs, which are predominantly used to treat cardiovascular problems, liver disorders, central nervous system, digestive and metabolic disorders.

The *Mimosa pudica*, invites attention of the researchers worldwide for its pharmacological activities such as anti diabetic, antitoxin, antihepatotoxin, antioxidant and wound healing activities. It is reported to contain alkaloid, glycoside, flavonoid and tannis. It is used in suppresses kapha and pitta heals wounds, coagulates blood and sexual weakness. [5] All parts of the tree are considered to possess medicinal properties and used in the treatment of biliousness, leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, fatigue, asthma, leucoderma, blood diseases. [6] The purpose of this article is to review phytochemical and pharmacological properties of this medicinal plant.

Common Names of *Mimosa pudica*

Mimosa pudica is also known as chuimui [6] or lajwanti in hindi because of its unique property to droop or collapse when touched and opens up a few minutes later. Its other names are *Betguen Sosa* (Guam), Memege (Niue), Mechiuaiu (Palau), Limemeihr (Pohnpei), Ra Kau Pikikaa (Cook Islands). The Chinese name for this plant translates to "shyness grass". [7] Its Sinhala name is Nidikumba, where 'nidi' means 'sleep'. Its Tamil name is Thottal Sinungi, where 'Thottal' means 'touched' and 'Sinungi' means 'little cry'. Other non-English common names include Makahiya (Philippines, with maka- meaning "quite" or "tendency to be", and -hiya meaning "shy", or "shyness"), Mori Vivi (West Indies). In Urdu it is known as Chui-Mui. In Bengali, this is known as 'Lojjaboti', the shy virgin. In Indonesia, it is known as Putri Malu (Shy Princess). In Myanmar (Burma) it is called 'Hti Ka Yoan' which means "crumbles when touched". It has been described as "sparshaat sankochataam yaati punashcha prasruta bhavet" -a plant which folds itself when touched and spreads its leaves once again after a while.

Scientific Classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Fabales
Family	:	Fabaceae
Subfamily	:	Mimosoideae
Genus	:	Mimosa
Species	:	*M. pudica*

Distribution

Mimosa pudica is native to South America and Central America. It is regarded as an invasive species in Tanzania, South Asia, South East Asia and many Pacific Islands. [7] It is a declared weed in the Northern Territory. [8] Control is

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recommended in Queensland. [9] It has also been introduced to Nigeria, Seychelles, Mauritius and East Asia but is not regarded as invasive in those places. [7]

Fig. 1: Mimosa pudica

Botanical Description

Mimosa pudica was first formally described by Carl Linnaeus in *Species Plantarum* in 1753. Mimosa is usually a short prickly plant with its branches growing close to ground. It grows up to a height of about 0.5 m and spreads up to 0.3 m. The stem of mimosa is erect, slender, prickly and well branched. Leaves are bipinnate [10], fern like and pale green in colour with a tendency of closing when disturbed. These are quadri-pinnate, often reddish, leaflets 15 to 25 pairs, acute, bristly, usually 9 to 12 mm long and 1.5mm wide. Flowers of this plant are axillary in position and lilac pink in colour usually occurring in globose heads. Calyxes are companulate, and petals are crenate towards the base. Flowering occurs from August to October in Indian conditions. Fruits of mimosa are pods, 1.5 to 2.5 cm long, falcate and closely prickly on sutures. [10]

Botanical description of *M. pudica*

Characters	***M. pudica***
Plant	Short prickly branches, hairs glandular
Leaves	Bipinnate, sensitive to touch
Flowers	Axillary, globose head, lilac pink in colour
Stem	Erect, slender, prickly and well branched
Calyxes	Companulate
petals	Petals crenate towards base
Pods	1.5 to 2.5 cm long, Closely prickly on the sutures and falcate
Flowering and Fruiting time	August to October in Indian conditions

Plant Movement

Mimosa pudica is well known for its rapid plant movement. In the evening the leaflets will fold together and the whole leaf droops downward. It then re-opens at sunrise. This type of motion is termed as nyctinastic movement. The foliage closes during darkness and reopens in light. [11] The leaves are drooping because of stimulus, in conditions such as touching, warming or shaking. The stimulus can be transmitted to neighbouring leaves. These types of movements are termed as seismonastic movements. This is due to loss of turgor pressure. The movement is caused by a rapid loss of pressure in strategically situated cells that cause the leaves to droop right before one's eyes.

Principal Constituents of Mimosa plant

M. pudica contains Mimosine [6, 12], which is a toxic alkaloid. Adrenalin like substance has been identified in the extract of its leaves. Some workers have reported the presence of Crocetin dimethyl Easter in the extract of the plant. Roots contain tannin up to 10 per cent. Seeds contain a mucilage which is composed of d-xylose and d-glucuronic acid. The plant extract contains green yellow fatty oil up to 17 per cent. The plant is reported to contain tubuline and a new class phytohormone turgorines is found to be active in the plant. The periodic leaf movement factors are reportedly the derivatives of 4-α-(b-D-glucopyranosyl-6-sulphate)gallic acid. The preliminary phytochemical screening of the *M. pudica* leaf extract showed the presence of bioactive components such as terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins, and coumarins. [13]

Traditional Uses

Ayurveda has declared that its root 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.

According to different researches done so far, *Mimosa 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. [14]

Pharmacological Activities

Wound healing activity

The *M. pudica* shoot methanolic extract, *M. pudica* root methanolic extract showed very good wound healing activity. [15] The methanolic extract exhibited good wound healing activity probably due to presence of phenols constituents. [16-18]

Antimicrobial Activity

The antimicrobial activity of methanolic extract of *Mimosa* was tested against *Aspergillus fumigatus, Citrobacter divergens* and *Klebsiella pneumonia* at different concentrations of 50, 100 and 200µg/disc. The antimicrobial activity was attributed to the presence of bioactive constituents like terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins and coumarin. [13]

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. [19]

Anticonvulsant

The decoction of *M. pudica* leaves were given intraperitoneally at dose of 1000-4000 mg/kg which protected mice against pentylentetrazol and strychnine-induced seizures. *M. pudica* had no effect against picrotoxin-induced seizures. It also antagonized N-methyl-D-aspartate-induced turning behavior. [20]

Antidiarrhoeal 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 PGE_2 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. [21]

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. [22]

Anti oxidant 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 (IC_{50} 296.92µg/ml) compared to ascorbic acid (IC_{50} 131.29µg/ml) suggesting presence of biologically active constituents in the methanolic extract of *M. pudica.* [23]

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. [24]

Anti-hepatotoxic activity

The ethanol extract of *M. pudica* leaves was evaluated for its hepatoprotective against carbon tetrachloride (CCl_4)-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 CCl_4 treatment, were restored towards near normal by *M. pudica* (Mimosaceae), 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 an antioxidant effects in CCl_4-induced hepatic damage. [25]

Antihelminthes 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. [26]

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, very low-density lipoprotein and low-density lipoprotein 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. [27]

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. [28]

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 caerulus* 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 $2LD_{50}$ of *Naja naja* and *Bangarus caerulus* venoms respectively. [14]

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