



An overview on *Mimosa pudica*

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ABSTRACT

Medicinal plants contain secondary metabolites hence they are used in medicines to cure various diseases. The studies done on the plant *Mimosa pudica* shows several biological activities. The plant's different parts consist of various chemical constituents that possess medicinal activities. *Mimosa pudica* found in different parts of the world mainly in tropical regions and used in medication of different diseases like anti-anxiety, depression, analgesic, anti-ulcer, anti-venom, anti-diabetic, hypertension, hepatoprotective activity. The parts of whole plant are used as the medicines such as leaves, roots, stems and flowers. It has an appreciating homeopathy for dysentery, excessive bile secretion. The various phytochemical constituents present in the plant are glycosides, amino acids, flavonoids, alkaloids, saponins. In this review article, different biological activities of *Mimosa pudica* plant extracts are summarized. This literature review is prepared using articles obtained from pharmaceutical journals and internet searches such as Ayurveda Research Articles, Science Direct and Google Scholar and descriptions from which information is collected such as *Mimosa pudica*, phase intermediate metabolites, activities, pharmacological and phytochemicals value will be collected from internet documents and books. Approximately 140 compounds from this genus have been isolated and used in the treatment of different diseases.

KEYWORDS: *Mimosa pudica*, Solvent extraction, Isolation, Ailments, Pharmacological activities.

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INTRODUCTION

Mimosa pudica word is originated from two words, "mimic" which connects to sensitive nature of leaves and "pudica" means contraction of leaves, due to its sensitive nature [1]. It is a shrub like plant whose family is Fabaceae and taxonomic group Magnoliopsida. The plant grows in the moist locations. This plant is native of United States of America.

It's leaves, roots, flowers, stem, and fruits are useful for the treatment of various diseases like anxiety, depression, inflammation, fatigue, leprosy, dysentery, blood diseases, insomnia, epilepsy. Various parts of *Mimosa pudica* are useful, for example leaves are used as analgesics, antidepressants, anti-inflammatory, anticoagulant, antidiarrheal, hepatoprotective, anti-anxiety, and anti-ulcers. Similarly, roots are useful in wound healing activity, nephroprotective activity. It's stem and seeds are used as antimicrobials [2]. In this article various pharmacological activities, chemical constituents, botanical description of *Mimosa pudica* were briefly reviewed.

PLANT PROFILE

Taxonomical Classification:

Division- Magnoliophyta

Kingdom- Plantae

Order- Fabales

Family- Fabaceae

Class- Magnoliopsida

Species- *M. pudica*

Genus- Mimosa



Fig. 1 Whole plant of *Mimosa pudica*

Fig. 2 Flowers of *Mimosa pudica*

Fig. 3 Leaves of *Mimosa pudica*

Common Name:

Hindi- Chui mui or Lajwanti; Chinese-Shyness grass; Tamil- Thottal sinungi; Urdu- Chui mui; Bengali-Lojjaboti; Indonesia- Putri malu; Myanmar- Hti ka yoan; West Indies- Mori vivi; Phillipines- Makahiya [3].

Distribution:

Mimosa pudica plant is mainly found in South-east Asia, South Asia, Tanzania, Southern America, Central America and many specific islands. In India, it is mainly found in Southern states and some part of Northern India. Nowadays it is also cultivated in Mauritius, Seychelles, Nigeria and Eastern Asia. In some countries it is declared as weed so there is a control in cultivation in the countries like Queensland [2].

Botanical Description:

Mimosa pudica is a small plant, with spines in the branches, it always grows very close to the ground. Height is about 0.6 m from the ground and it spreads on the ground up to 0.4 m. Branches are spiny and well connected to the serrate stem. The leaves are similar to fern. Colour of leaves is pale green. The leaflets are 1.5 mm wide and grows in 15 to 20 pairs usually 10 mm long. Flowers have pink lilac colour and are in axillary position. The calyx lobes are united to form a bell-shaped structure, petals are rounded towards the base. Flowers bloom between July and October. Mimosa's fruits are pod shaped approximately 1 to 2.5 cm long. Its seeds are relatively small (10-25mm long and 3-6 mm wide) have stiff, almost prickly, bristles along their margins and they always break apart into one seeded segment when it gets mature [4].

Chemical Constituents:

1. Chemical constituents present in leaves are: adrenaline, nor-adrenaline, D-pinitol, mimosine, flavonoids, terpenoids, quinines, glycosides, phenols, tannins and saponins.

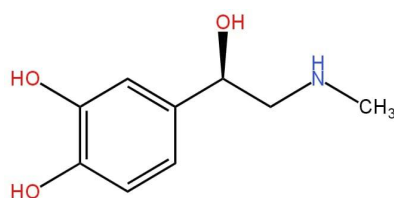


Fig. 4 Adrenaline

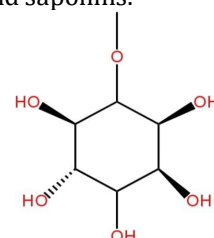


Fig. 5 D-pinitol

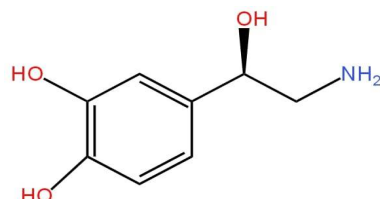


Fig. 6 Mimosine

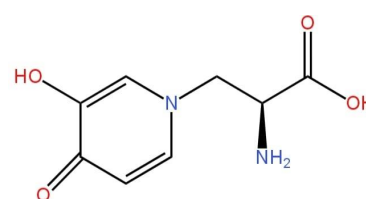


Fig. 7 Nor-adrenaline

2. Chemical constituents present in Roots are: phytosterols, flavonoids, alkaloids, ascorbic acid, linoleic acid, amino acids, glycosides, fatty acids, D-xylose, linolenic acid, palmitic acid and D-glucuronic acid.

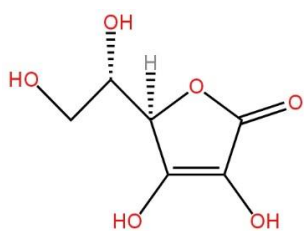


Fig. 8 Ascorbic acid

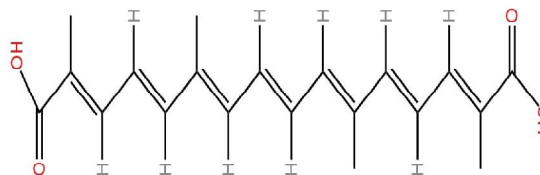


Fig. 9 Crocetin

3. Chemical constituents present in seeds are: D-xylose, phenolic ketone and buff dienolide.

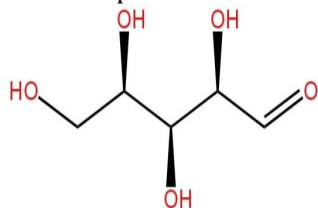


Fig. 10 D-xylose

4. Chemical constituents present in stem are: mimosine and 5-methoxy-N, N-dimethyltryptamine(5-MeO-DMT).
 5. Chemical constituents present in aerial parts are: O-glycosyl flavonoids known as isoquercitrin, orientin, isoorientin and C-glycosyl flavonoids.
 6. Chemical constituents present in whole plant are: crocetin, mimosinamine, mimosinic acid, tyrosine, gallic acid, phytohormones like turgorines, thiamine, (-)-Noradrenaline, cassiaoccidental B, mimopudine [5].

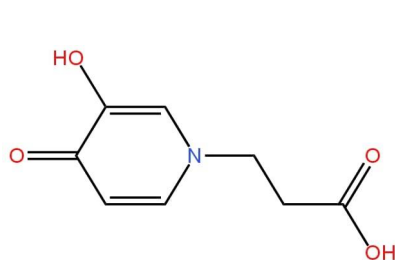


Fig. 11 Mimosinic acid

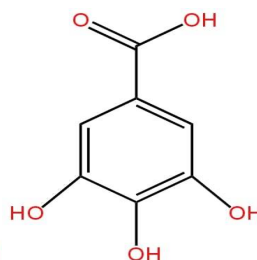


Fig. 12 Gallic acid

SENSATION OF PLANT

Leaves of *Mimosa pudica* closes in night and opens in sunlight. The leaves also react similar under various other conditions such as when touched or on warming or due to blow of air, or on shaking. These senses are called as seismonastic movements. The cause of such movement happens when turgor pressure decreases in some particular regions of cells, so the force will be applicable on the cell wall due to water within the cell vacuole. When the plant is affected, some areas of the stem become irritated and chemicals containing K^+ are released, these chemicals secrete water from the cell vacuoles, causing the energy of the cells to decrease and the cells to disintegrate. The reason for the constant cell congestion is the difference between the fields which closes leaves and branches. The exercise spreads to other leaves as well. Scientists believe that in *Mimosa* the plant uses this sensitivity to protect against insects and herbivores [2].

PHARMACOLOGICAL ACTIVITIES OF *MIMOSA PUDICA*

Antimicrobial activity:

Gandhiraja N *et al* checked out the methanolic extracts of *Mimosa pudica* leaves. Well diffusion method was used to investigate antimicrobial activity against different bacteria. The extract indicated the increment in the inhibition zone. The inhibition was depended upon dose [6].

Balakrishnan N *et al* investigated *Mimosa pudica* leaves for antibacterial activity. They used the hydro-alcohol extract of leaves against different bacteria. Study confirmed that extract of leaves was effective against almost all organism [7].

Lakshmbai R *et al* performed the activity of thorns of *Mimosa pudica* for the anti-microbial activity. Ethanolic and aqueous extracts of thorns were used in agar well diffusion method. Extracts in various concentrations were used against bacteria to find inhibition zones. In the process streptomycin and clotrimazole were used as the standard drugs. After the comparison of effectiveness of the extracts, the aqueous extract had the maximum inhibition [8].

Akter A *et al* evaluated different organic extracts of *Mimosa pudica* such as methanol, petroleum ether and chloroform for antimicrobial activity. All extracts were tested against multiple gram negative and gram-positive bacteria. Out of these extracts, ethanolic extract had the highest antibacterial activity. Bacteria of the Gram negative are sensitive towards the extract. Tetracycline was used as the standard drug [9].

Malathy D screened the antimicrobial action of leaves of *M. pudica*. In this study, the synthesis of copper nanoparticle was done using *Mimosa pudica* extract. The activity was maximum against *Pseudomonas aeruginosa* against the commercial antibiotics [10].

Antioxidant activity:

Lakshmbai R *et al* performed the antioxidant activity for free radical scavenging properties of water and alcoholic extracts of thorns of *M. pudica*. In this study, they used nitric oxide, ABTS and DPPH free radical scavenging methods to find antioxidant activity. Alcoholic extracts have the best inhibitory effect on the ABTS free radical scavenging pathway [11].

Zhang Jing *et al* investigated *Mimosa pudica* plant for the antioxidant activity. Ethanolic extract was mixed solution of DPPH in ethanol. It showed activity of DPPH scavenging [12].

Singh Sangeeta *et al* evaluated ethyl acetate, hexane and methanol extract of *M. pudica* root for free radical scavenging performance. According to DPPH determination, methanol extract has good activity, while ethyl acetate and hexane extracts have poor activity [13].

Antidepressant and antianxiety activity:

Shashikumara *et al* researched on the stressed rats for antianxiety activity of *Mimosa pudica*. They used the ethanolic extract. Wire mesh apparatus was used to check the immobilization for 4 hours. The model used was forced swim and tail suspension. There was significant reduction in mobility period in the rats, which was an indication of antidepressant action of the ethanolic extract [14].

Lokman Hossain Md. *et al* investigated the antianxiety effect for methanolic extract of *Mimosa pudica*. Different models like plus maze test. were used on Albino rats. Standard drug was diazepam. Observations showed that there was significant activity of extract which depend upon the dose [15].

Hepatoprotective activity:

Kaushik Kumar Kritartha *et al* performed the hepatoprotective action of leaves of *Mimosa pudica*. The liver toxicity was induced by lindane in mice. According to research *M. pudica*'s ethanolic extract cured the excess of liver enzymes such as alanine aminotransferase and aspartate aminotransferase. Extract normalized alanine aminotransferase and aspartate aminotransferase levels [16].

Rajendran Rekha *et al* investigated the protection against CCl_4 in liver by using the methanolic extract. Methanolic extract lowered the serum levels in various parameters like total cholesterol, alkaline phosphate, SGOT, SGPT, total bilirubin [17].

Kumaresan R. *et al* screened the hepatoprotective action of the *M. pudica* plant. In this study crude powder of plant was administered on hepatotoxic Albino rats. Rats were distributed into three groups such as normal, untreated and treated. After 10 days of treatment blood samples were checked for liver profile. The treated animals had almost same levels of enzymes as the normal levels. CCl_4 was used to induce the jaundice in the animals [18].

G Dhanya K. *et al* conducted the hepatoprotective action of *Mimosa pudica* leaves. In this study hepatotoxicity was induced using alcohol in albino rats. After administration as observed, there was significant increase in glycogen and protein levels in blood sample and there was reduction in Gamma glutamyl transferase, Lactate dehydrogenase and bilirubin [19].

Anti-inflammatory activity:

Kaur Palwinder *et al* researched for methanolic leaf extract of *Mimosa pudica* on anti-inflammatory effects. Necrotizing pancreatitis was induced in rats using L-arginine. In the research the animals were infused with L-arginine. According to observations there was significant decrease in lipase levels and serum amylase cytokine. Research indicated that there was anti-inflammatory effect of methanolic extract [20].

Vikram Pradeep Kumar *et al* performed the analgesic activity of *M. pudica*. In the research two models were used which were vinegar acid induced writhing and tail flick test on pre-treated animals with different doses of extract. Results showed that analgesic activity was dose dependent [21].

Rahman Md. Habibur *et al* screened anti-inflammatory action of roots of *Mimosa pudica*. Methanolic extract of root was used. Aspirin was the standard drug. Carrageenan was used to induce oedema in paw. Two different concentration of extracts i.e 100 and 200mg/kg was administered on Swiss Albino mice.

Results exhibited the significant reduction in paw oedema, which was possibly due to inhibition of cyclooxygenase synthesis [22].

Yang Eun Ju *et al* performed the anti-inflammatory activity. The study was for suppression of Asthma using *Mimosa pudica* extracts. Ethanolic extract of whole plant was prepared. Ovalbumin was used to induce the airway inflammation using nebulizer in adult mice. Asthma induced mice were treated with extract as well as dexamethasone as the standard drug in variable concentrations. The ethanolic extract reduced the eosinophils in significant number, it also reduced the airway inflammation [23].

Anthelmintic activity:

R Pratap Chandran *et al* conducted anthelmintic action of water and methanolic extracts of *Mimosa pudica* leaves on adult Indian earthworms. According to results, methanol extract had the best anthelmintic action compared to Albendazole [24].

Bendgude R. D. *et al* performed the anthelmintic action of *Mimosa pudica* leaves using different extracts. Research was performed on adult earthworms. Results revealed that petroleum ether extract had weaker performance compared to aqueous and ethanolic extract. Standard drug used was Albendazole [25].

Nzeakor Terry A *et al* conducted the anthelmintic action of leaves of *Mimosa pudica*. Methanolic extract was prepared using maceration process. In vitro activity was investigated through egg hatch assay and H. bakeri experiment. Albino mice was infected and treated with different doses of plant extract. Albendazole was used for the comparison. According to result, there were decrease in the worm count in infected animals [26].

Antifertility activity:

Valsala S *et al* screened the antifertility activity of *Mimosa pudica* roots, they administered powdered roots intra-gastrically to female rats. It changed the oestrous cycle pattern. Root powder showed decrease in the number of normal ova and increment in degenerated ova [27].

Devi J. Yamuna performed the antifertility activity of *Mimosa pudica* leaves using different extracts. Experiments was performed on female rats. Alcoholic extracts gave 80% antifertility activity while the water and petroleum ether extracts gave only 40% activity [28].

Ganguli Mausumi *et al* conducted the antifertility activity of *Mimosa pudica* roots. Methanolic extract was prepared using Thin layer chromatography. The prepared extract was given to Albino mice for 21 days at 300mg/kg doses. After 21 days reproductive hormones, oestrous cycle and number of litters was reviewed. Root extract prolonged the oestrous cycle and distributed gonadotropin hormone secretion. So, there was protection in fertility [29].

Antidiabetic activity:

Sutar N. G *et al* performed the antidiabetic activity of *Mimosa pudica* leaves. Two extract petroleum ether and ethanolic extract were used. Diabetes in rats was induced through alloxan. The ethanolic extract controlled the blood glucose levels in rats [30].

Rajendiran Deepa *et al* checked out the antidiabetic action of alcoholic extract of *Mimosa pudica* leaves. Type-2 diabetes was induced by two methods either by giving high fat diet or through streptozotocin. According to the results ethanolic extract reduced the glycated haemoglobin levels, glycolytic enzymes and insulin secretion were increased which helped in inhibition of type-2 diabetes [31].

Yupparach Piyapong *et al* conducted the antidiabetic action of water and hydroalcoholic extract of *M. pudica* plant powder. Streptozotocin and sucrose solution were used to generate the diabetes in rats. Standard drug used was Glibenclamide. *Mimosa pudica* extract significantly lowered the fasting food sugar in rats [32].

Anti-malarial activity:

Aarathi N. *et al* performed the anti-malarial action of *Mimosa pudica* leaves. Ethanolic extract of leaves was used on mice infected with *Plasmodium berghei*. There was a decrease in the infection due to use of *Mimosa pudica* 's extract [33].

Hypolipidemic activity:

Sowmya A *et al* conducted the hypolipidemic activity of *Mimosa pudica* plant. They used the ethanolic extract. Hyper-lipidemic effects were induced by high fat diet. According to result, ethanolic extract reduced the parameters involved in lipid profile such as, cholesterol levels, low-density lipoprotein, triglycerides. The standard drug used for comparative study was lovastatin [34].

Rajendran Rekha *et al* evaluated lipid lowering action of *M. pudica*. Hypolipidemia was induced in Albino mice through atherogenic diets. Chloroform extracts showed best hypolipidemic activity, it reduced the triglyceride and cholesterol. Standard drug used was Atorvastatin [35].

Parasuraman Subramani *et al* investigated lipid lowering action of methanolic extract of *M. pudica*. Diabetes was induced using Streptozotocin in the Albino rats. Standard drug used was Glibenclamide. Methanolic

extract treated animal showed significant decrease in triglycerides, glucose level and low-density lipoprotein [36].

Anti-ulcer Activity:

Divya T. *et al* performed the anti-ulcer activity. Leaves and stem contain mimosine which is an alkaloid. They are used in piles, fistula. Indomethacin induced and pylorus ligation ulcer models were used in Albino rats. Omeprazole was the standard drug. Aqueous, methanolic extracts were tested for anti-ulcer activity, out of them methanolic extract showed the better anti-ulcer activity [37].

Vinothapooshan G. *et al* performed the activity against peptic ulcer. Chloroform, methanol and ether extracts of *Mimosa pudica* leaves were used on rats. Induction of ulcer was done by using aspirin pyloric ligation and alcohol. Standard drug used was Ranitidine. Methanol extract had significant activity due to presence of flavonoids in it [38].

Wound Healing Activity:

Kokane Dnyaneshwar D *et al* investigated wound healing action of roots of *M. pudica*. Aqueous and alcoholic extract were used. The extracts were converted into ointment base in concentration 0.5%, 1% and 2% (w/w). The excision about 2mm deep was incised on the back of the rat. Results showed that when the excision was treated with 2% ointment of both extracts, they had significant wound healing effect and a lower epithelization period. Gentamicin was the standard drug used in the research [39].

Kannan S *et al* conducted the healing action of shoot and root extracts of plant in male Wistar rats. Two types of ointment were prepared with methanol extracts, one from root and other from shoot. After giving anaesthesia, 5mm square excision was made at the back of the rat. The standard drug used was the Gentamicin ointment. The wound healing activity was recorded 93.87% from root and 93.78% from shoot ointment [40].

Paul Jejo *et al* evaluated the wound healing action of methanolic extract of root of *M. pudica*. Standard drug used was Aloe vera. Methanolic extract ointment was prepared at 5% concentration and chloroform extract ointment at 2.5% concentration. Incision, excision and burn wound models were used. Both the prepared formulation demonstrated decrease in period of epithelization compared to standard drug. Topical application also revealed the 50% reduction in concentration of wound. In burn model there was also significant improvement compared to standard drug [41].

Singh Manish Pal *et al* investigated the wound healing action of *Mimosa pudica* leaves. In it, two models were used which were burn and excision wound models. Two formulations of ethanolic extract with concentration 5% and 10% were used. Sprague Dawely rats were used for the experiment. The excision was made by electric clipper at the back of properly anesthetised animal. Rats were treated in two groups with ointment formulations of 5% and 10% w/w. After 11 days of treatment 10% w/w ointment exhibited significant improvement compare to 5% ointment. Mupirocin was the standard drug [42].

Diuretic and Laxative Activity:

Rajendran Rekha *et al* conducted the diuretic action of *Mimosa pudica* leaves. Methanolic extract was used. Furosemide was used as standard drug. Wistar rats and male Albino rats, both were used in the model. Methanolic extract was given in doses of 200 and 400 milligram per kilogram. urine collection was examined for total volume, Na⁺ and K⁺ concentrations. According to results, the extract had significant diuretic and laxative activity which was due to alkaloids, tannins, flavonoids and mucilage [43].

Vh Pushpa *et al* screened the diuretic action of roots of *M. pudica*. Alcoholic extract was used. Standard drug used was Furosemide. Extract was given in various doses (100, 200 and 400mg/kg), whereas Furosemide was given in the dose of 20mg/kg. urine samples of Albino rats were examined after 5 hours of administration of drug for the analysis of the electrolytes. According to results, extract had significant diuretic activity [44].

EV Aswini *et al* performed the diuretic action of roots of *M. pudica*. Alcoholic extract was used. The alcoholic extract was given in the doses of 100 and 200mg/kg. Furosemide was used as the standard drug and administered in the dose of 20mg/kg. The urine sample was collected and evaluated for total volume, Na⁺, K⁺ and chloride ions. Results showed that extract had significant diuretic activity [45].

CONCLUSION

The plant is very popular in different literatures and articles of 'Ayurveda', so it intuited the author to compile the available authentic data from different sources and after proper analyzation the above review was prepared. This review gives a short profile of *Mimosa pudica* plant. According to various studies and researches it can be concluded that there is vast medicinal potential in this plant. It has multiple biological and pharmacological activities. Different extracts of leaves and roots showed the maximum pharmacological activities. In developing countries natural sources like *Mimosa pudica* will be an economical option for quality medication due to its significant medicinal properties. More research is

needed to discover and determine the medicinal benefits of leaves, roots, stems, thorns and flowers that will benefit human life.

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