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Mimosa- A brief overview

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Abstract
The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. Mimosa pudica also been suggested to posses antinociceptive, antihyperglycemic, antivenom, immunomodulatory, anticonvulsant, antihepatotoxic, antifertility, diuretic and posses wound healing activity. These pharmacological studies have established a scientific basis for therapeutic uses of this plant. In this article attempts were made to review pharmacological, phytochemical and medicinal properties of plant *Mimosa pudica*.

Keywords: *Mimosa pudica*, pharmacological, phytochemical.

1. Introduction
Mimosa pudica is commonly known as *Lajjalu.* This plant usually grows as a weed in fields or is cultivated as a garden plant. *Lajjalu* consist of dried whole plant of *Mimosa pudica Linn. (Fam. Fabaceae).Mimosa pudica* is native to south and central America and is also cultivated in India [23]. *Mimosa pudica* is known as a sensitive plant due to rapid movement of leaves in response to physical and chemical stimuli. These movements are controlled by biological clock and are periodic (circadian rhythm) in nature, which are called as nyctinastic movements [1].Based on sensitivity on *Mimosa pudica*, Sanberg attempted to correlate animal system and neural capacity of plant. [2]
In Ayurveda, 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. According to Ayurveda Lajjalu has tikta and kashaya rasa i.e it is bitter and astringent taste.It has property of cold (sheetha), and balances kapha, pitta. It is reported to be useful in the treatment of diarrhea (athisaara) Amoebic dysentery (raktaatisaara), bleeding piles, and to arrests bleeding [24]. Literature survey reveals that various extracts of *Mimosa pudica* when subjected to pharmacological studies, were found to be effective as antinociceptive, hyperglycemic, antivenom, immunomodulatory, anticonvulsant, antihepatotoxic, antifertility, diuretic and posses wound healing activity [6-19]. Phytochemical studies of plant have revealed presence of alkaloids, flavonoids, glycosides, phenolics tannins and fixed oil [4, 5]

2. Synonyms
Sanskrit: Samanga, Varakranta, Namaskari
Assamese: Lajubilata, Adamalati
Bengali: Lajaka, Lajjavanti
English: Touch-me-not
Gujrati: Risamani, Lajavanti, Lajamani
Hindi: Chhuimui, Lajauni
Kannada: Muttidasenui, Machikegida, Lajjavati
Malayalam: Thotta Vati
Marathi: Lajalu
Oriya: Lajakuri
Punjabi: Lajan
Tamil: Thottavadi, Tottalchurungi
Telugu: Mudugudamara
Urdu: Chhuimui

Table 1: Classification for Down to Genus Mimosa L. - [3]

Sr. no.	Species-	common name
1.	*Mimosa aculeaticarpa* Mimosa ul Variety- *Mimosa aculeaticarpaortega* biuncifera Var. (Benth.) Barneby	Ortega, catclaw mimosa Variety- catclaw *Mimosa*
2.	*Mimosa arenosa* (Wild),	Poir,elegant *Mimosa*
3.	*Mimosa asperata* L.	sensitive briar
4.	*Mimosa borealis* A.	Gray,Fragrant *Mimosa*
5.	*Mimosa casta* L.	graceful *Mimosa*
6.	*Mimosa ceratonia* L.	black ambret
7.	*Mimosa d Mimosa diplotricha*	C. wright giant false sensitive plant
9.	*Mimosa dysocarpa* Benth	velvetpod *Mimosa*
10.	*Mimosa emoryana Benth*.,	Emory's *Mimosa*
11.	*Mimosa grahamii* A.Gray	Graham's *Mimosa*
12.	*Mimosa hystricina* (Small ex Britton & Rose) B.L. Turner	porcupine *Mimosa*
13.	*Mimosa Mi Mimosa latidens* (Small) B.L. Turner, briar	Kairn's sensitive-briar
14.	*Mimosa malacophylla* A. Gray,	Soft leaf *Mimosa*
15.	*Mimosa microphylla Dryand*.,	little eaf sensitive-briar
16.	*Mimosa nuttallii* (DC. ex Britton & Rose) B.L. Turner	Nuttall's sensitive-briar
17.	*Mimosa pellita* Kunth ex Willd., *Mimosa pudica* L., Variety- *Mimosa pudica* L.varpudica, *Mimosa pudica* L. var. Unijuga, (Duchass. & Walp.) Griseb.,shameplant *Mimosa quadrivalvis* L.,fourvalve mimosa*Mimosa* ", Mimosa quadrivalvis L.	lollipop *Mimosa* shameplant Urban's *Mimosa*
18.	*Mimosa roemeriana* Scheele,	Roemer's *Mimosa*
19.	*Mimosa rupertiana* B.L. Turner,	eastern sensitive plant
20.	*Mimosa schomburgkii* Benth,	Schomburgk's *Mimosa*
21.	*Mimosa strigillosa* Torr. & A. Gray,	powderpuff
22.	*Mimosa texana* (A. Gray) Small,	Texas *Mimosa*
23.	*Mimosa turneri* Barneby	Desert *Mimosa*

3. Botanical description of *Mimosa pudica*

Kingdom- "Plantae", "Plants"
Subkingdom -"Tracheobionta", "Vascular plants"
Super division- "Spermatophyta","
Division-"Magnoliophyta",""
Class- "Magnoliopsida", "Dicotyledons"
Subclass-"Rosidae"
Order-"Fabales"
Family-Fabaceae
Genus-"*Mimosa L.*","sensitive plant"

Table 2: Morphological description of *M. pudica*- [4, 10, 22]

Plant parts	Description
Branches	Short prickly branches with glandular hairs
Leaves	Bipinnate, sensitive to touch
Flowers	Axillary, globose head, lilac pink in colour
Stem	Erect, slender, prickly and well branched
Calyx	Companulate
Petals	Petals crenate towards base
Pods	1.5 to 2.5 cm long, Closely prickly on the sutures and falcate

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 0.3m. The stem of mimosa is erect, slender, prickly and well branched. Leaves are bipinnate, 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.

Table 3: Phytochemical constituents in *Mimosa pudica* oil- [4] [5]

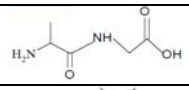
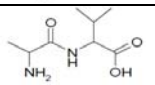
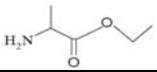
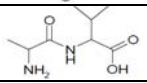
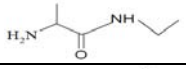
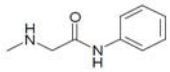
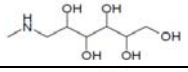
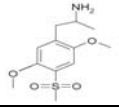
	Compound name	Structure
1.	**Amino acid derivatives**	
	N-dl-Alanylglycine, (C5H10N2O3)	
	dl-Alanyl-dl-Valine, (C8H16N2O3)	
	d-Alanin, (C3H7NO2)	
	dl-Alanin ethyl ester, (C5H11NO2)	
	dl-Alanyl-dl-Valine, (C8H16N2O3)	
	1-Alanine ethyl amide (C5H12N2O)	
	2-methylamino-N- phenyl-acetamide, (C9H12N2O)	
2.	**Carbohydrates**	
	Meglumine, (C7H17NO5)	
	5-Dimethoxy-(methylsulphonyl) amphetamines, (C12H19NO4S)	
3.	**Fatty acid derivatives**-	
	1)9, 12-Octadecadienoic acid (Z, Z), methyl ester	(C19H34O2)
	2) 12-Octadecadienoic acid,methyl ester	(C19H34O2)
	3) 13-Eicosadienoic acid, methyl ester	(C21H38O2).

Table 4: Flavonoid glycosides-

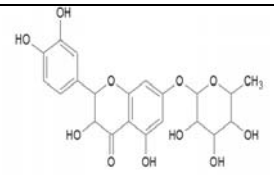
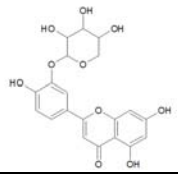
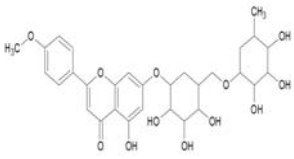
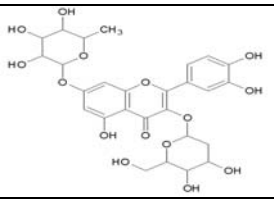
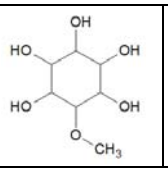
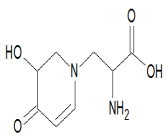
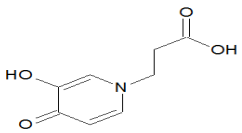
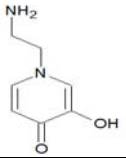
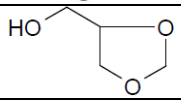
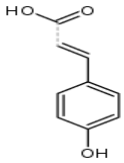
Compound name	Structure
Quercetin-7-rhamnoside	
Luteolin 3_-x Leutolin-3xyloside	
Acacetin-7-rutinoside	
Quercetin-3glucoside-7-rhmnoside	

Table 5: Chemical constituents present in leaves-

Miscellaneous	
D-Pinitol and L-Mimosine	 
Mimosainic acid	
Mimosinamine	
In the oil of whole plant, 1, 3-Dioxolane-4-methanol, (C4H8O3) In the oil of p	
P-coumaric acid	

4. Phytochemistry - [4, 5]

Various studies have been performed to elucidate the phytoconstituents present in plant one of study with GC-MS. In GC-MS studies of *Mimosa pudica* oil esterification was performed so as to break complex fatty acid chains present in oil. This made identification and charterisation of long chain molecule easier. In this study compounds observed to be present are amino acid derivatives like, N-dl-Alanylglycine,($C_5H_{10}N_2O_3$),which resembling to structures of alanine and glycine Fatty acid such as eicosadienoic acid found to be present in plant 2-methylamino-N- phenyl-acetamide (C9H12N2O), derivative of carbohydrate such as Meglumine, (C7H17NO5),5-Dimethoxy-4-(methylsulphonyl) amphetamine, (C12H19NO4S) were also found to be present. In oil of whole plant 1, 3-Dioxolane-4-methanol, (C4H8O3) was also found. Chemical constituents present in leaves of plant includes mimosinic acid and mimosa mine, toxic alkaloid like L-mimosine and inositol derivative d-pinitol. It has been reported that Phenolic compound. P-coumaric acid and its derivatives are also found to be present in plant which acts as leaf opening substances in *Mimosa pudica*.Flavanoids present in *Mimosa pudica* leaves are 5-deoxyflavonol derivatives [5]. High concentration of volatile flavonoid derivatives such as kaempferol 3-rutinoside, Leutolin-3-xyloside, Acacetin-7-rutinoside and nonvolatile flavonoide glycosides such as like Quercetin-7-rhmnoside, Quercetin-3 glucoside-7-rhmnoside are also found to be present in the plant [5].

5. Pharmacological effects -

1. Antinociceptive Activity- It was reported that antinociceptive activity of methanolic extract of *Mimosa pudica* was studied using acetic acid-induced writhing model in rats. Writhing test is a chemical method used to induce pain. Pain is induced by injection of irritants into the peritoneal cavity of mice. The animals react with a characteristic stretching behavior which is called writhing.

Extract of *Mimosa pudica* was found to produce significant inhibition of writhing due to acetic acid at doses 200 and 400 mg/ kg (route).In study conducted for evaluation of analgesic effect of *Mimosa pudica* extract significant inhibition of writhing due to acetic acid was observed at 200 and 400 mg/kg doses and dose dependant increase in latency period was reported when plant was tested using hot plate method [6].

2. Anthelminthic activity- It was reported that helminthes infections, repeatedly entitled helminthiasis are among the most pervasive infection and a foremost degenerative disease distressing a large proportion of world's population. In developing countries, they pose a large threat to public health and contribute to the prevalence of malnutrition, anemia, eosinophilia and pneumonia. The helminthes parasites mainly subsist in human body in intestinal tract. Development of resistance in helminthes against conventional anthelmintics is a foremost problem in treatment of helminthes diseases. Hence medicinal plants were screened for their anthelmintic activity. Anthelminthic activity has been reported for seeds of. *M pudica*. In a study undertaken for evaluation of anthelmintic activity, different successive extracts namely petroleum ether, ethanol and water using *Pheretima posthuma* as a test worm to the different concentrations (100, 200, 500mg/kg) were tested for bioassay which involved determination of paralysis and time of death of the worms, however, Petroleum Ether was reported to have weak anthelminthic activity as compared to other two extracts [11].

3. Antifertility activity- It has been reported that daily administration of *M. pudica* root extract, at a dose of 300 mg/kg p.o, was found to prolong the length of the estrous cycle with significant increase in the duration of the diestrous phase and also reduced the number of litters in albino mice. Root extract was also found to alter gonadotropin release and estradiol secretion which are the, hormones involved in regulation of estrous cycle [12].

4. Diuretic activity-It was reported that the Lipschitz test was employed for assessment of diuretic activity of petroleum ether, ethanolic and aqueous extracts of *Mimsoa pudica* was based on water and sodium excretion in test animals and compared to rats treated with a high dose of urea. The "Lipschitz- value" is the quotient between excretion by test animals and excretion by the urea control. The ethanolic and aqueous extract of Plant was reported to be tested for evaluation of diuretic activity by using Furosemide (20 mg/kg) as standard. Among the two extracts ethanolic extract was reported to produce significant diuretic activity at doses of 100 and 200 mg/kg. Extract caused increase in total urine volume and ion concentration of Na+, Cl-, k+. at these doses [13].

5. Immuno modulatory activity- The concept of immunomodulation relates to nonspecific activation of the function and efficiency of macrophages, granulocytes, complement, natural killer cells and lymphocytes and also to the production of various effector molecules generated by activated cells. It is expected that theses nonspecific effects give protection against different pathogens including bacteria, viruses, fungi. Immune functions are indispensable for defending the body against attack by pathogens or cancer cells, and thus play a pivotal role in the maintenance of health. However, the immune functions are disturbed by malnutrition, aging, physical and mental stress or undesirable lifestyle immuno modulatory effect is associated with compounds capable of modifying or regulating immune function. The Immuno modulatory effect of plant is reported for alcoholic extract of the various aerial parts of *Mimosa pudica*. The assessment of immuno modulatory activity was carried out by various hematological and serological test. Further, immuno modulatory activity was studied by Cell Mediated Immune Response (CMIR) measured by delayed type of hypersensitivity reaction to SRBC and humoral immune response (HIR) was measured by hemagglutination antibody titer. The alcoholic extract was reported to be significantly enhancing humoral as well as cell mediated response thus indicating the Immuno modulatory potential of *Mimosa pudica* (Linn) [14].

6. Antivenom activity- It was reported that about 0.13 mg and 0.17 mg of aqueous extracts of plant *Mimosa pudica* were able to significantly inhibit lethality, phospholipase activity, edema forming activity and hemorrhagic activity of Russell's viper and Saw scaled viper. In edema forming activity it was reported that the minimum edema-forming dose MED was defined as the least amount of venom which when injected subcutaneously into mice footpad results in 30% edema within 6 hours of venom injection and &50µl of *Mimosa pudica* extract was injected via s.c route. In haemorrhagic activity it was reported that the minimum haemorrhagic dose was defined as the least amount of venom which when injected intradermally (i.d.) into mice results in a haemorrhagic lesion of 10mm diameter in 24 hours while the haemorrhagic activity was estimated by mixing venom –plant extract and 0.1 ml of the mixture was injected intradermally into mice. It was reported that phospholipase activity phospholipase A2 activity was measured using an indirect hemolytic assay on agarose–erythrocyte–egg yolk gel plate method &the efficacy of *Mimosa pudica* aqueous extract in neutralizing the phospholipase activity was carried out by mixing constant amount of venom (µg) with different amount of plant extract (µl) and incubated for 30 minutes at 37°C & neutralization was expressed as the ratio mg antibodies/mg venom able to reduce by 50% the diameter of the hemolytic halo when compared to the effect induced by venom alone. The aqueous extract of roots of *Mimosa pudica is reported to* dose dependently inhibit the hyaluronidase and protease activities of Indian snakes (*Naja naja*, *Vipera russelii* and *Echis carinatus*) venom [15].

It has been reported that *Mimosa pudica* root extract was significantly inhibit lethality, phospholipase activity, edema forming activity and hemorrhagic activity of Russell's viper and Saw scaled viper
venoms [7].

7. Anticonvulsant activity - Epilepsy is a major neurological disorder and up to 5% of the world population develops epilepsy in their life time. The current therapy of epilepsy with modern antiepileptic drugs is associated with side effects, dose-related and chronic toxicity, as well as teratogenic effects, and approximately 30% of the patients continue to have seizures with current antiepileptic drugs therapy. Traditional systems of medicine are popular in developing countries and up to 80% of the population relies on traditional medicines or folk remedies for their primary health care need. Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effect. The electroshock assay in mice is used primarily as an indication for compounds which are effective in grand mal epilepsy. Tonic hind limb extensions are evoked by electric stimuli which are suppressed by anti-epileptics but also by other centrally active drugs. It has been reported that ethanolic extract of *Mimosa pudica* exhibit significant protection against tonic seizures in dose dependant manner, and maximum effect was observed at 200mg/kg p.o [16].

In another study it has been reported that decoction of leaves of *Mimosa pudica* when injected i.p at dose of 1000–4000 mg/kg protected mice against pentylentetrazol and strychnine-induced seizures [16] [17].

8. Anti-hepatotoxic activity- *Mimosa pudica* leaves are reported to possess hepatoprotective activity in a study involving 14 days administration of ethanolic extract to leaves at dose 200mg/kg p.o.to wistar rats treated with CCl4. In this study elevated levels of serum SGOT, SGPT, ALP and total bilirubin, due to CCl4 treatment, were found to be restored towards near normal on treatment with *M. Pudica*. Reduced enzymatic and non-enzymatic antioxidant levels and elevated lipid peroxide levels were also found to be restored towards

near normal. This study thus revealed the hepato protective effect of plant due to antioxidant properties. [22].

9. Wound healing activity - The wound is defined as a loss or breaking of cellular and anatomic or functional continuity of living tissues. Healing of wound is a biological process that is initiated by trauma and often terminated by scar formation. Screening for wound healing activity was reported to be performed by using excision and incision wound models which reveals that *Mimosa pudica* chloroform extract posses significant wound healing at dose of 200mg/kg in 5% ointment of leaf extract [18].

10. Hyperglycemic activity- Hyperglycemia may be described as an excess of sugar (glucose) in the blood. Endocrine system regulates the amount of sugar that is stored and used for energy. Ethanolic extract of *Mimosa pudic*a leaves given by oral route to mice at a dose of 250 mg/kg was significant hyperglycemic effect by measuring serum glucose levels [19]. D-pinitol, is reported to be found only in leaves of *Mimosa pudica* was found to exert anti hyperglycemic effect in Type-I diabetes and is also reported to reduces the plasma free fatty acid levels.in type-1diabetes and hence can be used in treatment of other metabolic disorders [20].

11. CNS depressant activity-The open field test (OFT) is a commonly used for measure of general locomotor activity and also to assess anxiety, depression. In addition, repeated exposure or extended session length provides a method for assessing habituation to the increasingly familiar chamber environment. It has been suggested that two factors influence anxiety-like behavior in the open field. The first is social isolation resulting from the physical separation from cage mates when performing the test. The second is the stress created by the novel test environment by using open field test and hole cross test it has been reported that, number of movements of animals and number of passage from chamber were significantly decreased in dose dependant manner at doses of 100 mg/kg and 200 mg/kg p.o [8].

12. Depilatory effect- Toxic alkaloid, such as L-mimosine is reported to be present in higher proportion in leaves than bark and roots of plant and is also responsible for depilatory effect & it was reported that depilatory activity of mimosine noted during the 1st hair growth cycle of the mouse at the dose of 10µl which was injected via s.c route causes significant loss of hairs from body surface. It was reported that mimosine bears a structural resemblance to L-tyrosine & mimosine probably acts as a tyrosine analogue or tyrosine antagonist which inhibits protein biosynthesis in the living body and causes toxic symptoms including retardations of growth. It was reported that in rats, growth inhibition caused by mimosine also the metal chelating power of mimosine could possibly disturb the action of metal containing enzymes, especially those containing iron cations [9].

13. Toxicity studies

It has been reported that aqueous extract of MP was tested for acute toxicity studies it was not found to produce any delirious symptoms and thus plant was found to be safe even at dose 2000mg/kg p.o [6].

6. Conclusion

From above discussion we can conclude that the *Mimosa pudica* plant shows various pharmacological and biological activities with different aspect of treating the diseases and disorders with help of herbal therapy using above plant also indicating the least adverse reactions as the benefit of natural therapy Herbal therapies applied worldwide to reduce adverse drug reaction, improve patient compliance, improve quality of life, and also enables its use in future research for treating different medical conditions.

7. References

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