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Review Paper

A Review: on Cardiovascular Effects of Mimosa Pudica

Sumit Rahangdale*, Hitashi Randive, Dhammadip Nandgaye, Chandrashekhar Badwaik, Upadesh Lade, Pavan Bisen, Vivek katre

Chhatrapati Shivaji College of Pharmacy, Deori (441901)

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ABSTRACT

Hypertension is a leading cause of morbidity and mortality, particularly in developing countries, where poor dietary habits and sedentary lifestyles prevail. This study investigates the antihypertensive potential of Mimosa pudica L. through in-vitro, in-vivo, and in-silico approaches. Methanolic leaf extract was analyzed using Gas Chromatography-Mass Spectrometry (GC-MS), revealing seven phytochemicals, with 9,12-octadecadienoic acid as the major component. In-vitro ACE inhibition using zebrafish eye homogenates showed significant enzyme inhibition at 40 mg/mL (50.92%) and 60 mg/mL (63.88%) concentrations. In-vivo tests on zebrafish embryos indicated a reduction in heart rate upon treatment, supporting the extract's blood pressure-lowering effect. Molecular docking further confirmed strong binding affinity of 9,12-octadecadienoic acid with ACE (-6.6 kcal/mol). These findings suggest that Mimosa pudica possesses promising ACE inhibitory activity and could serve as a natural source for antihypertensive drug development.

INTRODUCTION

Because of bad eating and lifestyle choices, hypertension is becoming a bigger problem in developing nations. According to the World Health Organization, high blood pressure is According to the World Health Organization (WHO), obesity is a leading cause of morbidity and mortality, contributing to approximately one million deaths globally each year. High blood pressure (BP) is the clinical definition of hypertension. The force that blood flow exerts against blood vessel walls is known as blood pressure, and its strength is determined by cardiac output and blood vessel resistance. [1] An increase in blood pressure is linked to a number of risk factors, primarily cardiovascular diseases, which raise mortality rates. [2]

***Corresponding Author:** Sumit Rahangdale
Address: *Chhatrapati Shivaji College of Pharmacy, Deori (441901)*
Email ✉: rahangdalesumit760@gmail.com
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Fig No.01. Mimosa Pudica Plant

Many of such Angiotensin converting enzyme (ACE) inhibitors a recurrently used for treating primary hypertension. ACE inhibitors inhibit the conversion of angiotensin I to angiotensin II, while renin blocks enzymatic action of renin, the conversion of angiotensinogen to angiotensin I. [3] The perennial herb Mimosa pudica L. is a member of the Mimosaceae family. Terpenoids, tannins, alkaloids, sterols, and fatty acids are among the phytochemical compounds that have been isolated from M. pudica and reported. [4-5] Mimosa pudica is said to have antidepressant, anticonvulsant, hyperglycemic, and anti-implantation properties. [6–7] Moreover, plant extracts were the source of many western medications. Numerous herbs are primarily used to treat disorders of the central nervous system, liver, heart, digestive system, and metabolism.

Synonym: -

Chui mui, Najuk, Lajawanti, Sensitive plant, Touch-shy plant, Varakranta, Vashini, Lajjabate. Mimosa pudica is a small or middle-sized tree, about 1.5 m (5 ft) in height cultivated throughout India. It is a multipurpose tree, used as vegetable, spice, a source of cooking and cosmetic oil and as a medicinal plant. It is known as Sensitive plant in English, Ajalikalika in Sanskrit, Lajawanti in Hindi, Lajjabate in Bangali, Hadergitte in Kannada, Kasirottam in Tamil and Manugumaramu in Telegu.

METHODS AND MATERIALS: -

1. Gathering of Plant Materials: -

Plant material was gathered in the Indian region of Chamarajpet. After being properly cleaned with running water, the plant leaves were allowed to air dry. later dried for 24 hours in an oven. A mechanical blender was used to coarsely ground the plant material. Soxhlet Extraction: The Soxhlet extraction method was applied to the homogenized plant material. [8] After filling the thimble with plant material, it was loaded onto a Soxhlet extractor that was set on a heating element, and a reflux condenser was positioned on top of the flask. The refluxed vapor moves to the distillation arm and floods the thimble as the solvent in the distillation flask heats up. A fraction of the non-volatile component dissolves in the solvent at the end of each cycle. The target compound was concentrated in the receiving flask after numerous cycles.

2. Gas Chromatography Mass Spectrometry (GC-MS) Analysis: -

The GC-MS analysis of leaf methanol extract of Mimosa pudica was performed to identify

different phytochemicals present in the extract. Oven temperature was maintained at 60°C and injection temperature was 260°C with split mode of injection and liner velocity flow control. 57.4 kpa pressure was adjusted for GC that provides the column flow of 1.0 ml/min and linear velocity of 36.5 cm/sec, with a distinct flow of 3.0 ml/min. and split ratio was 10.0.

Peak	Retention Time	I. Time	F. Time	Peak Area	Area%	Compound
1	8.882	8.858	8.925	160364	6.47	Alanyl glycine
2	11.707	11.642	11.767	277541	11.20	Alanyl valine
3	13.047	13.000	13.067	162435	6.56	Alanin ethyl ester
4	13.290	13.258	13.325	82868	3.35	N-methyloctylamine
5	14.210	14.167	14.242	110018	4.44	Phytol
6	14.319	14.242	14.458	1612785	65.10	9,12-Octadecadienoic acid
7	15.571	15.542	15.625	71344	2.88	13-Eicosdienoic acid methyl ester

3. Identification of Compounds: -

Phytochemical compounds present in plant extract of Mimosa pudica was identified by matching peaks obtained in the chromatogram with Wiley MS Libraries and confirmed by matching mass spectra of peaks with available online literature. [9]

4. Animals Used in Experiments: -

The adult zebra fish were kept in glass tanks at 28°C with adequate aeration after being obtained from a nearby aquarium. The zebra fish were exposed to fed until sanitation and exposed to both light and dark photoperiods. Individual embryos were gathered, raised in sterile 50 ml petri dishes, and maintained at 28°C in an incubator. At regular intervals, the water was changed and dead embryos were removed. [9]

5. IN-Vitro Isolation Of ACE: -

Adult zebra fish eyeballs were dissected, homogenized with 10 volumes of 10 mM Tris-HCl buffer at 4°C (pH 8.2), then centrifuged for 7 minutes at 4°C at 5000 rpm in order to isolate ACE in vitro. Two litters of 10 mM buffer were added to the supernatant, and it was centrifuged for ten minutes at 5000 rpm. After dialyzing, the supernatant was kept at 4°C for.

6. ACE inhibition test: -

The ability of Mimosa pudica methanol extract to suppress ACE activity was examined. The experiment was conducted in accordance with the With additional adjustments, the procedure by [9] uses a 0.5 ml reaction mixture with 300 µmol NaCl, 3 mM HCl in 40 µmol, and phosphate buffer at pH 8.3. After 30 minutes of room temperature incubation, the mixture was placed in a boiling water bath for 10 minutes. Three millilitres of 0.2 M phosphate buffer (pH 8.3) were added to the same reaction mixture. After vigorously stirring the mixture until the turbidity become transparent,

it was centrifuged for ten minutes at 1000 rpm. Methanol extract from Mimosa pudica leaves (20, 40, and 60 mg/ml) was added to the enzyme reaction mixture, and it was then incubated for 10 minutes. Afterward, to

7. ACE Inhibition Screening in Vivo: -

Zebra fish embryos were used for the in-vivo screening of ACE inhibition. Embryos in the treatment group were cultured in 50ml of petri dishes containing 30 millilitres of Mimosa pudica methanol extract at three distinct concentrations (20, 40, and 60 mg/ml), whereas the embryos in the control group remained untreated. After 72 hours of incubation, the embryos were examined under a microscope to assess their heart rates every minute for up to 30 minutes.

8. ACE Inhibitor Screening in-silico: -

Autodock 4.0[10] was used to conduct in-silico molecular docking investigations on ACE enzyme and phytochemical compounds found from Mimosa pudica methanol extract.

9. Ligand Preparation: -

GC-MS study of a methanol extract of Mimosa pudica revealed phytochemical components that were utilized for molecular docking. research. The National Center for Biotechnology Information's PubChem database (https://pubchem.ncbi.nlm.nih.gov/) [9] provided the SDF files of the discovered compounds. The web MS tool Open Babel was used to further convert the compounds to pdb.file format after they were further created using MarvinSketch (www.chemaxon.com) [11].

10. Making Proteins: -

All heteroatoms were eliminated from the human angiotensin converting enzyme's pdb structure, which was retrieved from the Protein Data Bank. PDB flatfile. Additionally, SPDBViewer was used to add the C-terminal oxygen to the protein structure with heteroatoms.

Fig No.02. Mimosa Pudica Plant

Traditional Uses of Mimosa Pudica: -

- Ayurveda has pronounced that its root is sharp, harsh, cooling, vulnerary, alexipharmic, and utilized within the treatment of sickness, diarrhoea, vaginal and uterine complaints, inflammations, burning sensation, asthma, leukoderma, and weariness and blood maladies.

- Unani Healthcare Framework its root is resolvent, alternative, and valuable within the treatment of maladies emerging from blood debasements and bile, bilious fevers, heaps, jaundice, and sickness etc.
- Decoction of root is utilized with water to swish to decrease toothache. It is exceptionally valuable in loose bowels (athisaara), amoebic loose bowels (raktaatisaara), dying heaps and urinary diseases. It captures dying and affixes the wound mending prepare.
- It is basically utilized in home grown arrangements for gynaecological disarranges. It has been said to have therapeutic properties to remedy skin infections. It is additionally utilized in conditions like bronchitis, common shortcoming and feebleness.
- It is additionally utilized to treat neurological problems. The substance of M. pudica contains a capacity of capturing dying and it affixes the method of mending of wounds. It is prescribed in the runs, amoebic loose bowels and dying heaps. It is additionally utilized in home grown arrangements of gynaecological disarranges. Its extricate can remedy skin maladies.
- A few home-grown specialists suggest it for bronchitis, general shortcoming and weakness. All the five parts of the plant clears out, blooms, stems, roots, and natural products are utilized as solutions within the conventional healthcare frameworks. In India, diverse parts of the plant have been in prevalent utilize for treating different sicknesses since long.
- Later inquiries about appear that the extricate of this plant can be utilized for checking child birth. A few creators have detailed that this herb can supplant prophylactic pills in the event that inquiries about are done legitimately.
- Agreeing to distinctive investigates done so distant, Mimosa tenuiflora bark is utilized to unwind the intellect, and calm sadness, mental trouble, fractiousness, extreme palpitations, and amnesia. It could be a disposition enhancer and makes strides circulation of the blood.
- A few accept Mimosa can decrease the onset of hair loss. Due to its capacity to advance solid cell development, Tepezcohuite is utilized in shampoos, creams, capsules, and cleansers. In Ayurvedic and Unani medication, Mimosa pudica root is utilized to treat bilious fevers, heaps, jaundice, sickness, loose bowels, vaginal and uterine complaints, inflammations, burning sensation, weariness, asthma, leucoderma, and blood infections.
- In Western pharmaceutical, Mimosa root is utilized for treating a sleeping disorder, fractiousness, premenstrual disorder (PMS), menorrhagia, hemorrhoids, skin wounds, and loose bowels. . It is moreover utilized to treat whooping hack and fevers in children, and there's a few prove to propose that Mimosa is successful in calming the indications of rheumatoid joint pain.
- All parts of the Mimosa plant are allegedly harmful in the event that taken specifically. Its utilization isn't suggested to pregnant or nursing women.
- Due to these reports, it seems to be best allude to">to allude to a doctor some time recently utilizing Mimosa inside. Investigates with respect to security in youthful children or those with serious liver or kidney infection have not been found. [12]

Cardiovascular Effects of Mimosa Pudica [13]:

Table No.01. Cardiovascular Effects of Mimosa Pudica

Formulation Type	Preparation Method	Use in Cardiovascular Research	Dosage (in animal studies)
Chloroform Leaf Extract	Leaves are dried, powdered, and extracted with chloroform	Hypolipidemic and anti-atherosclerotic effect	200–400 mg/kg orally
Ethanolic Leaf Extract	Leaves extracted with ethanol using Soxhlet or maceration	Hypolipidemic, antioxidant, hepato-renal protective effect	200–500 mg/kg orally
Hydroalcoholic Extract	Ethanol:Water (70:30 or 50:50) extraction	Antioxidant and vasoprotective potential	~200 mg/kg
Aqueous Extract	Boiling or cold maceration in distilled water	Mild hypotensive and cardioprotective effects	Less potent, 100–300 mg/kg

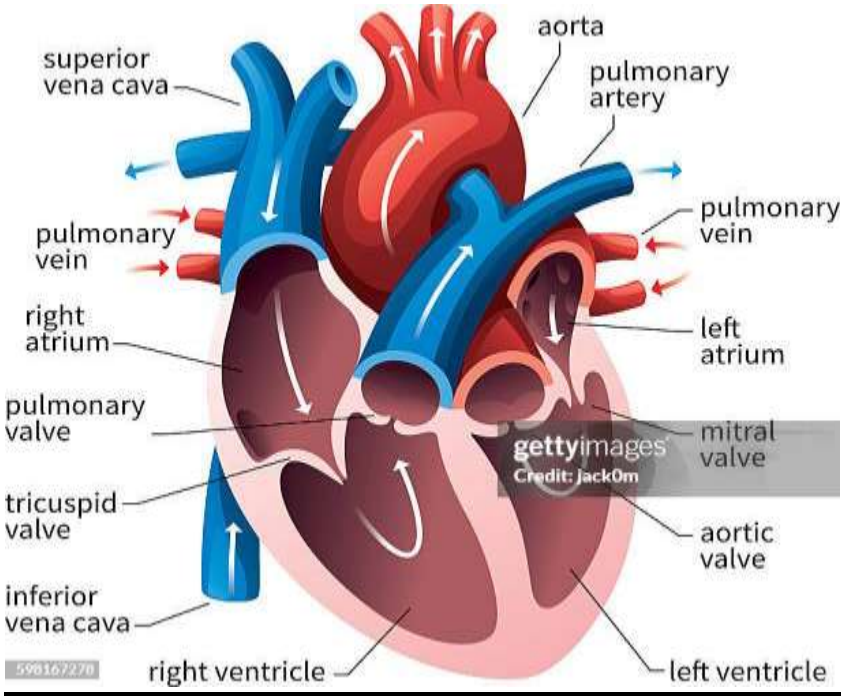

Fig No. 03. Heart

PATHOGENESIS:

Liver injury resulting from alcohol intake may arise from oxygen radicals like superoxide and hydroxyl radicals produced during the metabolism of ethanol by the microsomal oxidizing system. [14] Despite significant scientific progress in hepatology recently, liver issues are increasing. Sure! Please provide the text you would like me to paraphrase. Consumed alcohol causes significant metabolic disruptions in the liver and results in the generation of reactive oxygen species [15] and an increase in free radicals [16]. Medicinal plants are viewed as a significant source of antioxidant compounds, and the healing advantages of numerous medicinal plants are frequently linked to their antioxidant characteristics [17]. Mimosa pudica is a yearly shrub that can be found across India. The stem and rachis are covered with prickles that originate from bulbous bases. Earlier research has demonstrated that Mimosa pudica

alleviates congestion with phlegm, biliousness, leucoderma, and blood disorders [18]. The current research examines Mimosa pudica utilized in herbal medicine for its ability to scavenge free radicals, which may be regarded as effective means for addressing oxidative liver damage [19]. Despite several reports highlighting the usefulness of this herb for different disorders, no studies have been released so far detailing its positive effects against ethanol-induced liver toxicity in rats. In this research, the level of liver damage was evaluated by analyzing the hepatic antioxidant profile through the quantification of SOD, GSH, CAT, reduced glutathione, vitamin C, and TBARS indicated as malondialdehyde equivalents.

Pharmacological Activity: -

1]. 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. [20]

2]. Anticonvulsant:

A decoction of M. pudica leaves was administered intraperitoneally at doses ranging from 1000 to 4000 mg/kg, which provided protection to mice against seizures induced by pentylentetrazol and strychnine. However, M. pudica did not have any effect on seizures caused by picrotoxin. Additionally, it countered the turning behavior induced by N-methyl-D-aspartate. [21]

3]. Antioxidant Activity

The methanol crude extract from the aerial parts of M. pudica was evaluated in vitro for its antioxidant properties using the DPPH free radical scavenging assay. The extract demonstrated moderate antioxidant activity with an IC50 of 296.92 µg/ml, in comparison to ascorbic acid, which had an IC50 of 131.29 µg/ml. This indicates that the methanolic extract of M. pudica contains biologically active compounds. [22]

4]. 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 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 antidiarrhoeal property may be related to the tannin and flavonoids present in the extract. [23]

5]. wound healing activity:

The M. pudica shoot methanolic extricate M. pudica root methanolic **extricate appeard exceptionally great** wound mending action. the methanolic **extricate shown great wound mending action likely** due ti nearness of phenols constituents

Etiology Of Cardiovascular Diseases (CVDS) [24]

1. Atherosclerosis

- A major cause of many CVDs, especially **coronary artery disease**, **stroke**, and **peripheral artery disease**.

- Involves the buildup of **plaque** (cholesterol, fatty substances, calcium) in the arterial walls, leading to narrowing and hardening of arteries.

2. Hypertension (High Blood Pressure)

- Damages blood vessel walls and increases the workload on the heart.
- Major risk factor for **heart failure**, **stroke**, **renal disease**, and **atherosclerosis**.

3. Dyslipidemia

- Abnormal levels of lipids in the blood (e.g., high LDL, low HDL, high triglycerides).
- Contributes to plaque formation in arteries.

4. Diabetes Mellitus

- Causes damage to blood vessels and accelerates atherosclerosis.
- Increases risk for CAD, stroke, and peripheral artery disease.

5. Lifestyle Factors

- **Poor diet**: High in saturated fats, trans fats, sugar, and sodium.
- **Physical inactivity**: Contributes to obesity, hypertension, and diabetes.
- **Smoking**: Damages endothelial lining of arteries, promotes thrombosis and atherosclerosis.
- **Excessive alcohol**: Can raise blood pressure and lead to heart failure or arrhythmias.

6. Obesity and Metabolic Syndrome

- Excess body fat, particularly abdominal fat, increases the risk of CVD through insulin resistance, dyslipidemia, and hypertension.

7. Genetics and Family History

- Genetic predisposition can influence lipid metabolism, blood pressure regulation, and structural heart conditions.

8. Age and Sex

- Risk increases with **age**.
- Men generally at higher risk earlier in life, though postmenopausal women's risk increases significantly.

9. Inflammatory and Autoimmune Diseases

- Conditions like **rheumatoid arthritis** and **lupus** are associated with chronic inflammation, which can damage blood vessels.
- **10. Infections and Other Conditions**
- Certain infections (e.g., **Chlamydia pneumoniae**) and diseases like **chronic kidney disease** can contribute to CVD risk\

RESULT: -

- **GC-MS Analysis: -** A methanol extract of Mimosa pudica was analysed using GC-MS, revealing seven compounds, including phytol and 9,12 octadecadienoic acid. The highest peak area was 65.1% for 9,12 octadecadienoic acid.

- **ACE Inhibition In Vitro: -** The methanol extract inhibited the ACE enzyme from zebrafish eyes. At concentrations of 40 and 60 mg/ml, inhibition was 50.92% and 63.88%, respectively.

- **ACE Inhibition In Vivo: -** In zebrafish embryos, heart rate was reduced when treated with M. pudica extract. The control group had a heart rate of 129.33 bpm, while the treated groups showed lower rates, indicating potential blood pressure-lowering effects.

- **In-Silico ACE Inhibition: -** Docking studies showed 9,12 octadecadienoic acid had the strongest binding with ACE (-6.6 kcal/mol), suggesting its potential as an antihypertensive agent.

DISCUSSION:

The current tests were conducted to evaluate the hypolipidemic activity and to support its use in folkloric medicine against a variety of illnesses. Probucol, a hypolipidemic medication, is a powerful lipophilic antioxidant. known for its potential to suppress atherosclerosis [25]. Probucol decreases cholesterol levels in the blood by boosting the rate of LDL breakdown. Furthermore, probucol may block cholesterol production and slow cholesterol absorption. Probucol is a potent antioxidant that inhibits cholesterol oxidation in LDLs, slowing the production of foam cells, which contribute to atherosclerotic plaques. Similarly, flavonoids contained in the plant Mimosa pudica may be responsible for its hypolipidemic action, and as previously observed, the substantial antioxidant activity of chloroform extract indicates its significant hypolipidemic activity. [26] It is well understood that LDL plays a significant role in arteriosclerosis, and that hypercholesterolemia is associated with a problem involving the absence of LDL receptors. The decrease in cholesterol and LDL levels achieved by administering chloroform extract suggests a potential protective mechanism against hypercholesterolemia and the harm it causes. Previous research on several plant extracts may have validated the observed hypolipidemic action [27-28].

CONCLUSION: -

This comprehensive study demonstrates the antihypertensive potential of *Mimosa pudica* L. through integrated in-vitro, in-vivo, and in-silico approaches. The methanolic extract of the plant leaves revealed seven bioactive compounds via GC-MS analysis, with 9,12-octadecadienoic acid being the most abundant and pharmacologically relevant. The extract showed significant ACE inhibition in vitro using zebrafish eye homogenates and reduced heart rate in vivo in zebrafish embryos, indicating a notable blood pressure-lowering effect. In-silico molecular docking further validated the strong binding affinity of 9,12-octadecadienoic acid with the ACE enzyme, reinforcing its therapeutic potential. Moreover, the traditional uses and phytochemical profile of *Mimosa pudica* suggest a wide spectrum of medicinal applications, including hypolipidemic and antioxidant activities, which could play a secondary role in managing hypertension-related complications like atherosclerosis. In conclusion, *Mimosa pudica* exhibits promising ACE inhibitory properties and holds potential as a natural source for the development of antihypertensive agents. However, further pharmacological evaluations, toxicity studies, and clinical trials are necessary to validate its efficacy and safety for human use. Its multifaceted bioactivity also makes it a valuable candidate for broader cardiovascular and metabolic disease research.

ABBREVIATIONS: -

a) GC-MS: Gas chromatography and mass spectrometry.

b) ACE: Angiotensin converting enzyme.

c) FTIR: Fourier transform infrared spectrometry.

d) HPLC: High performance liquid chromatography.

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