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A Comprehensive Review on the Ethno pharmacological Potential of mimosa Pudica

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ABSTRACT: Medicinal plants obtained from natural sources have become the basis for pharmaceutical drugs. Nowadays,traditional herbal medicines are used for treatment and cure of various diseases.Mimosa pudica is one of the most recognized plant belonging to the family Fabaceae. Originally, the plant is native to South America and Central America but nowadays it has been introduced to other regions too. The plant is commonly known as touch-me-not or sensitive plant due to its nyctinastic movements. These movements have attracted researchers globally for further in-depth exploration of this plants. The most notable alkaloid in Mimosa pudica is mimosine, recognized for its anti-proliferative, anti-inflammatory, anti-diabetic, anti-asthmatic, anti-ulcer,wound healing properties.This paper is an attempt to explore and compile different pharmacognostic aspects and pharmacological activities of the plant Mimosa pudica.

KEYWORDS: Mimosa pudica, Mimosine, Nyctinastic movement, Phytochemical screening.

I. INTRODUCTION

Medicinal plants and their bioactive compounds are used worldwide to treat and prevent many diseases. Today, it is believed that about 80% of the world's population depends mainly on medicinal plants or herbal medicines for the treatment, prevention and management of various diseases. [1]Most of the important drugs of the past 50 years, which have revolutionized modern medicinal practice, have been isolated from plants.The research of pharmacologically active agents obtained by screening natural sources such as plant extracts had led to the detection of many pharmaceutically valuable drugs that play a key role in the treatment of human diseases. [2]

Parts of plants used in general are fruit, leaves, rhizome, rind, roots, stem, and seed. Some of the plants used the whole plant as a medicine. Before being used as traditional medicine, medicinal plants are processed first. Some plants are ground and used immediately, while some are boiled or soaked in warm water first. [3] One of the most essential and demanding tasks for scientists working in herbal drug development to investigate the efficacy of herbal medicine, to identify adverse effects, to identifytherapeutic agents in medicinal plants and to identify serious contaminants from herbal mixtures. [4]India is the second largest exporter of medicinal plants in the world.As per the Market Research Report of Fortune Business Insights, the global herbal medicine market is projected to grow from $165.66 billion in 2017 to $347.50 billion by 2029, at a CAGR of 11.16% in the forecast period. [5]

Mimosa pudica is a creeping annual or perennial herb. It was first described by Carl Linnaeus in Species Plantarum in 1753. "Mimosa" is a Greek word means mimic and "pudica" is a Latin word which means shy. It is often grown for its curiosity value. The compound leaves fold inward and drop when touched or shaken, defending themselves from harm, and re-open a few minutes later and this is called as seismonastic movement. The plant has 500 species and about 50-70 cm in height. [6]

The Mimosa pudica, invites attention of the researchers worldwide for its pharmacological activities such as anti-diabetic, antitoxin, anti-hepatotoxin, antioxidant and wound healing activities. [7]The plant exhibits various medicinal activities like anti-histaminic,anti-depressant, anti-

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diabetic, muscle relaxant, antifertility, antibacterial, anticonvulsant, anti-snake venom, antifungal, antimalarial, anticancer activities and is also an immunomodulator. It is used in traditional medicine for the treatment of various inflammatory conditions. [8]

Fig 1: Plant of Mimosa pudica

SYNONYMS [9]

- Mimosa hispidula Kunth
- Mimosa pudica var. tetrandra (Willd.) DC
- Mimosa pudica var. unijuga (Duchass. & Walp.)Griseb

VERNACULAR NAMES [10]

SL NO	LANGUAGES	VERNACULAR NAMES
1	Malayalam	Thottavati
2	Tamil	Tottalchurungi
3	English	Touch-me-not
4	Hindi	Lajauni
5	Kannada	Lajjavati
6	Telugu	Mudugudamara
7	Urdu	Chuimui
8	Marathi	Lajaluoriya
9	Punjabi	Lajan
10	Assamese	Lajubilata,

Table 1: Vernacular names

TAXONOMICAL CLASSIFICATION [11]
Kingdom:Plantae
Subkingdom: Tracheobionta
Superdivision: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Rosidae
Order : Fabales
Family : Fabaceae
Genus : Mimosa
Species : Mimosa Pudica

BOTANICAL DESCRIPTION

Mimosa pudica 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. [12] The roots are cylindrical, tapering with secondary and tertiary branches, varying in length up to 2 cm thick. It has longitudinally wrinkled surface with hard and woody fracture, more or less rough; greyish brown to brown. The stem is cylindrical, branched, about 1.5 m in length and up to 2.5 cm in diameter, longitudinally grooved, external surface light brown, internal surface grey. The stem is erect in young plants, but becomes creeping with age. The plant has bipinnate, compound sessile five primary leaves with petiolate, stipulate, linear lanceolate. There are 10-20 pairs of secondary leaflets which are 0.6-1.2 cm long, 0.3-0.4 cm broad.

The flowers are pink, spherical in globose head arise from the leaf axils in mid-summer, 8-10 mm in diameter, 0.5 mm height. It shows radial symmetry and is four lobed, with four stamens, sessile ovary as well as numerous ovules. Pollens have globose to ovoid heads and are circular with approximately 8 microns diameter and pollinated by insect and wind. The fruits are leguminous, simple, dry, 1-1.6 cm long, 0.4-0.5 cm broad having two to five seeds, The fruit consists of clusters of two to eight pods, these being prickly on the margins. The pods break into two to five segments and contain pale brown seeds about 2.5 mm long. The seeds are oval-elliptic, brown to grey in colour. [13,14]

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Fig 2: Leaves


Fig 3: Flower


Fig 4: Fruit

MICROSCOPICAL STUDIES [10,15]

1. MICROSCOPY OF ROOT

Epidermis is multi-layered, composed of 3-4 row of closely set thin-walled parenchyma tissue rectangular cells. The cortex is composing circular intercellular, parenchyma cells. Inner cortex is composed by multiseriate cell layer and form an endodermis pericycle is the outermost uniseriate layer of stele.

Vascular bundles are surrounded by sclerenchyma, vascular bundle is polyarch and radial 4-5 in numbers, phloem strand alternate to xylem strand, exarch, two protoxylem are in outside and metaxylem are inside. Phloem lies towards periphery and metaphloem lies towards the centre. Small pith observed central in position.

2. MICROSCOPY OF STEM

The stem consists of a distinct continuous epidermis, cortex, vascular bundle, and pith. Is thin and the epidermal cells are squarish or rectangular, coated with thick cuticle, stomata are frequently seen in the epidermis. Cortex is 150 mm wide. It consists of chlorenchyma and parenchyma cells which are compact and homogenous. Is in the form of the outside of the stem. It consists of about 25 discrete vascular bundles, separated from each other by narrow medullary rays.The rays are 3-5 cells wide, as they reach the periphery, the cells dilate tangentially into rectangular cells. The vascular bundles are open and collateral remain scattered in parenchymatous ground tissue. Cambium with 2-3 layers is located in between phloem and xylem, endarch radially elongated a thick semicircular mass of sclerenchymatous bundle-cap occurs on the cortex part of the phloem of each bundle.

Primary xylem occurs secondary xylem consists of outer cluster of wide vessels and inner narrow, compact band of thick-walled fibres and a few wide vessels. It is wide, homogenous, and parenchyma cells are angular and thick walled they vary and cells of different sizes are intermixed.

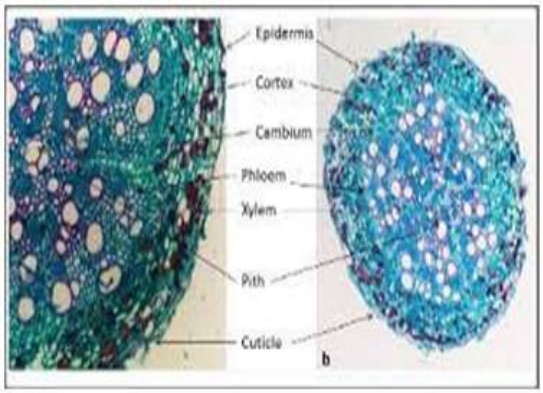

Fig 5: TS of the root and stem of Mimosa pudica

3. MICROSCOPY OF LEAF

Petiole shows single layered epidermis, covered with thin cuticle. Cortex four to seven layered of thin walled, parenchymatous cells. Pericycle arranged in a ring. Four central vascular bundles present with two smaller vascular bundles arranged laterally, one in each wing. Midrib Shows a single-layered epidermis, covered with thin cuticle, upper epidermis followed by a single-layered palisade, spongy parenchyma single-layered, pericycle same as in petiole. Single vascular bundle. Lamina shows epidermis on both surfaces, palisade single-layered. Spongy parenchyma, three to five layers consisting of circular cells. Rosette crystals and few veins present in spongy parenchyma.

4. MICROSCOPY OF FRUIT

Shows single-layered epidermis with few non-glandular, branched, shaggy hair. Mesocarp five to six layers of thin walled, parenchymatous

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cells. Some amphicribral vascular bundles found scattered in this region. Endocarp of thick-walled lignified cells followed by single-layered thin-walled, parenchymatous cells.

5. MICROSCOPY OF SEED

Shows single-layered radially elongated cells, followed by five to six layered angular cells filled with dark brown contents. Endosperm consists of angular or elongated cells, a few containing prismatic crystals of calcium oxalate. Cotyledons consist of thin-walled cells, a few cells containing rosette crystals of calcium oxalate. Embryo straight with short and thick radical.

6. POWDER MICROSCOPY

Reddish brown, shows reticulate, pitted vessels, prismatic and rosette crystals of calcium oxalate, fibres, crystal fibres, yellow or brown parenchymatous cells, palisade cells, non-glandular, branched, shaggy hair, single and compound starch grains, measuring 6–25 mm in diameter with two to three components. Reddish brown, shows reticulate, pitted vessels, prismatic and rosette crystals of calcium oxalate, fibres, crystal fibres, yellow or brown parenchymatous cells, palisade cells, non-glandular, branched, shaggy hair, single and compound starch grains, measuring 6–25 mm in diameter with two to three components.

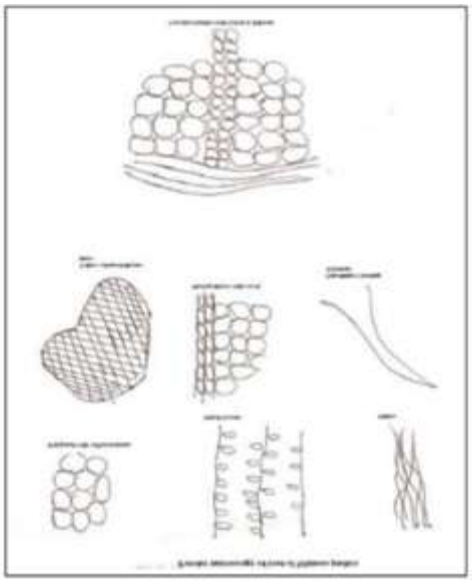

Fig 6: Powder microscopy of Mimosa pudica

CHEMICAL CONSTITUENTS [16-18]

Preliminary phytochemical analysis of Mimosa pudica revealed the existence of a diversity of phytoconstituents including alkaloid, sterols, glycoside, mucilage, flavonoid, tannins, non-protein amino acid (mimosine), terpenoids and fatty acids etc. Mimosine is reported as the principal alkaloid of plant Mimosa pudica.

Mimosine(β-(N-(3-hydroxy-4-oxypyridyl))-α-aminopropionic acid) is a non-protein amino acid present in all members of the Mimosoideae family. Structurally, it contains an alanine side chain bound to the nitrogen atom of a hydroxypyridone ring with a chemical formula of $C_8H_{10}N_2O_4$. Mimosine possesses several biological properties, including anti-inflammatory, anti-viral and anti-cancer properties. It is known as an anti-mitotic agent in many cancer cells, such as pancreatic, prostate, breast, cervical, osteosarcoma, and melanoma cells, where it blocks the G1 phase of the cell cycle and prevents DNA synthesis by inhibiting the formation of the replication fork via deoxyribonucleotide metabolism alteration.

Additionally, the plant's leaves include D-pinitol, an inositol derivative, mimosamine, and mimosinic acid. The leaf extracts also contain a chemical similar to adrenaline, and the presence of crocetin dimethyl ester in the plant's extract has also been noted. The seeds include mucilage made of D-xylose and D-glucuronic acid, and the flowers contain carbohydrate, proteins, and lipids. In addition to benzaldehyde and anise aldehyde, the essential oil also contains geraniol, furnisal, linalool, and numerous other aldehydes.

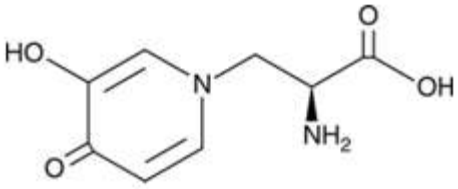

Fig 7: Mimosine

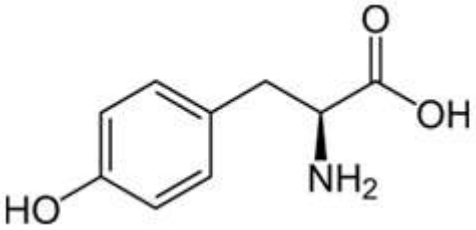

Fig 8:Tyrosine

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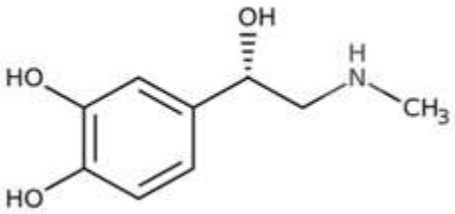

Fig 9:Adrenaline

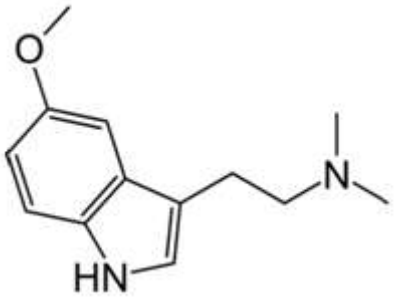

Fig 10: 5-MeO-DMT

PART	CHEMICAL CONSTITUENT
Stem	Mimosine, 5-MeO-DMT (5-methoxy-N, N-dimethyltryptamine).
Root	Mimosine, alkaloids, amino acids, glycoside, fatty acid, flavonoid, phytosterol, tannins, crocetin, ascorbic acid, D-glucuronic acid, linoleic acid, D-xylose and β-sitosterol.
Leaves	Tyrosine, vitexin, nor-epinephrine, D-pinitol, β-sitosterol, alkaloids-mimosine, terpenoids, flavonoids, glycosides, alkaloids, phenols, tannins, saponins, and coumarins terpenoids, flavonoids, glycosides, alkaloids, phenols, tannins, saponins, coumarins, polyunsaturated fatty acid, sphingosine, adrenaline, 5-MeO-DMT.
Whole plant	Mimosinamine, mimosinic acid, tyrosine, jasmonic acid, abscisic acid, mimosine, D-xylose, D-glucuronic acid, tubulin, gallic acid, glycosyl flavones, nor-epinephrine, thiamine, cassia occidentalin B and mimopudine.

Table 2: Chemical constituents of Mimosa pudica

TRADITIONAL IMPORTANCE [6]

Anti-diabetic agent, anti-asthmatic agent, anti-ulcer agent, anti-inflammatory agent, anti-pyretic agent, wound healing agent, for treatment of jaundice, for treatment of small pox, for treatment of toothaches, for treatment of cough, for treatment of bronchitis, for treatment of cholera.

PHYTOCHEMICAL ANALYSIS [19]

HPLC analysis for phenolic and flavonoid compounds was performed in Mimosa pudica seed extract. Stock solutions of all flavonoid standards and fractions of Mimosa pudica seed extract were prepared in methanol (1 mg/ml stock) and filtered through micro-filters. Gradient elution system was used with two mobile phases; mobile phase 1 is 40 mM potassium dihydrogen phosphate and mobile phase 2 is methanol. Thecolumn temperature was set to 60 °C and flow rate to 1 ml/min. The wavelength of 330 nm was used to detect phenolic and flavonoid compounds including gallic acid, chlorogenic acid, epicatechin, ferulic acid, hyperoside, luteolin, rutin, naringenin, benzenetriol, apigenin and chrysin.

PHYTOCHEMICAL SCREENING [15]

The powder of plant material 150 gm was mixed with different solvent like Ethanol, Methanol, Petroleum ether, and Acetone. The leaf and root powder were mixed with water boiled and filtered with a muslin cloth and it was condensed in hot air

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oven at 50'c coarsely powdered plant material was soaked in ethanol for 3 days filtered and allowed to condense at 50'c. The different types of solvent extracts were stored in a container and refrigerated for further use.

The preliminary "Phytochemical" screening of ethanol, methanol, acetone, and petroleum ether, extract of the leaves of Mimosa pudica showed the presence of alkaloids, carbohydrates, tannins, saponins, flavonoids, terpenoids, phenols, amino acids, protein, inulin, steroids, and absence of glycoside, resin, fat and oil, reducing sugar, phlobatannins, phytosterol. (Table 3).

Chemical constituent	Test	Petroleum ether	Acetone	Ethanol	Methanol
Alkaloid	Mayers test	+	+	+	+
	Dragendroff's test	+	+	+	+
	Wagner's test	+	+	+	+
Carbohydrates	Molisch's test	+	+	+	+
	Benedict's test Fehling's test	+	+	+	+
		+	+	+	+
Glycosides	Modified-Borntrager's	-	-	-	-
	Legal test	-	-	-	-
Saponins	Foam test	+	+	+	+
	Froth test	+	+	+	+
Phytosterols	Salkowski test	-	-	-	-
	Libermann Burchard	-	-	-	-
Fat and oil	Stain test	-	-	-	-
Resins	Acetone water test	-	-	-	-
Phenols	Ferric chloride test	+	+	+	+
Tannins	Alkaline reagent	+	+	+	+
Flavonoids	Gelatin test	+	+	+	+
	Lead acetate test	+	+	+	+
Steroids	Steroids test	+	+	+	+
Inulin	Inulin test	+	+	+	+
Phlobatannins	Phlobatannins test	-	-	-	-
Terpenoids	Salkowski test	+	+	+	+
Protein	Xanthoprotein test	+	+	+	+
Amino acids	Ninhydrin test	+	+	+	+
Reducing sugar	Fehling's test Benedict's test	-	-	-	-
		-	-	-	-

Table 3: Phytochemical screening of different solvent of Mimosa pudica

PHARMACOLOGICAL ACTIVITY

NEURO-PHARMACOLOGICAL ACTIVITY

Alam F et al. (2025) evaluated the neuro-pharmacological effects of Mimosa pudica by administering 200 mg/kg and 400 mg/kg methanolic extract of flowers of Mimosa pudica to swiss albino mice and by using diazepam and escitalopram (1 mg/kg) as standard drug, various test like open field test, light-dark box test, elevated plus maze test, tail suspension test, forced swim test, Y-maze test, hole cross test, and social interaction test were performed and results from various test concluded that the methanolic extract of Mimosa pudica reduce anxiety and depression. [20]

ANTI-EPILEPTIC ACTIVITY

Mambou HMAY et al. (2025)investigated on the effects of the aqueous extract of Mimosa pudica leaves and stems against pilocarpine induced epilepsy which was done byintraperitoneal injection of pilocarpine (360 mg/kg). The aqueous extract of Mimosa pudica leaves and stems (20, 40, 80, and

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160 mg/kg) were administered to the adult male swiss mice and the anti-epileptic action was evaluated by using sodium valproate (300 mg/kg) as standard drug and racine scale (stage 0 -5) was used to assess the severity of seizures and it was concluded that the aqueous extract of Mimosa pudica increased the time delay between seizures. [21]

ANTI-DIABETIC ACTIVITY

SingarapriyavardhananST et al. (2022)investigated the anti-diabetic activity of Mimosa pudica by oral administration of 400 mg/kg ethanolic extract of Mimosa pudica to wistar rats which has streptozotocin-induced diabetes (60 mg/kg streptozotocin) and the results were compared with the standard drug (metformin 200 mg/kg), which significantly shows reduced serum glucose levels and fasting insulin levels in streptozotocin-induced diabetic rats as compared to the normal animals. [22]

WOUND HEALING ACTIVITY

Ganesh CJ et al. (2017) studied the wound healing activity of Mimosa pudica by administering ethanol extract of Mimosa pudica (50, 100, 150, 200 mg/kg) to male swiss albino mice which has deep dermal excision wound and the results shows decreased mean wound healing time, that is, 18 days for 200mg/kg extract treated group and 24 days for control group, which confirm its wound healing property. [23]

ANTI-INFLAMMATORY ACTIVITY

Parvathy VN et al. (2017) investigated the anti-inflammatory effect of Mimosa pudica by administering hydroalcoholic extract of Mimosa pudica whole plant (200 mg/kg, 400 mg/kg and 800 mg/kg) to thirty albino rats of both sex and the results were compared with the standard drug aspirin (300mg/kg) and it was reported that, 800 mg/kg hydroalcoholic extract of Mimosa pudica whole plant shows the highest percentage inhibition, which proves its anti-inflammatory property. [24]

ANTI-MICROBIAL ACTIVITY

Muhammad MT et al. (2015) investigated on the anti-microbial effect of Mimosa pudica by isolating various fungi and treating them with ethanol and aqueous extracts of Mimosa pudica (150 mg, 200 mg, 250 mg and 300 mg) and the organisms likeTrichophyton verrucosum, Microsporum ferrugineum, Trichophyton shoenleinii, Microsporum canis, Trichophyton soudanense and Microsporum gyseum were sensitive to ethanol extract and Trichophyton verrucosum, Microsporum ferrugineum, Trichophyton shoenleinii, Trichophyton rubrum, Trichophyton concentricum, Trichophyton soudanense and Microsporum canis were sensitive to aqueous extract. [25]

ANALGESIC ACTIVITY

Uddipon A et al. (2014) evaluated the analgesic effect of Mimosa pudica on adult swiss albino mice using the tail immersion test models. The mice were treated with 250 mg/kg and 500 mg/kg chloroform, ethanol andmethanol extracts of Mimosa pudica and analgesic effect was evaluated using diclofenac sodium as standard drug and result shows that all extracts of Mimosa pudica showed significantly higher activity in mice as compared to the standard drug. [26]

DIURETIC ACTIVITY

Baghel A et al. (2013) reported that the Lipschitz test was employed for assessment of diuretic activity of petroleum ether, ethanolic and aqueous extracts of Mimosa pudica. Adult Albino rats of either sex was used for the experiment. The ethanolic and aqueous extract (100 and 200 mg/kg) of plant was tested for evaluation of diuretic activity by using furosemide (20 mg/kg) as standard drug. Among two extracts ethanolic extract was reported to produce significant diuretic activity. [27]

ANTI-ULCER ACTIVITY

Elango V et al. (2012) studied the anti-ulcer activity of Mimosa pudica by extracting it with various solvents like 90% methanol, chloroform and diethyl ether. Albino rats were used to investigate the activity and ulcer was induced with alcohol and aspirin (200 mg/kg).Mimosa pudica ethanolic extract of 100 mg/kg is administered to rats. Ranitidine 20mg/kg was used as standard drug. At the end of the study, the stomach was isolated and washed with saline, it was then observed for ulceration. The control animals showed ulceration, redness, increase in gastric volume, free acidity and total acidity.Mimosa pudica ethanolic extract significantly reduced the gastric volume andfree acidity when compared to control. This shows that Mimosa pudica has anti-ulcer properties. [28]

II. CONCLUSION

Mimosa pudica, commonly known as touch-me-not or sensitive plant, commonly seen in the wastelands and along roadsides. It belongs to the family Fabaceae. The folding movement of leaf due

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external physical disturbances or contact is a characteristics feature of Mimosa pudica. The medicinal chemistry of Mimosa pudica highlights its potential as a valuable source of bioactive compounds with diverse therapeutic properties.Through the isolation and characterization of phytochemicals from various parts of the plant, including the fruit, seeds, and leaves, researchers have identified compounds such asalkaloids, carbohydrates, tannins, saponins, flavonoids, terpenoids, phenols, amino acids, protein, inulin, steroidsand major bioactive component, mimosine with demonstrated anti-histaminic, anti-depressant, anti-diabetic, muscle relaxant, anti-bacterial, anti-convulsant, anti-fungal, anti-malarial, anti-cancer activities. The conclusion drawn from existing research suggests that Mimosa pudica holds promise for the development of novel therapeutic agents or adjunctive treatments for various health conditions. Moreover, exploring synergistic interactions between phytochemicals within Mimosa pudica extracts or with conventional drugs may lead to the development of combination therapies with enhanced therapeutic outcomes and reduced side effects. Overall, the medicinal chemistry of Mimosa pudica underscores the importance of interdisciplinary research collaborations and continued exploration of its pharmacological potential to harness the full spectrum of health benefits offered by this plant species.

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