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# A Comprehensive Review on Mimosa pudica: Phytochemistry, Traditional Uses, and Pharmacological Activities

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**Abstract:** *Mimosa pudica L. (family Fabaceae), commonly known as the "sensitive plant" or "touch-me-not," is a remarkable medicinal herb that has fascinated scientists and healers alike for centuries. The plant is best recognized for its extraordinary thigmonastic movement — a rapid, reversible folding of its feathery leaflets in response to touch, temperature changes, or physical disturbance. Beyond this intriguing biological behavior, Mimosa pudica has earned a distinguished place in traditional healing systems, particularly in Ayurvedic, Unani, and indigenous folk medicine across South and Southeast Asia, Africa, and Latin America. The plant harbors an impressive array of bioactive chemical constituents, including alkaloids (notably mimosine), flavonoids (quercetin, kaempferol, luteolin-7-O-rutinoside), tannins, terpenoids, glycosides, phenolic acids, fatty acids, and sterols. These compounds collectively underpin the plant's wide spectrum of pharmacological activities that have been documented in growing scientific literature. Modern experimental studies have validated several of the plant's traditional uses, confirming significant antioxidant, antimicrobial, anti-inflammatory, wound-healing, anti-diarrheal, hepatoprotective, antidiabetic, analgesic, and antivenom properties. This review synthesizes available ethnomedicinal knowledge and contemporary scientific evidence regarding Mimosa pudica, covering its botanical classification, geographical distribution, morphological characteristics, phytochemical profile, and documented medicinal applications. The article also highlights gaps in current research and outlines the future potential of this plant in herbal drug discovery and pharmaceutical development.*

**Keywords:** Mimosa pudica, Touch-me-not, Sensitive plant, Phytochemistry, Pharmacological properties, Ayurveda, Medicinal plants, Thigmonasty, Mimosine, Herbal medicine

## I. INTRODUCTION

The natural world continues to be an inexhaustible reservoir of therapeutic agents, and among its most curious offerings is Mimosa pudica L., a small, herbaceous plant whose medicinal value far outweighs its modest appearance. Belonging to the family Fabaceae and the subfamily Mimosoideae, this plant is native to the tropical regions of South and Central America but has since naturalized across vast swaths of Asia, Africa, Australia, and the Pacific islands. In India, it is so commonplace that it grows uninvited along roadsides, in fallow fields, and in disturbed habitats — yet its extraordinary sensitivity and proven healing potential have kept it firmly rooted in traditional medicine for generations.

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Known as Lajjalu in Sanskrit — meaning "the shy one" — Mimosa pudica has been described and prescribed in classical Ayurvedic texts for a wide range of conditions, from wound healing and inflammation to nervous disorders and urogenital complaints. The Unani tradition similarly praises its roots as cleansing, healing, and helpful in managing bilious fevers, jaundice, leprosy, and conditions arising from blood impurities. Traditional Chinese medicine and various indigenous communities across the tropics have independently discovered and utilized this plant's remarkable properties, suggesting a depth of biological activity that deserves serious scientific scrutiny.

The renewed global interest in plant-based medicines, partly driven by the limitations and side effects of many synthetic drugs, has brought Mimosa pudica back into the spotlight. Phytochemical investigations over the past three decades have uncovered a rich bouquet of bioactive compounds — from the unique non-protein amino acid mimosine to flavonoid glycosides, tannins, terpenoids, and fatty acids — each contributing individually and synergistically to the plant's pharmacological profile. Scientific studies have now confirmed antibacterial, antifungal, anti-inflammatory, antioxidant, analgesic, wound-healing, hepatoprotective, antidiabetic, and antivenom properties, among others. The convergence of traditional knowledge and modern science positions Mimosa pudica as a highly promising candidate for future herbal drug development.

This review article aims to present a thorough and well-organized account of Mimosa pudica — from its taxonomy and habitat to its phytochemistry and pharmacology — drawing on both classical ethnomedicinal documentation and contemporary research findings. It is hoped that this synthesis will serve as a useful reference for researchers, students, and practitioners interested in the therapeutic potential of this extraordinary sensitive plant.

## II. BOTANICAL CLASSIFICATION

Understanding the systematic placement of Mimosa pudica is fundamental to appreciating its biological relationships and shared biochemical characteristics with related species. Taxonomically, this plant sits within one of the largest and most ecologically diverse flowering plant families.

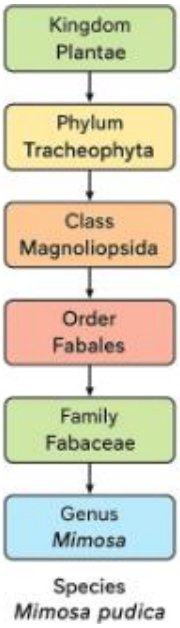


***Figure 1: Taxonomic classification of Mimosa pudica L.***

Mimosa pudica belongs to the Kingdom Plantae, Phylum Tracheophyta (vascular plants), Class Magnoliopsida (dicotyledons), Order Fabales, and Family Fabaceae — one of the largest plant families on Earth with enormous economic, ecological, and medicinal importance. Within Fabaceae, it is placed in the subfamily Mimosoideae. Its

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genus, Mimosa, contains over 400 species, the majority of which are native to the Americas. The species name pudica is derived from the Latin word meaning "modest" or "bashful," a direct reference to the plant's characteristic leaf-folding behavior upon touch.

The plant is known by numerous vernacular names across different cultures: Touch-me-not and Sensitive plant in English; Lajjalu, Lajwanti, or Chhui-mui in Hindi and Sanskrit; Thottavadi in Tamil; and Nidikumba in Sinhala, among many others. These diverse names across languages and geographies speak to the plant's wide recognition and cultural significance well before the era of formal botanical nomenclature.

## III. GEOGRAPHICAL DISTRIBUTION AND HABITAT

Mimosa pudica is originally indigenous to tropical South and Central America, where it evolved in open, disturbed habitats with abundant sunlight and moderate moisture. However, its exceptional adaptability and prolific seed production have enabled it to spread to virtually every tropical and subtropical region of the world. Today, it is found growing abundantly across South Asia (India, Sri Lanka, Bangladesh, Nepal), Southeast Asia (Thailand, Malaysia, Indonesia, Philippines), East Asia (China, Japan), East and West Africa, Australia, and throughout the Pacific island chains.

In India, Mimosa pudica is considered naturalized and grows across most states, particularly in warmer plains and foothill regions. It thrives in a variety of soil types, from clay-rich to sandy loams, and readily colonizes roadsides, agricultural margins, waste grounds, forest clearings, and disturbed ecosystems. The plant demonstrates a strong preference for full sunlight and warm temperatures ranging between 18°C and 30°C, though it can tolerate brief cooler periods. It grows most vigorously in soils with moderate fertility and adequate drainage, but has been observed tolerating both dry and moderately waterlogged conditions, which contributes to its classification as a widespread weed in many agricultural settings.

Despite its weed status in some contexts, the plant plays an ecologically constructive role in its habitats. Being a legume, it fixes atmospheric nitrogen through root-associated Rhizobium bacteria, thereby improving soil fertility. It also provides habitat and food resources for certain insects and small fauna. From an agricultural perspective, the challenge lies in balancing its weedy tendency with its recognized medicinal and environmental value — a tension that several research groups are actively exploring.

## IV. MORPHOLOGICAL CHARACTERISTICS

*Figure 2: Feathery bipinnate leaves of Mimosa pudica showing the characteristic leaflet arrangement.*

Mimosa pudica presents a compact, somewhat sprawling growth habit, typically reaching 30 to 50 centimeters in height, though occasionally growing taller under favorable conditions. As a creeping annual or short-lived perennial, it tends to branch extensively near the base, spreading along the ground or climbing gently on adjacent vegetation. Its overall appearance is delicate, even decorative, particularly when in bloom.

### 4.1 Stem

The stem is slender, green to purplish in color, and distinctively covered with fine, recurved prickles that assist the plant in climbing and provide physical protection against herbivores. The stem branches freely in a spreading pattern

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and has a slightly woody character near the base in older plants, while remaining herbaceous and flexible in younger growth.

**4.2 Leaves**

The leaves of Mimosa pudica are perhaps its most celebrated feature. They are bipinnately compound, meaning they consist of multiple pairs of pinnae (primary leaflet groups), each bearing numerous pairs of tiny oblong leaflets. A typical leaf may carry two to four pairs of pinnae, with each pinna holding 12 to 25 pairs of narrow, bright-green leaflets measuring approximately 10 to 12 mm in length. The entire leaf assembly can measure up to 5 cm across and possesses an elegant, feathery quality. When stimulated by touch, vibration, heat, or darkness, the leaflets fold rapidly inward along the midrib, and the leaf stalks droop downward — a response mediated by changes in turgor pressure within specialized motor cells (pulvini) located at the base of leaflets and petioles. This seismonastic movement is not merely a curiosity; it is believed to function as a defense mechanism against herbivores, as the sudden collapse makes the plant appear withered and less palatable.

**4.3 Flowers and Fruits**

The flowers of Mimosa pudica are small but visually striking — spherical, fluffy, pinkish-purple pompoms that emerge on slender stalks from the leaf axils. Each flower head is approximately 1.5 to 2 cm in diameter and consists of numerous individual tiny florets densely packed together, each contributing long, hair-like stamens that create the characteristic powder-puff appearance. The plant typically flowers during the summer months. The fruits are flat, pod-like legumes measuring 1 to 2 cm in length, organized in clusters of three to six pods, each segmenting into one- to five-seeded sections that break apart at maturity, facilitating seed dispersal.

**4.4 Roots**

The root system consists of a main taproot from which numerous fine lateral roots extend. Notably, the roots host nitrogen-fixing Rhizobium bacteria in characteristic nodules, a feature that benefits soil fertility in the plant's habitat. The roots contain a distinct chemical profile, including higher concentrations of certain alkaloids and sterols, which contributes to their use in traditional medicine for conditions different from those treated with leaves.

## V. PHYTOCHEMICAL CONSTITUENTS

The medicinal effectiveness of any plant ultimately resides in its chemical composition, and Mimosa pudica is exceptionally well-endowed in this regard. Decades of phytochemical research have revealed a complex and diverse array of bioactive molecules distributed across different plant parts — leaves, stems, roots, seeds, and flowers — each contributing to the plant's known therapeutic activities.

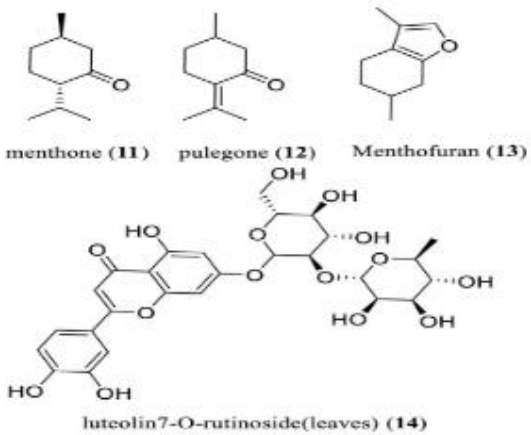


*Figure 3: Chemical structures of key phytoconstituents isolated from Mimosa pudica, including terpenoid monoterpenes and the flavonoid luteolin-7-O-rutinoside.*

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### 5.1 Alkaloids

Alkaloids represent one of the most pharmacologically significant classes of compounds in Mimosa pudica. The most notable is mimosine (β-N-(3-hydroxy-4-oxopyridyl)-α-aminopropionic acid), a unique non-protein amino acid that has attracted considerable research interest. Mimosine demonstrates multiple biological activities, including antimicrobial, antitumor, and antioxidant effects, though it can also be toxic at high concentrations, making dosage a critical consideration. Other alkaloids identified in the plant include tryptamine derivatives and related nitrogenous compounds that contribute to the plant's neurological and sedative properties observed in traditional use.

### 5.2 Flavonoids

Flavonoids are abundantly present in Mimosa pudica and are largely responsible for its notable antioxidant and anti-inflammatory activities. Key flavonoids isolated from this plant include quercetin, kaempferol, and their glycosidic derivatives — compounds well-studied for their capacity to scavenge free radicals, inhibit lipid peroxidation, and modulate inflammatory signaling pathways. The flavonoid C-glycoside vitexin and the flavonoid glycoside luteolin-7-O-rutinoside have been specifically identified in leaf extracts. These compounds interact synergistically with other plant constituents, amplifying the overall biological effect beyond what any single compound could achieve independently.

### 5.3 Tannins and Phenolic Compounds

Tannins are polyphenolic compounds that confer astringent properties to the plant, contributing significantly to wound healing and antimicrobial actions. The tannins in Mimosa pudica help precipitate proteins on damaged skin and mucosal surfaces, forming a protective layer that prevents microbial colonization and promotes tissue repair. Alongside tannins, various phenolic acids — including gallic acid, ferulic acid, and caffeic acid — have been detected, adding to the plant's antioxidant capacity and contributing to its anti-inflammatory effects through inhibition of pro-inflammatory enzymes like COX-2 and LOX.

### 5.4 Terpenoids and Sterols

Terpenoids found in Mimosa pudica include monoterpenes such as menthone, pulegone, and menthofuran — compounds typically associated with volatile essential oils and known for antimicrobial and insecticidal properties. Sesquiterpenes and triterpenoids have also been detected in root and aerial parts. Among sterols, β-sitosterol and related phytosterols have been isolated from seeds and roots; these compounds are known to have cholesterol-lowering potential and modest anti-inflammatory effects. Crocetin, a carotenoid-related compound, has been detected in roots alongside D-glucuronic acid and D-xylose.

### 5.5 Fatty Acids and Other Constituents

Fatty acid analysis of Mimosa pudica seeds has revealed the presence of linoleic acid, linolenic acid, palmitic acid, and stearic acid — essential and semi-essential fatty acids that play structural and functional roles in cell membranes and serve as precursors to important bioactive lipid mediators. Ascorbic acid (vitamin C) has been found in root extracts, adding to the plant's antioxidant properties. The seeds also yield sitosterol in significant quantities, alongside proteins and carbohydrates, making them nutritionally relevant beyond purely medicinal applications.

## VI. ETHNOMEDICINAL USES

Perhaps the most compelling testament to the value of Mimosa pudica lies in the remarkable consistency of its traditional uses across cultures separated by thousands of miles and centuries of independent development. From the Ayurvedic physicians of ancient India to indigenous healers of the Amazon basin, the same plant has been independently recognized and utilized for overlapping sets of conditions — a compelling indicator of genuine pharmacological activity.

### 6.1 Wound Healing and Skin Care

Fresh leaf paste prepared from Mimosa pudica has been among the most universally applied traditional remedies for managing wounds, cuts, burns, and skin infections. Healers across India, Sri Lanka, Thailand, and various parts of Africa apply the crushed leaf material directly to injured tissue, where it is observed to reduce bleeding promptly,

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create a protective layer over the wound, and accelerate the healing process. Scientific investigation has confirmed that leaf extracts stimulate fibroblast proliferation, collagen synthesis, and epidermal regeneration — the three pillars of wound repair — providing a molecular basis for this age-old practice.

**6.2 Digestive and Gastrointestinal Applications**

Diarrhea and dysentery have long been managed using Mimosa pudica in Ayurvedic practice. Decoctions of leaves and roots are administered to control excessive intestinal motility, reduce inflammation of the intestinal mucosa, and combat pathogenic microorganisms responsible for infectious diarrhea. The tannins in the plant play a key role here by acting as intestinal astringents. Additionally, the plant has been traditionally employed to treat stomach ulcers, indigestion, and intestinal worm infestations, the latter through the antiparasitic properties of root and seed extracts.

**6.3 Urinary and Reproductive Health**

Root decoctions are used in various traditional systems to relieve urinary tract infections, reduce burning sensations during urination, and improve urine flow. The antimicrobial action of the root extracts is thought to underlie their effectiveness against urogenital pathogens. Historically, Mimosa pudica has also been employed as a uterine tonic in some traditional systems, and modern animal studies have suggested both fertility-modifying and uterine-stimulating properties associated with specific alkaloid fractions — findings that highlight the need for careful clinical evaluation before widespread use in reproductive contexts.

**6.4 Nervous System and Mental Health**

Ayurvedic descriptions of Mimosa pudica include its utility in managing sleeplessness (insomnia), anxiety, stress, and depression — conditions collectively described under the concept of neurological imbalance in classical texts. The plant is described as having a calming, sedative quality when administered in appropriate preparations. Animal studies have documented anxiolytic and central nervous system depressant activity in plant extracts, supporting a scientific basis for these traditional indications. These properties make Mimosa pudica a subject of growing interest in the search for plant-based alternatives to conventional anxiolytics and sedatives.

## VII. DOCUMENTED PHARMACOLOGICAL PROPERTIES

**7.1 Antimicrobial Activity**

Among the most rigorously studied properties of Mimosa pudica is its capacity to inhibit the growth of pathogenic bacteria and fungi. Numerous in vitro studies have demonstrated antibacterial activity against both Gram-positive organisms (Staphylococcus aureus, Streptococcus pyogenes) and Gram-negative organisms (Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae). Antifungal activity has been demonstrated against Candida albicans and dermatophyte species. The mechanism appears to involve disruption of microbial cell membranes, inhibition of enzymatic activity, and interference with biofilm formation. These findings validate the plant's traditional use in managing skin infections, wound infections, and microbial diarrhea.

**7.2 Anti-inflammatory Activity**

Chronic inflammation underlies many of today's most prevalent diseases — from arthritis and cardiovascular disease to metabolic disorders and certain cancers. Mimosa pudica has shown promising anti-inflammatory activity in multiple experimental models. Leaf and root extracts significantly reduce carrageenan-induced paw edema in rodents — a standard model of acute inflammation — at doses comparable to or exceeding those of reference anti-inflammatory drugs. The mechanism involves suppression of pro-inflammatory mediators including prostaglandins, nitric oxide, and inflammatory cytokines (TNF-α, IL-1β, IL-6), achieved through inhibition of cyclooxygenase (COX) and lipoxygenase (LOX) enzymes. These findings firmly support the plant's use in treating arthritic conditions, inflammatory skin disorders, and post-injury swelling.

**7.3 Antioxidant Activity**

Oxidative stress — the imbalance between free radical production and antioxidant defenses — is now recognized as a central driver of aging and numerous chronic diseases. Mimosa pudica demonstrates potent free radical scavenging activity, attributed primarily to its flavonoid and phenolic content. DPPH, ABTS, and FRAP assays consistently

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confirm strong antioxidant potential in both leaf and root extracts, with activity comparable to standard antioxidants like ascorbic acid and butylated hydroxytoluene (BHT). This antioxidant activity not only explains several of the plant's direct health benefits but also enhances the stability and efficacy of the plant's other bioactive compounds in biological systems.

**7.4 Wound Healing and Tissue Repair**

Laboratory and animal studies have systematically validated Mimosa pudica's wound-healing effects. Topical application of leaf extracts to excision wounds in rodents accelerates wound contraction, promotes epithelialization, increases tensile strength of healed tissue, and reduces scar formation. Histological analyses confirm increased fibroblast proliferation, enhanced collagen deposition, and improved vascularization in treated wounds. Tannins contribute through their astringent, protein-precipitating effects; flavonoids reduce inflammatory cell infiltration; and alkaloids provide antimicrobial protection — creating a multi-pronged healing environment that outperforms many conventional topical treatments in experimental settings.

**7.5 Hepatoprotective Activity**

The liver's central role in metabolism, detoxification, and immunity makes hepatoprotective compounds of immense clinical significance. Experimental studies have demonstrated that Mimosa pudica extracts protect liver cells against chemically induced damage caused by agents such as carbon tetrachloride ($CCl_4$) and paracetamol (acetaminophen). Treated animals show significantly reduced serum levels of liver damage markers (ALT, AST, alkaline phosphatase) alongside improved histological appearance of liver tissue. The mechanism is thought to involve membrane stabilization, free radical neutralization, and induction of hepatic antioxidant enzymes. These findings are particularly relevant in the context of drug-induced liver injury and viral hepatitis.

**7.6 Antidiabetic Activity**

The global diabetes epidemic has intensified the search for plant-based agents with glucose-lowering properties. Mimosa pudica has shown meaningful antidiabetic activity in alloxan- and streptozotocin-induced diabetic rodent models. Seed and leaf extracts lower fasting blood glucose levels, improve glucose tolerance, and may enhance insulin secretion or sensitivity. Possible mechanisms include inhibition of intestinal glucose absorption (through alpha-glucosidase inhibition) and stimulation of pancreatic beta-cell activity. While these findings are promising, rigorous clinical trials in human populations are needed before the plant can be recommended as an adjunct in diabetes management.

**7.7 Analgesic and CNS Activity**

Mimosa pudica extracts have demonstrated dose-dependent analgesic activity in rodent pain models (hot plate, tail flick, acetic acid writhing tests), with effects comparable in some studies to standard analgesics such as aspirin and morphine at respective doses. This pain-relieving effect is attributed partly to central (opioid-like) mechanisms and partly to peripheral anti-inflammatory actions. The plant's sedative and anxiolytic properties have been confirmed in multiple behavioral studies in rodents, supporting the traditional use of Mimosa pudica preparations in managing stress, anxiety, and sleep disturbances.

**7.8 Other Pharmacological Activities**

Beyond the activities described above, scientific investigations have documented several additional pharmacological properties of Mimosa pudica. Antivenom activity has been reported against certain snake and insect venoms, with plant extracts neutralizing venom-induced lethality and edema in animal models. Anthelmintic (anti-worm) activity has been confirmed against common intestinal parasites including Ascaris lumbricoides and Haemonchus contortus, supporting the traditional use of root and seed preparations to treat intestinal worm infestations. Preliminary studies have also explored antiulcer, hypotensive (blood pressure-lowering), and immunomodulatory properties — areas that warrant deeper investigation.


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## VIII. TOXICOLOGICAL PROFILE AND SAFETY CONSIDERATIONS

Any discussion of a medicinal plant's therapeutic potential must be balanced with an honest assessment of its safety. Mimosa pudica, like all pharmacologically active plants, contains compounds that can cause adverse effects when consumed inappropriately. Mimosine, the plant's signature alkaloid, is known to be toxic at high doses — causing hair loss (alopecia), growth retardation, and reproductive effects in animals, particularly ruminants that consume large quantities of the plant as forage. These toxic effects are largely dose-dependent and differ significantly from the small amounts used in traditional herbal preparations.

Toxicological studies using standardized extracts at pharmacologically relevant doses have generally found acceptable safety profiles in rodent models, with median lethal dose ($LD_{50}$) values suggesting low acute toxicity. Subacute and chronic toxicity studies have not revealed significant organ damage at doses equivalent to those used therapeutically. However, the plant has demonstrated antifertility effects in animal studies, cautioning against its use during pregnancy or by individuals seeking to conceive. Traditional medical systems have recognized this nuance for generations, restricting certain Mimosa pudica preparations for specific populations. Modern research must continue to characterize safety parameters, particularly for long-term use and vulnerable populations such as pregnant women, children, and individuals with compromised organ function.

## IX. CONCLUSION AND FUTURE PERSPECTIVES

Mimosa pudica L. stands as a compelling example of how a seemingly humble roadside weed can harbor an extraordinary reservoir of therapeutic potential. This review has traced its journey from the pages of ancient Ayurvedic texts to modern pharmacological laboratories, revealing a plant that not only validates centuries of empirical traditional knowledge but also opens exciting new avenues for drug discovery and development.

The breadth of its documented pharmacological activities — antimicrobial, anti-inflammatory, antioxidant, wound-healing, hepatoprotective, antidiabetic, analgesic, anxiolytic, and antivenom — is remarkable for a single plant species. These activities arise from a chemically diverse array of bioactive compounds, including the unique alkaloid mimosine, multiple flavonoids, tannins, terpenoids, and fatty acids, many of which appear to work in concert through complementary mechanisms. The plant's rich phytochemical diversity makes it particularly amenable to multi-target therapeutic approaches — an increasingly valued concept in the management of complex, multifactorial diseases.

Looking ahead, several priority areas merit the attention of researchers. First, rigorous clinical trials are needed to translate promising in vitro and animal findings into evidence-based human applications. Second, advanced techniques such as metabolomics, proteomics, and network pharmacology should be employed to fully map the plant's chemical-biological interaction landscape. Third, sustainable and standardized methods for cultivation, extraction, and preparation need to be developed to ensure consistent quality and potency in any future herbal products. Fourth, combination studies exploring Mimosa pudica in synergy with other medicinal plants or conventional drugs could reveal clinically relevant additive or potentiating effects.

In an era when the limitations of synthetic pharmaceuticals — including rising antimicrobial resistance, chronic disease complexity, and drug toxicity — are increasingly apparent, Mimosa pudica represents exactly the kind of natural resource that deserves systematic, sustained scientific investment. With proper research, this sensitive, touch-responsive plant may one day be recognized not just as a botanical curiosity, but as a genuine contributor to human health and medicine.

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