ISSN: 0976-7126

INTERNATIONAL JOURNAL OF PHARMACY & LIFE SCIENCES

Pharmacological and biological overview on *Mimosa pudica* Linn.

Lubna Azmi*, Manish Kumar Singh and Ali Kamal Akhtar
Faculty of Pharmacy, Integral University, Lucknow, (U.P.) - India

Abstract

In the present study attempts were made to review on active constituents and pharmacological activity of *Mimosa pudica* Linn belonging to family Mimisace. The whole plant of *Mimosa pudica* is very useful for various pharmacological and biological activities. Mostly Root and leaves of *Mimosa pudica* are showed maximum pharmacological activity as anti-diabetic, antitoxin, antihepatotoxin, antioxidant and wound healing activity. The periodic leaf movement factors are reportedly the derivatives of 4-*o*-(b-D-glucopyranosyl-6-sulphate) gallic acid.

Key-Words: Chui mui, Pharmacological action, Phytochemistry

Introduction

Plants have played a significant role in maintaining human health and improving the quality of human life for thousands of years and have served humans well as valuable components of medicines, seasonings, beverages, cosmetics and dye. Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Today, we are witnessing a great deal of public interest in the use of herbal remedies. Furthermore many western drugs had their origin in plant extract[2]. There are many herbs, which are predominantly used to treat cardiovascular problems, liver disorders, central nervous system, digestive and metabolic disorders. Given their potential to produce significant therapeutic effect, they can be useful as drug or supplement in the treatment / management of various diseases. Herbal drugs or medicinal plants, their extracts and their isolated compound(s) have demonstrated spectrum of biological activities and continued to be used as medicine in folklore or food supplement for various disorders [3].

Syn[1-5] : Chui mui, Najuk, Lajawanti, Sensitive plant, Touch-shy plant, Varakranta, Vashini, Lajjabate, Lajak, Lajjabati.

*** Corresponding Author:**
E-mail: lubna.azmi1234@gmail.com

The *Mimosa Pudica*, invites attention of the researchers worldwide for its pharmacological activitiesuch as anti diabetic, antitoxin, antihepatotoxin, antioxidant and wound healing activity *Mimosa Pudica* (Family: Leguminosae) 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 Telgu[1-3].

It is reported to contain alkaloid, glycoside, flavonoid and tannis. It is used in suppresses kapha and pitta Heals wounds, Coagulates blood and sexsul weakness[1]. All parts of the tree are considered to possess medicinal properties and used in the treatment of biliousness, leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, fatigue, asthma, leucoderma, blood diseases etc.[3] According to the Unani system of medicine, root is resolvent, alternative, useful in diseases arising from blood impurities and bile, bilious fevers, piles, jaundice, leprosy etc. Its extract immobilizes the filariform larvae of *Strongyloides stercoralis* in less than one hour. In contemporary medicine, *Mimosa pudica* is being investigated for its potential to yield novel chemotherapeutic compounds. It contains an alkaloid called mimosine, which has been found to have potent antiproliferative and apoptotic effects. Aqueous extracts of the roots of the plant have shown significant neutralizing effects on the lethality of the venom of the

monocled cobra (Naja Kaouthia). It appears to inhibit the myotoxicity and enzyme activity of cobra venom[7].

M. pudica contains mimosine which is a toxic alkaloid. Adrenalin like substance has been identified in the extract of its leaves. Some workers have reported the presence of Crocetin dimethyl Easter in the extract of the plant. Roots contain tannin up to 10 per cent. Seeds contain a mucilage which is composed of d-xylose and d-glucuronic acid. The plant extract contains green yellow fatty oil up to 17 per cent. The plant is reported to contain tubuline and a new class phytohormone turgorines is found to be active in the plant. The periodic leaf movement factors are reportedly the derivatives of 4-*o*-(b-D-glucopyranosyl-6-sulphate) gallic acid[1, 7].

Taxonomy and nomenclature

Mimosa pudica was first formally described by Carl *Linnaeus* in Species Plantarum. The pecies epithet, *pudica*, is Latin for "bashful" or "shrinking", alluding to its shrinking reaction to contact[8].

Botany

Mumosa pudica is a diffusely spreading, half-woody herb, with branched stems up to 1 meter long, sparingly prickly with numerous deflexed, bristly hairs. The leaves are very sensitive, both pinnae and leaflets, folding when touched. Pinnae are usually 4, digitately arranged at the end of each petiole, and 4 to 9 centimeters long. The leaflets are narrowly oblong, inequilateral, 1 to 1.5 centimeters long, sessile, sparingly bristly, with pointed tips. Heads are long-peduncled, solitary or 2 to 3 in each axil, about 1 centimeter in diameter. Pods are flat, slightly recurved, 1 to 2 centimeters long, with 3 to 5 one-sided joints that fall away on maturity. Florets are red in the upper part with pink to lavender filament [6]

Leaflet movement physiology

The leaflets fold together in the early evening and reopen at sunrise. It is called bashful or sensitive because the leaflets fold together on touching, warming and shaking. The phenomenon is called ***seismonastic*** movement due to a rapid change in turgor pressure and changes in membrane permeability in the pulvini cells in the leaf regions with rapid movement of calcium ions. At night, the leaves also fold and bend, termed ***nyctonastic*** movements (reaction to absence of light)[10,11.]

Seismonastic Movement / Actin Cytoskeleton: Study showed fragmentation of actin filaments occurring during bending was invovled in the regulation of movement. The effect of phosphatase inhibitors on the actin cytoskeleton affects dynamic reorganization of actin filaments and causes the seismonastic movement.Mimosa pudica is a thigmonastic plant that reacts in response to stressors such as electrostimulation, wound, wind, vibration, touch,drought, change of illumination, and hot or cold stimuli. Mimosa pudica reacts to stimulation by closure of leaves and descent of petiole. The anatomy of *M. pudica* is unique and contributes to the bioelectrochemical response mechanism of the plant. The propagation of action potentials is a signaling mechanism in *M. pudica*. The action potentials that occur in plants have many of the same properties as action potentials that occur in animals including the all-or-nothing law, threshold potential, and refractory period. Tactile stimulation of *M. pudica* induces transmission of an action potential that stops at the base of a single pinna with no further transmission occurring, leaving leaflets from neighboring pinnae unfolded. Effects of ion-channel inhibitors, aquaporins, and uncouplers on the kinetics of signal transduction and mechanoresponses in *M. pudica* are discussed[15-19].

Range

Sensitive plant was first described from Brazil (Pacific Island Ecosystems at Risk 2001) and is perhaps native to much or all of the New World Tropics[21-]. Today, it is pantropical in its distribution [22].

Ecology

Sensitive plant grows on most well drained soils, even scalped or eroded subsoil's and soils with low nutrient concentrations. It requires disturbed soils to establish itself. Repeated burning may encourage its spread in pastures. Sensitive plant is shade intolerant and does not compete with tall vegetation or grow under forest canopies. The species' roots produce carbon disulfide, which selectively inhibits colonization of the rhizosphere by mycorrhizal and pathogenic fungi. This plant occurs in croplands, orchards, pastures, mowed areas, roadsides, and areas disturbed by construction. It may grow as a single plant or in tangled thickets. Sensitive plant grows from near sea level up to 1,300 m in elevation and in areas with annual precipitations from about 1000 to over 2000 mm. The species is frost-sensitive[23-25].

Reproduction

In the Philippines, sensitive plant flowers all year and may produce as many as 675 seeds per plant per year (Holm and others 1977). The species is both wind (Chieng and Huang 1998) and bee-pollinated (Payawal and others1991). Air-dry seeds from Puerto Rico weighed an average of 0.0065 + 0.0002 g/seed[26-29]. With no pretreatment, seeds from this collection began germinating 7 days after sowing and reached a maximum germination of 17 percent by 94 days (author's observation). In another test, 80 percent

germination was obtained in 4 weeks with alternating temperatures of 20 and 40 °C [30-31]. Bui (2001) recommends apretreatment with hot water followed by overnight soaking. Germination is epigeal. The Seeds are transported by means of the bristles on the edges of their pods that cling to clothing[32-34].

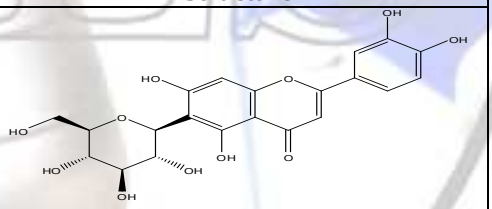
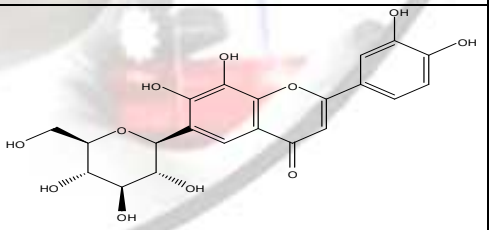
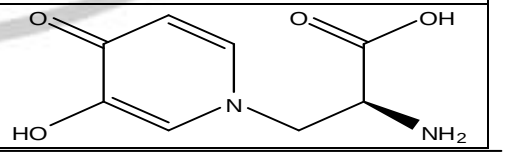
Constituents

The Structures of selected phytochemicals (mimosine, tyrosine 3,4-dihydroxypiridine, mimosinamine, mimosinic acid) from *Mimosa pudica* [1 -4, 7].

Table 1: Botanical variation among the major species of *Mimosa*[9-14]

Characters	*M. pudica*	*M. himalayana* Syn. *M. rubicaulis*	*M. hamata*
Plant	Small woody herbs or low-spreading undershrub with hairy and prickly branches, hairs glandular	A large straggling shrub, studded with straw-coloured, hooked prickels	A much branched, armed shrub, branches downy, with numerous straw-coloured, curced or straight prickles
Leaves	Bipinnate, sensitive to touch, pinnae 1-2 pairs, leaflets 10-20 pairs, linear, glabrous	Bipinnate, main rachis with hooked prickles, pinnae 5-11 pairs, linear-oblong	2-pinante, main rachis pubescent, some timely prickly, leaflets 6-10 pairs
Flowers	Heads small, peduncled, globose, axilalry, pink-purple, Calyx campanulate, Petals crenate towards base	Numerous, in globose heads, peduncles crowded at the ends of branchlets	4-merous in globose heads, peduncles axillary, crowded at the end of branches
Pods	1.5-2.5 cm long, closely prickly on the sutures	7-10 cm long, falcate, glabrous, one seeded joints, persistant but not prickly	5-7 cm long, falcate, consisting 4-8 one seeded joints, pubescent
Flowering and Fruiting time	Sept.-March in Indian conditions	August-Sept. and October in Indian conditions	Aug.-Nov. and Dec.-Feb. in Indian conditions

Table 2: Chemical constituents of *Mimosa pudica*

Chemical Name	Structure
5, 7, 3', 4'-tetrahydroxyl-6-C-beta-D-glucopyranosyl flavones	
7,8,3',4'-tetrahydroxyl-6-C-beta-D-glucopyrano-sylflavone	
Mimosine	

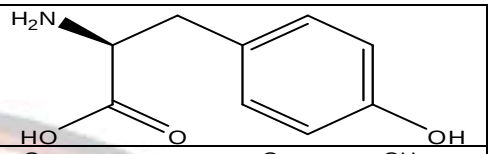
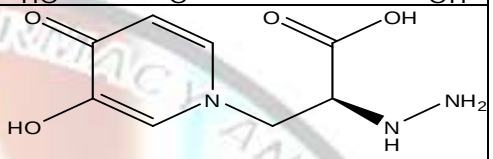
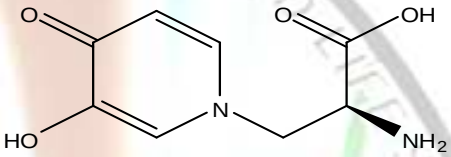
Tyrosine	
Mmimosinamine	
Mimosinicacid	

Table 3: Pharmacological activity of *Mimosa pudica*

Parts and its form	Pharmacological activities
Aqueous and alcoholic extracts of *Mimosa pudica* dried root.	Myotoxicity and toxic enzymes of *Naja kaouthia* venom[7,35-41]
Ethanolic extract of *Mimosa pudica* leaves	Hyperglycemic activity[42, 61]
Methanolic and the total aqueous extract *Mimosa pudica* stem	Wound healing activity [43-45,
Aqueous extract of stem bark, mthanolic extract of leaves, and seed	Antimicrobial activity [46-47, 49, 62]
Phenolic extract of roots	Antiasthmatic [50]
Paste of leaves, Ethanolic extract of seeds	Anticancer [51]
leaf extract	Strong antimicrobial activity against *Staphy-lococcus aureus* and *Bacillus subtilis*[43-44 and 46-47]
Roots	Constipating [1], Febrifuge 1, conditions of *pitta* leucoderma[1], Metropathy [1], Ulcers[1], Dysentery[1], Burning sensation[1], vaginopathy [2], Fistula [7], Strangury[7], Asthma[49], Small pox[49], Antispasmodic[55], Emetic[56], Fevers [57], Inflammations [58] and Hemorrhoids, jaundice[59]
Aqueous extract of leaf	Enzymic antioxidants such as Superoxide dismutase, peroxidase, catalase and polyphenol oxidase [56]
Aqueous extract of dried roots	fibrinolytic activity [7], hemorrhagic activity of *Naja naja* and *Bangarus caerulus*, Analegsic activity [6]
Ethanolic and Petroleum ether extract of leaf	Anti-diabetic activity

Myotoxicity

Aqueous and alcoholic extracts of dried roots of *Mimosa pudica* were tested for their inhibitory activity on lethality, myotoxicity and toxic enzymes of *Naja kaouthia* venom. The aqueous extract, particularly the normal water extract, displayed a significant inhibitory effect on the lethality, myotoxicity and tested enzyme activities of venom compared with alcoholic extracts. The present finding suggests that aqueous extracts of *M. pudica* root possess compound(s), which inhibit the activity of cobra venom[7].

Wound healing activity

Treatment of wound with ointment containing 2% (w/w) the methanolic and 2% (w/w) the total aqueous extract exhibited significant ($P < 0.001$) wound healing activity. The methanolic and total aqueous extracts were analyzed for total phenols content equivalent to Gallic acid. The content of total phenols was 11% (w/w) and 17% (w/w) in methanolic and total aqueous extract respectively. The methanolic extract exhibited good wound healing activity probably due to phenols constituents[16-18].

Anticonvulsant activity

The decoction of *Mimosa pudica* leaves given intraperitoneally at dose of 1000–4000 mg/kg protected mice against pentylentetrazol and strychnine-induced seizures. *M. pudica* had no effect against picrotoxin-induced seizures It also antagonized *N*-methyl-D-aspartate- induced turning behavior. These properties could explain its use in African traditional medicine[60].

Hyperglycemic activity

Ethanolic extract of *Mimosa pudica* leaves given by oral route to mice at a dose of 250 mg/kg showed a significant hyperglycemic effect[15-61].

Antimicrobial activity

The antimicrobial activity of Mimosa was studied using well diffusion method. The activity was tested against *Aspergillus fumigatus, Citrobacter divergens* and *Klebsiella pneumonia* at different concentrations of 50, 100 and 200µg/disc and the results have been illustrated[62].

Anti-diabetic activity

In the present study attempts were made to study anti-diabetic activity of the leaves of *Mimosa pudica* Linn belonging to family Mimisace. Ethanolic and Petroleum ether extract of *Mimosa pudica* Linn use used and compared with Metformin as standard drug. Wister strains of either sex were treated with Alloxan to induce diabetes. Glucose Oxidase/Perioxidase method was used for the determination of plasma glucose level. The ethanolic extract showed significant decrease in blood glucose level[50-54].

Antiasthmatic activity

The aqueous extract of *Mimosa pudica* (AEMP) is showed anti-asthmatic activity in *in-vitro* and in vivo animal models. Histamine induced contraction in isolated goat tracheal chain showed that aqueous extract of *Mimosa pudica* (AEMP) inhibited the contractile effect of histamine ($P<0.05$). A dose dependent contraction of goat tracheal chain is observed. Treatment with AECP protected 74% from degranulation of mast cell as compared to control group. AEMP showed excellent protection in guinea pigs against the histamine-induced bronchospasm. Thus, AECP showed antihistaminic, mast cell stabilizing and protected guinea pigs against his amine induced PCD and hence possesses potential role in the treatment of asthma[50].

Antioxidant activity

The antioxidant effect of the ethanolic extract of *Mimosa pudica* (Mimosaceae) against free radical damage by different standard methods such as DPPH (1,1-diphenyl-2-picrylhydrazyl), Nitric Oxide (NO), ABTS (2,2'-azino-bis (3-ethylbenzthiazoline-6-sulphonic acid)) and Hydrogen peroxide free radical model. The test extract exhibited significant inhibition in Nitric oxide and DPPH free radical formation with IC50 values of 78.1±1.75 and 35.00±1.15 g/ml respectively[65-66].

Antiulcer activity

Aqueous extract of the leaves *Mimosa pudica* were tested orally at the doses of 200 and 400 mg/kg, on gastric ulcerations experimentally induced bypylorus ligation, aspirin and alcohol models. Both the anti-secretory and cytoprotection hypothesis were evaluated. The aqueous extract at 200 and 400 mg/kg was showed significantly inhibited ulcer formation. There was a significant ($P < 0.01$) dose-dependent decrease in the ulcerative lesion index produced by all the three models in rats as compared to the standard drug lansoprazole[67-68].

Applications of *M. pudica* in Traditional Healthcare System

Ayurveda has declared that its root is bitter, acrid, cooling, vulnerary, alexipharmic, and used in the treatment of leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, asthma, leucoderma, and fatigue and blood diseases. Unani Healthcare System its root is resolvent, alternative, and useful in the treatment of diseases arising from blood impurities and bile, bilious fevers[57], piles, jaundice[59], and leprosy etc. Decoction of root is used with water to gargle to reduce toothache. It is very useful in diarrhea (athisaara), amoebic dysentery[1] (raktaatisaara), bleeding piles and urinary infections. It arrests bleeding and fastens the wound healing process. It is mainly used in herbal preparations for gynecological disorders. It has been said to have medicinal properties to cure skin diseases. It is also used in conditions like bronchitis, general weakness and impotence. It is also used to treat neurological problems. The content of *M. pudica* has a capacity of arresting bleeding and it fastens the process of healing of wounds. It is recommended in diarrhea, amoebic dysentery and bleeding piles. It is also used in herbal preparations of gynecological disorders. Its extract can cure skin

diseases. Some herbal doctors recommend it for bronchitis, general weakness and impotence.

All the five parts of the plant (that is the PANCHANG) - leaves, flowers, stems, roots, and fruits are used as medicines in the traditional healthcare systems. In India, different parts of the plant have been in popular use for treating various ailments since long. Recent researches show that the extract of this plant can be used for checking child birth. Some authors have reported that this herb can replace contraceptive pills if researches are done properly.According to different researches done so far, *Mimosa Tenuiflora* bark is used to relax the mind, and relieve depression, mental distress, irritability, severe palpitations, and amnesia. It is a mood enhancer and improves circulation of the blood. Some believe Mimosa can reduce the onset of baldness. Due to its ability to promote healthy cell growth, Tepezcohuite is used in shampoos, creams, capsules, and soaps. In Ayurvedic and Unani medicine, Mimosa pudica root is used to treat bilious fevers[57], piles, jaundice[59], leprosy, dysentery[1], vaginal and uterine complaints, inflammations, burning sensation, fatigue, asthma, leucoderma, and blood diseases. In Western medicine, Mimosa root is used for treating insomnia, irritability, premenstrual syndrome (PMS), menorrhagia, hemorrhoids, skin wounds, and diarrhea. It is also used to treat whooping cough and fevers in children, and there is some evidence to suggest that Mimosa is effective in relieving the symptoms of rheumatoid arthritis. All parts of the Mimosa plant are reportedly toxic if taken directly. Its consumption is not recommended to pregnant or nursing ladies. Due to these reports, it seems to be best to consult a physician before using Mimosa internally. Researches regarding safety in young children or those with severe liver or kidney disease have not been found[59-60]

Conclusion

The whole plant of *Mimosa pudica* is very useful for various pharmacological and biological activities. Mostly Root and leaves of *Mimosa pudica* are showed maximum pharmacological activity. This overview helps to new researchers.

References

1. Mimosa pudica information from NPGS/GRIN". www.ars-grin.gov. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?24405. Retrieved 2008-03-27.
2. Mimosa pudica L.". US Forest Service. http://www.fs.fed.us/ global/iitf/pdf/shrubs/Mimosa%20pudica.pdf. Retrieved 2008, P. 03-25.
3. Chauhan, Bhagirath S. Johnson; Davi, E. "Germination, emergence, and dormancy of Mimosa pudica". Weed Biology and Management 9 (1): (2009). 38–45.
4. Agharkar, S.P. Medicinal plants of Bombay Presidency. Pbl. Scientific publishers, Jodhpur, India: (1991). 142-143.
5. Bhandari, M.M. Flora of the Indian Desert. Pbl. MPS Repros, Jodhpur, India: (1990). 136.
6. Caius, J.F. Medicinal and poisonous Legumes of India. Pbl. Scientific Publishers, Jodhpur, India: (1980). 174-177.
7. Journal of Ethnopharmacology Volume 75, Issue 1, April 2001, Pages 55-60.
8. "*Mimosa pudica*". *Australian Plant Name Index (APNI), IBIS database*. Centre for Plant Biodiversity Resea Botanical differences among the major species of *Mimosa*. rch, Australian Government. http://www.anbg.gov.au/cgi-bin/apni?taxon_id=20037
9. Agharkar, S.P. Medicinal plants of Bombay Presidency. Pbl. Scientific publishers, Jodhpur, India: (1991). 142-143.
10. Bhandari, M.M. Flora of the Indian Desert. Pbl. MPS Repros, Jodhpur, India: (1990). 136.
11. Caius, J.F. Medicinal and poisonous Legumes of India. Pbl. Scientific Publishers, Jodhpur, India: (1980). 174-177.
12. Paranjpe, P. Indian medicinal plants: Forgotten healers. Pbl. Chaukhamba Sanskrit Pratisthan, Delhi, India: (1999). 155-156.
13. Singh, U., Wadhwani, A.M. and Johri, B.M. Dictionary of Economic plants of India. Pbl. Indian Council of Agricultural Research, New Delhi, India: (1996). 142.
14. Verma, D.M. Balakrishnan, H.P. and Dixit, R.D. Flora of Madhya Pradesh (Vol.I), Pbl. Botanical survey of India, Calcutta, India.: (1993). 440-441
15. A. G. Volkov, T. Adesina, E. Jovanov, Closing of Venus flytrap by electrical stimulation of motor cells, Plant Signal. Behavior, 2(2007) 139-144.
16. A. G. Volkov, T. Adesina, V. S. Markin, E. Jovanov, Kinetics and mechanism of Dionaea muscipula Ellis trap closing, Plant Physiology, 146(2008)694-702.
17. A. G. Volkov, Electrochemistry of photosynthesis, in:Electrochemical Dictionary, Eds. A. J. Bard, G. Inzelt, F. Scholz,Springer, Berlin, 2008.pp. 198-199,
18. A. G. Volkov, Plant Electrophysiology, in: Electrochemical Dictionary, Eds. A. J. Bard, G. Inzelt, F. Scholz, Springer, Berlin, 2008, pp.503-504,

19. A. G. Volkov, H. Carrell, T. Adesina, V. S. Markin. E. Jovanov,Plant electrical memory, Plant Signal. Behavior, 3 (2008)490-492.
20. Arora, S.K., Chemistry and biochemistry of legumes. Edward Arnold (Publishers) Limited, London. 1983. 358 p.
21. Bui, L-D. Mimosa pudicahttp://bio.maimi.edu/mimosa/mimosa.html. p.Chieng, H-T. and T.C. Huang. 1998. Aeropollen of the Pingtung area, South Taiwan. Taiwania 43(2): 2001.73-100.
22. Coimbra, A.F. and A. Magnanini. Considerations sobre Mimosa pudica nocombate a arosao superficial. Anucio Brazilero Economico da Floresta 6. Instituto Nacional, Pinho, Brazil. 1953.131-136.
23. Feng, Z., P.G. Hartel, R.W. Roncadori, S.J.S.Sung, and J.E. Box.. Inhibition of fungal colonization on the rhizoplane of the CS2-production plant, Mimosa pudica L. In: Plant and Soil Sciences 82. Kluwer Academic Publishers, Dordrecht, Netherlands. 1998, 115-126.
24. Guzmán, D.J. Especies utiles de la flora salvadoreña. Ministerio de Educación, Dirección de Publicaciones. San Salvador, El Salvador. 1975, 703 p.
25. Holm, L.G., D.L. Plucknett, J.V. Paucho, and J.P.Herberger. The world's worst weeds. 1977.
26. East-West Center, University of Hawaii,Honolulu, HI. 609 p.
27. Howard R.A. 1988. Flora of the Lesser Antilles,Leeward and Windward Islands.
28. Dicotyledoneae, Part 1. Vol. 4. Jamaica Plain,MA: Arnold Arboretum, Harvard University.
29. Liogier H.A. Descriptive flora of Puerto Rico and adjacent islands, Spermatophyta. Vol.2. Editorial de la Universidad de Puerto Rico,Río Piedras, 1988. p. 481
30. Martínez R.G, F. Rodríguez , C.M.Contreras, and M. Molina H. 1996.
31. Preliminary de las possibles acciones antidepresivas de Mimosa pudica L. In:Resumen de ponencias del Primer Congreso Nacional de Plantas Medicinales de Mexico. p. 69. July 24-30, 1996.
32. Allen, R. 1969. Mechanism of the seismonastic reaction in *Mimosa pudica*. Plant Physiol 44:1101-1107
33. Modern-natural. Mimosa pudica Linn.http://modern natural.com /mimosa_ pudica.htm. 2001. 4 p.
34. Pacific Island Ecosystems at Risk. 2001. Invasive plant species: Mimosa pudica Mart. ex Colla,Fabaceae. http://www.hear.org/pier/mipud.htm.
35. Irshad M. and Chauhuri P.S. (2002) *Indian J Expt Biochem* 40(2) 233 – 1239.
36. Bhadauria M.M., Jadon A., Sharma A. and Shukla S. (2002) *Indian J Expt Biol*40(2), 1254 – 1259.
37. Trivedi S. and Rawal U.M. (2000) *J Pharmacol* 7(3) 288 – 292.
38. Suja V., Sharmila S.S. and Shyamaladevi C.S. (1997) *Indian Expt Biol* 35(3), 50– 52.
39. Wanger B.A. (1994) *Biochemistry* 33(5), 4449-4452. Hayes W. and Francis T. (2000) Principles and Methods of Toxicology 4th Ed.,Philadelphia, USA.
40. Omotuyi I.O., Oluyemi, K.A., Omofoma C.O., Josiah S.J., Adesanya O.A. andSaalu, L. C. (2006) *African J Biotech*
41. T. Amalraj and S. Ignacimuthu Hyperglycemic effect of leaves of Mimosa pudica Linn 157, 231±234.
42. B.P 1993, Vol.II, Page number: 1096.
43. B.P 1993, Vol.I Page number: 485.
44. Dr.C.K.Kokate, Practical Pharmacognosy, III-Edition 1991, Page number 122, Published by Shri Dinesh K.Furia, Nirali Prakasham, Pune.
45. Palacious C, and Reyes, R. E. 1991. Antibacterial and Antimycotic of Mimosa pudica in experimental animals, Arch Invest Med. (Mex), 22(2) : 163-169
46. Ojalla, T, Remes, S, and Hans, P. 1999. Antimicrobial activity of some coumarin containing herbal plants growing in Finland. JEthnopharmacology, 68 (1-3): 267-274.
47. Ahmad, I, and Beg, A. Z. 2001. Antimicrobial and phytochemical studies on 45 Indian medicinal plants against multi-drug resistant human pathogens.J. Ethnopharmacol 74: 113–23.
48. Nguyen-Hai Nam[1], Hwan-Mook Kim Ki-Hwan Bae Byung-Zun Ahn Inhibitory effects of Vietnamese medicinal plants on tube-like formation of human umbilical venous cellsArticle first published online: 10 FEB 2003 DOI: 10.1002/ptr.934
49. John, A. Parrotta, Healing Plants of Peninsular India,CABI publishing USA, 557(2001). Alberti, K. G., Zimmet, P. Z.: Diabet. Med., 15: 539-553(1998).
50. Williams, Thomas, Foye's, Principles of MedicinalChemistry, 5th Edn Lippincott Williams and Wilkins Publication., 633(1995).
51. David, A. W., Thomas, L., Lemke, Foye's., Principles of Medicinal Chemistry, 5th Edn., Lippincott Williams and Wilkins Publication, pp629 (1995).
52. Fujita-Yamaguchi, Y., J. Biol. Chem., 259, 1206.

53. Das S.K. and Vasudevan D.M. (2006) *Indian J Clinical Biochem*, 21(1), 62 –69.
54. Chatterjee M. and Sil P.C. (2007) *Indian JPharmacol*, 39(3), (2007) 43 – 47.
55. Gupta S., Pandey R., Katyal R., AggarwalH.K., Aggarwal R.P. and Aggarwal S.K.(2005) *Indian J Clinical Biochem*, 20(1), 67 – 71.
56. Husni T, Hantash AEJ.Evaluation of Narcotic (Opioid Like) Analgesic Activities of Medicinal Plants. European Journal of Scientific Research, ISSN 1450-216X Vol.33 No.1 2009, 179-182.
57. Palacious C, and Reyes, R. E. 1991. Antibacterial and Antimycotic of Mimosa pudica in experimental animals, Arch Invest Med. (Mex), 22(2): 163-169.
58. *Volume 124, Issue 2, 15 July 2009, Pages 311-315* Dnyaneshwar D. Kokane, Rahul Y. More, Mandar B. Kale, Minakshi N. Nehete, Prachi C. Mehendale, Chhaya H. Gadgoli
59. *Fitoterapia, Volume 75, Issues 3-4, June 2004, Pages 309-314*
60. *Fitoterapia, Volume 73, Issue 4, July 2002, Pages 351-352*
61. Gandhiraja, N.; Sriram, S.; Meenaa, V.; Srilakshmi, J. Kavitha; Sasikumar, C.; and Rajeswari, R. (2009) "Phytochemical Screening and Antimicrobial Activity of the Plant Extracts of Mimosa pudica L. Against Selected Microbes," *Ethnobotanical Leaflets*: Vol. 2009: Iss. 5, Article 8. Available at: http://opensiuc.lib.siu.edu/ebl/vol2009/iss5/8
62. John, A. Parrotta, Healing Plants of Peninsular India,CABI publishing USA, 557(2001).
63. . Alberti, K. G., Zimmet, P. Z. : Diabet. Med., 15: 539-553(1998).
64. Arora S, Kaur K, Kaur S. Indian medicinal plants as reservoir of protective phytochemicals. Teratog Carcinog Mutagen.Suppl1:295-300. (2003)
65. Balakrishnan N, Suresh D,Pandian GS ,Edwin E,Sheeja E,Anti diarrhoeal potential of mimosa pudica root extracts .Indian J Nat Prod ., 22(2):21-23. (2006)
66. Badami S, Om Prakash, SH, Dongre, Suresh B. Invitro antioxidant properties of Solanum pseudocapsicum leaf extrat
67. Akhtar MS, Akhtar AH, Khan MA. Int J Pharmacog 1992; 30:97-8.
68. Repetto MG, Liesuy SF. Braz J Med Biol Res. 1994; 35:523-34.
69. M Malone. New Phytologist1996; 128:59-66.

ISSN: 0976-7126

Leaves

Seeds

Fig. 1 *Mimosa pudica* Linn.