

A REVIEW ON MIMOSA PUDICA PLANT

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ABSTRACT

Mimosa pudica plant also called sensitive plant, is a creeping annual and perennial herb. This plant which folds itself when touched and spreads its leaves once again after a while. The plant extracts from various parts of *Mimosa pudica* exhibits significant antimicrobial activities against a wide range of food borne pathogens. *Mimosa pudica* also used to avoid or cure several disorders like cancer, diabetes, hepatitis, obesity and urinary infections. A wide array of pharmacological properties like antioxidant, antifungal, antibacterial, antidepressant and etc..have been attributed to different parts of *M.pudica*. The whole plant of *Mimosa pudica* is very useful for various pharmacological and biological activities.

KEYWORDS: Antimicrobial, Medicinal plants, *Mimosa pudica*, Pharmacological, Phytochemicals

INTRODUCTION

For a long period of time plants have been a source of medicinal agents and that natural products used to maintain the human health. Although popularity of herbal medicine are sources of bioactive phyto compounds and they are used as therapeutic agents as antimicrobial agents. Herbal medicines are gaining growing interest because of their cost effectiveness, eco-friendly attributes and true relief from disease conditions (Tomar, Shrivastava and Kaushik, 2014). Now a day multiple drug resistance has developed using the plant derived antimicrobials drugs due to the indiscriminate used and that are considered to be safer compared with synthetic compounds because of their natural origin. This situation forced scientists to search for new antimicrobial substances and also that is need to develop alternative antimicrobial drugs to treat infectious diseases from medicinal plants. In recent times, the researches focus plants to show immense potential of medicinal plants used in various traditional systems (Joseph, George and Mohan, 2017).

1.1 Biological source of *Mimosa pudica* plant

Mimosa pudica is the herb first formally described by the Carl Linnaeus in 1753 which a creeping annual or perennial herb of the pea family fabaceae that often grows in any kind of soil. *Mimosa pudica* is derived from the word “mimic” means to allude, to sensitivity of leaves and “pudica” means bashful, retiring or shrinking because of its curious nature and easy procreation (Reed-guy *et al.*, 2017). This plant also called sensitive plant in English, Ajalikalika in Sanskrit, Lajawanthi in Hindi Lajjabate in Bangali, Hadergitta in Kannada, Kasirottam in Tamil, Manugumaramu and Sinhala name Nidikumba in Telagu belongs to the genus *Mimosa* (family: Mimosaceae) (Ahmad, Mishra and Gupta, 2012). *Mimosa pudica* is a small or middle sized tree and rods break into 2-5 segments and contain pale brown seeds 2.5mm long and calyxes are campanulate, and petals are create towards the base (Patro, Bhattamisra and Mohanty, 2016).



Figure1: *Mimosa pudica* plant(Chen *et al.*, 2004)

1.2 Scientific Classification

Kingdom : Plantae
 Division : Magnoliophyta
 Class : Magnoliopsida
 Order : Fabales
 Family : Fabaceae
 Subfamily : Mimosoideae
 Genus : Mimosa
 Species : *M. pudica*

Table 1: Botanical variation among the major species of *Mimosa* (Tomar, Shrivastava and Kaushik, 2014),(Reed-guy *et al.*, 2017)

| Characters | <i>M. pudica</i> | <i>M. himalayana</i> Syn. <i>M. rubicaulls</i> | <i>M. hamata</i> |
|------------|--|---|---|
| Plant | Small woody plant which is low spreading undershrub with hairy. The hairs are glandular and prickly branches. | This is a large straggling shrub which is studded with straw coloured. | This is the much branched with armed shrub. It has the numerous straw coloured straight prickles. |
| Leaves | Leaves are sensitive to touch which bipinnate with 1-2 pairs of pinnae. 10-20 pairs of leaflets can see linear and glabrous. | Leaves are bipinnate mainly with rachis hooked. 5-11 pairs of leaflets in pinnae are long and oblong. | These leaves are main rachis pubescent with 2 pinnae. Sometime it is prickly and contains 6-10 leaflet pairs. |
| Flowers | It has a small hair with pink purple. Flowers are peduncled, globose and petals crenate towards base. | The numerous flowers can see with globose heads and peduncles crowded at the ends of branchlets. | It has 4 merous in globose heads. The peduncles axillary which is crowded at the end of the branches. |
| Pods | Pods are closely prickly on the sutures and 1.5-2.5 cm long. | The one seeded joints and 7-10 cm long pods are persistant but not prickly. | 5-7cm long pods can see with 4-8 one seeded joints together. Pods are pubescent and falcate. |

1.3 Characteristics of *Mimosa pudica* plant

1.3.1 Root

Mature root shows cork 5-12 layered with tangentially elongated cells. The secondary cortex consisting of 6-10 layered which tangentially elongated with thin walled cells(Nanoparticles, 2017). The secondary phloem composed of sieve elements, fibers, crystal fibers and phloem parenchyma traversed by phloem rays, phloem fibers and single or in groups arranged in tangential bands. The secondary xylems consists of usual elements traversed by xylem rays and the vessels scattered throughout the secondary xylem having boarded pits and reticulate thickenings(Article, 2009). The crystal fibers in the root containing one or rarely two to four prismatic crystals of calcium oxalate in each chambers(Article, 2016).

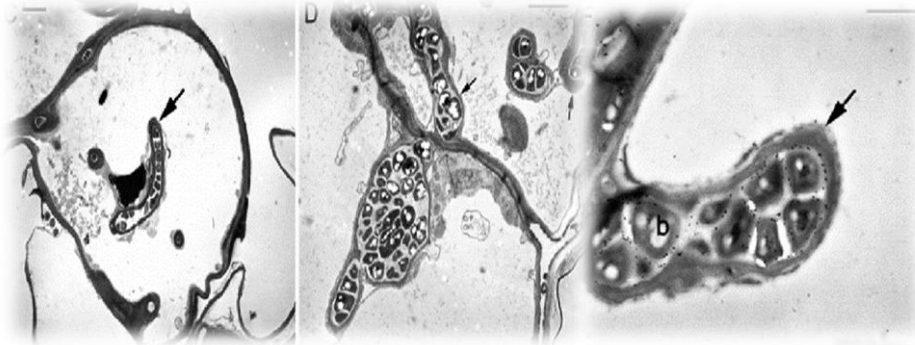


Figure2: Root of *Mimosa pudica* plant(Chen *et al.*, 2004)

1.3.2 Stem Mature stem shows 4 to 8 layered. The secondary cortex is consisting of large, moderately thick walled with parenchymatous cells filled with reddish brown contents(Azmi, Singh and Akhtar, 2011). The secondary phloem consisting of usual elements of 2-5 transversely arranged strips of fibers occur alternating with narrow strips of sieve elements(Article, 2016). The secondary xylem composed of vessels and drum shaped with spiral thickenings, tracheids pitted with pointed ends(Nanoparticles, 2017).



Figure 3: Stem of *Mimosa pudica* plant (Samy, Ignacimuthu and Sen, 1998)

1.3.3 Leaf

The petiole shows single layered epidermis, covered with thin cuticle. The cortex of the leaves are layered with 4-7 thin walled and consists of parenchymatous cells (Doss, 2011). The pericycle is arranged in a ring. There are four vascular bundles present with two smaller vascular bundles arranged laterally like one in each wing(Kaur *et al.*, 2011).

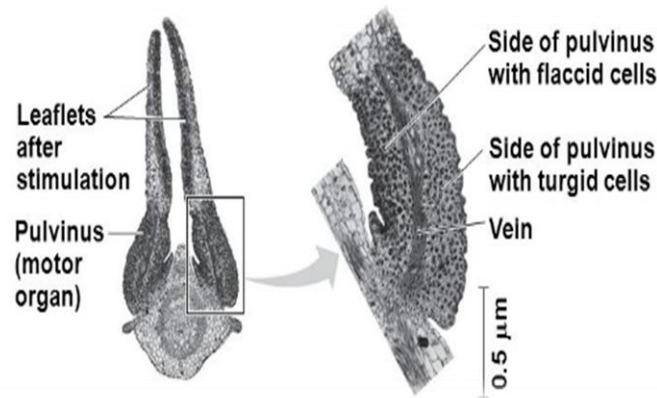


Figure 4: Cross section of the *M.pudica* leaves (Joseph, George and Mohan, 2017)

2. Medicinal applications of *Mimosa pudica*

The traditional medicine has originated with the infliction of diseases in the human as the natural products including plants which can easily reach of humans. According to the estimation of World Health Organization 80% of the world's population including all developed and developing countries use plants and natural products for their healthcare (Medicine, 2017). The whole plant of *Mimosa pudica* is very useful for various activities such as biological and pharmacological activities. The whole plant is crushed and used to relieve itchininess and itch related diseases (Article, 2009). According to the Ayurveda, the root is bitter, acrid, cooling, vulnerary, astringent, alexipharmic and used in the treatment of biliousness, leprosy, dysentery, vagina and uterine complaints, inflammations, burning sensation, fatigue, asthma, blood pressure and etc.. Its leaves are useful in hydrocele, haemorrhoids, fistulous withers, scrofula, pinkeye, cuts and bleeds and *Mimosa pudica* whole plant is a rich source as anti-diabetic, antitoxin, anti hepatotoxin, antioxidant, anthelmintic, antipyretic, antispasmodic, calmative and anti-inflammatory properties (Muhammad *et al.*, 2016), (Patro, Bhattamisra and Mohanty, 2016). This plant is mainly used in herbal preparations for gynaecological disorders.

Mimosa pudica is being investigated in contemporary for its potential to yield novel chemotherapeutic compounds because it contains an alkaloid called mimosine which has potent anti-proliferative and apoptotic effects (Tomar, Shrivastava and Kaushik, 2014). Recent research shows that the extract of *Miomosa pudica* plant can be used for checking child birth. According to different researches done so far, the bark of the plant is used to relax the mind and relieve depression, mental desires and irritability (Ahmad, Mishra and Gupta, 2012).

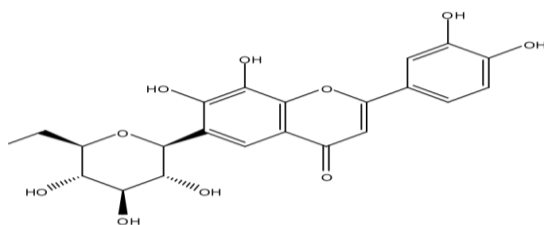
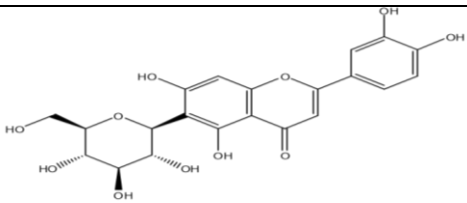
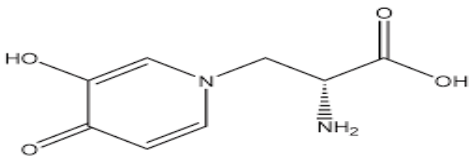
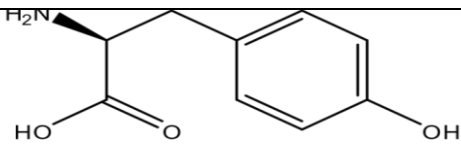
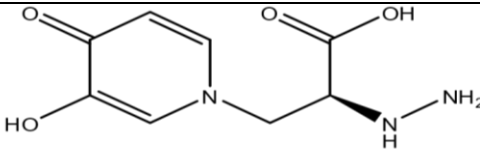
3. Principal constituents of *Mimosa* plant

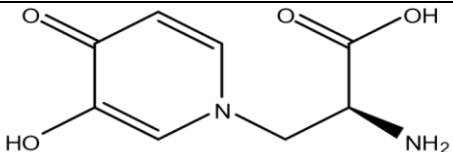
The therapeutic efficacy of plants, phytochemicals are pharmacologically active compounds and it contains alkaloid, glycoside, flavonoid and tannin (State, State and State, 2016). The antimicrobial property of compounds extracted from medicinal plants is of great significance for medical and food application. Seeds of *M. pudica* extrude a hydrogelable material, glucurono xylan polysaccharide that can be used for the delayed, sustained/ targeted release of different drugs. *M. pudica* is also a valuable source of jasmonic acid and abscisic acid, which can be isolated and characterized by mass spectrometry (Reed-guy *et al.*, 2017). Flavonoids constitute a major group of phenolic compounds in plants. They provide pigmentation for fruits, flowers, and seeds to attract pollinators and seeds dispersers. Although, mainly flavonoids can resist to microbial because they inhibit the synthesis of

nucleic acid, function of cytoplasmic membrane and energy metabolism (Joseph, George and Mohan, 2017).

Mimosa pudica contains toxic alkaloid which have antispasmodic, antimalarial, analgesic and diuretic activities. In the plant leaves extracts adrenaline like substances also can identified. Mimosine also contains an alkaloid which has been found to have potent antiproliferative and apoptotic effects (Nanoparticles, 2017). Crocetin dimethyl Ester is presence when in the extract of the plant. Roots contain tannin and seeds of this plant contain a mucilage which is composed of d-xylose and d-glucuronic acid. The plant extract of *mimosa pudica* contains green yellow fatty oil (Thi *et al.*, 2016). The plant is reported to contain tubuiline and a new class phytochrometurgorines is found to be active in the plant. The secondary metabolites of the plant extracts could be responsible for the antimicrobial activity (Azmi, Singh and Akhtar, 2011).

Table 2: Chemical constituents of *Mimosa Pudica* (Kaur *et al.*, 2011), (Azmi, Singh and Akhtar, 2011)

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

| | |
|---------------|--|
| Mimosinicacid |  |
|---------------|--|

Several research works have been carried out to study the phytochemical components of *M.pudica* and also the antimicrobial activity of the plant. The higher plants produce a large number of diverse chemical compounds with different biological activities(Article, 2016). The plant extracts of many higher plants have some properties under the laboratory study, that as antibacterial, antifungal and insecticidal properties. The antimicrobials of plant origin possess reduced side effects and are effective against infectious disease(Singh *et al.*, 2010). In recently, when searching new biomolecules of plant origin and evaluating them for antimicrobial property would result in developing eco-friendly management of human infectious diseases. The non-nutritive phytochemicals obtained from the plants have some characteristics such as protective or diseases preventive antimicrobial activities, the structural differences in them are they results in the difference in their mode of action(Linn, 2012). The mechanism behind the antibacterial activity of plants extracts includes disruption of bacterial membrane potential permeabilization and leakage of the cellular contents. Contemporary several research works is carrying out to study about the antimicrobial activity of the plants(Thi *et al.*, 2016).

4. Antimicrobial activity of *Mimosa pudica* plant

The antibacterial activity is important to check the presence of constituents like alkaloid, glycoside, flavonoid, tannis and etc.. The antimicrobials of plant is effective against infectious diseases(Thi *et al.*, 2016). When searching new biomolecules of plant origin is an effective method to develop the eco-friendly management of human infectious diseases. The mechanism behind antibacterial activity of the *Mimosa pudica* plant extracts includes the disruption of bacterial membrane potential leakage of the cellular contents(Joseph, George and Mohan, 2017).

4.1 Disc diffusion method to analyse the antibacterial activities

The antibacterial activity of *Mimosa pudica* can studied using the disc diffusion method against the *E. coli* bacteria.

4.1.1 Agar disc diffusion method

This is the method based on antibiotic impregnated disc which is placed on agar previously inoculated with the test bacterium through the agar medium producing an antibiotic concentration gradient. The antibacterial activity of *Mimosa pudica* can studied using the disc diffusion method against the *E. coli* bacteria (Hombach, Zbinden and Böttger, 2013). For the disc diffusion assay, bacterial suspension is uniformly spread on a solid growth medium in a Petri dish. The surface of the each agar plate with four sterile paper disks are impregnated under the cultivation conditions. The disks which served with distilled water and ethanol with impregnated disks act as a negative control and disks with antibiotic served as a positive control (Somily *et al.*, 2012).

4.1.2 Antimicrobial gradient method (Etest)

This is the technology based on the concepts of dilution and diffusion principals for susceptibility testing in order to determine the MIC value. This Etest MIC values creating a concentration gradient of the antimicrobial agent in the agar medium (Somily *et al.*, 2012).

4.1.3 Agar well diffusion method

This method is widely used to determine the antibacterial activity of plants or microbial extracts. Agar well diffusion method is similar to disc diffusion method ('On the theory of the disk diffusion test', 2018).

CONCLUSION

Plants have been the traditional sources of raw materials for medicine. The benefits of using the natural products has increased and the active plant extracts are frequently used for new drug discoveries and for the presence of antimicrobials (Tomar, Shrivastava and Kaushik, 2014). The standardized plant extracts provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. The review presented a brief information about *Mimosa pudica* that claims there is a vast potential in this herb in view of therapeutics and furthermore, commercialization of this herb would be in line with the WHO guidelines is highly desirable for the benefits of humanity (Reed-guy *et al.*, 2017). The general data have provided the basis for its wide use as therapeutic both in traditional and folk medicine. In recently, there are emerging many multidrug resistant human pathogenic bacteria (Azmi, Singh and Akhtar, 2011). The whole plant of the *Mimosa pudica* is very useful for various pharmacological and biological activities. Mostly root and leaves of *M. pudica* are showed maximum pharmacological activity. *M. pudica* are now also considered admirable because the various studies have concluded that the plant is rich in alkaloids, mimosine which have anticancer properties (Article, 2016). Further effects are required to elaborate the anticarcinogenic nature of mimosine and its isolation on a commercial scale for therapeutic applications in human beings. Using the extraction of *M. pudica* plant, a large number of studies have been done for its antivenomic activity. Some studies concluded that the antivenomic potential of the plant is due to tannins. *M. pudica* has been extensively studied for its antimicrobial activities (Lakshmibai, 2018), (Kaur *et al.*, 2011).

ACKNOWLEDGEMENT

The author wish to thank the International College of Business and Technology, Sri Lanka.

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