

ETHNOBOTANICAL AND PHARMACOLOGICAL ACTION OF *BIOPHYTUM SENSITIVUM* - (OXALIDACEAE) :REVIEW ARTICLE

DRISYA MK

ASSISTANT PROFESSOR

NEHRU COLLEGE OF PHARMACY

ABSTRACT

Biophytum sensitivum (L) is a medicinal plant also known as little tree plant or Mukkootti widely used in the treatment of various health disorders. It is commonly found in Kerala, wet lands of Nepal, tropical India and in other southern Asian countries. The plant has been extensively reported for its biological activities and therapeutic potentials such as wound healing, analgesic, antipyretic, anti-inflammatory, immunomodulatory, antitumor, antidiabetic, antioxidant, antibacterial, antihypertensive, chemoprotective and antifertility. The present review covers the ethnomedicinal uses and pharmacological action of the plant.

KEYWORDS : *Biophytum sensitivum*, Mukkootti, Ethnobotany, pharmacological

INTRODUCTION

Biophytum sensitivum commonly known as “Life plant” or Lajjalu belongs to the family Oxalidaceae. It is a mesophytic under-shrub growing in slightly moist places. It is distributed throughout the tropical regions of south Asia, Africa and Madagascar and also the hotter parts of the India, Nepal, Thailand, Malaysia, Indonesia and Srilanka. The plant has been traditionally used to cure various health ailments especially insomnia, convulsion, cramps, chest - complaints, inflammations, tumours, chronic skin diseases. The plant is rich in number of phenolic and polyphenolics compounds, saponins, flavonoids, essential oil, pectin and polysaccharides. Phytomedicines like plants, parts of plants and isolated biologically effective compounds have been used to treat or prevent various disorders. The secondary metabolites like bioactive compounds existing in the plants, furnished the basis for several worldly-wise traditional medicine system like Ayurveda, Unani and Folk and Chinese. The present review is an effort to deliver detailed information on Folkloric uses and pharmacological activities of the plant.

PLANT PROFILE



Figure 01 :*Biophytum sensitivum* plant

Taxonomical classification

Kingdom : Plantae
Phylum : Tracheophyta
Class : Magnoliopsida
Order : Oxalidales
Family : Oxalidaceae
Genus : *Biophytum*
Species : *sensitivum*

Synonyms

Oxalis sensitive

Oxalis cumingiana

Biophytum cumingii

Biophytum cumingianum

Vernacular names

English : Life plant, Little tree plant

Malayalam : Mukkutti, Theendavadi

Hindi : Lakchana, Lajalu

Sanskrit	:	Jhalapushpa,vipareetalajjaalu
Tamil	:	Nilaccurunki,Tintaanaalee
Kannada	:	Hara matchchaka,Horamani
Telugu	:	Attapatti,chumi

PLANT DISTRIBUTION

The plant is distributed worldwide but is most abundant in tropical and subtropical regions.

<i>Kerala</i>	:	Kasaragod district,Kannur district,Wayanad district,Malappuram district,Palakkad district,Kottayam district,Kollam district,Thiruvananthapuram district
<i>Tamil Nadu</i>	:	All districts of tamil nadu
<i>Andhra Pradesh</i>	:	East Godavari district,Vishakapatnam district,Srikakulam district
<i>Maharashtra</i>	:	All districts of Maharashtra
<i>Odisha</i>	:	Ganjam district,Mayurbhanj district

PLANT DESCRIPTION

These are annuals with a maximum height of 25 cm. The base is made of wood. The stem is simple, sturdy and thin, with thick, dense hair covering the apex. There can be as many as thirteen leaves a slender rachis that is fairly covered in thick, dense hair, six to fourteen pairs of leaflets, and oblong or obovate-oblong leaflets blades that measure 3-15 × 2-7 mm. The base is nearly symmetrical, mostly smooth and occasionally covered in trichomes. The umbels have several blooms, and the peduncle is 2-7 cm long, which is less than the leaf's length. A dense cluster of numerous lanceolate bracts, each measuring about 3mm, is present at the peduncles's tip. At the anthesis, the pedicle is around 1 mm, but it is 3mm in the fruit. Sepals are 5-6 mm in size and have glandular septate trichomes. The petals are yellow and longer than the sepals. The capsules have an ellipsoid-obovoid shape and is coated with hairs that measure 4-5 × 3.4 mm. Flowering and fruiting from July to December.

PARTS USED

Leaves, Seeds, stem, Flowers, Root, Whole plant

ETHNOMEDICINAL USES

Tracing the history of traditional practice of *Biophytum sensitivum* possess a wide spectrum of medicinal properties namely antiseptic properties including positive effects in inflammatory diseases. The bioactive of the plants show hypoglycaemic, immunomodulatory, chemoprotective, hypocholesterolemic, apoptotic, cell mediated immune response, antitumor, repetitive action potentials and antibacterial activity. Each part of this plant has its own unique medicinal properties



Figure 02 :Parts of *Biophytum sensitivum*

Leaves

The leaves of *Biophytum sensitivum* are highly valued in traditional medicine for their diverse medicinal properties

1. **Antiinflammatory** :Reduces swelling and inflammation,helpful for wounds and joint pain
2. **Antioxidant** :Protect cells from damaged cause by free radicals
3. **Antiviral** : effective against certain infections and boosts immunity
4. **Antiasthmatic** :Helps in managing respiratory conditions like asthma and bronchitis
5. **Wound -healing** :Promotes faster recovery of cuts,burns and ulcers
6. **Diuretic** :Aids in detoxification by increasing urine output
7. **Anti-diabetic** :Helps regulate blood sugar levels

Application of leaves

1. **Wound healing** :Crush fresh leaves into a paste and appkly directly to wounds,burns or skin infections
2. **Antiasthma** :Boil a handful of leaves in water for 5- 10 min utes.Strain and drink the tea to alleviate asthma,colds or fever
3. **Anti-inflammatory**:Soak a cloth in a warm decoction of the leaves and apply it to swollen or inflammed areas
4. **Skin health** : Use leaf paste as a natural face mask to traet acne and improve skin texture

Seeds

The seeds of *Biophytum sensitivum* also have notable medicinal properties and uses

1. **Antioxidant** :The seeds contain compounds that help protect the body from oxidative stress and free radical damage
2. **Anti-inflammatory** :They can reduce inflammation in the body,beneficial for condition like arthritis and joint pain
3. **Hemostatic** :The seeds are traditionally used to stop internal and external bleeding
4. **Reproductive health** :In some traditional medicine system,the seeds are believed to support fertility and enhance reproductive health

Application of seeds

1. **Antiulcer** :Seeds are dried and ground in to a fine powder,which can be mixed with water or honey to drink directly
2. **Diuretic** :The seeds can be soaked in water to create an infusion used and drink directly

Stem

The stem of *Biophytum sensitivum* is also known for its medicinal properties and is used in traditional medicine for various health benefits

1. **Immunomodulatory** : Strengthnens the immune system and helps the body fight infections
2. **Antidiabetic** :Aids in regulating blood sugar levels
3. **Anti oxidant** :Protects against cellular damage and supports overall helath

4. *Antiinflammatory* :Helps reduce inflammation in conditions like arthritis

5. *Mild sedative* : The stem has a calming effect ,helping to reduce anxiety and stress.It may have mild sedative properties,making it useful for promoting relaxation and improving sleep

6. *Antimicrobial* :The stem helps to prevent infections especially on cuts or wounds

Application of stem

1. *Wound healing* :Crush or pound the fresh stem to extract its juice or make a paste and apply directly to wounds,cuts or other skin injuries.

2. *Anti inflammatory* :Grind the stem into a coarse paste or poultice using a mortar and pestle and apply to areas of pain such as sore muscles,joint inflammation or swollen areas.

3. *Diuretic* : Boil the chopped pieces of the stem in water for about 10-15 minutes.Strain the decoction and drink it,typically in small amounts

4. *Skin conditions* : Extract the juice from the stem by crushing or grinding it and apply juice directly to minor cuts,abrasions or skin irritations

5. *Sedative* : Prepare a mild decoction or extract of the stem and drink the decoction in moderation to help relax,reduce stress or aid in sleep

Root

The root of *Biophytum sensitivum* has been used in traditional medicine for various health benefits

1. *Diuretic* :The root helps to increase urine production and aid in the eliminbation of waste and toxins from the body.This is beneficial to the kidney and urinary tract

2. *Anti inflammatory* :The roots helps tp reduce swelling and allievate oain particularly in cases of joint inflammation and arthritis

3. *Detoxifying* :The root used to help detoxify the body by supporting kidney and liver function.It may also help with digestive issues like constipation or bloating

4. *Antioxidant* :The root helping to neutraliuze harmful free radicals in the body and protect cells from damage which could contribute to overall health and wekll being

5. Analgesic : The root is used for pain relieving properties, especially for headache or other mild pains.

Application of root

1. Detoxifying : Boil the roots in water to make a decoction, Strain the decoction and drink it in moderation.

2. Diuretic : The root can be dried, ground into a fine powder, and taken with water in small doses

3. Antiinflammatory : The root can be crushed in to a paste or powdered and mixed with water to make a poultice and directly applied to inflamed or painful areas

4. Skin health : The root can be made into an extract or paste and applied to the skin, wound, infections.

Whole plant

1. Adaptogenic : The whole plant helps the body adapt to stress and promotes overall resilience. This makes it useful in managing stress, anxiety and fatigue

2. Anti-inflammatory : The whole plant has strong anti-inflammatory effects, making it helpful for treating conditions involving arthritis or muscle pain

3. Antioxidant : The whole plant helps to protect cells from damage caused by free radicals. It may help to contribute overall health and may slow the aging process

4. Antimicrobial : The whole plant is useful for preventing and treating infections, especially when used externally on wounds or skin conditions

5. Analgesic : The plant may help to alleviate mild pain like headaches, muscle aches or joint pain

6. Immunity booster : The plant helps to boost the immune system, helps the body fight off infections and maintain general health

7. Antipyretic : The plant is used a natural remedy for reducing fever. It makes the body a cooling effect and may help lower high temperatures.

8. Digestive health : The whole plant used to treat digestive issues like indigestion, bloating or constipation and support the digestive system by promoting regular bowel movements.

Application of whole plant

1. Detoxification : Boil the entire plant in water for 10-15 minutes .Strain the decoction and consume it in small amounts.

2. Wound healing : Extract juice from the whole plant by crushing or grinding it and apply the fresh juice to cuts,wounds and rashes

3. Analgesic : Grind the whole plant into a paste and apply to inflamed or painful areas such as sore muscles or joints

4. Adaptogenic : Boil the whole plant to make a herbal tea .Strain and drink the tea

5. Immune support : Make the whole plant alcohol-based tincture and take few drops of the tincture as a daily supplement

PHARMACOLOGICAL ACTION

Biophytum sensitivum exhibits several pharmacological actions, primarily due to its various bioactive compounds. While research on this plant is still emerging, traditional and pharmacological studies suggest the following actions:

1. Anti-inflammatory Action

Mechanism: *Biophytum sensitivum* has compounds that inhibit the production of pro-inflammatory cytokines and enzymes like cyclooxygenase (COX), which are involved in the inflammatory response.

Effect: This leads to reduced swelling, pain, and redness, making the plant useful for inflammatory conditions such as arthritis, muscle pain, and other inflammatory disorders.

2. Antioxidant Action

Mechanism: The plant contains several antioxidants, which neutralize free radicals in the body. This action is mainly due to flavonoids, phenolic compounds, and other bioactive metabolites present in the plant.

Effect: By scavenging free radicals, the plant may help protect cells and tissues from oxidative stress, potentially preventing chronic diseases and slowing aging processes.

3. Antimicrobial Action

Mechanism: Several parts of *Biophytum sensitivum*, including the leaves, roots, and whole plant, have demonstrated antimicrobial properties. This action is attributed to the plant's ability to inhibit the growth of bacteria, fungi, and other pathogens.

Effect: The plant can help treat and prevent infections, particularly when used topically on wounds or skin conditions

4. Analgesic Action

Mechanism: The plant has been shown to reduce pain, possibly by inhibiting pain signals or reducing inflammation. This effect is likely mediated by compounds that interact with the central nervous system or peripheral pain pathways.

Effect: It is used to alleviate mild to moderate pain, including headaches, joint pain, and muscular discomfort.

5. Diuretic Action

Mechanism: *Biophytum sensitivum* has mild diuretic effects, which means it promotes the increased production of urine. This action helps eliminate excess salts, toxins, and waste products from the body.

Effect: It supports kidney function, reduces bloating, and may help with conditions like high blood pressure or urinary tract infections.

6. Adaptogenic Action

Mechanism: The plant's adaptogenic properties are believed to help the body cope with stress. It may regulate the hypothalamic-pituitary-adrenal (HPA) axis, which controls the body's response to stress.

Effect: This action helps to normalize the body's response to physical and mental stress, improving overall resilience and reducing the effects of chronic stress or anxiety

7. Hepatoprotective Action

Mechanism: Some studies suggest that *Biophytum sensitivum* has hepatoprotective effects, meaning it can help protect the liver from damage caused by toxins, alcohol, or other harmful substances.

Effect: This action helps in detoxification and maintaining liver health, which is crucial for overall body function.

8. Antipyretic Action

Mechanism: The plant may help reduce fever by acting on the hypothalamus to lower body temperature.

Effect: It is traditionally used to treat fever, especially when accompanied by other symptoms like inflammation or infection.

9. CNS Depressant Action

Mechanism: Some parts of *Biophytum sensitivum*, especially in the form of a decoction or extract, have mild sedative effects, likely due to the presence of flavonoids and other bioactive compounds.

Effect: This action helps to relax the central nervous system, reduce anxiety, and promote better sleep. It may also contribute to an overall calming effect on the body.

10. Digestive Support

Mechanism: The plant's diuretic and mild digestive-stimulating properties may improve digestion and help alleviate issues such as bloating, constipation, or indigestion.

Effect: It supports healthy digestion and can help in cases of gastrointestinal distress.

CONCLUSION

Biophytum sensitivum possess a significant number of advantageous and natural properties against several diseases and ailments in the human body. The plant is a multitude of medicinal applications reported so far from various *Biophytum sensitivum* preparation are impressive. The whole plant and its various extracts covers a lot of pharmacological activities. The pharmacological actions of *Biophytum sensitivum* include anti-inflammatory, antioxidant, antimicrobial, analgesic, diuretic, adaptogenic, and hepatoprotective effects, among others. These properties make it a versatile plant with a range of potential therapeutic uses, though more scientific studies are needed to confirm the full extent and mechanisms of its pharmacological actions.

REFERENCE

1. Guruvayoorappan C, Kuttan G. Inhibition of tumor specific angiogenesis by Amentoflavone. *Biochem (Mosc)* 2008;73(2):209-18.
2. Grover JK, Yadav S and Vats V: Medicinal plants of India with antidiabetic potential. *J Ethnopharmacol* 2002; 1: 81-100. Das JS: The largest genetic paradise of India lacks biotechnological implementation. *Curr Sci* 2008; 94: 558-559
3. Inngjerdingen KT, Coulibaly A, Diallo D, Michaelsen TE and Paulsen BS: A Complement Fixing Polysaccharide from *Biophytum petersianum* Klotzsch, a medicinal plant from Mali, West Africa. *Biomacromolecules* 2006; 7(1): 48-53.
4. Bucar FS, Jachak M, Kartnig TH, Noreen Y, Bohlin L and Schubert ZM: Phenolic Compounds of *Biophytum sensitivum* and their Activities on COX Catalyzed Prostaglandin biosynthesis. International Symposium of Bioassay Methods in Natural Product Research and Drug Development, Swedish Academy of Pharmaceutical Sciences, Uppsala University, Uppsala, Sweden 1997, 49
5. Puri D, Baral N and Upadhyaya BP: Indigenous plant remedies in Nepal used in heart diseases. *J Nepal Med Assoc* 1997; 36: 334–337.
6. Pant PC and Joshi MC: Studies on some controversial indigenous herbal drugs based on ethnobotanical research. A review. *J Res Educ Indian Med* 1993; 12: 19–29
7. Yun LL and Wan YW: Chemical constituents of *Biophytum sensitivum*. *J Chinese Pharm Sci* 2003; 55(1): 71-75
8. Renu S, Some medicinal plants with antibacterial activity. *International Journal of Comprehensive Pharmacy*, vol 4, 22-24, (2010).
9. Sakthivel KM, Guruvayoorappan C. *Biophytum sensitivum*: Ancient medicine, modern targets. *J. Adv. Pharm. Tech and Res*, vol 3: 83, (2012).
10. Ananda Prabu K, Kumarappan CT, Sunil Christudas, Kalaichelvan VK, Effect of *Biophytum sensitivum* as streptozotocin and nicotinamide induced diabetic rats. *Asian Pac J. Trop Bio*, vol 2: 31-35, (2012).
11. Bhaskar VH, Rajalakshmi V. Anti-tumor activity of aqueous extract of *Biophytum sensitivum* Linn. *Annals Biol Res*, vol 1(3): 76-80, (2010).

12. *Biophytum sensitivum* or Mukkuty. Available from: <http://siddham.in/mukkuty-Biophytum-sensitivum>. [Last updated on 2010 June 26; cited on 2010 Aug 9].
13. Kritikar KR, Basu BD. Indian medicinal plant. Vol. 1. 2nd ed. 1935. p. 240-1.
14. Bucar F, Jachak SM, Kartnig T, Schubert-Zsilavec M. Phenolic compounds from *Biophytum sensitivum*. *Pharmazie* 1998;53:651-3.
15. Leopold J, Gerhard B, Andrea W, Mohamed SP, Beena J. Medicinally used plants from India: Analysis of the essential oil of air-dried *Biophytum sensitivum* (L.) DC. *Sci Pharm* 2004;72:87- 96.
16. Guruvayoorappan C, Kuttan G. Evaluation of the chemoprotective effect of *Biophytum sensitivum* (L.) DC extract against cyclophosphamide induced toxicity in Swiss albino mice. *Drug Metabol Drug Interact* 2006;22:131-50
17. Jachak SM, Bucar F, Kartnig TH, Shubert-Zsilavec M. C-Glycosylflavones from *B. sensitivum* leaves. Prague, Czech Republic: 44th Annual Congress of the society for Medicinal Plant Research; 1996: p.188