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Review Paper

Pharmacological and Phytochemical Profile of Bryophyllum Pinnatum

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ABSTRACT

Bryophyllum pinnatum, commonly known as the Air Plant or Life Plant, is a succulent species exhibiting remarkable resilience and adaptability. Native to tropical Africa, this plant has evolved unique physiological and morphological traits, enabling it to thrive in challenging environments. Studies have demonstrated Byrophyllum pinnatum's potential in traditional medicine, particularly in treating wounds, inflammation, and infections. Its antioxidant, anti-inflammatory, and antimicrobial properties make it a valuable subject for further research. Additionally, its ability to purify air and withstand extreme conditions has sparked interest in its applications for environmental remediation and urban agriculture. Bryophyllum pinnatum "Chandelier Plant," is a succulent species belonging to the Crassulaceae family, native to tropical and subtropical regions. The plant has attracted significant attention due to its medicinal properties, traditional uses, and unique vegetative reproduction methods. It is recognized for its ability to propagate through plantlets that develop along its leaf margins. Various studies highlight the plant's pharmacological potential, including its antimicrobial, anti-inflammatory, analgesic, antioxidant, and antidiabetic activities. These bioactive properties are primarily attributed to its rich composition of secondary metabolites, such as flavonoids, alkaloids, and phenolic compounds. Furthermore, the plant's ability to adapt to arid conditions makes it a subject of interest in sustainable agricultural practices. This abstract provides an overview of the botanical characteristics, medicinal significance, and ongoing research into the therapeutic applications of Bryophyllum pinnatum, underscoring its potential in both traditional medicine and modern pharmaceutical development.

INTRODUCTION

Bryophyllum pinnatum, commonly known as the "air plant," "miracle leaf," or "life plant," is a succulent perennial plant belonging to the family Crassulaceae. Native to Madagascar, it has become widespread in tropical and subtropical regions worldwide due to its medicinal uses and unique vegetative propagation.

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Biological Source: Byrophyllum pinnatum is a succulent plant that stores water in its leaves, stems, and roots, making it a valuable source of moisture and nutrients in arid environments,and it's native to Madagascar. FAMILY: Crassulaceae

Geographical Source: Bryophyllum pinnatum (syn. Kalanchoe pinnata) is a succulent plant it's native to Madagascar. It is also found in other parts of the world including tropical Africa, asia ,pacific islands,central and south America.Bryophyllum pinnatum has been naturalized in many regions and its often cultivated as an ornamental plant. Bryophyllum pinnatum has been an integral part of traditional medicine systems, such as Ayurveda, Unani, and folk medicine, due to its diverse medicinal properties. It is rich in bioactive compounds, including flavonoids, alkaloids glycosides, and organic acids, which contribute to its therapeutic potential. Traditionally, it has been used to treat ailments such as kidney stones, urinary infections, wounds, ulcers, respiratory disorders, fever, and inflammation. Its leaves are often crushed to extract juice, which is applied topically or consumed for medicinal benefits.Beyond its medicinal uses, the plant holds ecological significance due to its ability to thrive in harsh conditions and its role in soil conservation. Modern scientific research is increasingly validating the plant's pharmacological benefits, emphasizing its antimicrobial, antioxidant, analgesic, and nephroprotective properties.With its remarkable healing potential and widespread use in natural medicine, Bryophyllum pinnatum remains an important plant for both traditional and modern healthcare systems. Ongoing research continues to explore its full therapeutic applications, making it a subject of great interest in herbal medicine.

Indian Names of Bryophyllum Pinnatum:

- **English**: Bryophyllum pinnatum, Air plant, Life Plant, Miracle Leaf.
- **Hindi**: Panfuti.
- **Sanskrit:** Parnabija.
- **Gujarati:** Ghaymaari.
- **Telgu:** Simahmudu.
- **Tamil:** Ranakalli.

Chemical Constitutents:

1. **Flavonoids**: - In *Bryophyllum pinnatum*, flavonoids are one of the key bioactive compounds contributing to the plant's medicinal properties. These secondary metabolites play a significant role in the plant's ability to defend itself against environmental stressors like UV radiation, pathogens, and herbivores, as well as providing various therapeutic benefits to humans.The flavonoids present in *Bryophyllum pinnatum* are primarily responsible for its antioxidant, anti-inflammatory, antimicrobial, and anticancer activities. Some of the notable flavonoids found in the plant include **quercetin**, **kaempferol**, and **rutin**, which are common in many medicinal plants and contribute to their health-promoting effects.
2. **Steroids: -** Steroids in *Bryophyllum pinnatum* contribute to the plant's medicinal properties, much like other bioactive compounds found within it. Steroids are a class of organic compounds characterized by a core structure of four fused carbon rings. They are typically found in both plants and animals, where they serve a variety of physiological roles, such as in hormone regulation and maintaining cellular structures. In the case of *Bryophyllum pinnatum*, steroids are believed to play a role in the plant's anti-inflammatory, analgesic, and wound-healing activities. These properties make the plant useful in traditional medicine for treating various ailments.
3. **Alkaloids :-** Alkaloids in *Bryophyllum pinnatum* are among the key bioactive compounds that contribute to the plant's medicinal properties. Alkaloids are nitrogen-containing compounds found in many plants,

and they often have significant pharmacological effects on humans and animals. They are known for their diverse biological activities, including effects on the nervous system, metabolism, and immune function.In *Bryophyllum pinnatum*, alkaloids contribute to a variety of therapeutic effects, including **antimicrobial**, **analgesic**, **anti-inflammatory**, and **anti-diabetic** activities, which have made the plant important in traditional and folk medicine. While specific alkaloids in *Bryophyllum pinnatum* are still under investigation, the general profile of these compounds offers considerable promise for medicinal use.

These constituents contribute to the plant's pharmacological activities, such as anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties.

4. **Phenolic compounds:-** Phenolic compounds in *Bryophyllum pinnatum* are a significant class of bioactive molecules that contribute to the plant's medicinal and therapeutic properties. Phenolic compounds are characterized by the presence of a hydroxyl group (-OH) attached to an aromatic ring. These compounds are widely distributed in plants and are known for their antioxidant, anti-inflammatory, antimicrobial, and anticancer properties, among others.In *Bryophyllum pinnatum*, phenolic compounds are believed to play a crucial role in its ability to combat oxidative stress, inflammation, and infections, as well as promoting overall health. Research into the specific types of phenolic compounds in the plant continues, but some well-known phenolic acids and flavonoids likely contribute to its medicinal effects.
5. **Tannins:-** Tannins in *Bryophyllum pinnatum* are a class of polyphenolic compounds known for their ability to bind and precipitate proteins, as well as their diverse biological activities. These compounds are commonly found in many plants, where they serve as a defense mechanism against herbivores and pathogens. In *Bryophyllum pinnatum*, tannins contribute to its medicinal properties and are responsible for some of its characteristic astringency.Tannins are typically classified into two main types: **hydrolyzable tannins** and **condensed tannins**. While the exact composition of tannins in *Bryophyllum pinnatum* is still under study, their bioactive effects play a significant role in the plant's therapeutic applications.
6. **Glycosides:-** Glycosides in *Bryophyllum pinnatum* are important bioactive compounds that contribute significantly to the plant's medicinal properties. Glycosides are molecule composed of a sugar component (the glycone) bound to a non-sugar component (the aglycone or genin). This structure enables glycosides to exhibit various biological activities, which can be beneficial in both traditional and modern medicinal applications.In *Bryophyllum pinnatum*, glycosides are thought to play a role in its therapeutic effects, including **anti-inflammatory**, **antimicrobial**, **analgesic**, and **cardiotonic** activities. While the specific glycosides in *Bryophyllum pinnatum* are still being investigated, their known pharmacological actions are of great interest in developing natural remedies.

Ayurvedic Properties

Rasa: Kashaya, Amla

Guna: Laghu

Vipaka: Madhura

Doshaghnata : Vatakaphahara

Karma : Ashmarighna, Vranaropaka, Mootrala, Shonita

Pharmacological Uses: Bryophyllum pinnatum leaves are used to treat intestinal issues, ulcers, arthritis, inflammation, conjunctivitis, menstrual disorders, migraines, wounds, and dysenter as well

as kidney and urinary bladder stones.The leaves are poisonous to insects, according to Ayurveda.However, the bark of this plant is poisonous and bowel-mordant in Unani.and used in traditional medicine due to its rich phytochemical profile.

Antimicrobial activity:

Bryophyllum pinnatum extract have been shown to inhibit the growth of bacteria such as staphylococcus aureus, Escherichia colli and pseudomonas aeruginosa. Its antimicrobial effects make it useful for treating wounds, skin infections, and other bacterial or fungal infections. Bryophyllum pinnatum has gained significant attention in pharmacological research due to its potent antimicrobial properties. Various studies have demonstrated its effectiveness against a wide range of microorganisms, including bacteria, fungi, and viruses. The antimicrobial potential of this plant is attributed to its rich phytochemical composition, which includes flavonoids, alkaloids, tannins, glycosides, and saponins.

Anti-ulcer activity:

Bryophyllum pinnatum is widely recognized for its ability to treat gastric ulcers. It helps in mucosal protection, reduces gastric acid secretion, and accelerates the healing of gastric mucosal lesions. Its antioxidant and anti-inflammatory properties play a crucial role in protecting the stomach lining from injury caused by excessive acid or irritants. Bryophyllum pinnatum has been widely studied for its antiulcer properties, making it a potential natural remedy for gastric ulcers and other gastrointestinal disorders. Its effectiveness is attributed to the presence of bioactive compounds such as flavonoids, alkaloids, tannins, and glycosides, which contribute to its gastroprotective and healing effects.

Anticancer activity:

Preliminary studies indicate that *Bryophyllum pinnatum* may have anticancer effects due to its antioxidant and anti-inflammatory activities. Some compounds in the plant may inhibit cancer cell proliferation and induce apoptosis (programmed cell death) in cell death. Bryophyllum pinnatum has gained attention for its potential anticancer properties due to its rich phytochemical composition, including flavonoids, alkaloids, tannins, glycosides, and steroids. These bioactive compounds contribute to its cytotoxic, apoptotic, and antiproliferative effects against various cancer cell lines.

Wound healing activity:

The leaves of *Bryophyllum pinnatum* are commonly applied topically to wounds, cuts, burns, and ulcers. The plant promotes wound healing by stimulating the regeneration of tissues and enhancing blood flow to the affected. Bryophyllum pinnatum has been traditionally used for wound healing due to its rich phytochemical composition and remarkable regenerative properties. Scientific studies have validated its effectiveness in accelerating wound healing through multiple mechanisms, making it a valuable natural remedy for cuts, burns, ulcers, and other skin injuries.

Hepatoprotective activity:

Some studies have shown that extracts of *Bryophyllum pinnatum* may have hepatoprotective effects, helping to protect the liver from toxins and oxidative damage. This makes it a potential candidate for treating liver diseases like hepatitis. Bryophyllum pinnatum has been recognized for its hepatoprotective (liver-protecting) properties, which help in preventing liver damage caused by toxins, infections, and oxidative stress. Its hepatoprotective potential is attributed to the presence of bioactive compounds such as flavonoids, alkaloids, tannins, phenolics, and glycosides, which exert antioxidant, anti-inflammatory, and detoxifying effects on liver cells.

Antihypertensive activity:

The plant has been reported to have mild blood pressure-lowering effects, making it potentially useful in managing hypertension. It is believed to act by improving blood circulation and reducing vascular resistance. Bryophyllum pinnatum has been traditionally used for managing high blood pressure (hypertension) due to its natural bioactive compounds that exhibit vasorelaxant, diuretic, and cardioprotective effects. Scientific research suggests that the plant's antihypertensive properties are linked to its ability to regulate blood pressure by relaxing blood vessels, reducing oxidative stress, and modulating electrolyte balance.

Antidiabetic Activity:

Some studies suggest that *Bryophyllum pinnatum* may help in controlling blood sugar levels by enhancing insulin sensitivity. It is used in traditional medicine to manage symptoms of diabetes, although more clinical studies are needed to establish its effectiveness.Bryophyllum pinnatum has been traditionally used in herbal medicine for managing diabetes due to its ability to regulate blood glucose levels. Recent scientific studies have supported its antidiabetic potential, attributing its effects to the presence of bioactive compounds such as flavonoids, alkaloids, tannins, phenolics, and glycosides. These compounds contribute to its hypoglycemic, antioxidant, and insulin-sensitizing properties.

Diuretic Activity:

The plant has mild diuretic effects, promoting increased urine production and helping in conditions like fluid retention, edema, and kidney-related issues.Bryophyllum pinnatum has been traditionally used as a natural diuretic to promote urine production and support kidney function. Scientific research has validated its diuretic properties, attributing its effects to bioactive compounds such as flavonoids, alkaloids, saponins, and tannins. These compounds contribute to increased urine output, electrolyte balance, and detoxification, making the plant beneficial for conditions such as hypertension, edema, and kidney disorders.

Anticonvulsant Activity:

Some studies suggest that *Bryophyllum pinnatum* may possess anticonvulsant properties, potentially useful in managing seizure disorders.Bryophyllum pinnatum has been traditionally used in herbal medicine for neurological disorders, including epilepsy and seizures. Scientific research suggests that the plant possesses anticonvulsant properties, likely due to its rich content of bioactive compounds such as flavonoids, alkaloids, saponins, and glycosides. These compounds influence the central nervous system (CNS), helping to reduce seizure frequency and intensity.

CONCLUSION:

Bryophyllum pinnatum is a fascinating plant known for its unique regenerative abilities, medicinal properties, and adaptability. Its dual role as a medicinal resource and an ornamental plant underscores its importance in both traditional and modern contexts. However, care must be taken to manage its growth in regions where it may become invasive.Some small companies in India and Amazon are using B. Pinnatum as raw materials for phytochemicals. Bryophyllum pinnatum, commonly known as the "Miracle Leaf" or "Life Plant," is a medicinally significant plant with remarkable therapeutic properties. It belongs to the Crassulaceae family and is widely recognized for its ability to propagate through leaf buds, making it a unique and resilient species. Native to Madagascar but now found in tropical and subtropical regions worldwide, this plant has been traditionally used in various medicinal systems, including Ayurveda, Unani, and traditional folk medicine.The plant is known for its rich phytochemical composition, including flavonoids, alkaloids, glycosides, steroids, and tannins, which contribute to its numerous health benefits. Bryophyllum pinnatum exhibits anti-

inflammatory, antimicrobial, antioxidant, analgesic, nephroprotective, and wound-healing properties. It is commonly used to treat kidney stones, urinary disorders, skin infections, wounds, ulcers, and respiratory ailments such as asthma and bronchitis. Its juice is also utilized for relieving stomach disorders, fever, and insect bites. Scientific research has validated several traditional claims, confirming the plant's potential in modern medicine. However, further clinical studies are required to fully understand its mechanisms and ensure safe therapeutic applications. Despite its benefits, excessive consumption may lead to toxicity, emphasizing the need for proper dosage and consultation with healthcare professionals. In conclusion, Bryophyllum pinnatum is a valuable medicinal plant with immense pharmacological potential. Its easy propagation and diverse therapeutic uses make it a significant natural remedy. Continued research and controlled usage can help harness its full medicinal potential for future healthcare advancements.

REFERENCES

1. R.N. Chopra, S.L. Nayar, and I.L. Chopra. Glossary of Indian Medicinal Plants. NISCIR (CSIR). New Dehli. 42: (2002).
2. R.P. Rastogi, and B.N. Mehrotra. Compend. Indian Med. Plants. PID. New Dehli. 2: 112 (1991).
3. S.A. Da Silva, S.S. Costa, S.C. Mendonca, E.M. Silva, V.L. Moraes, and B. Rossi Bergmann. Therapeutic effect of oral Kalanchoe Pinnata leaf extract in murine leishmaniasis. Acta Tropica. 60 (3): 201-210(1995).
4. Mehta and J.U. Bhat. Studies on Indian Medicinal plant II, bryophyllin, a new antibacterial substance from leaves of Bryophyllum, Calycinum Salsib. J university Bombay. 21: 21-25(1952). 5.P. Siddharta, and A.K.N. Chaudhuri. Further studies on the Anti-inflammatory profile of the Methanolic Fraction of the fresh leaf extract of Bryophyllum Pinnatum. Fitoterapia. 63(5): 451-459 (1992).
5. Júlia M. Fernandes et al, 'Kalanchoe laciniata and Bryophyllum pinnatum: an updated review about ethnopharmacology, phytochemistry, pharmacology and toxicology; Revista Brasileira de Farmacognosia 29 (2019) 529–558.
6. Laure Brigitte Kouitcheu Mabeku et al, 'Treatment of Helicobacter pylori infected mice with Bryophyllum pinnatum, a medicinal plant with antioxidant and antimicrobial properties, reduces bacterial load,' Pharmaceutical Biology, 2017 Vol. 55, NO. 1, 603–610.
7. Reddy K.V., AshishYachawad, 'Overview on recent extraction techniques in bioanalysis' Int. Res. J. Pharm. 2016;7(2):15-24.
8. Farrukh Aqil et al, 'Broad-spectrum antibacterial and antifungal properties of certain traditionally used Indian medicinal plants', World Journal of Microbiology and Biotechnology August 2003, Volume 19, Issue 6, pp 653–657.
9. Sad, Sadman (12 September 2020). "Goethe plant: A Unique Medicinal Plant". The Green Page. Retrieved 16 November 2023.
10. Vaidhya B. Some controversial drugs in Indian Medicine. Edn 3, Chaukhambha Orientalia, Varanasi, 2010, 3-5
11. Chunekar KC, Pandey GS. Editor. Bhavaprakasha Nighantu of Bhavamishra, Chaukambha Bharati Academy, Varanasi, 2010 101-105.
12. Tripati ID. Dwivedi V. Editor. Raja Nighantu. Edn 1, Krishnadas academy, Varanasi, 112.
13. Gaind K. and Gupta R et.al., Alkanes and alkanols, triterpenes sterols from kalanchoe pinnata. Phytochemistry. 1983,11:150-1502

14. Seema V.P. Kalanchoe pinnata Phytochemical and Pharmacological Profile. International Journal of Pharmaceutical Science and Research 2012; 3(4):993-1000.
15. Nayak BS, Marshall JR, Isitor G. Wound healing potential of ethanolic extract of Kalanchoe pinnata Lam. leaf-A preliminary study. Indian Journal of Experimental Biology 2010; 48:572-576.
16. Khare CP, Encyclopedia of Indian Medicinal Plants, New York: Springer 2004:276
17. Chauhan MG, Pillai AP, Wijaay asriwardana C et.al. Microscopic Profile of powdered drugs used in Indian System of Medicine. Institute of PG, Training and Research in Ayurveda, Gujarat,2007; 2: 251.
18. Agoha RC. Medicinal Plants of Nigeria, Offset Drakkerij. Faculfcitder Wiskunde in Naturwetenschappen, The Netherlands 1974; 33:41.
19. David M, Hamann C, Chen F, Bruch L, Lichtenegger L.Comparison of the relaxation effect in vitro of nitroglycerin vs.fenoterol on human myometrial strips. Journal of Perinatal Medicine 2000; 28:232 –42.
20. Almedia AP, Costa SS. 1-octane3-O-α-Larabinopyranosyl-(16)-glucopyranoside, Aminor constituent from leaves of kalanchoe pinnata. Brazillian Journal of pharmacognosy 2006; 16(4):485-489.
21. Kalanchoe pinnata: In: urs: eggi(ed): Succulent lexicon.Crassulaceae (thick leaf) PIU.Eugen umer, Stuttgart 2003, ISBN.3-800/3998-7, p175. Article in Pharmaceutical Biology.5(3).203-217.
22. A comperehensive review on parnabeeja (Bryophyllum pinnatum(lam. oken). Asian Journal of Chemistry 25(9):4991-4993Aug2013.
23. Kanika P. Pharmacognostic and phytochemical evaluation of Bryophyllum pinnatum leaves. J Adv Sci Res 2011;2;42-9.25. Nguelefack TB, Nana P, Atsamo AD, Dimo T, Watcho P, Dongmo
24. Okwu DE, Josiah C. Evaluation of the chemical composition of two Nigerian medicinal plants. Afr J Biotechnol 2006; 5:357-61

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