

AN ASSESSMENT ON MEDICINAL USES AND BIOLOGICAL ACTIVITY OF BRYOPHYLLUM PINNATUM

¹SHAHANA JABI

¹Shri Guru Ram Rai University, Dehradun-248001

²KANEEZ FATIMA

²Galgotias University, Greater Noida-201310, Uttar Pradesh

³ANVAY SINGH

⁴AKSHITA TIWARI

⁵MAYANK UNIYAL

⁶MANJUSHA TYAGI

⁷Dr. NAVEEN GAURAV

(Corresponding Author)

ABSTRACT

In traditional medicine, *Bryophyllum pinnatum* was frequently employed. They are particularly prevalent in tropical regions of Asia, India, and Africa. The plant is also known as Parnabeeja and used by the locals of southern India and Bengal as a treatment for the kidney problems. It is an herb with variegated leaves and elliptic leaflets. The basic compounds presence in the plant is phenols, alkaloids, flavonoids, triterpenes, lipids, organic acids, and glycosides. It is frequently used to treat wound healing and homeostasis. It is also utilized medical conditions like CNS depressive, analgesic, anti-inflammatory, anticancer, antiallergic, nephroprotective, hepatoprotective, and antiulcer agent. The chemical components, medical applications and biological activity of plants are highlighted in this survey of plants.

Keywords: Bryophyllum Pinnatum, Chemical Constituent, Biological Activity, Anti-Inflammatory, Anticancer, Antiallergic, Nephroprotective, Etc.

INTRODUCTION

Bryophyllum pinnatum is the member of the Crassulaceae family and is widely used as a traditional medicine in several parts of India, primarily to cure kidney stones (Kamboj *et al.*, 2009). About 25 plant species make up the subgenus Bryophyllum, including *Bryophyllum pinnatum*. A perennial herb that grows wild in Madagascar and is used as a typical restorative plant is found there. It is one of the 450 species of Crassulaceae, which suggests that the leaves of the plant belonging to the Crassula clan are fleshy and succulent (Yadav *et al.*, 2003).

It is a perennial plant found in tropical regions such as tropical Africa, tropical America, China, Australia, and Indian Ayurvedic medicine (Yadav *et al.*, 2003). It typically grows to a height of 30 to 120 cm; however it has been known to grow as tall as 2 meters (Gwehenberger *et al.*,

2004). The common weed grows on banks, waste areas, hummocks and shrubberies in both dry and wet areas. It may grow up to 1400 meters in height and thrives in lower areas and along slopes, especially in the thin layer of soil next to exposed rocks (Sharma *et al.*, 2014). The majority of Unani and Ayurvedic doctors in Bengal, as well as traditional healers, employ this plant to treat illnesses including bleeding disorders, renal calculi, ulcers, and diarrhea (Salahdeen *et al.*, 2006).

PLANT DETAILS

Plant Name: *Bryophyllum pinnatum*

Synonym: Kalanchoe Pinnata

Family: Crassulaceae

Common Name: Cathedral bells, Loveplant, good luck leaf, green mother of millions, Curtain plant, Pattharchoor , Parnabeeja, Saião or Coirama , Zakham –e –hayat.



Taxonomical Classification:

Kingdom: Plantae

Subkingdom: Tracheobionta

Division: Spermatophyta

Subdivision: Magnoliophyta

Class: Magnoliopsida

Subclass: Rosidae

Order: Saxifragales

Family: Crassulaceae

Genus: Bryophyllum

Species: Bryophyllum pinnatum (Lam.)

(Ghani *et al.*, 2003 and Subrata *et al.*, 2011)

Chemical Constituent

Alkaloids, tannins, phenolic compounds, bufadienolides, saponin glycosides and flavonoids are all present in the plant. The plant contains ascorbic acid, riboflavin, thiamin and

niacin as well as alkaloids, flavonoids, tannins, phenolic compounds, and saponin glycosides. According to the definitions of various naturally occurring flavonoids, there are flavones, flavans, flavanones, iso flavonoids, chalcones, aurones, and anthocyanidines (Nwali *et al.*, 2012). Additionally, it contains syringic, caffeic, 4-hydroxy-3-methoxycinnamic, para-hydroxycinnamic, para-coumaric, para-ferulic, para-protocatechuic, and para-phosphoenolpyruvate corrosives (Aparna *et al.*, 2012). Along with syringic acid, caffeic acid, 4-hydroxy benzoic acid, parahydroxy cinnamic acid, paracoumaric acid, ferulic acid, protocatechuic acid, phosphoenolpyruvate, astragalol, rutin, kaemferol, luteolin, quercetin, and kaemferol-o-glycosides, it also contains kaemferol 6 Three flavonoids with antileishmanial action were found in the plant. Additionally, it includes bufadienolides such bryophyllin A, B, C, and bryophyllon (Kanika *et al.*, 2011).

Additionally, it contains syringic, caffeic, 4-hydroxy-3-methoxycinnamic, para-hydroxycinnamic, para-protocatechuic, para-coumaric, para-ferulic, and para-phosphoenolpyruvate corrosives. And some other chemical include benzaldehyde, 2-methyl, alpha-D, butyrolactose, 3, 4-epoxytetrahydrothiophene-1, 1-dioxide, 3, 5-dihydroxy-6-methyl-2, and butyrolactose. Glucopyranoside, n-hexadecanoic acid, oleic acid, and octadecanoic acid are all used to treat rheumatism, inflammation, and blood pressure, respectively (Teres *et al.*, 2008 uchegbu *et al.*, 2015).

Uses

There have been claims made about the antileishmanial, immunosuppressive, anti-ulcer, anti-inflammatory, anthelmintic, antidiabetic, analgesic, antihistaminic, antifungal, antihypertensive and antimutagenic properties of *Bryophyllum pinnatum* plant leaves. These leaves show Bactericidal, insecticidal, and CNS depressive effects (Afzal *et al.*, 2013). According to the research, leaf juice has hepatoprotective properties and is also use to cure jaundice. The antioxidant and oxidative radical scavenging properties of this substance may explain the Nephrotoxicity seen in rats. In India, kidney stones are also treated with the leaves of *Bryophyllum pinnatum*. The plant was used to cure menstruation problems and uterine contractions (Wachter *et al.*, 2011). When combined with ghee, the plant's leaves are also used to treat diarrhoea. The Juice or extract of the leaves of *Bryophyllum* is also used to treat cholera, toothaches and wounds. In the panfuti plant, quercetin plays a nephroprotective and antioxidant role. The fatty acids in *Bryophyllum pinnatum* may be the source of the plant's immunomodulatory effects (Gahlaut *et al.*, 2012).

To cure conditions like cough, influenza, uterine inflammation, cholera, diarrhoea, dysentery, ulcer, and gastrointestinal diseases, this plant's roots are prepared into a decoction. The extract of *Bryophyllum pinnatum* leaves has been used to treat serious conditions including gastritis, ulcers, various bacterial, bronchitis, viral, and contagious infections, leishmaniasis, inflammations, pain, a few tumours, respiratory diseases, diabetes, hypertension, influenza, and more (Akinsulire *et al.*, 2007). It plays a key role in the study of the biochemical, ecophysiological, and phylogenetic aspects of Crassulacean Acid Metabolism, a kind of photosynthetic carbon absorption that has evolved over time (Osmond *et al.*, 1978). It has anti-tumor properties, or the entire plant can be used to treat rheumatoid arthritis, stomach bugs, and injuries from falls or numbness in the limbs, bruises, burns, and ulcers (Nassis *et al.*, 1992).

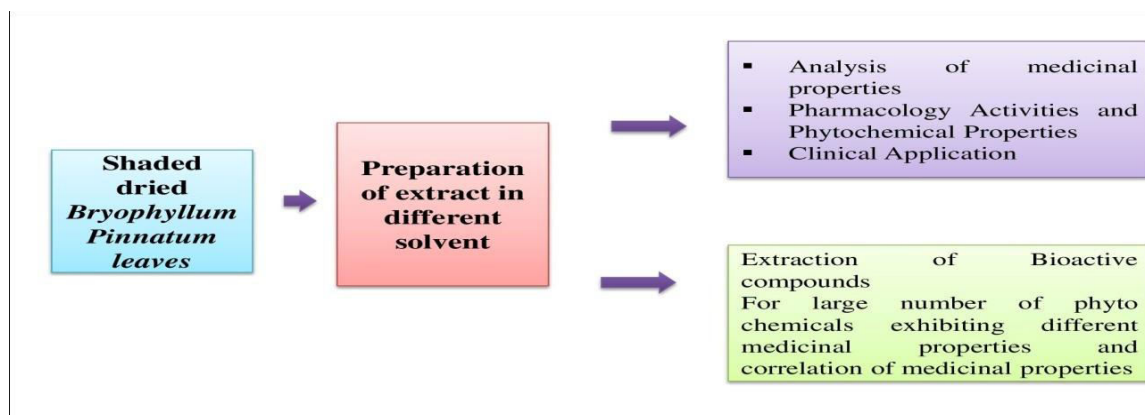


Figure 1: Extraction and medicinal overview

BIOLOGICAL ACTIVITY

Antileishmanial Activity

The isolation of quercitrin, which was separated by a methanolic extract of the plant, demonstrated the significance of flavonoids for the antileishmanial activity. The dominant genus of protozoa was *Leishmania*. *Leishmania* created an infection that spread around the globe. Two compounds, coumarin and quercetin, were taken from a methanolic plant extract and investigated. The main active ingredients responsible for antileishmanial activity were coumarin and quercetin (Bopda *et al.*, 2014).

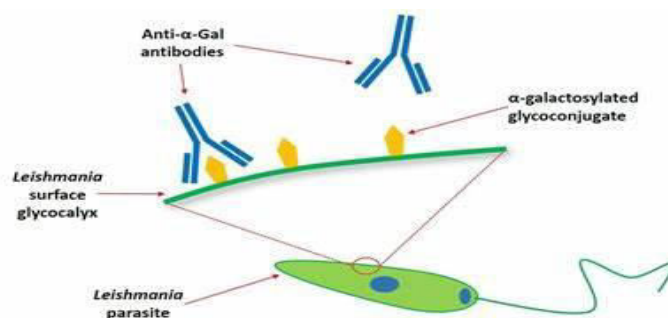


Figure 2: Antileishmanial activity

Anticancer Activity

From *Bryophyllum pinnatum* a substance called Bryophyllin (C₂₆H₃₂O₈) was discovered that possesses anticancer properties against cancer cells. The development of human cervical cancer cells has been demonstrated to be inhibited by the chloroform extract of the plant and its divisions in a concentration -dependent manner. Human papilloma virus, which plays a crucial role in the development of cervical malignant growth, was effectively combated by the portion, which was more potent than the extract (Mahata *et al.*, 2012).



Figure 3: Bryophyllin activity as Anti Cancer

Hepatoprotective Activity

By using the oral route of administration in an *in vivo* and *in vitro* histopathological examination on rats, the aqueous Extract or juice of the leaves was much more efficient than the ethanol extract of *Bryophyllum pinnatum*. Hepatoprotective action was demonstrated by the *Bryophyllum pinnatum* ethanol extract (Sheela *et al.*, 2017).

Rats' livers were damaged when exposed to aqueous and ethanolic extracts of *Bryophyllum pinnatum* leaves in doses of 250 and 500 mg/kg of N-diethylnitrosamin. A dose of 500 mg/kg of *Bryophyllum pinnatum* ethanolic extract marginally protects the liver. Both the doses (250 and 500 mg/kg) of aqueous extract have been *In vitro* mutagenesis of antigens (Nagaratna *et al.*, 2015).

Nephrotoxicity Activity

Gentamicine-induced Nephrotoxicity in rats was used to study the nephroprotective efficacy. This action was mediated by antioxidant and oxidative free radical scavenging. As opposed to using a conventional chemical, the *Bryophyllum pinnatum* extract was used to treat kidney stones (Heide *et al.*, 1965).

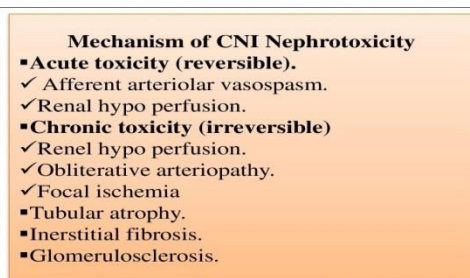


Figure 4: Nephrotoxicity activity

Antihypertensive Activity

All forms of hypertension, including yours, were treated with *Bryophyllum pinnatum* in Western Nigeria. The recording was made in Trinidad & Tobago. The study demonstrates the presence of antihypertensive action of *Bryophyllum* leaf extract in rats with normal and spontaneously hypertensive heart rates (50-800mg/Kg). In comparison to the normotensive rat, the hypertensive impact was more prominent (John *et al.*, 2002).

Antiulcer Activity

The methanolic extract of the leaf shows the antiulcer activity. Aspirin, indomethacin, ethanol, and stress-induced gastric ulcer in rats all have gastro protective effects. The pylorus-

ligated rat with an aspirin-induced ulcer exhibits considerable gastro protective action. The stomach ulcer brought on by acetic acid the gastric ulcer is healed by the methanolic extract. The primary active component in charge of activity was the flavanoid. These are the things that generate the free radical scavenging action that stops cell damage (Nguelefack *et al.*, 2006).

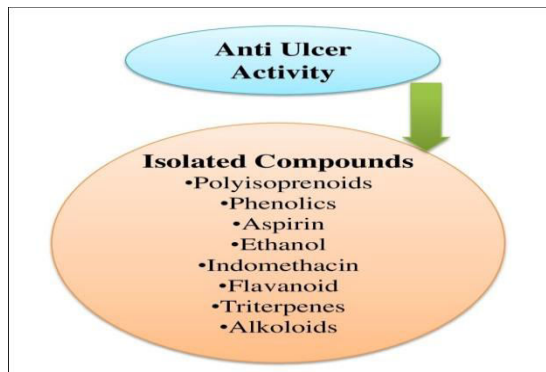


Figure 5: Anti-Ulcer activity
Antidiabetic Activity

The antidiabetic activity of a plant extract in aqueous form causes hypoglycemia in rats with diabetes mellitus caused by streptozotocin. A mineral called zinc may be important for activity and perhaps lead to insulin dysfunction. For a very long period, the herb has been used for its anti-hyperglycemic effects (Aransiola *et al.*, 2014). After postprandial and streptozotocin-induced diabetes in animals, the fluid content of leaves made for remarkably hypoglycemic effects. Additionally, a development examination has confirmed its suitability for treating diabetes and cardiac disorders (Ojewole *et al.*, 2005).

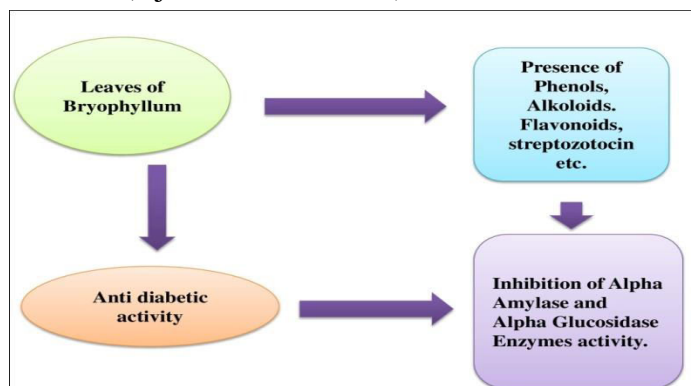


Figure 6: Anti diabetic activity

Immunosuppressive Activity

In mice, the aqueous extract of leaves significantly reduces the reaction that is mediated by cells and humor. Spleen cells were used in the in vitro experiment after being pre-treated with a plant extract and allowed to multiply when exposed to mutagens and antigens. On ovalbumin,

the delayed type hypersensitivity was investigated. The drug's topical application demonstrated more efficacy than any other. In essence, the fluid extract lessens the delayed hypersensitivity reactions, turning it into an immunosuppressive agent. To demonstrate the anti-anaphylactic activity undertook *in vitro* experiments in animal models (Rossi-Bergmann *et al.*, 1994).

Anti-Inflammatory Activity

Indomethacin was used as the standard medication, and the following substances were used: chloroform, methanol, pet ether, extract and also isolated fraction such as flavonoids, alkaloid and phenolic acid fractions of leaves extract, given orally once daily for a periods of two days by formaldehyde-induced hind paw in rats. In comparison to normal medication, the methanolic extract of leaves significantly inhibits formaldehyde-induced edoema (Seema *et al.*, 2012).

Pet ether, chloroform, and methanol extracts as well as purified fractions of the leaves' flavonoids and alkaloids were administered at a dose of 50 mg/Kg. As compared to typical drugs, a methanolic extract of the leaves significantly inhibits the formation of formaldehyde-induced edoema (Gupta *et al.*, 2010).

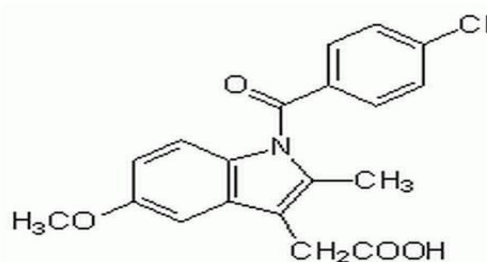


Figure 7: Indomethacin act as Anti-inflammatory compound

Neuropharmacological Activities

The presence of Bufadinolides, another component that is water soluble, may be the cause of the CNS depressing effect of the leaf extract in aqueous form. The plant also demonstrated sedative properties. Aqueous leaf extract has been shown to have CNS depressive properties. It was discovered that the rat treated with 50–200 mg/kg produced a drop in locomotors activity as well as a decrease in muscular tone. When administered a medication intraperitoneally, the rat also produced a change in behavior (Pal *et al.*, 1999).

In mice, the effects of *Bryophyllum pinnatum* aqueous leaf extracts on a few neuropharmacological activities were investigated. The extract was observed to significantly reduce exploratory activity in a dose-dependent manner at dosages of 50, 100, and 200 mg/kg. Additionally, it demonstrated a noticeable sedative effect as demonstrated by a considerable decrease in impolite behavior and potentiation of pentobarbitone-induced sleep duration (Salahdeen *et al.*, 2006).

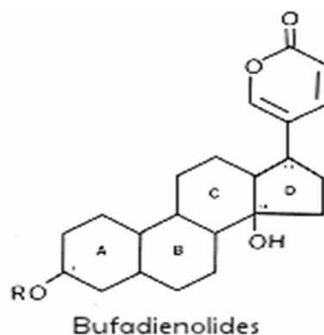


Figure 8: Bufadienolides act as Neuropharmacological compound

Bryophyllum Pinnatum

Traditional Uses	Pharmacology Activities and Phytochemical Properties	Clinical Application
<p><i>Bryophyllum pinnatum</i> is generally known as <i>Pattharcaṭṭa</i>. <i>Bryophyllum pinnatum</i> implies its stone breaking property in Indian traditional systems of medicine. The leaves of <i>Bryophyllum</i> are widely used for the treatment of stones by tribal and other populations (Yadav <i>et al.</i>, 2016).</p>	<p><i>Bryophyllum Pinnatum</i> is widely used to treat the various ailments in folk medicine. This plant is enriched with a adverse range of therapeutic active compounds which are responsible for various responsible for various pharmacological effects. The latest evidence based information regarding pharmacognostical, photochemical and pharmacological activity of the medicinal plant. The chemical constituents of <i>Bryophyllum pinnatum</i> shows various pharmacological activities like nephroprotective, anti-diabetic, analgesic, antioxidant, antimicrobial, neuropharmacological, anticonvulsant and antipyretic activity (Latif <i>et al.</i>, 2019).</p>	<p><i>Bryophyllum pinnatum</i> is a very common known medicinal plant, has been used in many traditional medicine systems. The plant is used to treating cough, fever, smallpox, convulsion, otitis, asthma, headache and general debility (Elufioye <i>et al.</i>, 2022).</p>

CONCLUSION

According to review on *Bryophyllum pinnatum*, the plant contain a variety of chemical components, including flavonoids, tannins, glycosides, and alkaloids. The plant shows variety of biological effects, including antileishmanial, anti-diabetic, anti-inflammatory, immunosuppressive, and anticancer action. Additionally, it is employed in conventional medicine to treat kidney disease, blood disorders, and toothaches. The analysis of this plant reveals that each plant has a unique set of medicinal properties and many types of secondary metabolites are found in the plant.

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