



PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILE OF FEW PLANTS OF THE GENERA BRYOPHYLLUM

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ABSTRACT

Herbs are plants grown for their medicinal, flavouring, or aromatic properties. Herbal treatments are safe and efficient for treating a wide range of ailments. Western medicine, or allopathy, is primarily reliant on medicinal plants for some of its constituents. Herbal plants are the traditional and widely used type of medication, according to research. Until the last century, most remedies were made by hand, either from plants or animals. Synthetic pharmaceuticals are becoming increasingly popular, whereas natural drugs are showing promise in treating various disorders. A perennial plant thrives in India's wet and hot regions, like Bengal. It has 25 genera and 450 species. Succulent perennials have hollow stems, four-angled leaves, and numerous branches. The leaves are 10–20 cm elongated and decussate. A long petiole surrounds the three- to seven-foliolate top leaf. They are dark green and scalloped with red ribbons. 30-35 cm long, 2–4 cm petioles, 6–8 X 3-5.5 cm blades, with latent buds that can develop into healthy plantlets with an acute tip. Rooting vegetative buds are on the leaves. This aromatic plant has been used for groups to heal many ailments. These studies look at the plant's acute toxicity, antiulcer effectiveness, and pharmacognostic properties. The plant's macrostructure varied. Microscopic examination discovered lignified walls in the root and stem bark. Phytochemical examination can identify plant metabolites. Leaves, stems, and roots had more physiologically lively constituents than the other three plant sections. Although more research is required to identify the molecules and their potential health effects, these substances must be extracted and evaluated for future application. This study is to review some of the important aspects regarding studies reported earlier on phytochemical and pharmacological activities of some plants of the genera Bryophyllum.

KEYWORDS: *Plants, Phytochemical profile, Pharmacological activities. Genera Bryophyllum.*

INTRODUCTION

Herbs are plantations that lack the wood tissue of trees or shrubs. Herbs are plants grown for their medicinal, flavouring, or aromatic properties. Herbal treatments are safe and efficient for treating a wide range of ailments. Western medicine, or allopathy, is primarily reliant on medicinal plants for some of its constituents [Harma A, 2008]. Herbal plants are the traditional and widely used type of medication, according to research [Kane SG, 2004]. Until the last century, most remedies were made by hand, either from plants or animals. Synthetic pharmaceuticals are becoming increasingly popular, whereas natural drugs are showing promise in treating various disorders. It used to refer to organic cures. Herbalists believe that removing a chemical from an herb rather than using whole plant loses the active components responsible for the herb's medicinal properties [Simões-Wüst et al., 2010] Herbs can warm the body, speed

metabolism, cleanse the blood, improve surface circulation, improve waste disposal, reduce inflammation, and relax and soothe irritation. They can be used topically or taken internally as syrups, infusions, or capsules. According to the World Health Organization (WHO), "it is a combination of skills, information and practises used to improve quality of life and prevent, detect, treat, or cure physical and mental diseases" WHO Traditional Medicine Strategy 2014–2023 [Biswas SK, 2011; Nayak BS, 2010; Pathak D, 2012].

Table 1: Scientific Classification.

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Spermatophyta
Subdivision	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Rosales
Family	Crassulaceae
Genus	Bryophyllum

Table 2: Traditional use of some *Bryophyllum* plants.

Parts of plants	Uses as	Preparation
Leaf	Used as swelling	Application of raw leaf topically over affected area.
Leaf	Used in skin problem scabies	Decoction and juice.
Leaf	High blood pressure	Decoction
Leaf	Pain in bones, injury due to numbness of limbs	Rubbing and massaging of leave paste
Leaf	Inflammation in lungs, cough	Syrup, juice with milk
Leaf	Kidney problems, stone, high cholesterol	Ingestion of raw leaves
Leaf	Headache	Crushed leave application
Leaf, flowers	Wound ulcer, diabetes, analgesic, convulsion	Flower and leaf juice
Leaf, root	Dysentery, ulcer, GIT disorders	Decoction of roots and leave juice
Leaves	Snake bite	Every hour after a snake bite, 1-3 teaspoons of a decoction of leaves should be taken
Stems, leaf	Antitumor activity	Extract
Leave	Sexually transmitted disease	Chopped leaves mixed with <i>Opuntia stricta</i> stem and <i>Euphorbia hypericifolia</i> , heated in 2 L of water and administered O.D as an enema
Seeds	Stye disease	The eye is treated with crushed seed juice (1-2 drops daily for 3 times a day)

ETHNO PHARMACOLOGY

The plants can also treat leg oedema. This powdered leaf is used to treat wounds. This herb is used in southern Nigeria to help a baby's placenta fall out. This can help children's illnesses. Consider the following: Herbs are widely used to treat high blood pressure and rheumatoid arthritis. *B. pinnatum* leaves and bark are used to cure diarrhoea, vomiting, stomach ulcers, and insect stings. Leaf juice is also used to treat ear infections, colds, palpitations, chickenpox, and asthma. This herb can also treat oedema [Ram PR, et al., 2004]. This plant is frequently used for its liver and vascular health benefits. *Bryophyllum* is also a muscle relaxant and analgesic. Immunosuppressive and immunomodulatory properties help it fight inflammation [Quazi M, et al, 2011].

ETHNOMEDICAL USES IN DIFFERENT COUNTRIES

- Brazil has a high prevalence of inflammatory diseases and antileishmanial medications.
- South West Nigeria offers treatment for ear, chest, and digestive system ailments. In the Philippines, it is used as a bitter tonic, astringent, inflammation, wound healing, and carminative for a variety of ailments, including diarrhea and dysentery, vomiting, and bruises. Poultice or powder, they are used to treat ulcers, infection, rheumatism, and inflammation.

The fresh juice of the leaf is used to treat smallpox, otitis, a cold, asthma, and palpitation [Planger N, et al., 2006].

- Analgesic, diarrhea-stimulating and other digestive problems, as well as acute or chronic bronchitis (asthma) and other respiratory ailments can be treated with this product
- These herbs have been used in India for the treatment of cuts, scrapes, burns, and bug bites to eliminate kidney stones
- People in West Africa use the fleshy leaves to treat a variety of ailments, including high blood pressure, diabetes, rheumatism, joint pain, headaches, and muscle aches. In addition, the leaves are used to treat inguinal lymphadenitis and ear infections [Recknagel RO. 1967].
- Treats a wide range of ailments in Malagasy
- In Europe, this substance is only used in anthroposophic Medicine.
- In Germany, it is used as a tocolytic to prevent preterm Birth.
- Broken bones and injuries should be treated in Ecuador.
- This Central American country treats skin disorders, aches, diarrhoea, and discomfort.
- For inflammation, menstrual discomfort,

conjunctivitis, and migraines, Mexico is a great choice. It also works well for a variety of other ailments such as pain, birthing discomfort, cough, pain, colds, fever, and headache [Almedia AP, et al., 2006; Afzal M, et al., 2012; Yamagishi T, et al., 1989].

PHYTOCHEMICAL PROFILE

- Flavonoids, coumarins, saponin sterols, bufadienolides, and anthocyanins were found in plant extracts from the leaves of *B. pinnatum*. The green callus and the juice of fresh leaves included malic acid, quinines, tocopherol, and lectins, as well as other antioxidants
- Classifying the various flavonoids found in nature has been made possible by recognizing flavonoids, flavanones, and isoflavonoids like flavans and anthocyanidines like auronones and chalcones [Morales AI, et al., 2006].
- The cytotoxic properties of bufadienolide–bryophyllin B and bersaldegenin–1,3,5-orthoacetate were identified.
- Bryophyllin A and Bryophyllin C, two insecticidal bufadienolides, were isolated and identified from a methanolic extract of *Bryophyllum pinnata* leaves [Alabi DA, et al., 2005].
- To identify flavonoids from the *B. pinnatum* plant in Nigeria, scientists used the following methods: spectroscopy, mass spectrometry, chromatography, and spectroscopy.
- Potassium malate, ascorbic acid, malic acid, and citric acid have all been isolated from *B. pinnatum* leaves.
- The dichloromethane/methanol extract and all fractions contained a 3-sitosterol glycoside, except for the aqueous residue

- The chemical composition, vitamins, and minerals of *B. pinnatum* were studied. There were alkaloids (ranging from 1.23% to 1.45% by weight), flavonoids (ranging from 1.49% to 1.85% by weight), saponins (ranging from 1.4 to 1.71 mg/100mg of protein), phenols (ranging from 0.6% to 0.7% by weight), and tannins (ranging from 0.06% to 0.7% by weight) (ranging from 0.04% to 0.05% by weight) [Okwu DE, et al., 2006].
- The mixture also contained bryophynol and two phenanthrene derivatives. One more hydrolyzed product was 180-Olcananc, γ -taraxasterol, and the B-arnyrin acetate, together with an amyryl combination and its acetate [Selvakumar P, et al., 2016; Flück, H. 1976].

PHYSICO-CHEMICAL AND PHYTOCHEMICAL ANALYSIS OF FEW PLANTS

1. *Bryophyllum pinnatum*

Results of quantifiable analysis for total ash, acid-insoluble ash, and loss on drying at 104°C values are arranged in Table 2. Total ash value is valuable in determining authenticity and purity of drug and also these values are important quantitative standards. Total ash values of root, stem, and leaf value were 10.01 ± 0.30 , 13.50 ± 0.43 , and $13.72\% \pm 1.01\%$, respectively. Total Ash value of plant material specified the amount of minerals, and earthy materials existing in the plant material. Analytical results shows that the total ash higher value was $13.76\% \pm 1.01\%$ in leaf extract. Percentage weight loss on drying or moisture content of root, stem, and leaf value was 80.06 ± 0.75 , 77.66 ± 0.83 , and $91.46\% \pm 0.80\%$, respectively. The less value of moisture content could prevent bacterial, fungal, or yeast growth. Stem having less value compared leaf and root.

Table 2: Physico-chemical analysis of *Bryophyllum pinnatum* (Lam.) Kurz.

Parameter	Root	Stem	Leaf
Loss drying (%)	80.06±0.75	77.66±0.83	91.46±0.80
Total ash (%)	10.01±0.30	13.50±0.43	13.72±1.01
Acid insoluble ash (%)	0.86±0.05	0.93±0.11	1.73±0.05

The primary phytochemical screening of *B. pinnatum* leaves, stem and root was observed for phytochemicals with different solvents revealed strong presence of

various chemical substances in methanol and slightly present in distilled water, petroleum ether, chloroform and benzene solvents.

Table 3: *Bryophyllum pinnatum* leaves examined for phytochemicals .

Type of constituents	Distilled water	Petroleum ether	Chloroform	Methanol	Ethyl acetate	Benzene
Carbohydrate	+	+	+	+	–	+
Flavonoids	+	–	+	+	–	+
Saponins	–	–	–	–	–	–
Glycosides	+	–	–	+	–	–
Alkaloids	+	–	+	+	+	–
Triterpenoids	+	–	–	+	–	–
Tannins and phenolic	+	–	–	+	–	–

(+) shows presence, (–) shows absence

Table 4: *Bryophyllum pinnatum* stems examined for phytochemicals.

Type of constituents	Distilled water	Petroleum ether	Chloroform	Methanol	Ethyl acetate	Benzene
Carbohydrate	+	+	+	+	-	+
Flavonoids	-	-	+	+	-	+
Saponins	+	+	+	+	-	+
Glycosides	-	-	-	+	-	-
Alkaloids	-	-	-	-	+	-
Triterpenoids	-	+	-	+	-	-
Tannins and phenolic	-	+	-	+	-	-

(+) shows presence, (-) shows absence

Table 5: *Bryophyllum pinnatum* roots examined for phytochemicals.

Type of constituents	Distilled water	Petroleum ether	Chloroform	Methanol	Ethyl acetate	Benzene
Carbohydrate	+	+	+	+	-	+
Flavonoids	+	-	+	+	-	+
Saponins	+	+	+	+	-	+
Glycosides	-	-	-	+	-	-
Alkaloids	-	-	-	-	+	-
Triterpenoids	-	-	-	+	-	-
Tannins and phenolic	-	+	-	+	-	-

(+) shows presence, (-) shows absence

2. *Bryophyllum calycinum*

Results of physicochemical analysis of leaves, stems and roots were determined.

Table 6: Physicochemical constants of leaves of *Bryophyllum calycinum*.

Solvent	Extracts		Ash value (%)	Extractive value (%)	Content of Na, K, Ca
	% yield	appearance			
Petroleum ether(40-60°C)	3.0% w/w	Greenish-black	Total ash-5.01 Acid insoluble ash- 1.69	Alcohol soluble- 5.6 Water soluble- 19.80	Na- undetectable. K- 76.4 µg/g. Ca- 96.45 µg/g.
Chloroform	1.8% w/w	Brownish- black	Water soluble ash- 4.19		
Methanol	5.7% w/w	blackish- brown	Sulphated ash- 12.84		
Water	21.0% w/w	Reddish-brown			

Table 7: Physicochemical constants of stems of *Bryophyllum calycinum*.

Solvent	Extracts		Ash value (%)	Extractive value (%)	Content of Na, K, Ca
	% yield	appearance			
Petroleum ether(40-60°C)	3.2% w/w	Greenish-black	Total ash-5.41 Acid insoluble ash- 1.67	Alcohol soluble- 5.4 Water soluble- 19.92	Na- undetectable. K- 76.8 µg/g. Ca- 96.2 µg/g.
Chloroform	1.6% w/w	Brownish- black	Water soluble ash- 4.16		
Methanol	5.8% w/w	blackish- brown	Sulphated ash- 12.80		
Water	20.2% w/w	Reddish-brown			

Table 8: Physicochemical constants of roots of *Bryophyllum calycinum* Salisb.

Solvent	Extracts		Ash value (%)	Extractive value (%)	Content of Na, K, Ca
	% yield	appearance			
Petroleum ether(40-60°C)	2.8% w/w	Greenish-black	Total ash-5.54 Acid insoluble ash- 1.58	Alcohol soluble- 5.3 Water soluble- 19.76	Na- undetectable. K- 76.1 µg/g. Ca- 96.03 µg/g.
Chloroform	1.4% w/w	Brownish- black	Water soluble ash- 4.26		
Methanol	5.9% w/w	blackish- brown	Sulphated ash- 12.73		
Water	19.3% w/w	Reddish-brown			

Table 9: Preliminary phytochemical studies on the leaf extracts of *Bryophyllum calycinum*.

Extract	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
PE	+	-	-	-	-	+	+	+	-	-	-	-	+
CE	+	-	-	-	-	-	+	-	-	-	-	-	-
ME	+	+	-	-	-	+	+	+	-	-	-	-	+
AE	+	+	-	-	-	-	+	-	-	-	-	-	+

PE- Petroleum ether (40-60°C) extract, CE-Chloroform extract, ME- Methanol extract, AE- Aqueous extract. I- Alkaloids. II- Carbohydrates(sugars), III- Glycosides, IV- Saponins, V- Phenolic compounds, VI- Flavonoids,

VII-Tannins, VIII- Steroids, IX- Proteins(amino acids), X- Terpenes, XI- Gum and mucilage, XII- Fixed oil, XIII- Organic acid. (+)-Present. (-)-Absent.

Table 10: Preliminary phytochemical studies on the stem extracts of *Bryophyllum calycinum*.

Extract	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
PE	+	-	-	-	-	+	+	+	-	-	-	-	+
CE	+	-	-	-	-	+	+	-	-	-	-	-	-
ME	+	+	+	-	-	+	+	+	-	-	-	-	+
AE	+	+	-	-	-	-	+	-	-	-	-	-	+

PE- Petroleum ether (40-60°C) extract, CE-Chloroform extract, ME- Methanol extract, AE- Aqueous extract. I- Alkaloids. II- Carbohydrates(sugars), III- Glycosides, IV- Saponins, V- Phenolic compounds, VI- Flavonoids,

VII-Tannins, VIII- Steroids, IX- Proteins(amino acids), X- Terpenes, XI- Gum and mucilage, XII- Fixed oil, XIII- Organic acid. (+)-Present. (-)-Absent.

Table 11: Preliminary phytochemical studies on the root extracts of *Bryophyllum calycinum*.

Extract	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
PE	+	-	-	-	-	+	+	+	-	-	-	-	+
CE	+	+	-	+	-	+	+	-	-	-	-	-	-
ME	+	+	+	-	-	+	+	+	-	+	-	-	+
AE	+	+	-	-	-	-	+	-	-	-	-	-	+

PE- Petroleum ether (40-60°C) extract, CE-Chloroform extract, ME- Methanol extract, AE- Aqueous extract. I- Alkaloids. II- Carbohydrates(sugars), III- Glycosides, IV- Saponins, V- Phenolic compounds, VI- Flavonoids,

VII-Tannins, VIII- Steroids, IX- Proteins(amino acids), X- Terpenes, XI- Gum and mucilage, XII- Fixed oil, XIII- Organic acid. (+)-Present. (-)-Absent.

CONCLUSION

B. pinnatum, *B. calycinum* and many other plants of genus *Bryophyllum* are useful plants for treating several diseases such as wound healing, antiulcer, antidiabetic, anti-inflammatory, antinociceptive, and antibacterial activity. Chemical constituents such as flavonoid, alkaloid, saponin and triterpenoid are responsible for these activities. These herbs have been used for generations to heal many ailments. More research is required in the field of Phytochemical and Pharmacological analysis to identify the molecules and their potential health effects, these substances must be extracted and evaluated for future application.

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