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UNRAVELLING PHYTOCHEMICAL AND PHARMACOLOGICAL POTENTIAL OF *BRYOPHYLLUM PINATTUM (LAM)*: AN HERBAL BOON

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ABSTRACT

Bryophyllum pinnatum (*Lam)*is a medicinal plant which cause a virtue to the mankind due to its medicinal value. The plant belongs to *Crassulaceae* family and widely spreads around the globe in many countries such as Asia, Australia, New zealand, India and many more. It is annual plant in nature. The present study focused on its pharmacological value due to the biocomponent present in it. The plant enbrassed with alkaloid, flavonoid,glucocoid and many more phytocomponent those are responsible for its pharmaceutical efficacy in it. The plant shows many pharmacological efficient potentials on many activities such as antibacterial, antioxidant, antileishmanial, antiinflammatory, antitumorous etc. which shows its sufficient herbal potency to defeat many diseases as an herbal potent plant. The plant was used as a traditional remedy for many years to cure diseases but as a modern era plan, this plant proves its good pharmaceutical value to defeating many disorder conditions. The plant considered a great potent source of remedy in many therapies and ailments methods.

Keywords: Crassulaceae, pharmacological, antileishmanial, antitumorous, antibacterial

INTRODUCTION

Bryophyllum pinnatum (Lam.) is a perennial herb rising widely and used in folkloric medication in humid regions of Africa, America, India and Australia. The divine medicinal herb holds a variety of active bio compounds such as alkaloids, triterpenes, glycosides, flavonoids, steroids, bufadienolides, lipids and organic acids. This plant is used in medicine for the treatment of many diseases and famous for its antimicrobial, wound healing and many more properties. The pharmacological studies are reviled and discussed that many different extracts from this plant

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possess pharmacological activities as immunomodulator, CNS depressant, analgesic, antimicrobial, anti-inflammatory, antiallergic, ant anaphylactic, antileishmanial, antitumorous, antiulcerous, antibacterial, antifungal, antihistamine, antiviral, febrifuge, gastroprotective, immunosuppressive, insecticidal and more due to presence of alkaloid, flavonoid and other phytocomponent those are present in this plant. Due to presence of many metabolite, it is useful in many therapeutic ways of medication in ancient as well as in new scientific research also. It is annual herb with many phytocomponent present for its pharmacological value. Many extract yields of this plant are useful in many areas of research.

Objective: The aim of this review research paper is to explore the phytochemical constituent and pharmacological activity of *Bryophyllum pinnatum* (Lam).

Methods and Methodology: Data for the current review article was taken from previously published research paper from reputed journal and publishers. The databases were included Scopus, Google Scholar, PubMed, Science Direct, and MEDLINE. The research content was search by using keywords: *Bryophyllum pinnatum*, *Bryphyllum, pharmacological constituents of Bryphyllum, pharmacological activity of Bryphyllum, phytocontituents of Bryophyllum.*

Vernacular names

English: Air plant

Hindi: Zakhmhaiyat, Patharchur

Bengali: Koppatha, Patharkuchi

Sanskrit: Parnabeeja, Asthibhaksha

Other common names include: Miracle leaf,

Mexican Love plant, Panfutti, Divine herb, Wonder of

the World, Canterbury bells, life plant,

air plant and Cathedral bells. In Pakistan, it is

famous as Pathar Chat and Zakham-e-Hayat.

Taxonomy:

Kingdom: Plantae

Division: Spermatophyta

Order: Rosales

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Family: Crassulaceae

Genus: Bryophyllum

Species: *Bryophyllum pinnatum (Lam.) Kurz*

Distribution:

Bryophyllum pinnatum (Lamm) is native to Madagascar. It grows naturally and grows in temperate regions of Asia, West Indies, New Zealand, Macaronesia, Caribbean and Pacific areas, Melanesia, Polynesia, Hawaii and Australia (Zamora, A.B., et al, (1998))

Plant habit:

The plant grows all over India in tropical areas in the globe. It is a succulent perennial herbious plant that nurtures 1-1.7 m in height and the stem is hollow, long, four-angled and branched towards upward. Phyllotaxy explains that leaves are opposite, decussate, succulent, 15-20 cm long and ovate in shape. The lower leaves are simple whereas the upper leaves are foliate and long-petioled. They are muscular dark green that are characteristically scalloped and clipped in red. Leaf blade pinnately compound of 3–6 leaflets, petiolules 3–4 cm; leaflet blades oblong to elliptic in shape, margin crenate with notch bearing a dormant bud potent to develop a new plantlet, apex obtuse in morphology. The leaves are well-appointed with rooting vegetative buds. Inflorescences terminal paniculate 50 cm long. Flowers are many bell-like drooping. Calyx tubular in shape; Corolla reddish to purple in colour, base sparsely ciliate, lobesovate-lanceolate,stamens inserted basally on corolla, nectar scales oblong,follicles included in calyx and corolla tube. The fruit-pod are equipped with four septa and numerous, ellipsoid, smooth striate seeds within. The plant flowers in Nov to Mar and fruiting in April to june .

Leaves

flower

stem

roots

Reproduction:

In vivo propagation:

This plant can be capable to reproduce by seed and by the edges of its leaves called leaf bulbils. Its fleshy leaves are capable of taking root and forming new plants

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In vitro propagation:

Tissue culture proliferation strategies can be utilized to propagate such plants foe renewed them. After establishing axenic cultures, PTC (Plant Tissue Culture) convention techniques is used with approving harmones, temperature, nutrient media and light conditions for regeneration of plant.

Ethnomedical uses of *BRYOPHYLLUM PINNATUM*:

According (Sharma, G., et al., (2024)) *bryophyllum pinnatum* is used as in many ethanomedicinal uses. Some uses are as follows:

1. In Brazil it is useds as inflammatory curative agent and antileishmanial medicator.
2. In South West Nigeria it is used in treatment for ear, chest, and digestive system ailments.
3. In the Philippines, the plant is cast-off as a bitter tonic, astringent, inflammation, wound healing and used to treat ulcers, infection, rheumatism, and inflammation. Its leaf juice is used to treat smallpox, otitis, cold, asthma.ans respiratory diseases
4. In India it is used for the treatment of cuts, scrapes, burns, and bug bites to dissolve kidney stones.
5. In West Africa, fleshy leaves use to treat many illnesses, such as high blood pressure, diabetes, rheumatism, joint pain, headaches, muscle aches, inguinal lymphadenitis and ear infections.
6. In Europe, this plant component is only used in anthropomorphic medicine.
7. In Germany, it is used to prevent preterm birth.
8. Broken bones and injuries should be treated by this plant.
9. It also used to treat skin disorders, aches and diarrhea.
10. For inflammation, menstrual discomfort, conjunctivitis and migraines.

Ethnopharmacological relevance:

Around the globe, it is consuming for the treatment and management of various pathologies such as conjunctivitis, edema, piles, cuts, eczema, constipation, epilepsy, cholera, asthma, chest colds, menstrual disorders, chicken pox and fever. The plant parts are frequently applied for the cure of burns, rheumatoid arthritis, anti- septic, blisters, cough suppression, insect bites, psychiatric disorders and abdominal discomforts. It is well-known for its anti-inflammatory, wound healing, analgesic and hemostatic qualities. Leaves extracts are useful for the remedy of jaundice, hypertension, renal stones and diabetes. Slightly heated leaves are applied on superficial skin infections and also used for the dropping of placenta in Southeast Nigeria, hence it acts as a tocolytic agent to prevent the premature labor. The plant is also used for the cure of leg edema, fever, gout, abscesses, otitis and palpitations. Bryophyllum pinnatum is widely utilized in ayurvedic medicines for the treatment of numerous conditions such as menorrhagia, hemorrhoids,

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vomiting, corns, ophthalmia and hematemesis. Root extract is being used for its hepatoprotective, laxative, diuretic and anti-psychotic effects. Paste of the crushed leaves is applied on skin for the treatment of boils and abscess. In Germany, anthroposophic physicians prescribed *Bryophyllum pinnatum* preparations for tocolysis and behavioral disorders. (Latif, A., et al (2019).

Pharmacological Activities of *Bryophyllum pinnatum (Lam):*

Chemical constituent:

Bryophyllum pinnatum, rich in diverse chemical constituents, display a complex profile with a wide range of bioactive components. The plant *Bryophyllum pinnatum* is known as for having a variety of macro and microelements like alkaloids, flavonoids, tannins, phenolic compounds and saponin glycosides. Among the macro elements are magnesium, calcium, potassium, sodium and phosphorous while microelements include iron and zinc are present in plant. Moreover, the plant is a source of vital vitamins, ascorbic acid, riboflavin, thiamin and niacin. Chemical analysis discloses the presence of precise acids, syringic acid, caffeic acid, 4-hydroxy-3-methoxy cinnamic acid, 4-hydroxy benzoic acid, parahydroxy cinnamic acid, para coumaric acid, ferulic acid, protocatechuic acid and phosphoenolpyruvate. The leaves of *Bryophyllum pinnatum* are rich in compounds like protocatechuic acid, astragalin, luteolin, rutin, kaempferol, quercetin, and kaempferolo-glycosides. The plant also having Bryophyllin A, B, C, and Bryophyllon, which are examples of bufadienolides. Many different chemical phytocomponents have been isolated in *Bryophyllum pinnatum*these are responsible for its medicinal properties.

Alkaloids: Alkaloids have a variety of pharmacological activities. Alkaloids possess the ability to diuretic, which can help in the excretion of certain kidney stones. However, *Bryophyllum pinnatum's* particular possess alkaloids and their effect on kidney stones.

Flavonoids: Flavonoids are substances reported in *Bryophyllum pinnatum* that have been identified for their ability to act as antioxidants. The ability of flavonoids to lower oxidative stress which may contribute to the development of kidney stones.

Triterpenoids: These are another period of plant-found chemicals. Triterpenoids have been reported for their diuretic and anti-inflammatory properties, which may have results on kidney stone medication.

Betalains: Some varieties of *Bryophyllum pinnatum* contain betalains which are pigments with potential antioxidant properties.

Bufadienolides: Thirteen bufadienolides have been isolated in *Bryophyllum pinnatum* leaf extraction and among them, three are glycosides.

Some phytocompound isolated and reported are as follows in table below:

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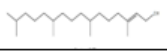
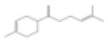
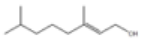
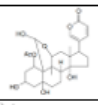
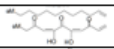
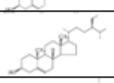
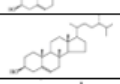
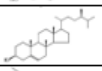
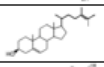
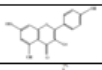
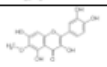
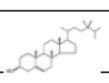
S. No	Phytocompound	Plant part	Chemical structure
1.	Isolongifolol	stem	
2.	Phytol	stem	
3.	β- Bisabolene	Leaves and stem	
4.	B-Gurjunin	Leaves and stem	
5.	Citronellol	Roots	
6.	Bryphyllin B	Stem ,leaves and roots	
7.	Bryphollone	Leaves	
8.	Bryphyllol	Leaves	
9.	Bryphynol	Stem and buds	
10.	Bersaldegenin-1,3,5-orthoacetate	Stem and flowers	
11.	Bryphollenone	Leaves and stem	
12.	Bryotoxin- A	Stem and roots	
13.	Stigmasterol	Leaves and roots	
14.	B-sitosterol	Flowers and roots	
15.	Dihydrobracassisterol	Leaves and stem	
16.	Campesterol	Roots	
17.	Isofucosterol	Flowers	
18.	Codisterol	stem	
19.	Kaempferol	leaves	
20.	Taraxaserol	flowers	
21	Rutin	Stem and roots	
22.	Putoletin	flowers	
23.	Clionosterol	Stem and roots	

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Pharmacological Activities of *Bryophyllum pinnatum (Lam):*

Anti-inflammatory and Analgesic activity: A new steroidal derivative, Stigmast-4, 20 (21), 23-trien-3-one was isolated from the leaves of *Bryophyllum pinnatum*. The structure of this new steroidic compound was explained and determined by standard spectroscopic protocol. Paw edema model was explored for anti-inflammatory and acetic acid induced model was explore for analgesic activity. This steroidal complex was found to be active in reducing inflammation. Further, it showed their high activity in analgesic activity. In conclusion, the inhibition rate against carrageenan induced rat paw edema exhibited by steroidic compound, exposed that the anti-inflammatory and analgesic activity of aqueous extract *B. pinnatum* due to the presence of this steroidal compound.

Anti-cancer activity: Chloroform extract of this plant and its fractions have inhibited a concentration dependent dose of human cervical cancer cell growth. The fraction was more efficient than the extract and strong inhibition was observed against human *papilloma virus* (HPV) which achieves a vital role in the progress of cervical cancer. From leaves, five bufadienolides have been isolated and investigated for their inhibitory properties on Epstein-Barr virus. From all the bufadienolides, an understandable inhibition was carried out by compound bryophyllin A. Experimental results strongly recommended that the *Bryophyllum pinnatum* isolated compound bufadienolides can be the potential biocomponent to treat the cancer.

Anti-diabetic activity: Since Earlier times, *Bryophyllum Pinnatum* is employable to show its anti-hyperglycemic effects. The aqueous extraction of leaves part, after postprandial and streptozotocin encouraged diabetic effect in rats has showed their hypoglycemic effects. Also,an advance experimental reports has confirmed its efficacy in cardiac disease and in glucose level. (Ojewole, 2005).

Antihypertensive activity: Therapeutic herb is involved to treat various cardiovascular diseases (Tedge et al., 2005). Now experiments confirms that aqueous extract of the leaves of this plant has an antihypertensive effect on rats which validate its medicational practice in traditional medicines. It is reported that the extracts have potent anti- oxidant effect on aorta so it plays a noteworthy part in the reducing of blood pressure (Bopda et al., 2014).

Anti leishmanial activity: Different Flavonoids existing in the herb are accountable for its anti-leishmanial efficacy. In the aqueous extract of plant leaves, it has been experimented by experimenting three different flavonoids separately against the Leishmania *amazonenis amastigotes* with standard quercitrin, quercetin and afzelin. The quercetin aglycone type and a rhamnosyl unit linked at C-3 were found to be essential for anti-leishmanial activity in experiments. (Muzitano et al., 2006)

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Antimicrobial activity: Research study of the bioactive elements from the leaf of a curative plant *Bryophyllum pinnatum* give rise to results in the isolation of two new novel flavonoids i.e, 5I Methyl 4I, 5, 7 trihydroxyl flavone 1 and 4I, 3, 5, 7 tetrahydroxy 5-methyl 5I -propenamine anthocyanidines 2. The structure of these flavonoid compounds was explained using NMR spectroscopy and UV, IR and MS spectra. Antimicrobial experiments lessons showed that the isolated compounds having ability to inhibited *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Escherichia coli*, *Staphylococcus aureus, Candida albicans* and *Aspergillus niger*. The antimicrobial activity shows the efficacy inhibit the bacterial zone and its useful in formation of herbal medicine in around the globe. (Okwu, D. E., & Nnamdi, F. U. (2011))

Urolithic activity: This extract of plant parts roles meaningfully to decreases urinary oxalate levels. It can be advantageous in treating urolithiasis. This plant is traditionally castoff to cure successfully kidney stones. *B. pinnatum* release kidney stones by dissociate calcium oxalate dehydrate crystals into monohydrates. Leaf extracts dropped oxidative stress and redues kidney stone synthesis. (Sharma, A. B. H. I. S. H. E. K., et al.,(2014)) (Bind, A., et al.,(2020))

Hepatoprotective activity: The plant *Bryophyllum pennatum* has been observed for its hepatoprotective activity. In rats, carbon tetrachloride inspired hepatic injury was induced and claimed that the ethanolic extract of leaves of this plant decreases the levels of liver enzymes, serum bilirubin, serum cholesterol and serum total protein. Experimental results have demonstrated that this herbious plant has an understandable hepatoprotective activity. Increasing in renewal generation of hepatocytes and microsomal enzymes inhibition also secure the liver from damage. (Yadav, N. P., & Dixit, V. K. (2003))

Anti-oxidant activity: This medicinal herb is examined for its anti-oxidant activity by metal chelating assay, 1,1- diphenyl-2-picrylhydrazyl (DPPH) assay and 2,2'- azinobis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay. Experimental results shows that ethanolic extract has noticeable anti-oxidant activity (Sindhu and Manorama, 2015). Roots extracts have also exhibited the anti-oxidant effects when analyzed by DPPH assay (Gupta and Banerjee, 2011). (Gupta, S., and R. Banerjee (2011))

Nephroprotective effects: *Bryophyllum pinnatum* is broadly used for its nephroprotective activity in traditional remedies and the justification for its practice has been proved by the many experiments. Experiments results have shown that this is dose dependent effect. The nephroprotective activity against the *gentamicin* induced nephrotoxicity on Wistar rat's kidney was examined and it is estimated that this effect is due to the plant's anti-oxidant and radical scavenging properties (Harlalka et al., 2007). The juice of leaves of this plant is more effective in the curation of hyperactive bladder and has less side effects than anti-cholinergic drugs (Schuler et al., 2012)).

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Wound healing activity: The plant *Bryophyllun Pinnatum* is cast-off locally for the healing of wounds in traditional medicational recepies. It is proved by experiments that this plant has saponins in high amounts which encourage wound healing by accumulating the erythrocytes. Moreover, presence of tannin in this plant also improves the procedure of wound healing due to their astringent effect (Pattewar, 2012).

Neurosedative and muscle relaxant activity: The leaves extract of *Bryophyllum pinnatum* was experimented on neuropharmacological activities for local use. When examined on mice, it reflects a dose-dependent prolongation of onset and duration of pentobarbitone-induced hypnosis, reduction of exploratory activities in the head-dip and evasion are tested. Moreover, a dose-dependent experiments on muscle in-coordination was experimental in the inclined screen, traction and climbing experiments. It delayedin convulsion in both strychnine- and picrotoxin-induced seizures to minimal protection against picrotoxin seizures. (Yemitan, O. K., & Salahdeen, H. M. (2005))

Uterine relaxant activity: *In reported experiments* Contractility of uterus was measured in strips of term myometrium biopsied at caesarean section in 14 women and exposed to increasingit by applicating concentrations of *B.Pinnatum* versus +/- oxytocin 1 U/l in labour . Result experience that inhibition of impulsive contraction was considered as concentration dependent. *B.Pinnatum* raised contraction frequency by 91% at constant amplitude and inhibited oxytocin stimulating contractions in uterus by 20% at constant amplitude with reduced frequency. Fenoterol compound reportedly decreased contraction by 50% with a significant decrease in frequency. *B.Pinnatum* is more effective and has less side effects than traditional labour inhibitors in delivery. (B. Gwehenberger, et al., (2004))

Antimutagenic activity: *Bryophyllum pinnatum* has effective antihistamine and antiallergic activity. The methanol extract of their leaves has also reported to possess histamine receptor (H1) antagonism in the ileum, peripheral vasculature and bronchial muscle and defend against chemically treated anaphylactic reactions and death by selectively blocking histamine receptors in the lungs. Quercetin-3-o-α-L-arabinopyranosyl (1Æ2)-α-L-rhamnopyrano -side exhibited anti allergic activity in rats. Another experiment shows organic solvent extracts of plant leaf part shows inhibitory activity for His− to His+ reverse-mutations induced by ethyl methane sulfonate. The alkaloidal/ water soluble and acid fraction had no appreciable antimutagenic activity. (E.E. Obaseiki-Ebor, et al., (1993)). (G. Umbuzeiro-Valent, et al., (1999)) (C.Z. Nassis, et al., (1992)

Immunosuppressive effect: The fatty acids present in *B. Pinnatum* is for its immunosuppressive effect. The aqueous extract of leaves of this plant shows inhibition of cell-mediated and humoral immune responses in mice. The spleen cells of animals pre-treated with plant extract showed a decreased ability towards mitogen and antigen. Extract treated also impaired the ability of mice to

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show a delayed in hypersensitivity reaction (DTH) to ovalbumin. The intraperitoneal and oral route's compact reaction by 73% and 47% of controls, respectively. The definite antibody reacts on ovalbumin were also expressively reduced on action. So, the aqueous leaves extracts hold immunosuppressive activities. In other experiments leaf extracts inhibited *invitro* lymphocyte proliferation and showed immunosuppressive activity. A try to recognise the immunosuppressive substances present in *B. Pinnatum* guided by the lymphoproliferative assays from the ethanolic extract of leaf, a purified fraction (KP12SA) found more effective to block murine lymphocyte proliferation than the crude leaf extract. (A.P. Almeida, et al., (2000)). (B. Rossi-Bergmann, et al.,(1994))

Anticonvulsant activity: *B. pinnatum* leaf ethanolic extract was experimented for anticonvulsant properties in mice applying the maximum electro-shock and pentylenetetrazole seizure models. A dose-dependent procedure was applied to increase the duration of tonic extension and shows recovery in maximal electroshock-induced seizure study. The measured length of hind limb tonic extension and recovery time reduced considerably ($P = 0.01$) at extract dosages of 200, 300, and 400 mg/kg or 11.33, 8.33, and 5.5 s, respectively. Ethanolic extract of *B. pinnatum* leaves prolonged the seizure and reduced the time for the convulsion. There was a substantial ($P < 0.01$) increase in clonic convulsion duration at doses of 200, 300, and 400 mg/kg. In addition, the duration of convulsions was slashed significantly. (Adesanwo JK, et al., 2017) (Gwehenberger B., 2004)

Anti-ulcer activity: Flavonoids, the effective water-soluble antioxidants and free radical scavengers, which prevent oxidative damage of cell, have potent anticancer activity. Antitumor indorsing activity of bufadienolides isolated from *B. pinnatum* and found bryophyllin A has most effective inhibition and bersaldegenin-3-acetate compound is less active. Bersaldegenin-1,3,5-orthoacetate repressed growth of several cancer cell lines. As antioxidants, flavonoids extracted from this plant shows anti-inflammatory activity applied for the treatment of wounds, burns and ulcers in herbal remedies. The methanolic fraction of leaf extract was proved to possess noteworthy antiulcer activity. Premedication tests in rats exposed that the extract possessed noteworthy protective action against the gastric lesions, indomethacin, serotonin, reserpine, stress and ethanol also significant against protection for aspirin-induced ulcer in pylorus-ligated rats (Kamboj, A., & Saluja, A. (2009))

Toxicity effect of Bryophyllum pinnatum

Toxic to cattle:

Cardiac glycoside poisoning was formed in calvesby given flower heads of the hybrid Bryophyllum species in experiments 2 calves were each given a single dose of 20 g wet weight per kg bodyweight. The results of the calf toxicity experiment with the amounts of bufadienolide

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report in the plants that bryotoxins A, B and C probably responsible for disease (R.A. McKenzie, (1987)

Insecticidal, Fungitoxic and Phytotoxic activity

Isolated bufadienolides: bryophyllin A and bryophyllin C from B. Pinnatum showed strong insecticidal activity against third instar larvae of the silkworm. fungitoxic and phytotoxic effects of extracts on the fungal pathogens inducing wilting on cowpea grown in Ago-Iwoye, South Western Nigeria. The extract reduces the Disease Infection Rate (DIR) in treated plants. The extracts increased expressively the plant height, shelf life, relative water content and chlorophyll contents of the cowpea seedlings during both the wet and dry season. Instead of that, the extracts reduced transpiration rate and stomata aperture of treated plant in both seasons. Moreover, application of these extracts on the cowpea plants enhanced the Leaf Area Index (LAI), number of branches and pods per plant, total dry matter per plant, weight per pod, 100 grains weight and grain yield in both seasons. The extracts also inhibited the release of current photosynthetic rates from treated plants which can be oxidized to release energy needed for growth available to treated plants. (D.A. Alabi, et al., (2005))

Discussion and potential directions for future studies on Bryophyllum pinnatum:

The divine herb contains a wide range of active compounds, including alkaloids, triterpenes, glycosides, flavonoids, steroids, bufadienolides, lipids and organic acids, have been isolated from this species. The plant is widely used in traditional medicine for the treatment of variety of ailments and well known for its haemostatic and wound healing properties. The pharmacological studies are reviewed and discussed, focussing on that different extracts from this plant have been found to possess pharmacological activities as immunomodulator, CNS depressant, analgesic, antimicrobial, antiinflammatory, antiallergic, antianaphylactic, antileishmanial, antitumorous, antiulcerous, antibacterial, antifungal, antihistamine, antiviral, febrifuge, gastroprotective, immunosuppressive, insecticidal, muscle relaxant, sedative. The present review is an attempt to highlight the various ethnopharmacological and traditional uses as well as phytochemical and pharmacological aspects of B. pinnatum (Kamboj, A., & Saluja, A. (2009)). The plant is a promising source of safe and effective treatment for a variety of chronic diseases. This means that there is still space for anumerous research projects those explore highly active biomolecules of would be extremely beneficial to phytochemistry and pharmacology. Bryophyllum pinnatum is a plant has its therapeutic significance. The plant's taxonomy, morphology, chemical constituents, ecological roles, therapeutic properties, toxicological features explore in this review. Bryophyllum pinnatum grows in tropical and subtropical regions contains harmful substances. These chemicals are twin in nature, which emphasizes the need for toxicological and pharmacological researches to reveal its therapeutic potential. Bryophyllum pinnatum is a reasonably straightforward plant to

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cultivate and conserve it. This plant has has a lot of potential for use in the domains of ecology and medication. Connecting the benefits of Bryophyllum pinnatum while reducing its potential harmful effects will require more focus on research, conservation plans and careful assessment of its medical uses.

CONCLUSION

The review study focuses on pharmacognostical, phytochemical and pharmacological contour of the *Bryophyllum pinnatum* plant. It is determined that this divine herb contains many valuable active pharmacological bio constituents that are accountable for plant various therapeutic effects. More experimental studies reported to confirm and justify use of this remedial herb in traditional medicine and also to verify its safety and efficacy. The *B. Pinnatum* is majorly used divine herb. Many pharmacological experimental studies have confirmed that the folk use of *B. Pinnatum* and their extracts in various remodification such as inflammations, ulcers, fungal, viral and microbial infections, an impaired immune system, diabetes mellitus, spasms and insecticidal properties. The detailed data as presented in this review research on its phytochemical constituents and various biological properties of extracts and the constituents provided the use of this plant in medicine and in agriculture. Extracts and fractions experimented on mice and rats showed substantial analgesic, anti-allergic, anti-anaphylactic, anti-inflammatory, antileishmanial, anti-tumorous, anti-ulcerous, antibacterial, antifungal, antihistamine, antiviral, CNS depressant, febrifuge, gastro protective, immunosuppressive, immunomodulator, insecticidal, muscle relaxant, sedative results without adverse side effects. The pharmacological experimental research studies confirm traditional understanding worth of plant of a rational phytotherapy on the toxicity of plant and on bufadienolides and promotes its use during pregnancy and also to understand the molecular mechanism of action, in quest of lead molecule from natural resources. It could be concluded that *B. Pinnatum* is a rich source of compounds, interesting chemical structures and various biological active products.

Conflict of interest: There is no conflict of interest among authors.

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