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A Review on Life Plant- Bryophyllum Pinnatum

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ABSTRACT

Bryophyllum pinnatum belongs to the family crassulaceae was widely used in traditional medicine especially in the tropical areas like in tropical Africa, tropical America, India, China, and Australia. Is a perennial herb grows 3-5 feet tall, fleshy dark green leaves that are distinctively scalloped and trimmed in red, and bell like pendulous flowers. It is widely used in traditional medicine for the treatment of variety of ailments like anthelmentic, immunosuppressive, hepatoprotective, antinociceptive, anti-inflammatory and antidiabetic, nephroprotective, antioxidant activity, antimicrobial activity and analgesic, anticonvulsant, neuropharmacological and antipyretic. It is well known for its haemostatic and wound healing properties. This review covers detailed ethnopharmacology, Phytochemistry and bioactivities of Bryophyllum pinnatum. A number of active compound groups including alkaloids, triterpenes, lipids, flavonoids, glycosides, bufadienolides, phenols and organic acids have been covered. The present review was designed to highlight the chemical constituents and pharmacological effects of Bryophyllum pinnatum.

Keywords: Bryophyllum pinnatum, chemical constituents and pharmacological effects

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INTRODUCTION

The plant, Bryophyllum pinnatum (Crassulaceae) is commonly known as air plant, love plant, miracle leaf, life plant, Zakham-e-hyat, panfutti, Ghayamari [1], has been accepted as a herbal remedy in almost all parts of the world [2, 3,4] etc. Bryophyllum calycinum (Synonyms: Kalanchoe pinnatum, Bryophyllum pinnatum) [5], belongs to the family crassulaceae was commonly known as sprouting leaf. It was found in the tropical parts, southern Africa, and American [6] Bryophyllum pinnatum popularly known as "Resurrection plant" is a perennial herb used in folkloric medicine in tropical Africa. It is classified as weed and the plant flourishes throughout the southern part of Nigeria.[7] The name Bryophyllum comes from bruo'Isprout' and jullon 'leaf': the plant, classified as a weed, is notorious for its growth potential. Shortly after a leaf falls to the ground, a whole garland of new little plants develops from the notches along the leaf margin. Studies have shown the following in vitro effects in rodent tissue: positive in tropism, sedation, H1 antagonism (ileum, bronchial muscle, peripheral vasculature), and antimicrobial activity [8, 10] Phytochemical studies showed that the plant contained alkaloids, phenols, flavonoids, tannins, anthocyanins, glycosides, bufadienolides, saponins, coumarins, sit sterols, quinines, arytenoids, tocopherol and lectins [11-13.] These secondary metabolites include several classes such as saponins, terpenoids, phenolic compounds, steroids, alkaloids and flavonoids. Different naturally occurring flavonoids have been described and subcategorized into flavones, falvans, flavanones, isoflavonoids, chalcones, aurones and anthocyanidines [14, 15] The leaves and leaf juice of the plant were used traditionally as antiviral, antipyretic, antimicrobial , anti-inflammatory , antitumor , hypocholesterolemic, antioxidant, diuretic, antiulcer, styptic, antidiabetic, astringent, antiseptic, antilithic and cough suppressant. The pharmacological studies showed that it exerted many pharmacological effects including anticancer , antioxidant immunomodulating , antibacterial , anthelmentic , antiprotozoal , ,neurological (sedative and anticonvulsant) , anti-inflammatory , analgesic , diuresis , antiurolithitic , nephroprotective, hepatoprotective , anti-peptic ulcer , hypertensive , antidiabetic , wound healing and other pharmacological effects. The present review aimed to provide detail information regarding the chemical constituents and pharmacological effects of Bryophyllum calycinum.[16-24] In ethno medicine, Bryophyllum pinnatum is used to induce vomiting of blood, cut, umbilical cord in new born baby, expel worms, cure acute and chronic bronchitis, pneumonia and other forms of respiratory tract infections. The plant is considered a sedative wound-healer, diuretic, anti-inflammatory and cough suppressant[25]. The juice from the leaf is used to treat boils and skin ulcers. Bryophyllum

pinnatum is widely used in herbal medicine to cure diseases and heal injuries. It is used for the treatment of all sorts of respiratory ailments such as asthma, cough and bronchitis [26.] It is employed for the treatment of kidney stones, gastric ulcers and edma of the leg. The juice from the leaf is used to treat boils and skin ulcers. Bryophyllum pinnatum is widely used in herbal medicine to cure diseases and heal injuries.[27, 28] In Southeastern Nigeria, this herb is used to facilitate the dropping of the placenta of new born baby [29]

Taxonomy

Kingdom– Plant (Plants)

Subkingdom – Tracheobionta (Vascular Plants).

Superdivision– Spermatophyta (Fiowering Plants)

Division – Mangoliphophyta (Dicotyledonous)

Subclass– Rosidae

Order– Saxifraggales

Family– Crassulaceae Stone Crop Family

Genus– Kalanchoe

Species – Kalanchoe Pinnata Lam Per.[30].

Synonym: Bryophyllum calycinum, Bryophyllum pinnatum, also known as the Air Plant, Life Plant, Miracle Leaf, Goethe Plant and the Katakataka (Filipino) [31.]

Regional Name

Marathi- Panfutti

Hindi- Zakhm – Hayat

Arabic-Kushnulhayat

Bengal-Koppata

Sanskrit-Asthi Bhaksha

Telgu-Simajamudu

Tamil – Rankali

Kannad – Ganduklinga

Malayalam – Elamurunga

Persian and Urdu – Chubehayat

Common Names

Cathedral Bells, Air Plant (USA), Life Plant, Miracle Leaf, Goethe Plant and Katakataka. Also called “Wonder of the World” in the English speaking Caribbean.’Oliwa Ka Kahakai (Hawai'i), Mother Of Thousands, Herbe Mal Tete (Dominica) Never Dead, Parvu, Hoja Del Aire (Bolivia).

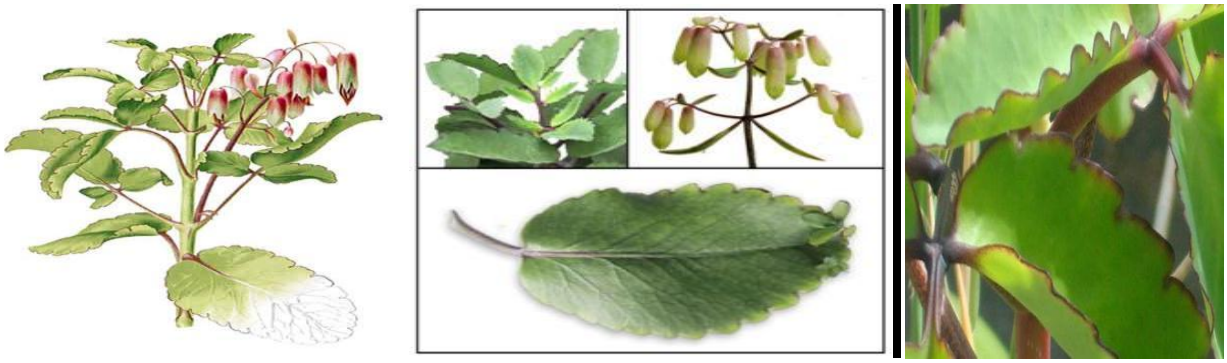

Figure 1: Plant of Bryophyllum pinnatum

Description of Bryophyllum Pinnatum Plant

Figure 2: Height of Bryophyllum pinnatum plant

It is a glabrous herb 0.3-1.2 m high.

Stems: obtusely four angled the older light colored, younger parts reddish speckled with white.

Leaves

Figure 3: Leaves of Bryophyllum pinnatum plant

Variable decussate, the flower usually simple or occasionally compound ,8-12 and 6-8 cm in size and the upper usually 3-5 or sometimes 7-follate ,long pointed , the petioles united by a ridge round the stem, leaflets ovate or elliptic , crenate or serrate.

Flowers

Figure 4: Flowers of Bryophyllum pinnatum plant

Reddish purple, pendent in large spreading panicles with opposite stout branches, pedicle slender.

Fruits: Enclosed in the persistant papery calyx and corolla.[32.]

Physicochemical Properties:

Total ash 5.1%, acid insoluble ash 1.69%, water soluble ash 4.19%, water soluble extractive value 19.80%, and alcohol soluble extractive value 5.60%[10.]

Chemical Constituents

Leaves of Bryophyllum calycinum contained many acids including malic acid, is citric acid, oxalic acid and succinic acid. The overall yield was 49 to 62% of the is citric acid in the organic acid extract. syringic acid, caffeic acid, 4-hydroxy-3-methoxy-cinnamic acid, 4- hydroxybenzoic acid, p- hydroxycinnamic acid, paracoumaric acid, ferulic acid, protocatechuic acid, phosphoenolpyruvate, protocatechuic acid were also isolated from aerial parts of plants[34.] The leaves contained flavones, falvans, flavanones, isoflavonoids, chalcones, aurones, anthocyanidines, 5 Methyl 4, 5, 7 trihydroxyl flavone 1, 4, 3, 5, 7 tetrahydroxy 5-methyl 5I-propenamine anthocyanidines2 , 24-epiclerosterol (R)-stigmasta-5, 25-dien-3β-ol], 24(R)- 5α-stigmasta-7, 25-dien-3β-ol, 5α-stigmast-24-en-3β-ol and 25-methyl-5α-ergost-24 (28)-en-3β-ol, 1-octane3-O-α-L-arabinopyranosyl-(1-6)-glucopyranoside,isorhamnetin-3-O-a-L-1C4-rhamnopyranoside, 40-methoxy-myricetin-3-O-a-L 1C4-rhamnopyranoside and protocatechuic-40-O-b-D-4C1-gluco-pyranoside, bersaldegenin- 1, 3, 5-orthoacetate, Bufadienolide- bryophyllin B , Bryophyllum C, Stigmast-4, 20 (21), 23-trien-3-one , stigmata-5-en-3β-ol , α – amyrin- β-D-glucopyranoside and nundecanyl n-octadec-9-en-1-oate and n-dodecanyl noctadec- 9-en-1-

oate[35,36.] The plant also contained calcium (96.45 µg/g of crude drug), potassium (76.40 µg/g of crude drug), phosphorus, sodium, magnesium, iron, zinc, ascorbic acid (26.42 to 44.03 mg/100 g), riboflavin (0.20 to 0.42 mg/100 g), thiamine (0.11 to 0.18 mg/100 g), niacin (0.02 to 0.09 mg/100 g), casein hydrlylsate and nicotinamide [37.]

Ethanopharmacology

The juice from fresh leaves is used to treat smallpox, otitis, cough, asthma, palpitatious, headache, convulsion and general debility[38.] The leaves and bark of B. pinnatum are bitter tonic, astringent, analgesic and carminative, ethanopharmacologically used for the treatment of diarrhea and vomiting, earache, burns, abscesses, gastric ulcers, insect bites, and lithiasis [39.] The plant has also been employed for the treatment of edema of legs[12.] Leaves powder used as wound dressing and sold as 'Jakhmehayat'. In Southeastern Nigeria, the herb is used to facilitate the dropping of the placenta of newly born baby. In Mexico and Nicaragua it is also used to promote menstruation and assist in childbirth. In Nigeria and other West African countries, its fleshy leaves are frequently used as herbal remedy for an array of human disorders, including: hypertension, diabetes mellitus, bruises, wounds, boils, abscesses, insect bites, arthritis, rheumatism, joint pains, headaches and body pains. They are useful in vitiated conditions of vata and pitta, cuts, wounds, hemorrhoids, menorrhagia, discoloration of the skin, boils, sloughing ulcers, ophthalmic, burns, scalds, corn, diarrhea, dysentery[40.] This is also applied on the bodies of young children when they are ill[26] B. pinnatum is a refrigerant, emollient, mucilaginous, haemostatic, vulnerary, depurative, constipating, anodyne, disinfectant, antitonic. The plant proved to be useful in vitiated conditions pitta and vata, epilepsy, piles, haematemesis, haemorrrhoids, menorrhagia, cuts and wounds, discolourations of the skin, boils, ophthalmic, scalds, corn [41.] Bryophyllum can reduce fever and does provide anti-inflammatory, and muscle relaxant effects[42]. It is applied externally and taken internally for all types of pains and inflammations, various bacterial, viral and fungal infections, leishmaniasis, earaches, upper respiratory infections, stomach ulcers, flu and fever.[23]

Pharmacological Activities

Anticancer effects

Prescreening method for cytotoxic effect showed that the ethanolic extract of bryophyllum pinnatum has anti cancerous activity[43, 44.] Five bufadienolides isolated from the leaves of the plant were examined for their inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation in Raji cells induced by the tumor promoter,12- Otetradecanoylphorbol-13-acetate. All bufadienolides showed inhibitory activity, and bryophyllin A exhibited the most marked

inhibition among the tested compounds. Bryophyllin C and bersaldegenin-3-acetate were less active[45.] MTT assay on a highly metastatic human HT-1080 fibrosarcoma cell line showed that metanolic. Methonolic aqueous, aqueous extract have mild antiproliferative activity[46.]

Antimicrobial activity

Two novel flavanoids; 5 methyl 4, 5,7 trihydroxyl flavones and 4,3,5,7 tetrahydroxy 5 methyl 5 propenamine anthocyanidines showed potential antimicrobial activities against Pseudomonas aeruginosa, Klebsiella pneumonia, E.coli, Staphylococcus aureus, Candida albicans and Aspergillus niger[12.] The antimicrobial effects of petroleum ether, chloroform, methanol and aqueous extracts was evaluated in vitro against Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa and Candida albicans. Methanolic extract of roots was found to be most effective antibacterial compared to others, while none of extract showed the activity against C. albicans[47.] When 60% methanolic extract of Bryophyllum pinnatum leaf used to inhibits the growth bacteria, at a concentration of 25 mg/ml it showed good antibacterial effects[48]. Agar cup plate test was used to determine the sensitivity of the tested Bryophyllum calycinum Salisb leaf extracts and the micro-dilution method was used to determine the minimum inhibitory concentration. The aqueous extract was active against all tested microbial strains (Gram-positive: Staphylococcus aureus ATCC 25925, Bacillus subtilis ATCC 6633, Staphylococcus epidermis ATCC 12228 and Micrococcus luteus ATCC 10240; and Gram-negative: Enterobacter aerogens ATCC 13048, Escherichia coli ATCC 25922, Salmonella typhi ATCC 51812 and Shigella dysenteriae ATCC 25931). The aqueous extract showed antimicrobial activity against all tested microorganism with minimum inhibitory concentration ranging between 0.26 to 2.08 mg/ml, while, the MICs of alcoholic extract ranged between 1.04 to 8.32 mg/ml[1]. Some researchers suggested that the active constituents Bufadienolides: bryophyllin A and bryophyllin C from B. Pinnatum showed strong insecticidal activity against third instar larvae of the silkworm[49.] The Fungitoxic and phytotoxic effects of extracts on the fungal pathogens have also studied by the researchers[50, 51].

Antioxidant effects

Physiological burden of free radical causes imbalance in homeostatic phenomenon between oxidants and antioxidants in the body. The imbalance leads to oxidative stress that is being suggested as the root cause of aging and various human diseases like arteriosclerosis, stroke, diabetes, cancer and neurodegenerative diseases such as Alzheimer's and Parkinson's disease. The DPPH and nitric oxide free radical scavenging method were used to detect oxidative activity of Bryophyllum calycinum Salisb leaf extracts. The results of DPPH method showed 50%

inhibition rate at the 144.23µg/ml and 117.42µg/ml with aqueous and alcoholic extract, respectively. Nitric oxide scavenging inhibition showed 50% inhibition rate at the 525.92µg/ml and 460.48µg/ml with aqueous and alcoholic extract, respectively. The researchers stated after screening that the extract from leaves have interesting potential free radical scavenging activity for treatment of diseases.[52.] Morales and colleagues suggested that quercetin has a marked protective effect on cadmium-induced nephrotoxicity that results from an increase Metallothionein, a small cysteine-rich protein and eNOS (endothelial nitric oxide syntheses) expression and the inhibition of COX-2 (cyclooxygenase-2) and ions (inducible nitric oxide syntheses) expression[53].

Anthelmentic effects

The crude extracts contained tannins which produced anthelmentic activity. The chloroform, methanolic and aqueous extract of the plant root cause paralysis and deaths of worms and showed significant anthelmentic activity[54.]

Anti ulcer activity

It also been demonstrated by the investigators that the Methanol-soluble fraction of B. pinnatum leaf extract inhibited the development of a variety of acute ulcers induced in the stomach and duodenum of rats and guinea pigs[55]

Antileishmanial activity

The flavanoids like Quacertin[56], leuteolin was recently described as a promising antileishmanial drug with low toxity[57.] Infections caused by protozoa of the genus Leishmania are a major worldwide health problem, with high endemicity in developing countries. The incidence of the disease has increased since the emergence of AIDS. L.G. Rocha et al refered in a review on a plant extracts that a chemically defined molecules (coumarin, quercetin) of natural origin showing antileishmanial activity. Quercitrin, a flavonoid is responsible for the antileishmanial activity of B.Pinnatum[58,59.]

Antidiabetic Activity

The presence of zinc in the plants could mean that the plants can playvaluable roles in the management of diabetes, which result from insulin malfunction. The plant aqueous extract of B. pinnatum caused significant reductions in the blood glucose levels of the fasted normal and fasted streptozotocin –treated diabetic rat. The anti-inflammatory and antidiabetic effects of the plant extract were investigated in rats, using fresh egg albumin-induced pedal oedema, and streptozotocin –induced diabetes mellitus.[6, 60.]It exerts antinociceptive and anti-inflammatory

effects probably by inhibiting the release, synthesis and /or production of inflammatory cytokines and mediators, including: prostaglandins, histamine, polypeptide kinins and so on[3.]

Anticonvulsant activity

The CH2Cl 2/CH3OH extracts reduced seizures induced by pentylenetetrazol, strychnine sulphate and thiosemicarbazide and increases in the latency period of seizures and reduced the duration of seizures induced by the three convulsive agents. The extract protected 20% of animals against death in seizures induced by TSC and STN[2, 61.]

Hepatoprotective and Nephroprotective

The hepatoprotectitve activity of B.pinnatum was reported by various scientists. It was found very effective hepatoprotective as it significantly lowers the enzyme SGOT, SGPT SALP and SBLN levels as increased level are well known sensitive indicators of liver injury[62.] Juice of the fresh leaves is used very effectively for the treatment of jaundice in Bundelkhand region of India. Yadav et al studied that the juice of leaves was found more effective than ethanolic extract as evidenced by in vivo and in-vitro histopathological studies for hepatoprotective activity of plant and justifies the use of juice of plant leaves in folk medicine for jaundice. The protective effect on gentamicin-induced nephrotoxicity in rats which may involve its antioxidant and oxidative radical scavenging activities. It is also used for the treatment of kidney stones in India where is goes by the name of Pather Chat or Paan-futti. The Quercetin has neproprotective and antioxidant role[63.] Another finding along with the histopathological studies clearly showed the hepatoprotective activity of Bryophyllum pinnatam[63].

Cardiovascular effects

The aqueous and methanolic leaf extracts decreased arterial blood pressures and heart rates of anaesthetized normotensive and hypertensive rats[3.] Both the aqueous and methanolic leaf extracts of the plant (50-800 mg/kg IV or ip) produced dose-related, significant ($P<0.05$ - 0.001) decreases in arterial blood pressures and heart rates of anaesthetized normotensive and hypertensive rats. The inhibitory effects of the leaf extracts on the cardiovascular system of the laboratory animals were resistant to physiological doses of standard antagonist drugs[64.]

Wound healing activity

The high saponin content justifies the use of the extracts to stop bleeding and in treating wounds. The extract of B. pinnatam was evaluated for its wound healing activity by using excision wound model in rats. The histological analysis showed that plant leaf extract exhibited significant wound healing potential. The wound healing exhibited by the extract may be attributed to the presence of steroid glycosides[65.]

Anti-inflammatory and analgesic effects:

Aqueous extract of B.Pinnatum can demonstrate strong analgesic potency comparable in a time and dose-dependent manner to a non steroidal anti-inflammatory drug. Anti inflammatory activity of Bryophyllum pinnatum plant extract was investigated on rats using fresh egg albumin-induced pedal (paw) edema. The plant extract significantly inhibited fresh egg albumin-induced acute inflammation[3.] The plant extract significantly inhibited fresh egg albumin-induced acute inflammation and significantly exhibited antinociceptive effects against thermally- and chemically-induced nociceptive pain stimuli in mice[60.] The analgesic and anti-inflammatory activity of a new Stigmast-4, 20 (21), 23-trien-3-one, a steroidal derivative obtained from the leaves extract of the plant has also been evaluated [12.]

Immunomodulatory effect

The spleen cells of animals pre-treated with plant extract showed a decreased ability to proliferate in response to mitogen and antigen in vitro as well as the specific antibody responses to ovalbumin were also significantly reduced by treatment. The aqueous extract of leaves causes significant inhibition of cell-mediated and humoral immune responses in mice.[66.] Investigation found that leaf extracts inhibited *in vitro* lymphocyte proliferation and showed in vivo immunosuppressive activity; hence it has been proved that the aqueous extract of leaves possesses immunosuppressive activities[66.] It has been stated that the fatty acids present in B.Pinnatum may be responsible for its immunosuppressive effect in vivo as from the ethanolic extract a purified fraction (KP12SA) of B. Pinnatum found twenty-fold more potent to block murine lymphocyte proliferation than the crude extract[67.] Mice treated daily with oral B. pinnatum during hyper sensitization with ovalbumin were protected against death. Oral protection was accompanied by a reduced production of OVA-specific IgE antibodies, reduced eosinophilia, and impaired production of the IL-5, IL-10 and TNF- α cytokines. Oral treatment with the quercitrin flavonoid isolated from plant extract prevented fatal anaphylaxis in 75% of the animals. These findings indicated that oral treatment with Bryophyllum pinnatum effectively down modulates pro-anaphylactic reactions inducing immune responses[68.]

Sedative effects

The methanolic extract of Bryophyllum calycinum Salisb showed neuropharmacological effects in experimental animals (rats and mice). The fraction produced alteration of behavior pattern, caused dose-dependent potentiation of pentobarbitone sleeping time and had significant analgesic activity and possesses a potent CNS depressant action. The saline leaf extract of Bryophyllum calycinum Salisb produced a dose-dependent prolongation of onset and duration of

pentobarbitone-induced hypnosis, reduction of exploratory activities in the head-dip and evasion tests. Moreover, a dose-dependent muscle in-coordination was observed in the inclined screen, traction and climbing tests in mice. The saline leaf extract produced a dose-dependent prolongation of onset and duration of pentobarbitone-induced hypnosis, reduction of exploratory activities in the head-dip and evasion tests and a dose-dependent muscle incoordination in the inclined screen, traction and climbing tests[36, 69, 70.]

Antihistaminic effect

The methanol extract of the leaves has also been reported to have histamine receptor (H1) antagonism in the ileum, peripheral vasculature and bronchial muscle[71.]

Effects on reproductive system

A prospective double-blind trial with orally applied Bryophyllum versus placebo was carried out. Thirty-two patients divided into two groups, 15 patients received Bryophyllum and 17 received the placebo. The time of delivery did not differ between the groups. In both groups the mean time of birth was in the 35 week of gestation. The mean birth weight was slightly higher in the placebo group (2192g) compared to the Bryophyllum group (1948g). A transition to the intensive care unit was slightly higher in the placebo group (13) compared to the Bryophyllum group (11).[72.] The plant exerted relaxant effect in vitro on the contractility of human myometrium on oxytocin-stimulated contraction at a minimum concentration almost 100-fold lower than in the case of spontaneous contraction[73].

Effects on renal system:

The aqueous extract of the leaves possessed potent nephroprotective activity in gentamycin-induced nephrotoxicity in rats. The plant hydroalcoholic extract was also found to exert significant diuresis and antiurolithitic activity when given by oral and ip route to rats[74, 75].

Neurosedative and muscle relaxant activity

When tested in mice, it produced a dose-dependent prolongation of onset and duration of pentobarbitone-induced hypnosis, reduction of exploratory activities in the head-dip and evasion tests. The saline leaf extract of Bryophyllum pinnatum was investigated for neuropharmacological activities to ascertain ethanopharmacological significance. Moreover, a dose-dependent muscle in-coordination was observed in the inclined screen, traction and climbing tests [42.]

Contraindications and adverse effects

In acute toxicity study, it was observed that the LD50 values of methanolic extract in mice and rats were 1159.03 and 1459.69 mg/kg respectively and the LD50 of aqueous extract were 957.02

and 1064.21 mg/kg respectively. The extracts were found to be non-toxic orally in doses up to 3 g/kg body weight in mice and rats. 2 g/ kg body weight orally for 35 days in rats didn't cause histological changes in kidneys, hearts and spleen. No changes in body weight, hematological and biochemical parameters. There was no death at a maximum acute dose of 5 g kg/ body weight by the oral route. The intraperitoneal LD50 was 1.8 g/ kg body weight in rats. Sub acute treatment did not significantly alter animal weights, organ-to-body weight ratios, fluid intake, hematological indices and the levels of AST, ALP and albumin. ALT level was significantly reduced ($p<0.03$) in the treated group. Total bilirubin and conjugated bilirubin levels were not significantly altered in the treated group[6, 33.]

Patent

1. Dr. Tejal Gandhi, Dr. Kirti Patel applicant from Anand Pharmacy College, Gujarat have Indian patent on novel process for the isolation of flavonoids and saponins from Bryophyllum pinnatum fresh leaves, Filed on 2011-09-29,Publication date 2011-12-09[76].

2. A Chinese medicine having emulsifying property got US Patent comprising Akebia trifoliata, Polygonum perifoliatum, Euodia rutaecarpa, Stemona tuberose, and Bryophyllum pinnatum[77.]

Marketed Preparation

1. Amatol Cream: Its indications are respiratory disorders, Sinusitis, bronchitis, allergic reactions, blocked nose. Ingredients are Mentha Viridist extract (mint.), Iresine difusa (escanel) extract, Lippia alba extract (yantria), Zingiber officinalis extract (ginger),Bryophyllum pinnata extract (Pakipanga),Mansia alliacea extract (ajode monte),mentol, alcanfor, water cream base, external use only. Manufacturing company:-The Pure Source-Private Label Contract Manufacturer since 1995, Miami, Florida.

2. Parnabija savarasa: anti obesity [78.]

Manufacturing company:- State Library of Queensland

CONCLUSION

Bryophyllum pinnatumis a perennial herb growing widely and used in folkloric medicine in tropical Africa, India, China, Australia and tropical America.A number of active compounds, including flavonoids, glycosides, steroids, bufadienolides and organic acids, have been identified in Bryophyllum pinnatum. Its bufadienolides are structurally similar to Cardiac glycosides and have demonstrated in clinical research to posses' antimicrobial, antifungal, anticancer, anti tumour, insecticidal actions. It also possess other activities like anti ulcer, anti-inflammatory and analgesic, antihypertensive, hepatoprotective, Nephroprotective, diuretic, anti diabetic,

anticonvulsion, antioxidant, uterine relaxant, muscle relaxant and neurosedative activity and tocolysis activity. The present review shows the pharmacological potentials of Bryophyllum pinnatam which is very helpful to researcher to explode more about this valuable plant.

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