**Title of the Research Project:A Detailed Study on Isolation and Pharmacological Activity of BryophyllumPinnatum.**

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***Abstract****-Bryophyllumpinnatum*(syn. *Kalanchoepinnata*), is a perennial succulent herb that originated from Madagascar,it is divine herb contains many valuable active pharmacological constituents that are responsible for plant various therapeutic effects,Inrecent years, a number of research were conducted on the chemical constituents, pharmacological effects, and clinical efficacy of *Bryophyllum*. Here the pharmacological and clinical data are reviewed. Recent studies suggest different pharmacologicalactivity of*B. pinnatum*.

**Keywords:** *Bryophyllumpinnatum*, Crassulaceae, Anthroposophic medicine, Phytochemistry, Pharmacological activities, Clinical studies.

**Introduction: -**Globally, medicinal plants are extensively usedfor the treatment of various diseases (Gover*et al.,* 2002).According to the World Health Organization (WHO),medicinal plants are the great source to offer a diverse range of potential therapeutic drugs and these drugs canbe relatively safe and economical as compared to thesynthetic medicines (Mekuria*et al.,* 2017; Ekor, 2014;Bahmani*et al.,* 2014). Since the last many years, herbaldrugs are increasingly focused by the researchers andseveral plants are being monitored for their prospectivetherapeutic effects (Uprety*et al.,* 2010). Based on thetherapeutic value of medicinal plants the current study provides an updated insight of *Bryophyllumpinnatum*which is extensively used in folk therapeutics.

**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 ofthe World (Pattewar, 2012), Canterbury bells, life plant, air plant and Cathedral bells (Plangger*et al.,* 2006; Naz*et al.,* 2009; Kamoj and Saluja, 2017).

**Taxonomy**

Kingdom: Plantae

Vascular plants Division: Spermatophyta

Order: Rosales

Family: Crassulaceae – stonecrop

Genus: Bryophyllum

Species: *Bryophyllumpinnatum*(Lam.) Kurz

**Distribution:** *Bryophyllumpinnatum*is indigenous toMadagascar. It grows naturally and found in thetemperate regions of Asia, Galapagos, West Indies, NewZealand, Macaronesia, Mascarenes, Caribbean.

**PHYTOCHEMICAL CONSTITUENTS:** *Bryophyllumpinnatum*contains numerous important chemical constituents and secondarymetabolites Such asFlavonoids, steroids, terpenoids, phenolics, Vitamines alkaloids,bufadienolides, glycosidestannins. Flavonoids present are quercitrin, 4’-dimethoxy quercetin 8-methoxyquercetin-3, plant leavescontains bufadienolideslike bryophyllin B and A. The herb is an excellent reserve ofvitamins such as ascorbic acid, niacin and thiamine andalso has minerals i.e. Ca, Mg, Na, P, K and Zn (Milad*et al.,* 2014).

**BIOLOGICAL AND PHARMACOLOGICALEFFECTS**

**Anti-inflammatory and Analgesic activity:**

*Bryophyllumpinnatum*leaves and itsflowers are used for the anti-inflammatory and analgesiceffects. It contains flavonoids whichhave ability toinhibit the cyclooxygenase enzyme and minimize theactivity of α- tissue necrosis factor (Ferreira *et al.,* 2014).Leaves ethanolic extract was proved to be effectiveagainst the topical acute and chronic inflammation whichis due to stuffing of the arachidonic acid pathway(Chibli*et al.,* 2014).

**Anti-allergy activity:** An *in vitro* study has shown thatthe plant is helpful in reducing allergy. Its anti-allergiceffect is due to the halting of antigen induced mast celldegranulation and also by minimizing the secretion ofhistamine (Cruz *et al.,* 2008).

**Anti-cancer activity:** The plant chloroform extract andits fractions have exhibited a concentration dependentinhibition of human cervical cancer cell growth. Thefraction was more potent than the extract and strongactivity was observed against human papillomavirus (HPV) which performs a vital job in the growth ofcervical cancer (Mahata*et al.,* 2012). In leaves of *Bryophyllumpinnatum* fivebufadienolides are present. Studyresultssuggested that the*Bryophyllumpinnatumcontains* bufadienolides which isresponsible for potential chemotherapeutic efficacy to treat the cancer(Afzal*et al.,* 2012).

**Anti-diabetic activity:** For many years, the plant hasbeen utilized for its anti-hyperglycemic effects.Furthermore, an advanceresearch has confirmed its efficiency in heartdiseases and in diabetes (Ojewole, 2005).

**Antihypertensive activity:** Medicinal herb is used totreat various cardiovascular related disorders in folkloretherapeutics (Tedge*et al.,* 2005). Now it is confirmedthat aqueous extract of the leaves has an antihypertensiveeffect of folk medicines. Ithas been demonstrated that the extract has potent antioxidanteffect on aorta thus plays a significant role in thelessening of blood pressure (Bopda*et al.,* 2014).

**Anti leishmanial activity:** Flavonoids present in the herbare responsible for its anti leishmanial effects. In theaqueous extract of leaves, it has been proven by testingthree flavonoids separately against the *Leishmaniaamazonenis*amastigotes in comparison with quercitrin,quercetin and afzelin. The quercetinaglycone typestructure and a rhamnosyl unit linked at C-3 were foundto be essential for anti leishmanial activity (Muzitano*etal.,*2006).

**Antimicrobial and Antifungal activity:** The plantdifferent crude extracts were analyzed for their antimicrobialeffect and it was determined that the extractshave broad spectrum anti-bacterial activity (AqilandAhmad, 2003). Remarkable antibacterial activity wasconfirmed against gram positive and gramnegative bacteria by the ethanolic extract of the plant (Biswas*et al.,* 2011). A methanolic extract of the rootswas found to be effective against *S. aureus, P.* aeruginosa

and*E. coli* but not effective against *C. albicans*(Majaz*etal.,* 2011).

**Urolithic activity:** The medicinal herb is used for thetreatment of renal stones in traditional medicines (Tedge*et al.,* 2005). Leaves aqueous extract significantly reducesthe level of urine oxalate and therefore it can behelpful in the cure of urolithiasis (Shukla*et al.,* 2014). This medicinal herb is used to treatkidney stone treatment. *Bryophyllumpinnatum*isuseful in the reduction ofrenal stones because it increases the excretion of oxalatecrystals by reducing the size of crystals and by alteringthem from dehydrate crystals to calcium oxalatemonohydrate form (Yasir and Waqar, 2011).Investigations have confirmed that the plant extractsprotect the kidney cell from calcium oxalate crystals,oxidative stress and also lessened the formation of renalstones by increasing the solubility and excretion of thesestones through the urine (Tiwari*et al.,* 2012).

**Gastroprotective/ Anti-ulcer activity:** *Bryophyllumpinnatum*possess gastroprotective effects and it has beenverified by its striking dose dependent defensive effect onethanol induced gastric injury. However, further studiesshould be carried out to validate its use in gastric ulcers(Sharma *et al.,* 2014).

**Effect on hematological parameters:** *Bryophyllumpinnatum*methanolic extract of the leaves has exhibited amarked effect on various hematological parameters i.e. Itimproves the hemoglobin level, packed cell volume andtotal white blood cell count (Aprioku and Igbe, 2017).

**Hepatoprotective activity:** The plant has beenmonitored for its hepatoprotective activity. Plant has shown an obvious hepatoprotectiveactivity. Increased regeneration of hepatocytes andmicrosomal enzymes inhibition also defend the liver fromdamage (Yadav and Dixit, 2003).

**Anti-oxidant activity:** The medicinal plant is tested forits 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. Study outcomes have indicated that theethanolic extract has marked anti-oxidant activity (Sindhuand Manorama, 2015). Roots extracts have also exhibited the anti-oxidant effects when analyzed by DPPH assay(Gupta and Banerjee, 2011).

**Nephroprotective effects:** *Bryophyllum pinnatum* iswidely used for its nephroprotective activity in folkloreand the rationale behind its use has been proven by thestudies. Outcomes ofresearch have shown that thiseffect is dose dependent. The nephroprotective effect is due to the plant anti-oxidant and radicalscavenging properties (Harlalka*et al.,* 2007). It issuggested that the juice of leaves is more effective in thecure of hyperactive bladder and has fewer side effectsthan anti-cholinergic drugs (Schuler *et al.,* 2012).

**Wound healing activity:** The plant is used topically forthe healing of wounds in traditional therapeutics. It isproposed that the plant has saponins in huge amountswhich promote wound healing by aggregating theerythrocytes. Furthermore, tannins present in the plant alsoimprove the process of wound healing because of theirastringent effect (Pattewar, 2012).

**Neurosedative and muscle relaxant activity:**

*Bryophyllumpinnatum*has marked effect on the CNS andit has been proven that the methanolic extract produced asignificant change in behavior pattern. A study resultshave demonstrated that the herb caused the CNSdepression and dose-dependent stimulation ofpentobarbitone sleeping time (Ojewole, 2005). Anotherstudy has also suggested that it is useful in treating thesleep troubles during pregnancy (Afzal*et al.,* 2013). Themedicinal plant is helpful for the treatment andmanagement of seizures and that was confirmed bytesting on mice. It showed a dose dependent increaseonset and duration of pentobarbitone-induced sleep anddecline of exploratory activities in the head-dip andevasion tests. A dose-dependent muscle incoordinationhas been verified in the inclined screen, traction andclimbing tests. In both strychnine and picrotoxininducedseizures it caused a late onset of convulsions (YemitanandSalahdeen, 2005).

**Figure 1. The plant of *Bryophyllumpinnatum***

**Uterine relaxant activity:** In traditional therapeutics, theplant is used for tocolysis and the rationale behind its use proven by *in vitro* studies and further research is stillrequired (Gwehenberger*et al.,* 2004). The effect of leafpress juice and its chemical fractions were studied onhuman myometrial strips and were found to be useful inrelaxing the myometrial strips (Wächter*et al.,* 2011).

**Conclusion:** The current study focuses on the latestevidence base information regarding pharmacognostical, and pharmacological profile of the *Bryophyllumpinnatum*. It is concluded that the divine herb contains many valuable active pharmacological constituents that are responsible for plant various therapeutic effects. Different studies have explained and verified the wisdom behind its use in traditional medicines. More exploratory studies are still required to confirm and justify use of the herb in folk medicine and also to prove its safety and efficacy.

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