Kalanchoe pinnatum –“RAKASTAMBHAK” – A Review

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Abstract: In India, a number of medicinal herbs have been contributing significantly in sustaining economic developments and affordable health care. Kalanchoe pinnatum is one such herb which has been used in India for thousands of years for its therapeutic properties. It is commonly known as “Patharchatta”. It is a xerophytic plant having thick and fleshy leaves. Its leaves are used as a remedy for the treatment of urinary bladder & kidney stone, intestinal problems, ulcers, arthritis, inflammation, conjunctivitis, menstrual disorders, urinary disorders, migraine, nausea, urethritis, wound and dysentery, digestion problems, diarrhea, etc. Kalanchoe pinnatum has wide application, as this herb is also popular antimicrobial, antioxidant, insecticidal, encapsulation, anti fungal properties. Thus it not only acts as a neutraceutical but can also be used as a functional food in future.

Keywords: Neutraceutical; Pulmonary disease; Antioxidant; Insecticidal; antifungal; Antibacterial; Phytochemicals

I. Introduction

Herbal ingredients have been used as food flavourings for hundreds of years, some herbs have also been traditionally regarded as natural remedies for common ailments, yet it is only in recent years that food producer focused on the health benefits of such ingredients in food products and among such herb is Kalanchoe pinnatum.

Kalanchoe pinnatum (Synonyms: Bryophyllum pinnatum, Bryophyllum calycinum,[23] is the perennial herb generally grown in tropical area, southern Africa and America, India, China, and Australia[14]. Generally this plant is used in herbal medicines to heal injuries, cure disease and is adopted as a herbal remedy in almost all over the world[22,19,51]. The leaves and leaf juice of this plants is considered as folkloric for the curing of kidney stone, gastric ulcer[43], pulmonary infection, rheumatoid arthritis [36] etc.

II. Plant specification

In Hindi it is commonly known as “Patharchur”, which is a very common household plant and has become naturalized in temperate regions of Asia, The Pacific and Caribbean. B. pinnatum grows in hot and moisty region in all over India, mainly in Bengal area.

Other Ordinary names on the basis of properties:

- Air Plant
- Miracle Leaf
- Life Plant
- Cathedral Bells
- Love Plant
- Bryophyllum pinnatum
- Katakataka
- Zakham-e-hyat
- Mother of Thousands

Taxonomy:
- Kingdom - Plantae
- Phylum - Charophyta
- Class - Equisetopsida
- Subclass - Magnoliidae
- Order – Saxifragales
- Family – Crassulaceae
Genus – Bryophyllum
Species – Bryophyllum pinnatum
It is a xerophytic plant having thick and fleshy leaves. It is a popular houseplant. Flowers of this plant arises in the month of Nov-March and fruits in April month[24,52,25]. This plant mature up to height of 1-1.5 m and having four-angled, tall and branched stem and have fleshy dark green color leaves & reddish purple flower.

Leaves are opposite and have simple arrangement of lower leaves and have 7- folio late[26], long pointed & petioles joined by ridge of stem. It has harsh and sour flavour, sweet in post digestive effect. The plant contains alkaloids, phenols, flavonoids [3,62], tannins, bufadienolides and other chemical compound.

III. Phytochemistry of Bryophyllum pinnata

Alkaloids, triterpenes, bufadienolides, tannins, anthocyanins, glycosides, saponins, sitosterols, quinines, carotenoids, flavonoids, phenolic compound [28,45,49,1] macro elements; magnesium, calcium, potassium, phosphorus, sodium, microelements; iron, zinc, vitamins; niacin, riboflavin, thiamine and ascorbic acid are present in this plant[17,37,42,38,57]. Three main components such as bryophyllol, bryophollone and bryophollenone can be extract from fresh leaves of Bryophyllum pinnatum.

Three unexpected flavonoids also have been isolated from plant such as Kaempherol 3-O-α-Larabinopyranosyl (1-2) α-L-rhamnopyranoside, Quercetin-3-di-arabinoside, Quercetin-3-L-rhamnosido-L-arabino furanoside [41], glycosides which are responsible for antileishmanial activity without toxity[39,61,11,8]. Some other phytochemicals are also in this plant such as arachidic acid, astragalin, behenic acid, beta-amyrin, benzenoids, pyruvate, cinnamic acid, clionasterol, codisterol, succinic acid, codisterol, beta-sitosterol, caffeic acid, syringic acid, taraxerol, bryotoxin C, ferulic acid, triacontane, Bryophyllone, Bryophylnol [60,56]. Amino acids i.e. thiamine, pyridoxine, ascorbic acid, glycine, cysteine, casein hydrolsate, nicotinamide, Food content i.e. carbohydrate, protein, lipids, Minerals; sodium, calcium, potassium, phosphorus, magnesium, ferrous, copper, zinc, and sugars; raffinose, lactose, sucrose, glucose etc are also accumulate in leaf of Kalanchoe pinnata [12].

IV. Properties of leaf

The leaf of B. Pinnata are health-giving chiefly used in holistic medicines for curing urinary bladder & kidney stone[31], intestinal problem, ulcers, arthritis, inflammation, conjunctivitis, menstrual disorders, migraine, nausea, urethritis, wound and dysentery[29]. According to Ayurveda, the leaves of Bryophyllum pinnata are moderately toxic to insects and according to Unani the bark of this plant is toxic, alexipharmic, mordant to the bowel. These leaves are also acts as palliative, carminative; helpful in diarrhea and vomiting.

The leaf of this plants posses remedial property use for various infection caused by microorganism or they acts as antineoplastic [33], antibacterial, antiviral, anti fungal[59,2,7,46], anti-inflammatory, anti-inflammation [47]. Anti-ulcer [53] and also posses antihistamine and anti-allergic activity[48, 58, 27]. In Ayurveda, the plant of Bryophyllum pinnatum is claimed to be beneficial in vitiated condition of vata and pitta & piles[21]. Phenolic compounds which are present in Bryophyllum pinnatum represents the antimicrobial activity of plant since in disinfection phenols and phenolic compounds are generally used. The leaf of plant Bryophyllum pinnatum also posses phenolic compounds which also may be liable for the therapeutic, antiseptic, antifungal besides antiviral and anti-tumor activity, antiseptic, cough suppressant, styptic [48, 56, 15, 20, 9, 4, 34]. The phenolic compound of this plant may be subjected to oxidation and cause formation of phenolates ion or quinine that are able to scavenge and capture microorganism[50]. The presence of flavonoids, flavones and anthocyanidines characterize antioxidant, anti-inflammatory and anticancer activity [35] of B. pinnatum. Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumonia, Aspergillus niger & Candida albicans microorganism can be
successfully retard by the presence of these flavonoids compounds [49]. K. pinnata acquire antiurolithic activity because pods and leaves enhance the diluting properties of calcium oxalate crystals. The extracts of B. pinnatum have capacity to reduce size of calcium oxalate crystals by dissolving or preventing the formation of calculi in kidney, ureter and bladder and promote the formation of calcium oxalate dehydrate crystal [30].

1. **Anthelmentic and antiprotozoal effects**: The leaves of this plant show antihelmentic property due to presence of tannins in leaves of B. pinnata.

2. **Antileishmanial Activity**: The leaves of this plant show this property due to the presence of flavonoids like Quercetin, leuteolin.

3. **Healing the wound**: A compound Hydroxyproline that is responsible for healing the wound is also present in the leaf of B. pinnata [43].

4. **Anticancer effect**: Against cancer cells, bryophyllin compounds have proved anticancer therapeutic value[35].

5. **Antiparasitic effects**: In both humans and animals, a common parasitic disease which is caused by transmission of the bite of sand flies that is leishmaniasis can be treat by the aqueous extract of Kalanchoe leaves.

6. **Anti-insecticidal effects**: Bryophyllin A in Kalanchoe pinnata acts as anti-insecticidal against third instar larvae of Bombyx mori.

7. **Anti-allergic effect**: With accumulating antibacterial property, Kalanchoe pinnata also use for upper respiratory problems and coughs because the leaf juice posses high potent to anti-histamine and anti-allergic function.

8. **Anti-inflammatory**: In vivo research it is proved that Kalanchoe leaves help in reducing fevers and provides anti-inflammatory, muscle relaxant and pain relieving effects[47].

9. **Anti-depressent**: In animal study Bryophyllum pinnata has also display sedative and depressant actions of central nervous system.

10. **Anti-ulcer**: Extract of leaves suppress ulcer inducers as aspirin, stress, ethanol, histamine and reduces hypertension thus protects mice from ulcer[33,54].

In Bundelkhand region of India, Juice of leaf of B. pinnata is utilized for curing jaundice and in treatment of kidney stones.

### V. Future Aspects

The diagram illustrates the process of preparing a drink from the leaves of Pattharchur. The steps include:

- **Pattharchur Leaves**
- **Juice Extraction**
- **Preparation of sugar syrup**
- **Mixing of juice and sugar syrup**
- **Carbonation**
- **Carbonated pinnata drink**
VI. Conclusion

Till date there is no functional carbonated beverage available in the market. Such functional beverages are those which are non-alcoholic that has been formulated by herbs, vitamins, minerals and amino acids. These drinks have health promoting benefits such as heart health and boon for immune system. So in future we can look forward towards functional carbonated drink from pinnata leaf extract. This ready-to-serve drink will not only be good in taste but will also contribute to high nutritional benefits.

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