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PHARMACOLOGICAL AND THERAPUETIC LANDSCAPE OF KALANCHOE PINNATA: A REVIEW ON ITS TAXONOMY AND FORMULATIONS.

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ABSTRACT:

The plant *Kalanchoe pinnata (Linn.)* Pers. is primarily found in temperate and tropical climates worldwide. It has long been recognized for demonstrating a broad spectrum of pharmacological properties, including the ability to treat the most severe human illnesses. The plant's medicinal and therapeutic properties, such as its anti-inflammatory, muscle-relaxant, antipyretic, anticonvulsant, antidepressant, sedative, antilithiatic, hepatoprotective, gastroprotective, antidiabetic, nephroprotective, chemoprotective, antihistamine, antihypertensive, wound-healing, antiproliferative, antimicrobial, antiviral, antiprotozoal, antileishmanial, insecticidal, anti-allergic, analgesic, antinociceptive, antiprotozoal, anti-inflammatory, muscle-relaxant, antidepressant, anti-inflammatory, muscle-relaxant, antidepressant, and immunosuppressive properties have all been thoroughly examined in this review. It is now an endangered plant that must be protected and studied for its important green chemistry.

KEYWORD*:* *Kalanchoe pinnata*: Taxonomy, Pharmacological activity, Therapeutic Formulation and Uses.

INTRODUCTION:

Since the beginning of life on Earth, diseases have increased. For researchers, acquiring something to protect themselves is difficult. Humanity gains much from plants. They have been examined, studied, and used to treat a number of horrible illnesses. Medicinal plants are those that show promise in addressing illnesses. Because of their therapeutic properties, some illnesses are additionally avoided from occurring. These compounds made from plants have negligible or no adverse effects and are less harmful. The majority of the species in the genus Kalanchoe are employed as agents to cure a variety of conditions.

Scientists have been studying plants of this genus for a very long time because of their traditional medication's usefulness. Podophyllum pinnate is a different term for Kalanchoe pinnata. The Crassulaceae family includes the plant generally referred to as "Rakali," "Miracle leaf," "Mexican Love plant," "Katakana," "Cathedral Bells," "Air plant," "Life plant," "Goethe plant," "Wonder of the World," and so on. This perennial water-storing plant reaches to a height of between one and one-half meters. The leaves are distinctly scalloped, meaty, and thick green.

Most of this plant is found in the temperate, tropical, and plains regions of America, Australia, and Africa. It is one of the medicinal herbs used in ethnomedicine, according to Asian legend. For nearly nine decades, this medicinal herb has been applied extensively in anthroposophic therapy due to Rudolf Steiner's suggestions as well as knowledge of how it works in humans.

The medicinal plant *K. pinnata (Linn.)* Pers. has been briefly discussed for a variety of activities, which involves wound-healing, antioxidant, antiproliferative, antimicrobial, antiviral, antiprotozoal, antileishmanial, anthelmintic, insecticidal, antiallergic, analgesic, antinociceptive, anti-hematogenic, anti-inflammatory, muscle-relaxant, antipyretic, anticonvulsant, antidepressant, sedative, antilithiatic, hepatoprotective, gastroprotective, nephroprotective, chemoprotective, antihistamine, antihypertensive, immunosuppressive, tocolytic, and anthroposophical effect.

Taxonomical Classification of *Kalanchoe pinnata :*

- **Kingdom**: *Plantae* (Plants)
- **Subkingdom**: *Trophobionts (*Vascular Plants)
- **Super division**: *Spermatophyta* (Seed Plants)
- **Division**: *Magnoliophyte* (Flowering Plants)
- **Class**: *Magnoliopsida* (Dicotyledons)
- **Subclass**: *Reside*
- **Order**: *Saxifrages'*
- **Family**: *Crassulaceae* (Stonecrop Family)

- **Genus**: *Kalanchoe*
- **Species**: *Kalanchoe pinnata (Lam.)* Pers.

➢ **STEMS:** obtusely four-angled, with younger, reddish-speckled white sections and older, lighter-coloured sections.

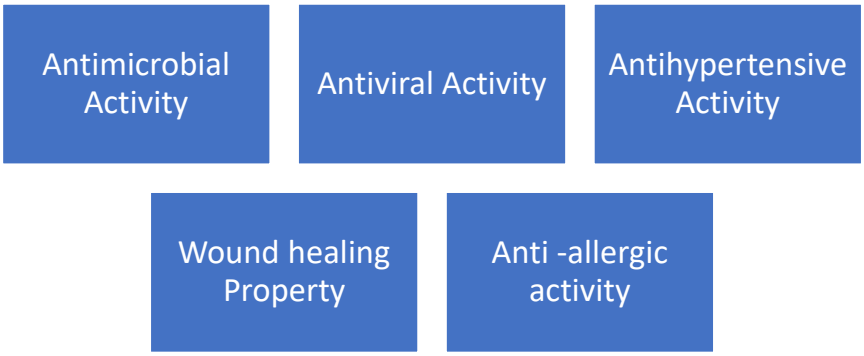
➢ **FLOWER:** Reddish purple flowers with slender pedicles that are pendent in large spreading panicles with opposite stout branches. The teeth are triangular, the calyx is striated, and the base is red and green. The corolla is reddish purple, octagonal at the base, and constricted in its middle. Filaments are pinkish beneath the anther and green at the base. Black and hastate anther.

➢ **SEEDS:** Small smooth oblong –ellipsoid, scarcely striate, smooth. The leaves often produce, on their crenature at the extremities of the lateral nerves, buds furnished with root, stems and leaves, which drop off and at once become new plants

➢ **FRUITS:** Surrounded by the corolla and persistent papery calyx.

FIGURE:01 KALANCHOE PINNATA LINN

PHARMACOLOGICALACTIVITY:



❖ **ANTI MICROBIAL ACTIVITY:**

At a concentration of 25 mg/ml, it emerged the fact *kalanchoe pinnata* leaf extract (60% methanolic extract) prevented the growth of five of the eight microbes used. Resistance has been demonstrated by Candida albicans, Klebsiella pneumoniae, and pseudomonas aeruginosa (20)

❖ **ANTIVIRAL ACTIVITY:**

One of the sexually transmitted viruses that presents serious danger on individuals is the human papillomavirus, or HPV. HPV is the cause of the arising cases of cervical cancer. Mahanta et al. (2012) examined the plant's chloroform extract's anticancer and anti-HPV properties. When given to cancer cell lines, the extract fractions inhibited the growth of both the virus and the tumour by reducing the expression of viral proteins (8)

❖ **ANTIFUNGAL ACTIVITY:**

They evaluated the plants' antifungal activity against various types of Candida albicans, Candida glabrata, Candida tropicalis, and Candida pseudocritical. They conclude that the ethanolic extract of Kalanchoe pinnata doesn't inhibit a single of the strains of C. pleiotropically. On the other hand, it has good inhibitory effects on other species. Multiple enzymes, which includes phosphoenolpyruvates, carboxin's (PCK) and phosphoenolpyruvates carboxylase, are found in the plant (7)

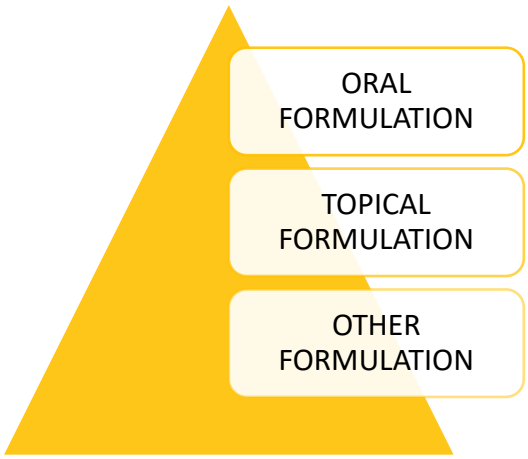
❖ **WOUND HEALING PROPERTY:**

By lowering the size of the suffering area and oedema at the wound site, the ethanolic extract of K. pinnata revealed interesting wound-healing activity. In the case ofthe presence of phenolic antioxidants and steroidal glycosides may be the cause of this. A study conducted by demonstrated that the plant's alcoholic extracts, petroleum ether, and water all have the potential towards. (15)

❖ **ANTI-ALLERGIC ACTIVITY:**

The development of allergic asthma is significantly impacted by mast cells' anti-allergic activity. In accordance with the study, the plant's aqueous extract effectively inhibited mast cell degranulation, halting the onset of allergic airway disorders. According to the published data, the extract may also have immunosuppressive properties. Another possibly deadly immune response in extreme situations is allergic anaphylaxis. Acute events caused by allergen-induced anaphylaxis are prevented by distributing K. pinnata aqueous extract continuously. Flavonoids may be the cause of the possible antiallergic action. (19)

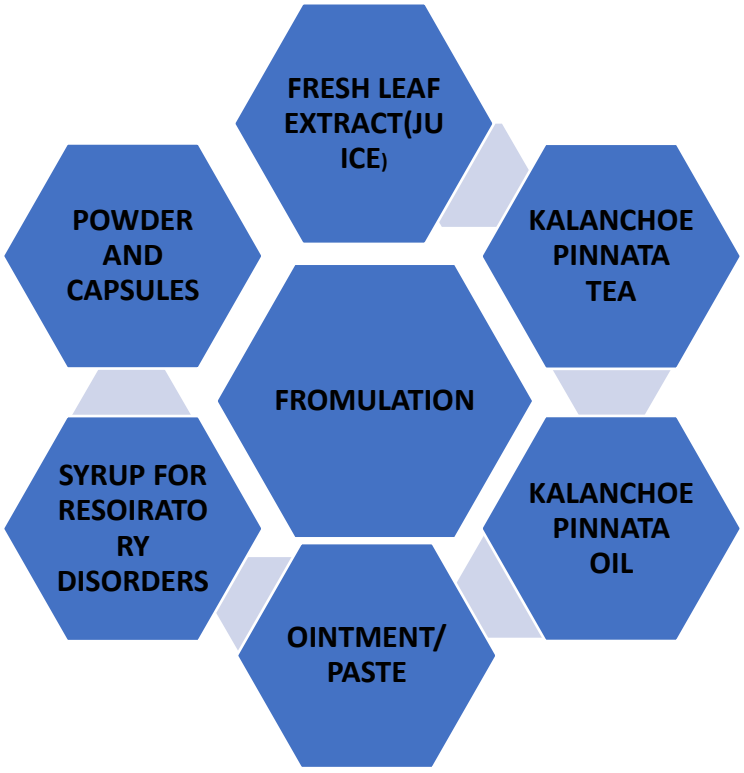
FORMULATIONOFKALANCHOEPINNATA:



1.ORAL FORMULATION:

The main goals of taking Kalanchoe pinnata orally are to treat inflammatory diseases, digestive issues, and respiratory ailments.

- **JUICE EXTRACT:**Crushed fresh leaves are used to make juice extract, which is then eliminated. used for treatment of ulcers, sneeze and kidney stone
- **HERBAL TEA:** In order to extract active compounds that support the immune system and aid in digestion, dried leaves are infused in hot water.
- **SYRUP:** To treat cough and throat infections, leaf extract is mixed with honey or a sugar base.
- **CAPSULES/TABLETS:** Excipients are compressed with dried leaf powder to provide analgesic and anti-inflammatory effects across the body.



2. FORMULATIONS FOR TOPICAL:

Kalanchoe pinnata is used directly to treat burns, cuts, and skin infections.

- **ONITMENT**: A semi-solid product for wound healing that includes extract from Kalanchoe pinnata in a petroleum jelly or beeswax base.
- **GEL:** Hydroalcoholic or aqueous extract included skin soothing and anti- inflammatory effect.
- **POULTICE:** Making an application crushed fresh leaves directly to wounds, boils, or insect bites is termed as a poultice.
- **CREAM AND LOTION:** Extract included to an emulsion for skin hydration and minor skin infections is used in lotions and creams that moisturize.

3. OTHER FORMULATION:

- **TINCTURE:** A leaf extract that may have been preserved and used therapeutically by absorbing it in glycerine or alcohol.
- **INFUSION OF ESSENTIAL OILS**: An extract combined with carrier oils for aromatherapy and massage.

For antibacterial and skin-healing characteristics it is added to herbal soap formulations.

1.MEDICINAL USES OF KALANCHOE PINNATA:

- Wound healing properties.
- Anti-inflammatory and analgesic activity.
- Antimicrobial activity.
- This plant used for also kidney stones.
- Headaches and other aches.
- Liver protection (hepatoprotective effect)
- Antidiabetic potentials.
- cancer and antitumor properties.
- Immune system booster.
- Antiviral activity.

CONCLUSION:

Its place in both conventional as well as modern herbal medicine is shown by the range of herbal formulations based on Kalanchoe pinnata. This plant remains to be one of the most effective natural treatments for an extensive number of illnesses, from simple bending aqueous extracts to ointments and syrups. To investigate all of its pharmacological uses and incorporate it into modern medicine, scientific examination in the form of clinical trials is required. Its place in both conventional as well as modern herbal medicine is shown by the range of herbal formulations based on Kalanchoe pinnata.

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