

A Review on Cathedral Bells (The Miracle Plant)

Shravani A. Mhatre¹, Pooja R. Surve², Dr.Nitin C. Mohire³,Ritesh Y. Raut⁴, Shweta S. Sagale⁵

^{1,4,5} Student, Shivajirao S.Jondhle College of Pharmacy, Asangaon Thane

²Assistant Professor Department of Quality Assurance, Shivajirao S.Jondhle College of Pharmacy, Asangaon Thane

³Principal Department of Pharmacology, Shivajirao S.Jondhle College of Pharmacy,Asangaon Thane

Abstract—Numerous pharmacological characteristics of *Kalanchoe pinnata* (Lam.) include anti-diabetic, anti-cancer, antibacterial, insecticidal, and anti-urolithiatic effects. The leaves of the *K. pinnata* plant have long been employed in ethnomedicine. Free radical-induced oxidative stress is linked to a number of illnesses. Brazil and Madagascar are the native habitats of the plants *bryophyllum pinnatum* and *kalanchoe laciniata*. Both are members of the family Crassulaceae, which is frequently utilised by people as a natural anti-inflammatory. Because of their similar leaf morphologies, these two species are referred to by the same common name, “saiao” or “coirama.” Preparation and parts of these species have been the subject of numerous published research¹⁰.The perennial plant *Kalanchoe pinnata*, which belongs to the Crassulaceae family, is distributed around the world, but primarily in the Caribbean, Central America, North America, and some parts of Africa and Asia. Originating in Madagascar, *Kalanchoe pinnata* thrives in sandy and granitic soil in subhumid to temperate humid climates with an average annual rainfall of roughly 1000 to 2000 mm. Because it contains unique chemical elements such essential oils with alkaloids, lipids, triterpenes, bufadienolides, glycosides, steroids, flavonoids, and cardienolides, this aromatic plant has great therapeutic potential and high medical significance¹¹.

Index Terms—*Kalanchoe pinnata*, bufadienolides, cardienolides, digitoxin, digoxin, triacotane, stigmasterol, Insecticidal, anti-tumor, anti-diabetic.

I. INTRODUCTION

Illnesses have been worse ever since life first evolved on Earth. It is difficult for researchers to identify a defence mechanism. Humanity is blessed with plants. Researchers may find it challenging to pinpoint a defence mechanism. Plants have been given to humanity. They are researched, examined, and used to treat a variety of severe illnesses. Their

pharmacological properties prevent the onset of a number of diseases. These plant-based compounds have minimal to no negative effects and are less dangerous. In this sense, medicinal plants are highly prized worldwide and have long been acknowledged as the foundation of successful treatments for illnesses and infections².

India is one of the ecosphere’s most abundant floral regions because man has utilised plants and their products in many ways since ancient times, particularly as food and medicine. The majority of plants in the genus *Kalanchoe* are typically used as medicines to treat a wide variety of illnesses. Scientists have long investigated the traditional legacy of this genus of plants as potentially having therapeutic benefits. In 1763, the genus was initially described by the botanist Michel Adanson. The plant *Kalanchoe pinnata* (Lam.) Pers., also called *B. Pinnatum*, is a member of the Crassulaceae family and is utilised as a traditional medicine in many temperate regions of the world².

II. HISTORICAL PERSPECTIVE

Widely found throughout all tropical climates, *Kalanchoe pinnata* comes in a variety of varieties with distinct chemical compositions, structural and botanical variances, and possible applications as a medical remedy in the ayurveda medical system. After the first century, Malayo-Polynesian-speaking navigators from the Indo-Malay Archipelago came to colonise Madagascar and used this plant. It was clear that *Kalanchoe pinnata* had spread over the Indian Oceans to other nearby Indian islands. In a similar vein, *Kalanchoe pinnata* may have moved towards South America and the Caribbean following the early arrival of European traders in the Indian Ocean, or

perhaps more likely during the slave trade of West Africa in that area³.

II. SYNONYMS

Bryophyllum calycinum, B. Germinans, B. Pinnatum, Cotyledon calycina, C. Calyculata, C. Pinnata, C. Rhizophilla, Crassuvia Floripendia, Crassula pinnata, Sedum madagascariense, Vereia Pinnata⁴.

III. REGIONAL NAMES

Hindi: zakhm- hayat, Arabic: kushnulhayat, Bengali: koppata, Sanskrit: asthi-bhaksha,
Telugu: simajamudu, Tamil: ranakalli, Kannad: ganduklinga, Malayalam: elamurunga .
Botanical Name: Bryophyllum pinnata Family: Crussulaceae⁴.

IV. TAXONOMY OF PLANT

Kingdom: Plantae (Plants)

Subkingdom: Tracheobionta (Vascular plants)
Super division: Spermatophyte (Seed plants)
Division: Magnolia -ophyta (Flowering plant)
Class: Magnoliopsida (Dicotyledonous)
Subclass: Rosidae
Order: Saxifragales
Family: Crassulaceae Stonecrop family
Genus: Kalanchoe
Species: Kalanchoe pinnata (Lam.) ⁴.

V. CHARACTERISTICS AT THE MACROSCALE

Kalanchoe pinnata is a glabrous herb that is succulent.

1. Elevation: 1-2 meters
2. Obtusely four-angled stems.
3. Variable and decussate leaves.
4. Oval or oval, crenate or serrated plant leaves
5. Flowers: thin pedicels, calyx, 2.5–3.8 cm long, striated in red, Octagonal corolla, Triangle-shaped lobes⁴.



Image of the plant.

VI. ETHNOPHARMACOLOGY

Kalanchoe pinnata is a well-known Ayurvedic Ethnomedicinal herb. Its application in traditional Indian folk medicine is well documented.

A. Treatment by plant parts:

Leaves: - Bruises, swellings, Boils, sores, Scabies, Hypertension, Constipation, fever, pneumonia, Dermatitis, UTI and kidney problems, Rheumatoid Arthritis, migraine, Antidiabetic.

Roots: - Stomach ulcer, Sexually transmitted Infections, Cholera, diarrhoea, UTI, Kidney stone, warts.

Seed: - Styne Disease, Eye pain, Eye disorder⁵.

VII. CHEMICAL CONSTITUENTS

Numerous chemical compounds for *B. Pinnatum* and *K. Laciniata* have been isolated mostly from the leaves of both species and published in the literature. The most widely used extracts of *K. Laciniata* and *B. Pinnatum* are aqueous and methanolic, respectively. Flavonoids are the predominant component in both species and the most prevalent class of secondary metabolites among the constituents that have been identified thus far. While quercetin, kaempferol, and luteolin aglucons were discovered for *B. Pinnatum*, some patuletin aglycone derivatives have been reported for *K. Laciniata*. Furthermore, *K. Laciniata* has been shown to contain polysaccharides, carotenoids, and chlorophylls.

- Macroelements: -Sodium, Calcium Magnesium, potassium, phosphorous.
- Microelements: - Iron, zinc, vitamins, Ascorbic acids, riboflavin, thiamine, niacin.
- The herb contains gallic acid, caffeic acid, Coumaric acid, quercetin.
- Alkaloids, flavonoids, phenolic compounds, And tannins are other compounds present⁶.

VIII. THERAPEUTIC ACTIVITIES

A. Anthelmintic activity:

K. pinnata roots were extracted using petroleum ether, chloroform, methanol, and aqueous solvent, respectively, and their anthelmintic activity against *Ascaridia galli* (nematode) and *Pheretima posthuma* (Annelida) was assessed in vitro. The findings

indicate that *K. Pinnata* extracts in aqueous, methanolic, and chloroform form exhibit strong anthelmintic activity, whereas petroleum ether has no helminth-fighting properties. When compared to other anthelmintic extracts, methanolic extract of *K. Pinnata* root was shown to be the most efficacious. When compared to the reference medication, piperazine citrate, the *K. Pinnata* root extract not only showed paralysis but also killed worms in a shorter amount of time, particularly at higher concentrations of 100 mg/ml^{11, 3}.

B. Wound healing activity:

The ethanolic extracts of *Kalanchoe pinnata* demonstrate wound healing properties by considerably reducing the size of cuts and wounds as well as oedema at the affected locations. Recent studies, however, have shown that the inclusion of steroidal glycosides and phenolic antioxidants may be the cause of this wound-healing capacity. According to some recent research, extracts made using water, petroleum ether, and alcohol may have the ability to heal wounds. Compared to alcoholic and etheric extracts, these experimental studies showed that aqueous extracts have greater potential^{16, 3}.

C. Hepatoprotective & Nephroprotective activity:

The traditional treatments of the Bundelkhand region of India heavily rely on the juice of fresh leaves to treat jaundice^{15, 20}. Rats were used to test the potential of the leftover ethanolic extracts of the marc and leaf juice from expressing the juice to prevent hepatotoxicity caused by CCL4. Juice¹⁵ proved to be more effective than the ethanolic extract. Their anti-oxidant activity and oxidative radical scavenging may be responsible for the protective effect against gentamicin-induced nephrotoxicity³⁶. In India, it is crucial to the treatment of kidney stones^{3, 15}.

D. Anti-Diabetic activity:

The fact that plants contain zinc may indicate that they can help treat diabetes, which is caused by insulin failure. The 'hot-plate' and 'acetic acid' test models of pain in mice were used to assess the anti-nociceptive efficacy of the herb's aqueous leaf extracts. Rats with streptozotocin-induced diabetes mellitus and fresh egg albumin-induced pedal oedema were used to test the plant extract's anti-inflammatory and anti-diabetic properties. Mice exposed to chemically and thermally generated nociceptive pain stimuli showed considerable

($P < 0.05-0.001$) anti-nociceptive responses to the aqueous leaf extract. Likewise, fresh egg albumin-induced acute inflammation and hypoglycemia in rats were significantly ($P < 0.05-0.001$) inhibited by plant extract. This herb's various phytosterols, flavonoids, triterpenoids, and polyphenols are thought to have anti-inflammatory and antidiabetic properties⁷.

E. Diuretic and anti-urolithiatic:

Male Wistar rats were given an intraperitoneal and oral hydroalcoholic extract of *K. Pinnata* leaves. Comparing the volume of urine collected while each animal was housed in a metabolic cage allowed researchers to ascertain how the extract affected urine output. Calcium oxalate urolithiasis was induced in rats by giving ethylene glycol orally for 7 days and the effect of the extract was observed by its concurrent administration. The extract was discovered to have considerable diuretic and anti-urolithiatic activity and the intraperitoneal administration of the extract gave more potent diuretic impact^{13, 3}.

F. Antioxidant activity:

The potential preventive benefits of *Kalanchoe pinnata* aqueous extract against gentamicin-induced nephrotoxicity in rats were assessed. According to in-vitro studies, *Kalanchoe pinnata* leaf extract has substantial antioxidant activity and oxidative radical scavenging capabilities. Additionally, if gentamicin causes nephrotoxicity in test animals, water-based leaf extracts of *Kalanchoe pinnata* may also have nephroprotective effects^{12, 3}.

G. Anti-tumor activity

The inhibitory effects of five distinct bufadienolides extracted from *Kalanchoe pinnata* leaves on the activation of EBV-EA (Epstein-Barr virus early antigen) in Raji cells produced by the tumour promoter 12-Otetradecanoylphorbol-13-acetate were investigated. Bryophyllin-A shown significant inhibition among the substances examined, whereas bufadienolides indicated possible inhibitory effects. Bryophyllin-C, a reduction analogue of type-1, and bersaldegenin-3-acetate without the orthoacetate moiety were found to be less active. According to these findings, bufadienolides may be a possible agent that prevents cancer and chemotherapy^{3, 16}.

H. Anti-inflammatory activity

To test *Kalanchoe pinnata*'s effects on formaldehyde-induced oedema experimentally, leaf extracts were made in methanol, acetone, chloroform, and

petroleum ether. When compared to the other extracts, the methanolic extract had the strongest impact on preventing paw oedema. Bradykinin, prostaglandins, serotonin, and histamine were also measured in formaldehyde-induced inflammations from injured cells that have sufficient ability to create the endogenous mediators. Based on these experimental findings, it was determined that the presence of bufadienolides and other water-soluble extract ingredients was primarily responsible for the suppression of oedema in rats caused by formalin^{15, 16}.

IX. MARKETED FORMULATIONS



Tea



Soaps

X. CLINICAL USES



Capsules



Tincture



Juice

1. Burns, boils, insect bites, congestive ophthalmia, diarrhoea, dysentery, impetigo, polyuria, phlegmon, swelling, TB, ulcers, and wounds can all benefit from the leaves.
2. For blood mix diarrhoea, 3g of leaf juice, 3g of jeera, and 6g of ghee are combined and administered.
- 3) The leaf poultice is used to sprains, wounds, inflammations, and swellings.
4. In cholera, leaf juice is helpful.
5. Haemorrhoids and blood-oozing piles can benefit from the leaf juice combined with kali mirch.
6. The kali mirch leaf powder is also helpful for leprosy, inflammation, heat when urinating, and blocked urination.
7. To avoid skin discolouration, the leaves that have been roasted over fire are applied to the areas of the skin where wounds and surgical sutures are located³.

XI. CONCLUSION

Since ancient times, the plants have been recognised as potential sources of healing. Since they have been thoroughly studied for effectiveness and are usually regarded as safe for human use, ethnobotanical and traditional uses of natural substances, particularly those derived from plants, have attracted a lot more interest in recent years. The pharmacological potential of K. Pinnata is demonstrated in this review, which will greatly aid researchers in learning more about this important plant.¹⁴

A comprehensive review of the pharmacological applications of the medicinal plant K. Pinnata (Linn.) Pers. Covered a wide range of activities, including anti-inflammatory, muscle-relaxant. The medicinal potential of the plant's extracted biomolecules and extracts has been examined in research investigations. Few scientists have noted the existence of toxic compounds that injure animals, despite the plant's longstanding reputation for having great therapeutic benefit. However, in order to conduct clinical trials and research for the industrialisation of plant metabolites in the future, a knowledge foundation is necessary¹⁵.

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