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Comprehensive Review on the Miracle Plant 'Kalanchoe Pinnata'

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ABSTRACT:
A complete examination of kalanchoe plant phytochemical or medicinal properties is included at this article. Around all over the globe the kalanchoepinnata is a plant that grows both in cold and tropical climates. We call this plant an "air plant" or a "miracle plant". The most severe conditions are managed with plants lots pharmacological properties such as lithiasisactivity,Anti-tumor, antiviral,gasto-protective activity,anti-inflammatory,anti-pyretic activity, musclerelaxant,neuropharmacologicalactivity,hypo protective,haemoprotective,insecticidal and antiallergic effects. Additionally there are other regional names for these plants such as "pather chat" in india and "patharchur" among others. This plant have various species such as Kalanchoemanginii, Kalanchoedaigremontiana, K. porphyrocalyx, kalanchoedelagoensis, K. beharensis. In its native Madagascar, it goes by several local names, such as "tsilafafa" and "sodifafanamalainana".The multiple titles are due to of the differences throughout nations and areas it is called "hoja del aire" in spain "lao di sheng gen" and "oliwa-ku-kahakai" in hawaii and "ka-takataka or kataka-taka" in the philippines which translates to remarkable. This plant need bright sunlight, well-draining soil & conditions above 50 degrees Fahrenheit to thrive. Kalanchoepinnata belonging to the Crassulaceae family, having a worldwide range, Kalanchoepinnata grows mainly in the Caribbean, Central America, the United States, and certain parts of Africa Asia. The foliage of this plant includes several kinds of medicinal plants elements, including avicularin, kaempferol, apigenin, epigalloca techingallate, quercetin, bufadienolides & flavonoids. The Kalanchoe Pinnata characteristics thick, meaty, elliptical leaflets that are crimson in color, curled, and have a crenate or serrated edge.

Keywords: Kalanchoepinnata, K. porphyrocalyx, Airplant,,Patharchur, Bufadienolides**,** Kaempferol.

I. INTRODUCTION:

Every plant in the natural world has numerous kinds of secondary metabolites having protective properties. These substances are also referred to as antioxidants because they have a capacity to prevent and halt oxidation. Because of the negative effects with chemical substance, customers increasingly selecting products that are organic. Preference for natural products has increased as a result of changing lifestyles or developing consumer knowledge of the possible dangers related to chemicals. Consumer desire for safer natural substitutes for synthetic chemicals preservatives is driving food manufacturers.Through their wide range of bioactive chemicals, plants have preservation properties equal to those of artificial additions. By absorbing free radicals, these plants not just have preservation qualities but also provide health advantages by decreasing oxidative stress in the human body. [1]

Diseases have been more severe since the beginning of life's existence on Earth. Researchers have difficulty discovering a defensive mechanism. For humans, **plants are a gift.** Finding a defensive mechanism may prove to be challenging for scientists. Plants are gifts to the human species. Numerous critical illnesses are being researched, examined, and treated using them. [2]

In addition to unique pharmacological features, may stop particular illnesses from starting. These plant-based substances have little or no adverse effects. The medicinal flora, which has been widely accepted as the source of efficient cures for illnesses and parasites, is highly valued around the world. Nowadays, researchers are searching for potent antibacterial medications in plants. [3]

A few plants have potent antimicrobial properties that allow us to cure illnesses medicinally. Nowadays, researchers are actively looking for effective antibiotics that work in plants. Since of their powerful antibacterial qualities, multiple herbs are used for healthcare to treat disorders. In most cases, certain varieties are truly

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remarkable. Although plants carry bioactive ingredients like flavonoids, or alkaloid compounds, tannins, &terpenoids, th have a wide range of antibacterial activity. [4]

One such plant with fortunate antibacterial qualities is Kalanchoepinnata, sometimes referred to as **"Setawar**" in the local dialect. This plant is a good substitute for the synthetic antibiotics that are already on the market since it contains bioactive components that show its antibacterial activity against pathogenic microorganisms and offer a number of therapeutic benefits.

Although Ayurveda uses a lot of these plants and trees, not many people are aware of their health advantages. For instance, the plant Bryophyllumpinnatum, often known as Kalanchoepinnata, has been used to cure a number of infections.[5]

Kalanchoepinnata is a potent, succulent, perennial vegetable with glabrous and tuberous stems. This kind can grow up to 150 cm in height. Due to its attractive and unique appearance, it is a popular houseplant that is commonly planted as an interior decoration. Kalanchoepinnata pants are known by several different names nowadays. [6]

Kalanchoe plants can be found in parts of the West Indies, Bermuda, Micronesia, the Macaroni's, Brazil, Suriname, the Galapagos Islands, Melanesia, Polynesia, and Hawaii. In several of these places, including Hawaii, it is regarded as an invasive species. The plant's widespread naturalization is mostly due to its appeal as a garden plant .[7]

It aside from treating bloody diarrhea, urinary problems, cough, asthma, and skin fungus, the herb Bryophyllumpinnatum can help women with spotting in the vagina and drainage problems. This plant is also treat a stone problem which is a major problem in a whole world.[8]

The variances in countries and areas give rise to the many names. For example, it is known as **"Hoja del aire"** in **Spain, "Lao di sheng gen"** and **"Oliwa-ku-kahakai"** in **Hawaii, and "Katakataka"** or **"Kataka-taka"** in the

Philippines, which means **"remarkable.**"[9]

Many medicinal qualities, involving **CNS antidepressant, soothing antibiotic, anti-allergic, anti-anaphylactic, anti-tumors, anti-viral, anti-fungal, antimicrobial, febrifuge, sedative, anti-cancer, and anti-lithiasis.**[10]

Fig No: 1 Kalanchoepinnata

Common name of kalanchoepinnata:

Kalanchoe plant usually referred to as "Ranakalli", "Miracle leaf", "Mexican Love plant", "Katakataka", "Cathedral Bells", "Air plant", "Life plant", "Goethe plant", "Wonder of the World", etc., is a member of the Crassulaceae species.[11]

Botanical classification:

Table no.1.1: Botanical classification of Kalanchoepinnata

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyte
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Saxifragales
Family	Saxifragales
Genus	Kalanchoe
Species	Kalanchoepinnata[12]

Synonyms of Kalanchoepinnata:
BryophyllumcalycinumSalisb.,Kalanchoepinnata (Lam.) Pers., Cotyledon pinnata Lam., and Sedum madagascaricumClus.[13]

Various Species of Kalanchoepinnata:
(1) K. manginii: It is called as **"beach bells"** plant has dense leaves and enormous swinging blossoms the resemble bells air must be wet for flowers to blossom**.**[14]

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(2). Kalanchoedaigremontiana: It is also called as a **"maternity herb"** which can produce due to the quantity of leaflets which can form on the leaf margin.[14]

(3) K. porphyrocalyx: This species, also called **"pearl bells"**, has purple hanging blooms and thin, leaves**.** [15]

(4) kalanchoedelagoensis: also referred to as the **"chandelier plant"**, gets its name from the way its tubular
orange blossoms dangle from the top of its stalks. [16]

(5) K. beharensis: Hardy in USDA hardiness zones 9 through 11, this species of kalanchoe is also known as **"velvet-leaf"**kalanchoe. It is highly valued for its big, fluffy, pale green, silvery leaves. [17]

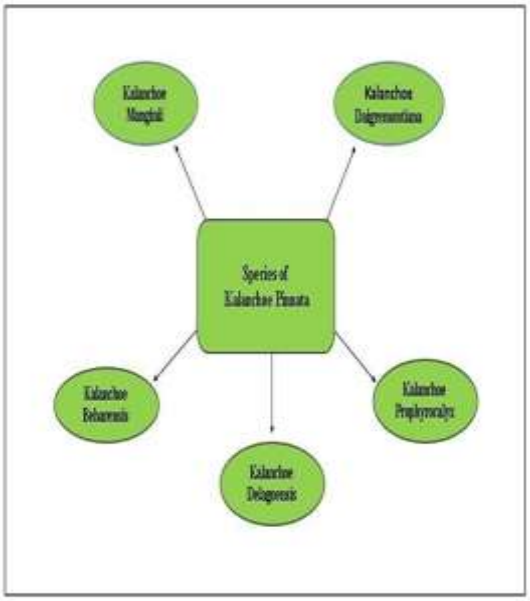

Fig.no 2: Species of Kalanchoepinnata

Main chemical constituents of Kalanchoe pinnate:

Table no. 1.2 chemical constituent of Kalanchoepinnata

Classification	Plant type	Compounds	References
Bufadienolides	Aerial part of plants	Bersaldegenin-1-acetate,bersaldegenin-135orthoacetate,bryotoxin-c-glycosides, bersaldegenindaigremontianum.	[18]
Triteroenoids	Whole plant	Bryophollenone, bryophallone, taraxerol, pseudotaraxasterol,glutinol,friedelin,alphaamyrin,betaamyrinacetate.	[18]
Steroids	Aerial parts	Bryophyllol,bryophunol,bryophyllin B,bryophyllin A, bryphyllinC,bersaldegenin - 3-acetate,bryotoxin A,brytoxin B.[19] Pyranosyl-7-Orthamnopyranside patuletin,complexed b/w anhydro amino acid(1:2)[19]	[19]
Organic salt	Leaves	HCN,citricacid,oxaloacetate,isocitric acid.	
Ferrites and Fatty acid	-		[19]

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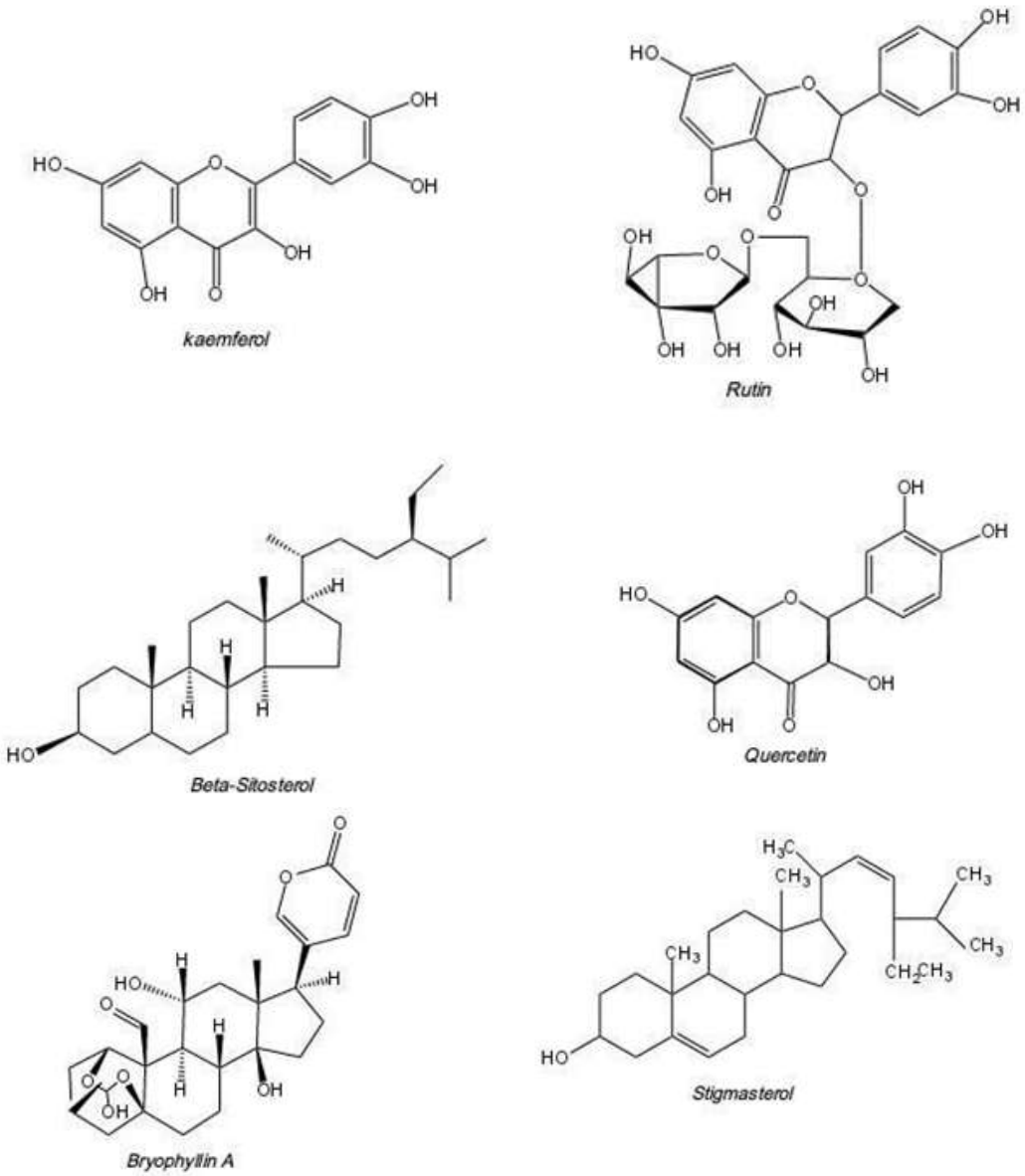

Fig.no.3: Chemical Constituents of KalanchoePinnata

Morphology studies of kalanchoepinnata:

Table no.1.3: Morphology study of Kalanchoepinnata

Leaves	Simple or in opposito
Size	Size range from 12–18 cm to 6–8 cm, with an oblong or elliptic apex and a lightercolored lower epidermis.
Odors	These are characteristically bitter.
Taste	Bitter in taste

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Flowers	These have a large terminal panicle that is pendulous and cylindrical in shape.
Calyx	It is 3.5–4 cm long, inflated, cylindrical, and brownish or purplish.
Corolla	It is elongated, measuring approximately 5cm in length, with a puffed base and reddish or purplish extended portion.
Fruits	These are clusters of seeds within follicles. [20]

Pharmacological properties of Kalanchoepinnata Anti- tumor activity

In their work, Devbhuti et al. (2012) created tumors in the peritoneal area of mice. Specific dosages of the plant's methanolic and aqueous extracts were given as medications. As a tumor suppressor, these extracts reduced the volume of ascitic fluid and stopped the growth of the tumor. Consequently, it was stated that the extracts have antitumor properties.[21]

Anti viral activity

One of the viruses that can be transmitted through physical contact and poses a serious risk to people is the human papillomavirus (HPV). HPV is the reason of the rising incidence of cervical cancer. Mahata et al. (2012) investigated the plant's chloroform extract's anticancer and anti-HPV properties. When the extract fractions were exposed to cancer cell lines, they inhibited the growth of both the virus and the tumor by inhibiting the production of viral proteins. The Epstein-Barr virus is a herpes virus that damages human B-lymphocytes and causes tumors to grow.[22]

Anti-inflammatory:

The plant's anti-inflammatory properties were investigated in a research study by Gupta et al. (2010). Experimental models with oedema caused by formaldehyde were given petroleum ether, chloroform, acetone, and methanol fractions from leaves. The methanolic fraction, among other extracts, showed a more notable reduction of paw edema. Since cell damage caused by formaldehyde causes inflammation, natural mediators such histamine, serotonin, prostaglandins, and bradykinin are produced.[23]

Antipyretic activity

Plant extracts were shown to have an impact on laboratory animals' hyperthermic conditions by Biswas and Montal (2015). Brewer's yeast was injected into rats to cause pyrexia. The laboratory specimens' body temperature decreased when K. pinnatahydroalcoholic extract was given to them, demonstrating its antipyretic properties. The extract's flavonoid content could be the cause of this activity.[24]

Muscle-relaxant activity

The impact of ethanolic extract on serum creatine kinase was ascertained by Nwose (2013). In the albino rats given the plant's ethanolic extract, there was an increase in creatine kinase activity values. This rise in activity may promote the flow of ATP, which is required for muscle contraction and relaxation, which in asthmatic patients may cause the bronchi's built-up smooth muscles to dilate.[25]

Insecticidal activity

Supratman et al. (2000) separated two bufadienolides from K. pinnata'smethanolic extract. Strong insecticidal activity against silkworm larvae in their third instar was observed for isolated compounds, and this was linked to the presence of the 1, 3, 5-orthoacetate moiety of the bufadienolides.[26]

Anti-allergic activity

Cruz et al. (2012) investigated how K. pinnata affected mast cells. An important factor in the onset of allergic asthma is mast cells. According to the study, the plant's aqueous extract successfully stopped mast cell degranulation, halting the onset of allergic airway disorders. According to the study, the extract may possibly have immunosuppressive properties. Another potentially fatal immunological response in dire circumstances is allergic anaphylaxis. Acute incidents associated with allergen-induced anaphylaxis were avoided by continuously administering an aqueous extract of K. pinnata.[27]

Neuropharmacological activity

Salahdeen and Yemitan (2006) conducted a study to show the aqueous extract's sedative and anticonvulsant properties. Mice were kept from dying and their convulsions caused by picrotoxin were postponed. When mice were given aqueous

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extract, behavioral alterations were noted. The inclusion of bufadienolides and other water-soluble components in the extract may be the cause of its CNS-depressant action.[28]

Antilithiatic activity

Calcium oxalate stones develop as a result of decreased oxalate excretion in the urine. According to medical prophylaxis, people with stones in their bodies were given fresh juice made from K. pinnata leaves. Regardless of the stones' location, type, or prior treatments, regular use of the juice successfully dissolved them. The amount of urine expelled increased, indicating the juice's diuretic properties. Additionally, it increased citrate excretion while decreasing oxalate excretion. According to this study, the juice might have antilithiatic qualities (. Shukla et al. (2014) assessed the aqueous extract's anti-urolithiatic efficacy on rats' renal calculi caused by ethylene glycol. [29]

Hepatoprotective activity

After giving the plant's aqueous extract to mice suffering from DENA-induced hepatotoxicity, Afzal et al. (2013) noted a reduction in lipid peroxidation in the liver of the treated animals. It's possible that the extract demonstrated antioxidant activity by scavenging free radicals in the rats' liver. The development of normal liver cells and the lack of necrosis and vacuoles were further indications that the treatment was somewhat protective against the toxicants. Its antioxidant impact, which would have prevented the buildup of harmful DENA-derived metabolites, could be the cause of the hepatoprotective effects.[30]

Gastroprotective activity

Sharma et al. (2014) conducted another investigation to ascertain the plant's gastroprotective potential. It was discovered that by lowering the ulcer index, the plant's aqueous extract significantly protected mice's stomachs. The plant's mucilage was separated and tested on ethanolinduced ulcers. There have also been reports of possible antiulcer properties in the mucilage. The study's findings indicated that for stomach ulcers, mucilage and aqueous extracts may be utilized.[31]

Haemoprotective activity

The human erythrocyte membrane was considerably shielded against lysis (haemolysis of RBCs) brought on by heat and hypotonic solution by the crude methanolic extract of K. pinnata. Sharker et al. conducted this investigation (2012). Blood clots in the blood vessels can even be broken up by specific bioactive substances found in the plant. In order to clear a blocked artery and prevent irreversible damage to the perfused tissue, these thrombolytic medicines are helpful in the treatment of myocardial infarction, thrombo-embolic strokes, deep vein thrombosis, and pulmonary emboli.[32]

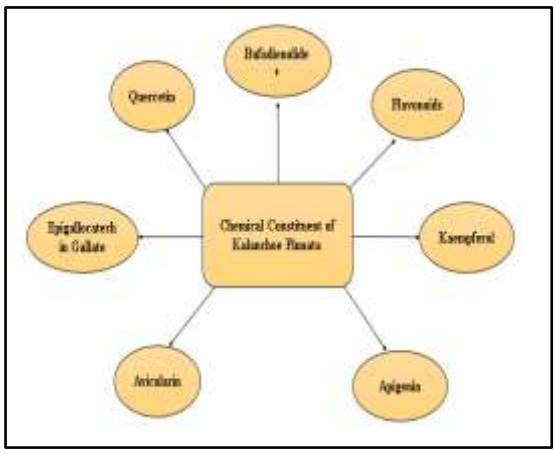

Fig. No. 4: Chemical constituent of kalanchoepinnata

Classification and characteristics of kalonchoepinnata:

Plant Division	Angiosperms
Plant Growth Form	Herbaceous Plant
Lifespan (in Singapore)	Perennial
Mode of Nutrition	Autotrophic
Plant Shape	Shrubby
Growth Form	Herbaceous succulent shrub, upto1.8m height.
Foliage	Leavessmooth, glossy,fleshy,with brownish crenate margin.[33]

Propagation:

It is very easy to propagate Kalanchoe pin nata because of its unique capacity to produce plant lets along the margins of its leaves, a trait shared by the Bryophyllum genus. Two main methods of pro pagation are plantlets and leaf cuttings. The most popular method of proliferation is through plantlets, which are tiny plantlets that grow along

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the margins of the leaves. These plantlets split out when they reach maturity and can establish roots in the earth. To propagate plantlets, just place them on well-draining potting mix and water them lightly. A few weeks from now, they will begin to grow. Using leaf cuttings for propagation: As an alternative, Kalanchoepinnata can be propagated using leaf cuttings. On top of moist potting mix that drains well, place a robust leaf. The roots at the base of the leaf will give way to new shoots a few days later. Since young roots are particularly susceptible to rot, excessive watering should be avoided.[34]

II. CONCLUSION:

The overview review offers a pharmacogenetic characteristics, phytochemical compounds, therapeutic effects, and traditional medicinal importance of Kalanchoe pinnate, which known as the "miracle plant". This plant is used to treat many diseases such as Kidney stone ,promoting wound healing, reducing inflammation, modulating the immune system, managing diabetes, combating fungal infections, preventing ulcers, and more. It also has some medicinal properties such as diuretics astringent, analgesic, antilithics, cytotoxic etc.Kalanchoepinnata has a promising future role in various fields, including medicine, cosmetics, food, environmental remediation, and ornamental plants. While challenges and limitations exist, the potential benefits of this plant make it an exciting area of research and development. As our understanding of Kalanchoepiñnata's properties and potential uses grows, its future role is expected to expand, leading to improved human health, sustainable agriculture, environmental sustainability, and economic growth.

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