Review Article

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Pharmacological approach on kalanchoe pinnata – a concise report

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Abstract

The herbal extract of different parts of the *kalanchoe pinnata* plant are being used for the treatment of injuries, respiratory infections, diabetes, wound healing, diabetic wound healing, bug stings, and pain and inflammation. This genus has about 125 species. Alkaloids, flavonoids, phenolic compounds, tannins, macro elements, microelements, iron, zinc, vitamins, ascorbic acid, riboflavin, thiamine, and niacin are all present in the plant. It is mainly used in treatment of urinary bladder stones, diarrhea, cold, coughs, fever, headache, pain. It has wide pharmacological properties such as antihypertensive, anti-mutagenic, antibacterial, wound healing, antidiabetic, hepatoprotective, nephroprotective and antioxidant activities.

Keywords: *kalanchoe pinnata,* herbal extract, inflammation, pharmacological properties, and urinary bladder stones.

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Introduction

An essential component of a nation's natural resources is medicinal plants. They are crucial in supplying rural residents with primary healthcare services. They work as a therapeutic agent and as vital raw materials in the production of conventional plant [1]. The *Kalanchoe plants*, which are native to Madagascar and South Africa, are commonly grown as ornamental plants throughout the world. Interest in their culture has grown recently due to its potential as a source of medicine. There are over 125 species in this genus, some of which are used in conventional medicine to treat ailments like pain and inflammation [2]. Diabetes, wounds, insect bites, respiratory infections, cutaneous leishmaniasis among others [3].

A succulent plant known as *Kalanchoe pinnata* (Lam.) (also known as *Bryophyllum pinnate* or *Siempreviva*) can reach a height of 1.5 meters. A 1.5 m tall, erect, succulent, perennial shrub belonging to the Crassulaceae family, Kalanchoe pinnata reproduces both vegetative from leaf buds and through seeds [4]. India's hot, humid regions, particularly Bengal, are where the plant thrives. A hollow, four-angled, perennial succulent plant with branched stems. The succulent, opposite leaves are 10–20 cm long and decussate. While the higher leaves, numbered 3–7, are foliate and have long petioles, the lower leaves are plain. They have prominent scallops and are trimmed in red, and they are meaty dark green. [5] it is a common folk medicine remedy for kidney stones, gastric ulcers, lung infections, rheumatoid arthritis, etc. is the usage of the medicinal plant *kalanchoe.* Asia, Australia, New Zealand, the West Indies, Macaronesia, the Mascarenes, the Galapagos, Melanesia, Polynesia, and Hawaii are among the temperate places where *Kalanchoe pinnata* has established itself as a naturalized species. In many of these, such as Hawaii, it's considered to be an invasive species. A threat to biodiversity has been identified in

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French Polynesia with *Kalanchoe pinnata.* It is also extensively available in the Philippines where it is known as katakataka or kataka-taka, which is also an adjective that denotes something extraordinary or noteworthy. It grows wild on the hills of North-Western India, the Deccan, Bengal as well as being cultivated in gardens

Fig no:1 *Kalanchoe pinnata* leaves

Phyto - chemical constituents

The plant contains alkaloids, flavonoids, phenolic compound, tannins, macro elements; magnesium, calcium, potassium, phosphorus, sodium, microelements; iron, zinc, vitamins; ascorbic acid, riboflavin, thiamine, niacin [6]. *B. Pinnatum* is rich in alkaloids, triterpenes, glycosides, flavonoids, cardienolides, steroids, bufadienolides and lipids [7]. Leaf contains amino acids i.e., thiamine, pyridoxine, ascorbic acid, glycine, cysteine, casein hydrlylsate, nicotinamide, Food content i.e., carbohydrate, protein, lipids, Minerals; sodium, calcium, potassium, phosphorus, magnesium, ferrous, copper, zinc, and sugars; raffinose, lactose, sucrose, glucose etc [8]. The flavonoids found in leaves include astragalin, 3, 8-dimethoxy-4, 5, 7-trihydroxyflavone, friedelin, epigallocatechin-3-o-syringate, luteolin, rutin, kaempferol, quercetin, quercetin-3-O-diarabinoside, and kaempferol-3-glucoside [9].

Roots—Roots have the highest concentration of elements like potassium,

iron, calcium, phosphorus, sodium, copper, and zinc [10].

Leaves- Leaves of *Bryophyllum pinnatum* contain Butyrolactose, 3,4- Epoxy

tetrahydrothiophene -1,1-dioxide, 3, 5-Dihydroxy-6-methyl-2, 3-dihydro-4H-pyran-4-one (DDMP), Benzaldehyde, 2-methyl, alpha-D Glucopyranoside, n-hexadecanoic acid use for the treatment of rheumatism and inflammation, oleic acid helps in decreasing risk of breast cancer and reduction of blood pressure (Teres *et al.,* 2008, uchegbu *et al.,* 2015, Aparna *et al.,* 2012) and octadecanoic acid [10].

Stem: Phytochemical screening of the *k. pinnatum* stem showed the presence of the accompanying flavonoids, alkaloids, tannin, saponins, phenol, phytate, and HCN. Elemental examination shows that the stem of *k. pinnatum* contains an apparent amount of calcium, magnesium, phosphorus, sodium, and potassium [10].

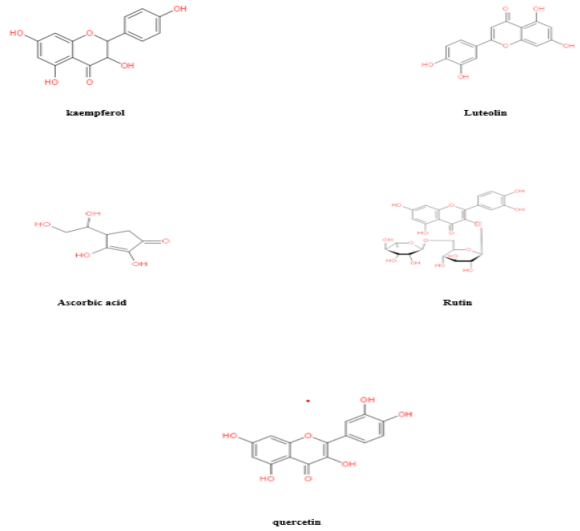

Fig no: 2 Phyto constituents isolated from *K pinnata*

Ethnomedical uses

Leaf extract is taken in empty stomach is used in the treatment of urinary bladder stones and fewer in children's., Leaf extract is used for the treatment of diarrhea., The leaves juice is used against cough, dysentery Leaf juice externally applied to scabies and leucoderma and leaf decoction applied over cuts to stop bleeding., Used for eye infections, headaches, inflammation, menstrual disorders, pimples, wounds for aches, burns, childbirth, colds, coughs, fever, headache, pain, respiratory infections for coughs, earaches, eczema, inflammation, pimples and Used for bacterial infections, boils, broken bones, bronchitis, cancer (lymphoma), conjunctivitis, coughs, earaches, eye infections, epilepsy, erysipelas, fever, gas, headache, heartburn, inflammation, intestinal problems, migraine, nausea, skin problems, sores, ulcers, urethritis [11].

Pharmacological activities

Antihypertensive activity

The effects of *K. pinnata* aqueous leaf extract on anaesthetized cats' blood pressure as well as the rabbit's liver and kidney function were investigated. The results showed that the extract reduced the blood pressure of the anaesthetized cat somewhat and also lessened the

effects of adrenaline-induced hypertension. This study established the pharmacological basis for the Nigerian Igbos' use of *K. pinnata* as a blood pressure-lowering herb. However, the little blood pressure reduction and potential danger to humans from *K. pinnata* leaf extract prevent its use as a blood pressure lowering medication [12].

Hepatoprotective activity

The juice of fresh leaves is very helpful for treating jaundice among the folk remedies of the Bundelkhand region of India. Rats' resistance to CCl4-induced hepatotoxicity was assessed using the leaves' juice and the ethanolic extract of the marc that was left over after the juice was expressed. Studies in histology, *in vivo,* and *in vitro* demonstrated the test substance's hepatoprotective properties. It was discovered that the juice was more efficient than the ethanol extract [13].

Anti-mutagenic activity

The herb has antihistamine and anti-allergic properties. By specifically suppressing histamine receptors in the lungs, methanol extract from the leaves protects against chemically induced allergic reactions and death. It does this by inhibiting histamine receptors (H1) in the ileum, peripheral vasculature, and bronchial muscle. Quercetin-3-o—Larabinopyranosyl (12) When utilised on S. typhimurium TA100 or TA1002, Obaseiki-Ebor et al. discovered that organic solvent extracts of leaves prevented His — to His + reverse-mutations as well as reversions brought on by 4nitroo-phenylenediamine and 2-aminofluorene in TA98. The alkaloid/water soluble and acid fractions have no apparent ant mutagenic efficacy [14].

Antibacterial activity

The bacteria that cause typhoid fever and other bacterial diseases include Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, klebsiella aerogenes, Escherichia coli, Klebsiella pneumoniae, and Salmonella typhi. Using the agar diffusion method, the antibacterial activities of the infusion and methanolic extracts were examined against S. aureus ATCC 13709, E. coli ATCC 9637, Bacillus, P. aeruginosa, K. pneumonia, and S. typhi, as well as adjacent to S. aureus, E. coli, S. typhi, Klebsiella spp and P. aerugi [14,15].

Insecticidal activity:

The *K. pinnata's* methanolic extract produced two bufadienolides. It was discovered that the bufadienolides' 1, 3, 5-orthoacetate moiety is what gives the isolated compounds their substantial insecticidal effect against silkworm third instar larvae [15].

Wound-healing activity

There were two bufadienolides produced by the methanolic extract of *K. pinnata.* It was discovered that the isolated compounds' considerable insecticidal effect against silkworm third instar larvae was caused by the presence of the 1, 3, 5-orthoacetate moiety in the bufadienolides [16].

Antidiabetic activity

The presence of zinc in the plants may indicate that they could be useful in the treatment of diabetes caused by insulin dysfunction. The antinociceptive effect of the herb's aqueous leaf extract was tested in mice using the 'hot-plate' and 'acetic acid' pain models. Fresh egg albumin-induced pedal oedema and Streptozotocin-induced diabetes mellitus were used to test the plant extract's anti-inflammatory and anti-diabetic properties in rats [17].

Anti-ulcer activity

The incidence of ulceration, mean basal and histamine induced stomach acid production were significantly reduced in a dose-dependent manner, supporting its usage as an anti-ulcer drug in traditional medicine [18].

Nephroprotective and antioxidant activity:

The preventive effects of *K. pinnata's* aqueous extract against rats' nephrotoxicity brought on by Gentamycin's were examined. It was discovered that rat kidneys are significantly shielded by the aqueous extract of *K. pinnata* leaves from Gentamycin's histological alterations [19].

Ovicidal and larvicidal activity:

Crude extracts of kalanchoe pinnata leaf showed against Culex, ovicidal and larvicidal activity extracts from quinquefasciatus demonstrated dose-dependent toxicity to the eggs of Culex quinquefasciatus plus larvae The crude acetone extract of medicinal plant leaves, out of all the extracts tested, was shown to be effective, resulting in 100% egg death at 250 ppm and LC50 and LC90 values of fourth instar larvae of 199.86 and 387.70 ppm, respectively. The results of this study showed that *Kalanchoe pinnata* leaf extracts have exceptional ovicidal and larvicidal efficacy against medically significant vector mosquitoes, making them the best, most affordable, and environmentally benign method for mosquito control [20].

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Table 1: Pharmacological activity of different plant extracts of ***kalanchoe pinnata*** [21].

Plant part	Extract	Activity observed	Reference
Leaves	Methanolic extract (60%), aqueous, ether, chloroform extract	Antibacterial activity (Sensitive against Bacillus subtilis, Escherichia coli, Proteus vulgaris, Shigella dysenteriae and Staphylococcus aureus).The methanolic extract is more effective as an antioxidant than any other extract	Akinpelu *et al.,* (2000) and Majaz et al., (2011)
Leaves	Ethanolic extract (70%)	Antimicrobial activity is seen against Gram-positive and Gram-negative bacteria, yeast, and filamentous fungi (C. Albicans, Rhizoctonia bataticola, A. niger, and Alternaria alternate).	Aqil and Ahmed *et al.,* (2003)
Leaves	Chloroform extract	The extract exhibits a very low antibacterial activity against B.subtilis, B. megaterium, S.aureus, E.coli, P.aureginosa, an d S.enterica var. Typhi and S.dysenteriae.	Biswas *et al*., (2012)
Whole plant	Methanolic extract and aqueous extract	There is a less antimicrobial effect against B.cereus, Bacillus megaterium, B.subtilis, Sarcina lutea, S.aureus, E.coli, Salmonella entérica var. Typhi, Salmonella paratyphi, Shigella boydii, S.dysenteriae, P.aeruginosa, Vibrio mimicus, Vibrioparahaemolyticus, Aspergillus, S.niger, C.albicans, and Saccharomyces cerevisiae and both extract show antioxidant activity.	Sharker *et al.,* (2012) and Sharma *et al.,* (2014)
5. Leaves	Hydroethanolic 70%	Antioxidant activity.	Hara *et al.,* (2017)

Conclusion

It is anticipated that comprehensive information provided in this review, on the Phytochemical contents and diverse biological aspects of extracts and constituents may encourage an assessment of the use of the plant in agriculture and medicine. *K. Pinnatum* is used as a source of raw materials for Phytochemical by a few small businesses in Amazon and India. Both *In vitro* and *In vivo.* Future research must assess isolated principles of B. Pinnatum using specific animal models and clinical studies are urgently required to support conventional wisdom in the context of a sensible phytotherapy on the toxicity of plants. The pharmacological potentials of *K. pinnata* are highlighted in the current review, which will help researchers learn more about this priceless plant.

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