Journal of Biomedical and Allied Research

ISSN: 2582-4937
Dogra P, et al., 2022-J Biomed Allied Res
Review Article

Kalanchoe Pinnata is a Miraculous Plant: A Review

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Abstract

A variety of names for Kalanchoe pinnata include wondering the world, miraculous plant, and the Pattharchatta. It features tall cylindrical stems, meaty, deeply scalloped dark green leaves, and pendulous scarlet and bell-shaped blooms that are trimmed. It is well-known in the scientific community to display a wide spectrum of pharmacological actions that include the treatment of the most severe human disorders. The pharmacological studies are reviewed and discussed, focusing on actions such as immunomodulator, CNS depressant, pain reliever, antimicrobial, anti-inflammatory, anti-allergic, anti-anaphylactic, antileishmanial, Anti tumorous, antiulcer, anti-bacterial, fungicidal, antihistaminic, antiviral activity, febrifuge, gastroprotective, immune suppressants, insecticidal, muscle relaxant, sedative, and anticancer. The plant includes a variety of active substances, including lipids, organic acids, bufadienolides, alkaloid, triterpenes, glycosides, flavonoids, and steroids. Due to its current state, it is an endangered plant that needs to be preserved and researched.

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Received Date: 11-24-2022

Accepted Date: 12-11-2022

Published Date: 12-22-2022

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Keywords: Kalanchoe pinnata; Phytoconstituents; Pharmacological activity.

Introduction

Since the beginning of life's evolution on Earth, illnesses have gotten worse. Finding a defense mechanism is challenging for researchers. Plants are a gift to humanity. It might be difficult for researchers to identify a defense mechanism. The human race has been given plants. They are investigated, studied, and used to treat a number of serious ailments. Their pharmacological qualities avoid the development of several illnesses. These plant-based substances are less harmful and have negligible to no adverse effects [1]. Curative flora historically

Citation: Dogra P, Sharma K, Bharti J, Kumar N, Kumar D. Kalanchoe Pinnata is a Miraculous Plant: A Review. J Biomed Allied Res. 2022;4(2):1-10.
DOI: https://doi.org/10.37191/Mapsci-2582-4937-4(2)-029

recognized as on the basis of effective remedies to cure the diseases and infections, and they are highly valued globally in this regard [2].

Since earlier civilizations, man has used plants and their products in various ways to fulfill his needs, especially as food and treatment, making India single of the most lavish floral regions in the ecosphere [3]. Most of the plants belonging to the genus Kalanchoe are usually used as medicines to cure broad range of ailments. This genus of plants has long been explored by scientists traditional legacy as possessing medicinal benefit [4]. Botanist Michel Adanson published the first description of this genus in 1763 [5]. In many temperate parts of the world, a plant known as Kalanchoe pinnata (Lam.) Pers., sometimes known as B. pinnatum and belongs to the family Crassulaceae and is used as a folk remedy [6]. An straight, succulent, perennial bush called Kalanchoe pinnata grows to a height of about 1.50m and reproduce both vegetative and by the germination of seeds [7]. This species can grow as tall as 150cm. Attractive and distinctive appearance, it attends by way of common houseplant and is frequently grown as an indoor ornamental [8].

Common name

It is commonly referred to in English as "floppers," "air plants," "best of luck leaves," "Hawaiian air plants," "life plants," and "American life plants." It is known as "Patharchattam," "Patharchur," "Pather Talk," and "Paan-futti" in India, especially in Hindi. It is mentioned to by way of “Koppat," "Patharkuchi," "Gatrapuri," "Kaphpat," and "Pathorkuchi " in Bengali, and as "Zakhm-e-Hayaat," "Pattharchoor," and "Pattharchat" in Unani (Table 1,2) [9].

Habitat

It is a Madagascar-native succulent plant. Its characteristics are comparable to those Kalanchoe genus members in the Bryophyllum division. This makes it distinct the edges because so many small plantlets grow on its leaves. widespread covered plant, it has spread to temperate areas of Asia, the Pacific, and the Caribbean.

Distribution

Kalanchoe pinnatain the common natural plant in tropical areas of Asia, Australia, New Zealand, the West Indies, Macaronesia, the Mascarenes, the Galapagos Islands, Melanesia, Polynesia, and Hawaii. Many of these locations, including Hawaii, consider it to be a native species. Additionally, it is commonly available in the Philippines, where it is called kata kataka or kataka-taka, a name that likewise denotes anything special or precious. [2].

Traditional uses

The juice of the kalanchoe plant is used locally to treat conditions such as cholera, urinary infections, whitlow in African countries, tissue wounds in Taiwan, joint pain, gastric ulcers, ear contamination, bubbles, and breaking lips in children. This spice is used in South-Eastern to assist with the placenta of a newly conceived baby's dropping. To treat migraines, scrubbed shrubberies are functional to the skull or attached to it.

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Treatment of pneumonic disease, rheumatoid joint discomfort, immunomodulatory, and stomach ulcers in Africa, an illness in Indonesia [10,11].

Kingdom	Plantae
Subkingdom	Tracheobionta
Super division	Spermatophyte
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Saxifragales
Family	Crassulaceae
Genus	Kalanchoe
Species	Kalanchoe pinnata [12]

Table 1: Taxonomy of Kalanchoe Pinnata.

Hindi	Zakhm-hayat
Arabic	Kushnulhayat
Bengal	Koppata
Sanskrit	Asthi-bhaksha
Telegu	Simajamudu
Tamil	Ranakalli
Persian and Urdu	Chubehayat [13,14]

Table 2: Regional Names of Kalanchoe Pinnata.

Figure 1: A. Kalanchoe pinnata plant, B. Kalanchoe pinnata plant leaves.

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Phytochemicals found in kalanchoe include: arachidic acid, astragalin, behenic acid, beta amyrin, benzenoids, beta-sitosterol, bryophollenone, bryophollone, bryophyllin, bryophyllind, oxaloacetate, palmitic acid,protocatechuic acid, pseudotaraxasterol, pyruvate, quarcetin, steroids, stigmasterol, succinic acid, syringic acid, taraxerol, and triacontane (Figure 2) [15].

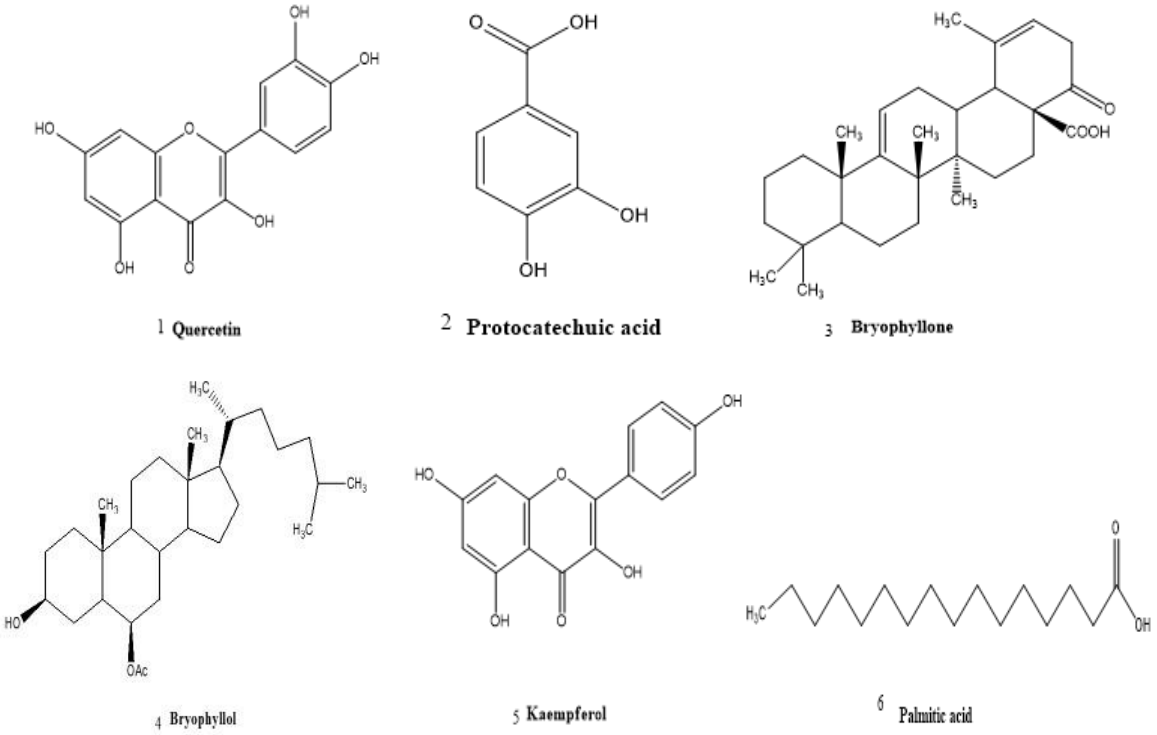

Figure 2: Phytochemical Constituents Structure of Kalanchoe Pinnata.

Macroscopic character

Oblong or elliptic in form, with a crenate or serrated edge, An asymmetric base, and reticulate venation. The petiole is long, the surface is glabrous, the upper epidermis is a dark green color, and the lower epidermis is lighter in color and distinctive odor.

Microscopic character

Microscopic examination of plant leaves revealed xylem, phloem, mesophyll tissue, and midrib, whereas trichomes were lacking on both the adaxial and abaxial sides. On both the adaxial and abaxial sides, it is convex and generally shallow. It possesses a thin layer of tiny, less noticeable cells on its adaxial epidermis. Additionally, a thin and less apparent abaxial epidermis is another feature. The parenchymatous, uniform ground tissue dense, spherical or angular cells make up the tissue. The small, hemispherical, unilateral, collateral, and collateral vascular strand is all of this characteristic. Both a thick ring of xylem and a large horizontal phloem make up this structure. The horizontal length of the

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bundle is 170 m, while the vertical length is 100 m. The lamina's surface is uniform and flat throughout. Palisade and spongy parenchyma are not differentiated in the mesophyll tissue. The stomata are numerous, with 18 to 20 of them per square millimeter and anisocytic in nature [16].

Pharmacological activities

According to a review the genus Kalanchoe possesses a number of pharmacological properties, comprising those of an antiviral, sedative, antiulcer, immunomodulatory, anti-leishmanial, CNS depressant, anti-inflammatory, thyroid peroxidase inhibitor, cytotoxic, hepatoprotective, antioxidant, analgesic, anticonvulsant, antimicrobial, B cell growth inhibitor, cardiovascular activity, Larvicidal, insecticidal, and antihyperglycemic properties [11].

Wound healing activity

By minimizing the size of the injured region and the oedema around the incision, significant wound-healing activity was demonstrated by the ethanolic extract of Kalanchoe. pinnata [17]. Nayak et al state that, (2010), This may be caused by phenolic antioxidants and steroidal glycosides. According to a 2004 study by Khan et al, the plant can be used to treat wounds with water, petroleum ether, and alcoholic extracts. Activity-wise, water extract fared better to the other two extracts [18].

Anti-inflammatory activity

To study the extracts impact on oedema brought on by formaldehyde induced oedema on an experimental basis, the leaves were produced in Petroleum ether, methyl alcohol, dimethyl ketone and trichloromethane. In comparison to other extracts, methanolic extract had the strongest impact on inhibiting paw oedema. Additionally, bradykinin, prostaglandins, serotonin, and histamine levels were examined in inflammations caused by formaldehyde in injured cells with the potential to create endogenous mediators. Therefore, it was concluded from these experimental findings that Bufadienolides and some other water-soluble extract components were principally in charge of preventing the oedema brought on by formalin in rats [19].

Immunomodulatory activity

In a model in which animal spleen cells were pre-treated with Kalanchoe pinnata leaf extract and aqueous extract of plant leaves greatly reduced mice's humoral and cell-mediated immunological responses. It had been discovered that intravenous, topical, intraperitoneal, and A delayed-type hypersensitivity response to ovalbumin had been brought on by all oral routes. These immunosuppressive properties of the K. pinnata aqueous extract exist [20]. Similarly, in deadly anaphylactic shock, a Th2 type T cell-driven immunopathology and the protective effects of K. pinnata leaves were seen. Reduced eosinophilia decreased IgE antibody formation, and impaired interaleukin-5, interaleukin-10, and tumor necrosis factor cytokine production were all observed in conjunction with oral protection in vivo. K. pinnata stopped the degranulation of mast cells caused by antigens in-vitro [21].

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Nephroprotective and antioxidant activity

K. pinnata aqueous extract for its anti-nephrotoxic properties against rats exposed to Gentamycin. It has been found that the rat kidneys are significantly shielded against Gentamycin-induced histopathological alterations by the liquid extraction of K. pinnata leaf. The batch subjected through leaf elicit of Kalanchoe pinnata along with Gentamycin showed reduced contraction of glomerulus, vascular contraction in the peritubular region, tissue shedding, made of inflamed cells, and death of renal cells. Rats given simply the levels of blood urea, blood urea nitrogen, urine creatinine, and kidney weights in patients treated with gentamycin were found to be significantly higher. Rats administered an aqueous extract of K. pinnata, however, were discovered to be shielded from these Gentamycin side effects. When rats were given K. pinnata leaf extract, the amount of urine they produced was found to have greatly increased. When histopathological analysis was performed, in addition to inflammatory cells being present in the renal sections treated with gentamycin group, it was shown that gentamycin also produced contraction of glomerulus, peritubular capillaries and blood vessels. The histopathology of the glomeruli and tubules in control rats was normal. It was discovered that concurrent administration of the extract lessened these Gentamycin-induced alterations in kidney histology. In-vitro studies have shown that the leaf extract of K. pinnata possesses important antioxidant and oxidative free radical scavenging abilities. The discovery of kaempferol and quercetin in the leaves of K. pinnata revealed that quercetin has a notable protective effect against cadmium-induced nephrotoxicity. This is caused by an increase in the tiny cysteine-rich protein metallothin, the production of endothelial nitric oxide synthase (eNOS), and a decrease in the expression of iNOS and COX-2 [22,23].

Antidiabetic activity

Given that diabetes is caused by an inefficient insulin system, the plants' zinc concentration may suggest that helpful in treating the condition. Using the "hot-plate" and "acetic acid" test models of pain, the herb's aqueous leaf extract was evaluated for its capacity to lessen discomfort in mice. 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 effects.

Mice subjected to thermally and chemically induced nociceptive pain stimuli showed significant antinociceptive effects from aqueous leaf extract. The plant extract was also shown to significantly lessen the acute inflammation and severe hypoglycaemia that rats were exposed to after ingesting raw egg albumin. Numerous flavonoids, polyphenols, triterpenoids, and phytosterols in the plant are thought to be responsible for its anti-nociceptive, anti-inflammatory, and anti-diabetic effects. It contains anti-inflammatory and anti-nociceptive qualities that are most likely brought about by synthesis of inflammatory cytokines and mediators such prostaglandins, histamine, and polypeptide kinins [24].

Antileishmanial Activity

The illness leishmaniasis is brought on by protozoans in the genus Leishmania. Leishmania amanuensis-infected mice were administered an oral dosage of K. pinnata's aqueous extract. Following the study, a few findings were made, including the lesions' reduction and parasite load in the affected region. The extract, when used consistently, both halted the infections from spreading and regulated their development. This strategy may also be applied to the treatment of visceral leishmaniasis. Muzitano and others (2009) [25]. The antileishmanial action of the plant extract might be attributed to the presence of flavonoid glycosides. Muzitano and others (2006) [26].

Antifungal activity of Kalanchoe pinnata

According to a previously study on the antifungal properties of petroleum spirits and liquid extraction of Kalanchoe. pinnata, both extracts exhibit effects that are almost identical to those of the conventional drug Griseofulvin, which is available in pharmacies [27]. According to the results of a different study, *Aspergillus niger* and *Aspergillus flavus*, two different fungal strains, are successfully inhibited by the methanolic extraction of Kalanchoe. pinnata by 76% and 51%, respectively. Cecropin P1 (CecP1) antimicrobial peptides are reportedly produced by transgenic K. pinnata. In comparison to commercial fungicides, K. pinnata extract enhanced with CecP1 has demonstrated effective and quick removal of the fungus C. albicans from infected wounds [28].

Antiulcer Activity

Indomethacin-induced stomach mucosal lesions are not prevented from progressing although acute ulcers are treated by ethanolic extract [29].

Neuropharmacological activity

On several neuropharmacological activities, the effects of aqueous leaf extracts of Kalanchoe. pinnata were examined in mice. It was shown that the extract substantially and dose-dependently decreased exploratory activity. Furthermore, it had a strong sedative effect. It was shown that the extract substantially and dose-dependently decreased exploratory activity. Furthermore, it had a strong sedative effect. It was shown that the extract substantially and dose-dependently decreased exploratory activity. Furthermore, it had a strong sedative effect., which was demonstrated by the potentiation of pentobarbitone's ability to induce sleep and a large decrease in obnoxious behavior. It delayed the start of seizures caused by picrotoxin and strychnine, with the latter's protective impact being noticeably greater former. Additionally, it lowers the LD50 of 641 mg/kg picrotoxin-induced death in mice. Overall, these results confirmed the extract's depressing impact on the central nervous system [30]. B. pinnatum leaf extract in ethanol's effects on the neurological systems of mice. A significant reduction in spontaneous locomotor activity and a dose-dependent potentiation of pentobarbital-induced sleep duration were both produced by the ethanolic extract of B. pinnatum leaves. The results show that the

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improvement of barbital hypnosis is a good sign of CNS depressive activity. The head dip, climbing, and avoidance tests revealed that the ethanol extract significantly reduced exploratory behaviour. According to the results of the head-dip, climbing, and dodging tests, the extract also dramatically decreased the exploratory behaviour.

Additionally, the ethanolic extract had a negligible anticonvulsant effect by postponing seizures brought on by strychnine and picrotoxin. The presence of glycosides and flavonoids may be the cause of the ethanolic extract's CNS depressive effects. Bufadienolide, a cardiac glycoside that has been shown to have considerable CNS depressive properties, is one of the main phytoconstituents that was isolated from the leaves of kalanchoe pinnatum [31].

Antilithiatic activity

Calcium oxalate stones develop because of the decreased excretion of oxalate in urine. According to medical prophylaxis, individuals with internal stones were given freshly extracted juice from K. pinnata leaves. No matter where the stones were or how they were treated in the past, regular use of the juice efficiently removed them. Indicating the juice's diuretic properties, there was an increase in the amount of urine voided. Additionally, it aided in the rise in citrate excretion and the decrease in oxalate excretion. This study makes the case that the juice might be antilithiatic [32]. On ethylene glycol-induced renal calculi in rats, Shukla et al (2014) assessed the anti-urolithiatic activity of a liquid extraction. In all the rats treated with the extract, a histopathological analysis of the renal revealed decreased renal failure, low epithelial lining degradation, and tubular refining [33]. When were made into tablets, Gilhotra et al (2013) observed that the medication was successful in reducing calcium oxalate crystal buildup and preventing kidney stone development [34].

Hematological parameter

Some hematological parameters of the crude methanolic leaf extract of B. pinnatum were assessed in wistar rats. In comparison to the control group, all and total white blood cells (TWBC). All of the treatment groups experienced a fall in platelet count, however only group A's reduction from the control group was statistically significant. Both the treatment and control groups had normocytic and normochromic red blood cells, according to the analysis of the blood film. The pattern of the results suggests that certain of the phytochemical components of the crude methanolic leaf extract of B. pinnatum may stimulate the bone marrow for the generation of leucocytes and the synthesis of hemoglobin. The tannin, ascorbic acid, and phenol concentration may be responsible for the impact that was seen. The hematological parameters in this study may have been impacted by additional phytochemical components of B. pinnatum, including flavonoids, zinc, riboflavin, and niacin [35].

Conclusion

The current review provides a summary of the information on the Pharmacognostic description, phytoconstituents, biological activity, and ethnopharmacological

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significance of kalanchoe pinnata. Kalanchoe pinnata belongs to crassulaceae family called as miracle plant. It is found in tropical region belt. It is used in many treatments of diseases. It works in wound healing, anti-inflammatory, immunomodulatory, anti-diabetic, anti-fungal, anti-ulcer activities and many more.

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