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## Rare Medicinal Plant-Kalanchoe Pinnata

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### ABSTRACT

The main objective of this review is to provide advance information for the drug discovery research from rare medicinal plant *Kalanchoe pinnata*, which has potential anticancer and insecticidal compounds etc. This plant leaf and stem and leaf portions contains significant chemicals which are most needed in medicinal industry, e.g., Bufadienolides. It is potential anticancer and insecticidal active compound. The other phytochemicals proved against UTI, parasitic, bacterial infections, antiulcer active and antidepressant. Now it becomes endangered plant which needs to be conserved as well as explored for its significant green chemistry.

**Key words:** Bufadienolides, insecticidal, anticancer, antimicrobial

### INTRODUCTION

Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of diseases and ailments (Sharma *et al.*, 2008; Joseph and Priya, 2010a, b; Joseph *et al.*, 2010). *Kalanchoe pinnata* (Lam) (syn. *Bryophyllum pinnatum*) succulent plant native to Madagascar. This Wonder plant or Divine plant (Kane, 2004) Leaf, Stem and Root portions and its chemicals has high index in therapeutic values (Simoes-Wust *et al.*, 2010). This is commonly known as a Master herb or a cure for all by a large community of Tribal and Herbal practitioners (Nayak *et al.*, 2010) of various countries. *Kalanchoe* is rich in alkaloids, triterpenes, glycosides, flavonoids, steroids and lipids. The leaves contain a group of chemicals called bufadienolides. They are very similar in structure and activity as two other cardiac glycosides, digoxin and digitoxin (drugs used for the clinical treatment of congestive heart failure and related conditions).

### PLANT DESCRIPTION

It is a perennial, succulent, stout, erect herb with tuberous and glabrous stem which are mottled with purple scales. The leaves are simple, opposite, 3-5 lobed, thick, fleshy and blackish with crenate margins. The inflorescence is terminal paniculate cyme with orange-red colored and pendulous flowers. The fruits are follicles. This plant is specially noted for developing small plantlets on the outer edges of its leaves, when its leaves are detached (Jessica, 2008).

### TAXONOMICAL TREE

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida  
Order: Saxifragales  
Family: Crassulaceae  
Genus: *Kalanchoe*  
Section: Bryophyllum  
Species: *K. pinnata*

### COMMON NAMES

Air plant, balangban, bruja, clapper bush, coirama, coirama-branca, coirama-brava, curtain plant, dipartenga, farine chaude, fel pavo, floppers, folha-da-costa, green love, hoja de aire, life leaf, live forever, mexican loveplant, miracle leaf, motta patti, paichecara, pashipadeh, paochecara, pirarucu, potagoja, sayao, saiao, siempre viva

### CLINICAL USAGE

- The leaves are useful in burns, boils, bites of insects, congestive ophthalmia dysuria, diarrhoea, dysentery, impetigo, polyuria, plegmon, swellings, tuberculosis, ulcers and wounds
- The leaf juice 3 g, jeera 3 g and ghee 6 g is mixed and given for blood mixed diarrhoea
- The leaf poultice is applied on wounds, sprains, swellings and inflammations
- The leaf juice is useful in cholera
- The leaf juice mixed with Kali Mirch is useful in blood oozing piles and haemorrhoids
- The leaf powder with Kali Mirch is also useful in inflammation, burning in urination and blocked urination and leprosy
- The leaves roasted over fire are applied to places of wounds and surgical sutures in the skin to prevent discoloration of the skin (Nadkarni, 1976; Willcox and Bodeker, 2004)

### CHEMICAL COMPOUNDS

The leave contains:

- P-coumaric acid
- Ferulic acid
- Syringic acid
- Caffeic acid, citric acid, isocitric acid, malic acid
- P-hydroxybenzoic acid
- Flavonoids as quercetin, kaempferol
- Quercetin-3-diarabinoside
- Kaempferol-3-glucoside
- Quercetin-3-L-rhamnosido-L-arabino furanoside
- $\eta$ -hentriacontane
- $\eta$ -tritriacontane
- Sitosterol
- Two homologous phenanthrene derivatives – 2(9-decenyl) phenanthrene (I) and 2 (undecenyl) phenanthrene (II)
- Bufadienolides-Bryophyllin A (bryotoxin) (Supratman *et al.*, 2000); Bryophyllin B (Fig. 1); Bryophyllol (Fig. 2); Bryophollone (Fig. 3); Bryophollone (Fig. 4); Bryophynol (Fig. 5) (Ram and Mehrotra, 2004)

The aerial part contains:

- 18  $\alpha$  oleanane
- $\Psi$ -taraxasterol
- Alpha and  $\beta$ -amyrins and their acetates
- 24-epiclerosterol [24(R)stigmasta-5, 2-dien-3  $\beta$ -oI]
- 24 (R)5  $\alpha$ -stigmasta-7, 25-dien-3  $\beta$ -oI
- 5  $\alpha$ -stigmast-24-en-3  $\beta$ -oI and 25-methyl-5  $\alpha$ -stigmast-24-en-3  $\beta$ -oI and 25-methyl-5 $\alpha$ -ergost-24 (28)-en-3  $\beta$ -oI
- A potent cytotoxic compound-bersaldehyenin-1, 3, 5-orthoacette (Fig. 6) (Ram and Mehrotra, 2004)
- Glutamic acid was major amino acid of the 16 amino acids detected in leaf protein hydrolysate, methionine, tryrosine and phenylalanine identified as three limiting acids

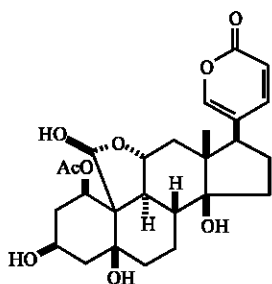


Fig. 1: Bryophyllin

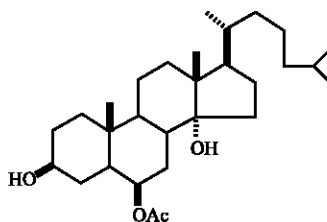


Fig. 2: Bryophyllol

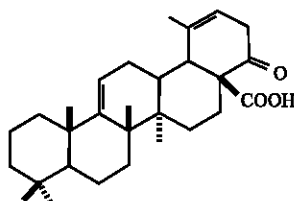


Fig. 3: Bryophollone

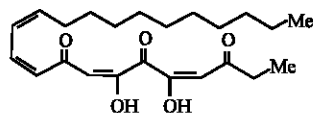


Fig. 4: Bryophollenone

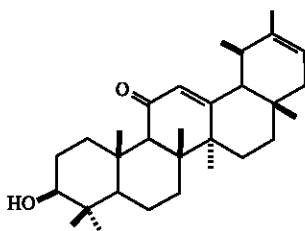


Fig. 5: Bryophynol

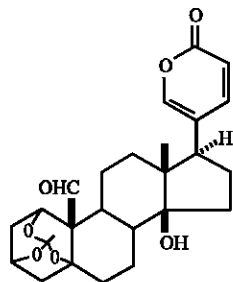


Fig. 6: Bersaldegenin

## BIOLOGICAL ACTIVITY

Many of Kalanchoe's traditional uses can be explained by the clinical research conducted thus far on the plant. The traditional use for infectious conditions (both internally and externally) is supported by research indicating Kalanchoe leaves have antibacterial, antiviral and antifungal, anti-insecticidal activity.

**(1) Antibacterial:** The leaf and leaf juice have demonstrated significant *in vitro* antibacterial activity towards Staphylococcus, *E. coli*, Shigella, Bacillus and Pseudomonas, including several strains of multi-drug resistant bacteria

**(2) Anticancer:** Bryophyllin compounds have marked anticancer therapeutic value against cancer cells (Supratman *et al.*, 2001). Bersaldegenin-1,3,5-orthoacetate inhibited cancer cell growth on several cancer lines

**(3) Antiparasitic:** A aqueous extract of Kalanchoe leaves (administered topically and internally) has been shown to prevent and treat leishmaniasis (a common parasitic disease in tropical countries which is transmitted by the bite of sand flies) in both humans and animals. Quercitrin, a potent antileishmanial flavonoid present in the leaves (Muzitano *et al.*, 2006). This plant extract showed anti-plasmodial activity against CQ resistant Plasmodium falciparum (Chenniappan and Kadarkarai, 2010)

**(4) Anti-insecticidal:** Bryophyllin A showed strong insecticidal activity against third instar larvae of the silkworm (*Bombyx mori*)

**(5) Anti-allergic:** In addition to its antibacterial properties, Kalanchoe's traditional uses for upper respiratory conditions and coughs might be explained by research demonstrating that the leaf juice

has potent anti-histamine and anti-allergic activity. In an *in vivo* study (with rats and guinea pigs) the leaf juice was able to protect against chemically induced anaphylactic reactions and death by selectively blocking histamine receptors in the lungs.

**(6) Anti-inflammatory:** Other *in vivo* research confirms that Kalanchoe can reduce fevers and provides anti-inflammatory, pain-relieving and muscle relaxant effects. Its anti-inflammatory effects have been partially attributed to the immunomodulatory and immune suppressant effect.

**(7) Anti-depressant:** Kalanchoe has also shown sedative and central nervous system depressant actions in animal studies. These effects were attributed partially to the leaf extract demonstrating the ability to increase the levels of a neurotransmitter in the brain called GABA (gamma aminobutyric acid).

**(8) Anti-ulcer inducer:** A leaf extract protected mice from such ulcer-inducers as stress, aspirin, ethanol and histamine and reduces Hyper tension (Lans, 2006).

**(9)** The plant leaf contains Hydroxyproline heals the wounds (Nayak *et al.*, 2010) and the Quercetin has neproprotective and antioxidant role (Yadav and Dixit, 2003).

## CONCLUSION

Traditionally this plant parts were used against fever (Willcox and Bodeker, 2004). Interestingly, the plant leaf extracts were recently explored against drug resistant malarial parasites has been proved its potential. But specific chemicals which active against malarial parasitic is still remains elusive. It should be explored very much to control such drug resistant organisms.

## REFERENCES

- Chenniappan, K. and M. Kadarkarai, 2010. *In vitro* antimalarial activity of traditionally used Western Ghats plants from India and their interactions with chloroquine against chloroquine-resistant *Plasmodium falciparum*. Parasitol. Res., (In Press). 10.1007/s00436-010-2005-9
- Jessica, L.K., 2008. Investigation of Kalanchoe homeobox 1 (Kh1) gene in Apical Meristems of *Kalanchoe pinnatum*. Undergraduate Honors Theses, Butler University, Indiana, USA.
- Joseph, B. and R.M. Priya, 2010a. *In vitro* Antimicrobial activity of *Psidium guajava* L. leaf essential oil and extracts using agar well diffusion method. Int. J. Curr. Pharmaceutical Res., 2: 28-32.
- Joseph, B. and R.M. Priya, 2010b. Preliminary phytochemicals of *Psidium guajava* L. leaf of methanol extract and its cytotoxic study on HeLa cell lines. Inventi Rapid Ethnopharmacol., Vol. 1.
- Joseph, B., R.M. Priya P.A.M. Helen and S. Sujatha, 2010. Bio-active compounds in essential oil and its effects of antimicrobial, cytotoxic activity from the *Psidium guajava* (L.) Leaf. J. Adv. Biotechnol., 9: 10-14.
- Kane, S.G., 2004. Extracts from plant and non-plant biomass and uses thereof. US Application Publication, Publication No. US2004/0156920 A1. <http://ip.com/patapp/US20040156920>.
- Lans, C.A., 2006. Ethnomedicines used in Trinidad and Tobago for urinary problems and diabetes mellitus. J. Ethnobiol. Ethnomed., 2: 45-45.

- Muzitano, M.F., L.W. Tinoco, C. Guette, C.R. Kaiser, B. Rossi-Bergmann and S.S. Costa, 2006. The antileishmanial activity assessment of unusual flavonoids from *Kalanchoe pinnata*. *Phytochemistry*, 67: 2071-2077.
- Nadkarni, K.M., 1976. Indian Materia Medica. Popular Prakashan, Mumbai.
- Nayak, B.S., J.R. Marshall and G. Isitor, 2010. Wound healing potential of ethanolic extract of *Kalanchoe pinnata* Lam. leaf--a preliminary study. *Indian J. Exp. Biol.*, 48: 572-576.
- Ram, P.R. and B.N. Mehrotra, 2004. Compendium of Indian Medicinal Plants, Vol. 5. 1990-1994. Central Drug Research Institute, Lucknow and Publications and Information Directorate, New Dehli, ISBN: 81-85042-13-6.
- Sharma, A., C. Shanker, L.K. Tyagi, M. Singh and C.V. Rao, 2008. Herbal medicine for market potential in India: An overview. *Acad. J. Plant Sci.*, 1: 26-36.
- Simoes-Wust, A.P., M. Graos, C.B. Duarte, R. Brenneisen and M. Hamburger *et al.*, 2010. Juice of *Bryophyllum pinnatum* (Lam.) inhibits oxytocin-induced increase of intercellular calcium concentration in human myometrial cells. *Phytomedicine*, 17: 980-986.
- Supratman, U., T. Fujita, K. Akiyaa, H. Hayashi, A. Murkami, H. Sakai, K. Koshimizy and H. Ohigashi, 2001. Anti-tumor promoting activity of bufadienolides from *Kalanchoe pinnata* and *K. daigremontiana* X tubiflora. *Biosci. Biotechnol. Biochem.*, 65: 947-949.
- Supratman, U., T. Fujita, K. Akiyama and H. Hayashi, 2000. New insecticidal bufadienolide, bryophyllin C, from *Kalanchoe pinnata*. *Biosci. Biotechnol. Biochem.*, 64: 1310-1312.
- Willcox, M.L. and G. Bodeker, 2004. Traditional herbal medicines for malaria. *BMJ*, 329: 1156-1159.
- Yadav, N.P. and V.K. Dixit, 2003. Hepatoprotective activity of leaves of *Kalanchoe pinnata* Pers. *J. Ethnopharmacol.*, 86: 197-202.