IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

INSULIN PLANT: *CHAMAECOSTUS CUSPIDATUS*

Shekhar Shahaji Nalawade

Anandi Pharmacy College, Kalambe Tarf Kale, Dist. Kolhapur, India.

ABSTRACT

Chamaecostus cuspidatus (Costus igneus Nak) is commonly known as fiery costus, it is a member of costaceae, and it is a newly introduced plant in India from South-central America. In India, it is known as insulin plant for its purported anti-diabetic properties. The leaves of this plant are used as directly supplement in treatment of diabetes mellitus type -2. It has been proven to posses various pharmacological activities on Anti-diabetic, antioxidant, antimicrobial and anti-cancerous. Present review focuses on the pharmacological activities of *Chamaecostus cuspidatus.*

Keywords*:* - Insulin Plant, Antidiabetic Activity, Chemical Constituents, Spiral Flag

INTRODUCTION

Herbal products are extensively used globally for the treatment of many diseases where allopathic fails or has severe side effects. Psycho neural drugs are also have very serious side effects like physical dependence, tolerance, deterioration of cognitive function and effect on respiratory, digestive and immune system. So in this contest, treatment through natural source is seen with the hope that they have lesser side effects than that observed with synthetic drugs. *Chamaecostus cuspidatus* belongs to the family **costaceae** which was first raised to the rank of family by Nakai on the basis of spirally arranged leaves and rhizome being free from aromatic essential oils. This family consists of 4 genera and approximately 200 species. The genus costus is the largest family because it is having 150 species. It is used in India to control diabetes, and it is known that diabetic people eat one leaf daily to keep their blood glucose low. In Mexican folk medicine, the aerial part of *C. pictus* D. Don is used as an infusion in the treatment of renal disorders.

Fig 1: *Chamaecostus cuspidatus* (Insulin Plant) Photos

Chamaecostus cuspidatus (formely known as fiery costus, spiral flag, insulin plant). It is a species of herbaceous plant in **costaceae** family native to eastern brazil (states of Bahia and Spiritosanto) in India it is known as insulin plant due to its antidiabetic property.

The synonyms of this plant are: *Costus cuspidatus, Costus igneus, Globba cuspidatus, Costus pictus.*

Morphology:

It is a perennial, upright, spreading plant reaching about two feet tall, with the tallest stems falling over and lying on the ground. Leaves are simple, alternate, entire, oblong, evergreen, 4-8 inches in length with parallel venation. The large, smooth, dark green leaves of this tropical evergreen have light purple undersides and are spirally arranged around stems, forming attractive, arching clumps arising from underground rootstocks. Beautiful, 1.5-inch

diameter, orange flowers are produced in the warm months, appearing on cone- like heads at the tips of banches.

Cultivation and propagation:

In Siddha medicine, it is known as kostum. It is being cultivated in Kashmir and the Himalayan regions for its root. It is related to the gingers and was originally part of the family Zingiberaceae. But now the Costus species and their kin have been reclassified into their own family, Costaceae. The species reproduces vegetative by rhizome and birds disperse seeds when they feed on the fruits. Costus products are sometimes called *Costus comosus* and are edible in nature. The flower petals are quite sweet and nutritious. It's a lower grower and makes a great ground cover. The long red flower spikes of *Costus pulverulentus* are unique to the family and they are sure to create interest in the garden. The plant grows very quickly. And the propagation is by stem cutting. It needs sunshine but it also grows in slightly shady areas [6]. It is cultivated in India for its use in traditional medicine and elsewhere as an ornamental.

Phyto Chemical Constituents:

The phytochemical constituent of this plant is quercetin. It is a flavonoid. It was isolated as active principle from methanol extract of *Chamaecostus cuspidatus*.

Pharmacological Activities:

This plant has been proven to posses various Pharmacological activities on Antimicrobial, anti cancerous, Antidiabetic and antioxidant.

Antimicrobial Effects:

Methanolic extract of *C. igneus* showed maximum anti-bacterial activity against gram-positive *Bacillus cerus, Bacillus megaterium, Micrococcus leuteus, Staphylococcus aureus, Streptococcus lactis*, and gram-negative strains *Pseudomonas aeruginosa*, *Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae*, and *Salmonella typhimurium*. Among the extracts of various parts of *C. pictus*, methanolic extracts of stem and flower exhibited maximum inhibitory activity on the growth of tested microbes, viz., *Shigella flexneri, Klebsiella pneumonia, Bacillus subtilis, Escherichia coli* at the concentration of 150 µg/ml. The isolated compound from the ethanolic extract of *Costus igneus* showed moderate anti-bacterial and anti-fungal activity against *Staphylococcus aureus, Eschericia coli,* and *Candida albicans.*

Anticancerous Effect:

The ethanolic extract of leaves of C. *pictus* was found to have anti-proliferative and anti-cancer potential in in-vitro mammalian fibrosarcoma (HT-1080) cells. All the extracts of bark had potent anti-cancer properties against HT 29 and A549 cells. Study evaluated the cytotoxicity activities of crude ethanolic extracts from *Chaemaecostus subsessilis* and *C. cuspidatus* and six fractions against a panel of six human cancer cell lineages (HL60, Jurkat, MDA-MB231, MCF-7, HCT, THP-1). Cytotoxic effects in the HL60, Jurkat and THP-1 lineages were mediated via an apoptotic mechanism.

Antidiabetic activity:

It reduces fasting as well as postprandial blood glucose levels. But the exact mechanism of action behind the antidiabetic activity is not known yet. Along with the antidiabetic activity, insulin plant also reduces the diabetic associated complications; bring renal, hepatic parameters to a controlled level, decreases the amount of glycosylated haemoglobin, corrects the lipid profile, increases body weight as well as insulin level and shows marked Improvement in the histopathological examination.

Antioxidant:

The antioxidant activities of leaves and rhizomes in methanol, aqueous, ethanol, and ethyl acetate extracts were assessed using different models like DPPH, β-carotene, Deoxyribose, superoxide anion, reducing power, and metal chelating assay at different concentrations. Leaves and rhizomes of *C. pictus* showed good antioxidant activity of about 89.5% and 90.0% when compared with standard BHT (Butylated Hydroxy Toulene) (85%) at a concentration of 400 µg/ml.

Antioxidant activity:

It was evident from the study that the polyphenols and antioxidants not only scavenge off the free radicals but also inhibits the generation of the free radical.

Medicinal Uses and Studies:

In Siddha medicine, used for diabetes; leaves chewed twice daily or dried powder of leaves taken 1/2 to 1 gram twice daily. Used by tribal people of Kolli hills of Tamil Nadu for diabetes. Leaves consumed as fresh, dried and powder leaf forms.

Anti-Diabetic / Increased Insulin and GLUT3 Expression / Leaves: Study evaluated lost ß-cell regeneration in diabetes and successfully differentiated human haematopoietic stem cells (HSCs) from functional ß-like cells. *Costus igneus* leaf extract is known to exhibit anti-diabetic properties by lowering blood glucose level in mice models. This study evaluated the

effect of *C. igneus* on differentiated ß-like cells. The leaf extract exhibited anti-diabetic property elevated glucokinase activity which catalyzes the rate-limiting step of glucose catabolism in ß-like cells and acts as a sensor for insulin production while decreasing the glucose-6-phosphatase activity. Results showed enhanced IBS and GLUT2 gene expression and elevated glucokinase activity in ß-like cells differentiated from HSCs. The extract has potential for use in the treatment of diabetes.

Antioxidant / Cytotoxic / Anticancer / Leaves: Study evaluated the antioxidant and cytotoxic potential of different leaf extracts A hexane extract showed highest Antioxidant activity was evaluated using FRAP, ABTS, . DPPH and reducing power assay while cytotoxicity was evaluated using MTT assay on breast cancer cell line MCF-7 (Michigan Cancer Foundation). In FRAP assay, the acetone extract showed highest antioxidant activity, the hexane extract in ABTS showed highest radical scavenging activity and the acetone extract in DPPH assay. The acetone leaf extract at concentration of 150µg/ml showed highest cytotoxic activity on the cancer cell line with cell viability of 65.51%. Results suggest efficient antioxidant and cytotoxic activity and could be a safe and cost-effective potential for biologic applications.

Effect of leaves on Blood Glucose Levels of Diabetic Patients: A Cross-Sectional Study: A study in diabetic patients evaluated the effect of consumption of insulin plant on glycemic control. Retrospective data was collected from diabetic patients who consumed the leaves of the insulin plant in fasting and postprandial blood sugar levels in all the patients who consume the leaves.

Antidiabetic / Antioxidant / Antimicrobial / Leaves: Study of an aqueous leaf extract of *C. cuspidatus* showed antidiabetic against streptozotocin induced diabetic mice. Antioxidant activity was evaluated using DPPH, superoxide anion scavenging activity, hydroxyl radical scavenging activity and reducing power assays. Antibacterial activity was tested against *S. aureus, B. subtilis, E. coli* and antifungal activity against *A. flavus* and *C. albicans*.

Potential Anticancer Source: Study evaluated the cytotoxicity activities of crude ethanolic extracts from *Chaemaecostus subsessilis* and *C. cuspidatus* and six fractions against a panel of six human cancer cell lineages (HL60, Jurkat, MDA-MB231, MCF-7, HCT, THP-1). Cytotoxic effects in the HL60, Jurkat and THP-1 lineages were mediated via an apoptotic mechanism.

CONCLUSION

The treatment of diabetes using the *Chamaecostus cuspidatus* plant has no side effects. The anti-diabetic effect of its leaves is currently been tested in diabetic patients. Studies reveal its role in various diseases, which opens up new clinical research areas. Investigations are needed to analyze the mechanism of action of the compounds and standardization of herbal drugs using models and this in turn would be useful to provide many links to develop various kinds of ant diabetic drugs in low costs. Medicinal plants are better to use in the treatment than conventional medicine.

REFERENCES

1) A review on Insulin plant (*Costus igneus* Nak) Prakash K. Hegde, Harini A. Rao, and Prasanna N. Rao Pharmacognostical and Phytochemical study of *Costus igneus* NE Br leaf J-ISM, V2 (4), Oct-Dec 2014, pp 174-178.
2) Sources of Anticancer Agents, Natural Products Chemistry & Research (2016), 4(2)
3) Devi VD, Urooj A. Hypoglycemic potential of *Morus indica*. L and *Costus igneus*. Nak: A preliminary study, Indian J Exp Biol. 2008;46:614–6.
4) Meléndez-Camargo ME, Castillo-Nájera R, Silva-Torres R, Campos-Aldrete ME. Evaluation of the diuretic effect of the aqueous extract of Costus pictus D. Don in rat. Proc West Pharmacol Soc. 2006;49:72–4.
5) http://www.zipcodezoo.com/Plant/C/Costus_igneus