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OVERVIEW SPIRAL FLAG

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ABSTRACT

Costus igneus Nak and Costus ictus D. Don, commonly known as spiral flag is a member of costaceae and a newly introduced plant in india from south and central America it is a perennial, upright, spreading plant reaching about two feet tall, with spirally arranged leaves and attractive flowers. In southern india, it usually grows as an ornamental plant and its leaves are used as a dietary supplement in the treatment of diabetes mellitus. Recently, a number of research have been carried out the evaluate the anti-diabetic potential of this plant. Besides, it has been proven to possess various pharmacological activities like hypolipidemic, diurect, antioxidant, anti- microbial, anti-cancerous. Further, various phytochemical investigations reveal the presence of carbohydrates, triterpenoids, proteins, alkaloids, tannins, saponins, flavonoids, steroid, and explore the different pharmacological and phytochemical studies reported till date.

The plant belongs to the family Costaceae. The Costaceae was first raised to the rank of family by Nakai on the basis of spirally arranged leaves and rhizomes being free from aromatic essential oils. Before the elevation to family status, Engler and Prantl recognized Costoideal as a subfamily under Zingiberaceae. Several anatomical and morphological features support this isolated position including well developed aerial shoot with distinct, rigid, and commonly branched stems. The leaves are inserted in a low spiral with divergences. The family Costaceae consists of four genera and approximately 200 species. The genus Costus is the largest in the family with about 150 species that are mainly tropical in distribution.[2,6] The present review deals with the recent research carried out in the area of phytochemistry, pharmacological, biological activities, and safety of Costus igneus Nak.

Keywords: Anti-diabetic activity, costus, igneus Nak, costus ictus D. Don, diabetes mellitus, insulin plant.

1. INTRODUCTION

Costus igneus N. E. BR. also known as fierycostus or spiral flag or insulin plant is a tropical evergreen plant large, smooth dark green leaves which are spirally arranged around steams, forming attractive arching clumps arising from underground rootstocks. Plant reach to about 60cm height, with a tallest steam falling over and lying on the ground. Beautiful 2.5 – 12.5 cm diam., orange flowers are produced in the worms months, appearing on cone-like heads to the tips of branches, in Ayurveda system the rhizome of this plant considered as bitter astringent, acrid, cooling, aphrodisiac, purgative, anthelmintic, depurative, febrifuge, expectorant, and useful in burning sensation, constipation, leprosy, worm infection, skin diseases, fever, asthma, bronchitis, inflammation, and anemia, 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.

Costus specious (Koenig) Sm, (Hindi-keukand; Tamil-Kostum; Telugu-Cengalva kostu, Sanskrit:Kushta, Kashmira, shura, Pushkarmula, katar katar) commonly called as crepe ginger is a tall and dramatic landscape plant with large dark green leaves arranged on the stalk in spiral form. This plant can grow up to 3.1m in height in frost free areas, but typically grows to about 1.8m tall in cooler regions where it roots hardy but dies back in winter. The flowers appears in late summer or early fall and quite unusual looking. The flowers look like crepe paper, thus the common name of crepe ginger, it has a very wide distribution in India, occurring throughout the sub- Himalayan tract from himachal Pradesh to Assam, Vindhya and Saputara hills and central India and the western Ghats of Maharashtra, Karnataka and Kerala. This species is also used in India to control diabetes and it is known that diabetic people eat one leaf daily to keep their blood glucose.

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Scientific classifications:

Botanical name: Costus igneus sun.e.br
Domains: Ekaryotic
Inherited blast name: Monocot
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Trahceophyta
Subphylum: Euphyllophytina
Infra phylum: Radiotopses
Class: Liliopsida
Sub class: Commelinidae
Order: Zingeberanae
Family: Costaceae
Sub family: Asteroideae
Tribe: Coreopsideae
Genus: Chamaecostus chamecostuse
Specific epithet: Igneus

2. MORPHOLOGY

It is a perennial, upright, spreading plant reaching about two feet tall, with the tallest steam falling over and lying on the ground. Leaves are simple, alterna te, 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 steams, forming attractive, arching clumps, arising from underground rootstocks. Beautiful, 1.5 inch diameter, orange flowers are produced in the worm months.

Macroscopic analysis:

Macroscopic observation of the plant was done. The shape, size, surface characters, texture, colour, odour, taste etc was noted. It is a technique of qualitative evaluation based on the study of morphological and sensory profiles of herbs 22

Microscopic analysis:

Transverse section midrib region of fresh leaf pieces were cut and fixed in FAA and then dehydrated by employing graded series of ethyl alcohol and tertiary butyl alcohol 23. Sections were taken using microtome. The sections were then stained with toludine blue as per standard procedure 24. The dye rendered pink colour to the cellulose walls, blue to the lignified cells, dark green to suberin, violet to the mucilage, blue to the protein bodies etc. The sections were also stained with saffranin and fast-green and iodine wherever necessary. In order to supplement the descriptive part the photomicrographs in different magnifications of all necessary cells and tissues were taken with NIKON Coolpix digital camera and Labphot2 microscopic unit.

3. PHYSICOCHEMICAL ANALYSIS

Total ash, acid insoluble ash, water soluble ash, loss on drying, extractive values, foaming index, swelling index and moisture content were performed as per standard procedure

Growth and propagation:

Spiral flag grows in either full sun or partial shade.it needs fertile soil and ample moisture, and is often planted near water. Propagation it by division of the clumps, cutting or by separating the offsets or plantlets that form below the flowers heads. Mites and nematodes can be a problem, especially on light, sandy soil. The plant has no diseases are of major concern. Ds at the tips of branches. Fruits are inconspicuous, not showy, less than 0.5 inch, and green-colored.

Phytoconstituents:

Phytochemical screening show the presence of steroids, triterpenoids, alkaloids, tannins, flavonoids, glycosides saponins, carbohydrates, and proteins. The methanol extract was find to contain the highest number of phytochemicals with plant and callus (MS and LS medium) extracted with different solvents in preliminary screening indicated the presence of high content of phytochemicals like phenols, alkaloids, flavonoids, and terpenoids in methanol extracts and the sequential screening for phytochemicals of Costus leaves revealed that it is rich in protein, iron and antioxidant components such as ascorbic acid α-tocopherol, β-carotene terpenoids, steroids, and flavonoids.

Powder microscopy:

The microscopic analysis of the powder of the leaf showed fragments of simple unicellular trichomes, hexacytic stomata; abaxial solitary bundle has single, wide, circular thin walled xylem elements and small clusters of phloem elements located on the upper side. The vascular bundle is surrounded by wide layer of parenchymatous bundle sheath, mesophyll cells containing starch grains, Calcium oxalate crystals of minute particle are aggregated in to large masses in the leaf mesophyll cells, Tracheid's with spiral thickenings and epidermal cells are observed.

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Pharmacological activity

The insulin plant has been reported with many activities. Among them, some are yet to be validated. The various plant parts are shown such activities are leaf, stem, root, rhizome and whole plant also. Leaves are contributed to prominent hypoglycemic potential. The stem is majorly reported with antiurolithiatic activity. Both steam and root have been shown significant antioxidant activity. The diabetes patients have to chew down the insulin plants leaves for a month. That is the patient has to take two leaves per day in the morning and evening for one week. Care should be taken that the leaves must be chewed well before swallowing. Then after one week, the patient should take one leaf each in the morning and evening. This dosage should be continued for 30 days.

Allopathic doctors also recommended this and are found to the effective in bringing blood sugar levels under completely under control the catchphrase of insulin plant is “a leaf a day keeps diabetes away”. The rhizome of insulin plant is considered as a bitter, astringent, acried, cooling, dephirative, febrifuge, expectorant, and useful in burning sensation, constipation, leprosy, worm infection, skin diseases fever, asthma, bronchitis, inflammation, and anemia.

Diabetes is a common ailment that almost every second household in the country has. The ailment also significantly reduces the immunity of the body making it vulnerable to many other diseases. This is where the good uses of the insulin plant come into the picture.

According to NCBI, blood sugar levels can be controlled with the right usage of the leaf. It is interesting to know that this plant does not contain insulin, nor does it create insulin in the body, but the natural chemicals present in this plant convert sugar into glycogen, which promotes the process of metabolism.

The insulin plant, whose scientific name is Coctus igneus, holds great importance in Ayurveda and chewing the leaves of this plant can control your sugar levels to a great extent, although its taste can leave a sour feeling in the mouth. The plant is also known by other names such as crepe ginger, kemuk, que, kikand, kumul, pakarmula and pushkarmula. These are some of the advantages of the insulin plant

Chewing insulin leaves improves the metabolic process of the body.The natural chemical present in this plant converts the sugar of the human body into glycogen, which helps those suffering from diabetes.Insulin plant is also used against ailments like cough, cold, skin infection, eye infection, lung diseases, asthma, uterine contraction, diarrhea, and constipation among others.

Wash and grind two leaves of the insulin plant. Now dissolve it in a glass of water and consume it regularly in the morning and evening. With its regular consumption, you will start noticing improvements in your sugar levels. You can plant insulin plant at your home anytime throughout the year. It is a bushy plant with a height of between two and a half to three feet. If you put compost and soil in the pot in the right proportion at home and keep watering, you will see results soon.

Anti-diabetic effects:

Costus igneus is a traditionally used medicinal plant and a common member of ornamental plants in south Indian gardens. Leaves are the important part which produces significant ant diabetic activity. It reduces fasting as well as postprandial blood glucose levels. But the exact mechanism of action behind the ant diabetic activity is not known yet. Along with the ant diabetic activity, insulin plant also reduces the diabetic associated complications; bring renal, hepatic parameters to a controlled level, decreases the amount of glycosylated hemoglobin, corrects the lipid profile, increases body weight as well as insulin level and shows marked improvement in the histopathological.

A comparison was made between the action of Costus igneus extract and a known antidiabetic drug glibenclamide (600 µg/kg body wt.). An oral glucose tolerance test (OGTT) was also performed in experimental diabetic rats. Ethanolic extracts of Costus igneus were obtained by simple maceration method & were subjected to standardization by phytochemical screening methods. Preliminary phytochemical investigations showed the presence of alkaloids and steroids in ethanolic extract.Dose selection was made on the basis of acute oral toxicity study (50mg to 5000 mg/kg body weight) as per OECD guidelines. Costus igneus ethanolic extract showed significant antidiabetic activity. These extracts also prevented body weight loss in diabetic rats. We are the first to report Costus igneus leaves pharmacognostic, phytochemical investigations and its antidiabetic activity in OGTT and alloxan induced model.

Antimicrobial effect:

Methanolic extract of C. igneus showed maximum anti-bacterial activity against gram-positive Bacillus cerus, Bacillus megaterium, Micrococcus leuteus, Staphylococcusn aureus, Streptococcus lactis, and gram-negative strains Pseudomonas aeruginosa, Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae, and Salmonella typhimurium.

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. 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.

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Anti–cancerous effect

The ethanol extract of leaves of C. ictus was found to have anti- proliferative and anti-cancer potential in-vitro mammalian fibro sarcoma [HT-1080] cells. All the extract of bark had potent anti-cancer properties against HT 29 and A549 cells. Study evaluated the cytotoxicity activities of crude ethanol extracts from chaemaecostus and C. cuspidate and six fractions against a panel of six human subsessilis cancer cell lineages.

Evaluted the anti-proliferative and apoptotic action of methanol extract of Costus igneus powdered leaves (MECIL) on in vitro MCF 7 (Michigan Cancer Foundation-7) breast cancer cell line. The extract (MECIL) was able to reduce the tumor size without affecting the normal cells. Also evaluated the cytotoxicity and cell viability for given extract (15-2000µg/ml) on L6 (Rat skeletal muscle cell line) using MTT (3-(4, 5-dimethyle thiazol-2-yl)-2, 5-diphenyle tetrazolium bromide) assay. It showed IC 50 value of 2000µg/ml extract. The extract showed cytotoxicity aligned with the normal cell lines only at very high concentration, but it wasn't apoptotic to the normal cell lines. At the maximum dose of 2000 µg/ml the extract showed potent anticancer.

Antioxidant

The antioxidant activities of leaves rhizome in methanol, aqueous, ethanol, and ethyl acetate extracts where assessed using different model lie DPPH, β-carotene, deoxyribose, superoxide anion, reducing power and metal chelating assay at different concentrations.

Leaves and rhizomes of C. ictus showed good antioxidant activity of about 89.5% and 90.0%when compared with standard BHT [Butyrate Hydroxyl Toluene] [85%at a concentration of 400µg/m.

Result obtained revealed that methanol extracts of both leaves and rhizomes of C. ictus possess higher antioxidant activity when compared with other extracts. Methanol extracts of flower and stem of C. ictus possess in vitro antioxidant activity against.

Hypolipidemic activity

A study was carried out to comparatively evaluate the methanolic and aqueous extracts of C. igneus in diabetes-induced hyperlipidemia in rats. The study revealed that methanolic and aqueous extracts at a dose of 200 mg/kg body weight reversed the diabetes-induced hyperlipidemia. Alcoholic extract of C. igneus at the dose of 400 mg/kg (p.o) had significantly decreased the levels of serum cholesterol, triglycerides, LDL in Triton-induced hyperlipidemic rats.

Diuretic effect

A study was carried out to measure the diuretic effect of an aqueous extract of C. pictus D. Don at doses of 100 and 200 mg/kg body weight and to compare it with the one induced by furosemide at 4 mg/kg. The results revealed that C. pictus induced a natriuretic effect similar to furosemide. The aqueous extract induced an increment in sodium and potassium clearance similar to the one obtained with furosemide, suggesting that it represents significant diuresis.

Putative activity

Aqueous extract of Costus stem and isolated compounds lupeol, and stigmasterol had an inhibitory effect on calcium oxalate urolithiasis, and its putative activity was confirmed by the promotion of formation of calcium oxalate dehydrate (COD) crystals and may possibly treat urinary stones by inhibiting the formation of calcium oxalate monohydrate (COM) crystals.

Ameliorative effect

A study was conducted to evaluate the ameliorative effect of ethanolic extract (50 mg/kg b.wt, orally) of rhizome on mitochondrial enzymes in alcohol-induced free radical toxicity in male albino rats. After 21 days of treatment, mitochondrial enzymes were restored to normal levels, which showed that C. pictus improved mitochondrial activities during alcohol-induced free radical stress.

4. CONCLUSION

This review supports the therapeutic potential of the leaves in diabetes. However, these results have to be further evaluated and revalidated by clinical trials. 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. Furthermore, it paves new avenues to explore the compounds responsible for these therapeutic effects, and study the mechanism of its action.

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