A SHORT REVIEW ON CHAMAECOSTUS CUSPIDATUS-ANTI DIABETIC PLANT

[1]Sakshi A. Kadak, [2]Altamash A. khan, [3]Sakshi S. Mankar, [4]Sarim Kamran, [5]Ms. Amrin Tabassum, [6]Dr. Ravi P. Kalsait

[1,2,3,4]students of pharmacy, [5]Assistant professor, [6]Principal
Central India College of Pharmacy, Lonara, Nagpur-441 111
DBATU University, Lonere, Raigad, Mumbai, Maharashtra, India.

***Abstract*- The Chamaecostus cuspidatus, often known as the insulin plant, has long been utilized as a medicine. The plant was very recently introduced to India, where south India grows it as an ornamental plant. Numerous phytochemical components, including steroids, alkaloids, flavonoids, triterpenes, glycosides, and saponins, are found in the insulin plant. Its leaves are utilized in the United States as dietary supplements. Understanding the function of insulin in a variety of physiological processes, the factors that affect its production and secretion, as well as its activities at the molecular and systemic levels, has important ramifications for the majority of chronic diseases that are currently prevalent in the westernized population.**

Treatment for type 2 diabetes "A leaf a day keeps diabetes away" is the plant's motto. a variety of pharmaceuticals.

Actions include antidiabetic impact, antiproliferative potential, antibacterial activity, anti-inflammatory, and anti urolithiatic properties.

Potential, its impact on memory and learning, its anti-inflammatory and hypolipidemic properties, antioxidant activity, and more.

The current for research purposes, this review article looks at the insulin plant's many therapeutic characteristics.

Keywords: **Insulin plant, antidiabetic activity, spiral flag.**

INTRODUCTION

CHAMAECOSTUS CUSPIDATUS [FORMALY KNOWN AS SPIRAL FLAG, INSULIN PLANT, COSTUS IGNEUS]

IT IS SPECIES OF HERBACEOUS PLANT IN COSTACEAE FAMILY

This plant is a member of the costaceae family, which Nakai initially classified as a family due to the spirally organized leaves and the absence of fragrant essential oils in the rhizome. This family has over 200 species spread across 4 genera. With 150 species, the genus Costus is the largest family.[1]

It was brought to India from America as a herbal remedy for diabetes relatively recently. [2] In South India, it is commonly planted as a decorative plant in gardens and can also be seen growing wild in many areas. [3] It is known that diabetics who use it to manage their blood sugar use one leaf per day. It is used in India for this purpose. [4] The tribal inhabitants of the Kolli hills in the Namakkal region of Tamilnadu have been known to treat diabetes efficiently with C. igneus leaves. [5] The leaves of this plant are thought to help lower blood glucose levels, and diabetics who have eaten the leaves report a decrease in blood glucose levels. This investigation was designed to assess Costus igneus hypoglycemic impact. [8]

The synonyms of this plant are

1] Costus pictus
2] Costus cuspidatus
3] Costus igneus
4] Globba cuspidatus.
5]fiery costus
6]spiral flag

Treatment for renal problems involves infusion of the aerial component of C. pictus D. Don in Mexican traditional medicine.[9][10] In many cases around the world, herbal products are utilized widely to treat disorders for which allopathic medicine is ineffective or has negative side effects.

Aside from physical reliance and tolerance, psycho neuro medications also have highly dangerous adverse effects that affect the immune, digestive, and respiratory systems, as well as impair cognitive function. The expectation behind using natural sources for treatment is that they will have less adverse effects than artificial medications.[7][9][11]

Fig 1 Chamaecostus cuspidatus plant

BIOLOGICAL SOURCE

It is species of herbaceous plant native to eastern brazil
It belongs to the family costaceae

CHEMICAL CONSTITUENTS

Cuspidatus leaves were demonstrated to be high in

- Protein
- iron
- ascorbic
- tocopherol
- carotene
- terpenoids
- steroids
- flavonoids
- phytochemical screening

MEDICINAL USES

- 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 Tamilnadu for diabetes.
- Leaves consumed as fresh, dried and powder leaf forms.
- In Mexico, infusion of aerial parts used for treatment of renal disorders.
- The leaves of the insulin plant contain corosolic acid which helps to generate insulin thereby treating diabetes.
- It has been proven to be
  - Antioxidant
  - Antimicrobial
  - Anti cancerous
  - Hypolipidemic
  - Anti inflammatory
  - Hepatoprotective
  - Antiproliferative

HISTORY

The scientists NEES and MART discovered the insulin plant initially.

Specht & Steveson observed that this taxonomic group exhibits notable physical similarities with other costus species, including appendaged green bracts and sheaths that develop beyond the stem node and frequently cover the internodes completely.
It is stated that C. cuspidatus can be found in the Atlantic rain forest. By habit, it is caulescent South West Amazonia's seasonal dry forest makes up the varied geographic distribution. The middle Atlantic woodland is home to C. cuspidatus. There is a distribution that is entirely outside of the Amazon domain.[4]

TAXONOMY

Botanical name: Costus igneus
Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Tracheophyta
Subphylum: Euphyllophytina
Infraphylum: Radiatopses
Class: Liliopsida
Subclass: Commelinidae
Superorder: Zingiberanae
Order: Zingiberales
Family: Costaceae
Subfamily: Asteroideae
Tribe: Coreopsideae
Genus: Costus
Specific epithet: Igneus

MORPHOLOGY

1. This perennial grows to a height of around two feet, spreading uprightly.
2. With parallel venation, the leaves are simple, oblong, alternating, whole, evergreen, and 4–8 inches long. This exotic evergreen forms aesthetically pleasing, arching clusters from subterranean rootstocks with its huge, smooth, dark green leaves that have light purple undersides.[17]
3. They are complete, lanceolate, and petiolate.
4. During the summer months, gorgeous 1.5-inch-diameter orange blooms are produced and appear on cone-shaped heads at the tops of branches.
5. The fruits are green, less than 0.5inches, barely noticeable/unassuming.

Fig 2: Leaves of Insulin Plants

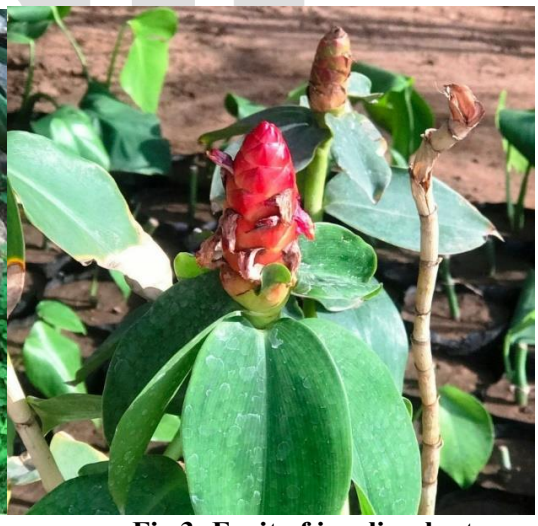

Fig 3: Fruit of insulin plant

Fig 4: Flowers of Insulin Plants

Fig 5: Rhizome of insulin plant

GROWTH AND PRAPOGATION

Spiral flags can grow in either direct sunlight or some shade. It is typically grown close to water and requires rich soil and lots of moisture. Division of the clumps, cuttings, or separation of the offsets or plantlets that grow beneath the flower heads are the methods used for propagation. Nematodes and mites can cause issues, particularly in light, sandy soil. There are no serious illnesses affecting the plant.[17]

CULTIVATION

Because it is a perennial plant. They appreciate either direct sunlight or some shade. It requires lots of moisture and healthy soil. It's usually planted close to water. sand loam is the appropriate substrate. Just temperatures above at least 1°C will do for them. They work well for planting little plants. They can grow to a height of 4 to 8 inches. This plant grows in Zone 9's temperature range. Shade to partially shaded light is needed. Clumps can be propagated by splitting them into sections, cutting or by dividing the offsets, or plantlets, that develop beneath the flower heads.

PHYTOCHEMICAL STUDY

The analysis of the chemical composition of C. igneus leaves showed that they are high in iron, protein, and antioxidants such α-tocopherol, β-carotene, terpinoids, steroids, and flavonoids.[12] [13]

Another study demonstrated that the greatest concentration of phytochemicals, including proteins, carbohydrates, triterpenoids, alkaloids, tannins, saponins, and flavonoids, was present in methanolic extract.[14]

The leaves of the insulin plant (C. pictus) contain 21.2% fibers, according to a preliminary phytochemical analysis. Following extractions yielded extractives in petroleum ether (5.2%), cyclohexane (1.06%), acetone (1.33%), and ethanol (2.95%). Steroids were present in every extract, according to an analysis of subsequent extracts. Alkaloid was also present in the ethanol extract. Other than α-tocopherol and ergastanol, a steroid, bis (2'-ethylhexyl)-1,2-benzenedicarboxylate made up the majority of the ether fraction (59.04%). A terpenoid molecule called lupeol and a steroid substance called stigmasterol were found in the stem. The steroidal sapogenin diosgenin and the bioactive component quercetin were extracted from the rhizome of C. igneus.Trace elemental study revealed that C. pictus leaves and rhizomes contain notable concentrations of K, Ca, Cr, Mn, Cu, and Zn.[17]

Clear, yellowish essential oils were obtained during steam distillation of the stems, leaves, and rhizomes of C. pictus D. Don.[7]

Table: 1

Stem oil (%)	**Leaf oil (%)**	**Rhizome oil (%)**
Hexadecanoic acid (28.3)	Hexadecanoic acid (24.51)	Hexadecanoic acid (25.26)
9,12-octadecadienoic acid (18.33)	2-pentanol (22.48)	9,12-octadecadienoic acid (7.74)
Dodecanoic acid (5.62)	Dodecanoic acid (3.96)	Dodecanoic acid (16.56)
Linalyl propionate (6.03)	Ionone (8.69)	Tetradecanoic acid (10.20)
Tetradecanoic acid (4.82)	Farnesyl acetone (7.04)	Linalool (8.48)

A-Eudesmol (3.55)	A-ionone (8.01)	Alfa-terpineol (4.44)
Eudesmol (3.21)		
4-ethoxy phenol (3.06)		

Study of essential oil yielded the following major constituents in %

PHARMACOLOGICAL ACTIVITIES

Pharmacological properties have been demonstrated for this plant, including antimicrobial, anti-cancer, anti-diabetic, and antioxidant properties.[35]

1) ANTI DIABETIC PROPERTY

prevention of diabetes Research on the anti-diabetic properties of insulin plants has been done extensively in recent years. [4],[7],[15],[16],[17],[18],[19],[20].

The results of the conducted animal experiments are tallied. In a cross-sectional clinical trial, patients who took one fresh leaf or one teaspoon of C. igneus powder per day, dried in the shade, along with other treatment methods, successfully reduced their blood sugar levels in diabetics.

A typical ornamental plant in south Indian gardens, Costus igneus has a long history of therapeutic usage. The component that has the greatest antidiabetic efficacy is the leaves.[36][37]

It lowers postprandial blood glucose levels and decreases fasting. However, the precise mode of action behind the antidiabetic effect is still unknown.[38]

In addition to its antidiabetic properties, insulin plants also lessen the consequences linked to diabetes; they include controlling renal and hepatic parameters, lowering the level of glycosylated hemoglobin, adjusting the lipid profile, raising body weight and insulin levels, and demonstrating notable enhancement in the histological analysis. [39] [40]

When GLUT4 translocation and glucose uptake activity were examined in vitro using an ethanolic extract of C. pictus leaves, however, no direct peripheral effect was observed at a dose of 300 µg/ml that was comparable to those of insulin and metformin. [43] An investigation examined the effects of a tea brewed from C. spicatus leaves on glucose homeostasis in C57BLKS/J (KS) db/db mice, a model of obesity-induced hyperglycemia with progressive beta-cell depletion. After the 10-week trial period, an intraperitoneal (IP) insulin tolerance test revealed that drinking C. spicatus tea did not change insulin sensitivity. This finding suggested that the tea prepared from C. spicatus leaves was ineffective at treating obesity-induced hyperglycemia at the prescribed dose.[44]

2) HYPOLIPIDEMIC ACTIVITY

An investigation was conducted to compare the effects of C. igneus methanolic and aqueous extracts on rats with diabetes-induced hyperlipidemia. A dose of 200 mg/kg body weight of methanolic and aqueous extracts restored the hyperlipidemia caused by diabetes, according to the study. In rats with hyperlipidemia brought on by triton, the levels of blood cholesterol, triglycerides, and LDL were dramatically reduced by an alcoholic extract of C. igneus administered at a dose of 400 mg/kg (p.o.).[41][42]

GEOGRAPHICAL SOURCES

Commonly known as spiral flag or fiery costus , Chamaecostus cuspidatus is a species of herbaceous plant in the Costaceae family that is indigenous to eastern Brazil, namely the states of Bahia and Espirito santo.[32] [33]

Because of its alleged anti-diabetic qualities, it is referred to as the insulin plant in India.[34]

MARKETED PRODUCTS

Fig 6 : markrted formulations

CONCLUSION

The review provides evidence in favor of the leaves' potential therapeutic use in diabetes. Clinical trials must, however, assess and validate these findings further. Its leaves are presently being investigated on diabetic patients for its anti-diabetic properties. Research reveals how it functions in a number of disorders, which creates new avenues for clinical study. It also opens up new possibilities for researching the substances causing these therapeutic effects and the manner in which they work.

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