



ORIGINAL RESEARCH PAPER

PHARMACOLOGY

In Vitro AntiDiabetic Activity of *Costus igneus* roots

KEY WORDS: Invitro antidiabetic, *Costus igneus*, - amylase, - glucosidase enzymes

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ABSTRACT

Objective: In vitro analysis of the anti-diabetic effect of various extracts of the medicinal plant *Costus igneus* roots.

Methods: Extracts of the plants were prepared by cold percolation. They were then tested for inhibition of α -amylase activity and α -glucosidase activity.

Results: Inhibition of amylase and glucosidase enzymes involved in digestion of carbohydrates can significantly decrease the post prandial increase of blood glucose after a mixed carbohydrate diet and therefore can be an important strategy in management of blood glucose. The hydroethanol extract of *Costus igneus* roots showed strong inhibition of α -amylase and α -glucosidase.

Conclusions: The findings indicate that all the extract of the plant possess antidiabetic properties too varying degrees. They can be used to develop natural drugs which may be used in lieu of commonly used strong allopathic drugs which possess a number of harmful side effects.

INTRODUCTION: Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Type 1 diabetes is predominantly a childhood disease and is more common in developed countries. It is also known as 'juvenile onset' diabetes. Management principally involves the injection of insulin into the body, as the cells of the pancreas cannot produce enough insulin. Type 2 diabetes on the other-hand, is a 'late onset' diabetes, and develops more commonly in people over 40 years of age. It is primarily managed through diet and exercise. Individuals with type 2 diabetes are not usually dependent on insulin injections. This is because impaired insulin secretion and cell resistance to insulin cause the condition – it is not caused by insulin shortage. Type 2 diabetes is often the result of an individual being overweight for many years. This leads to cells becoming insulin-resistant, as a result of increased levels of sugar being stored as fat and processed. Gestational diabetes mellitus (GDM) is less common than the other two forms. It is first diagnosed during pregnancy, and is primarily a temporary intolerance to carbohydrate, which returns to normal after the birth. More than 40% of women with GDM develop type 1 or type 2 diabetes in the following 10 years. As well as having a greater risk of birth defects, babies of women with GDM are more likely to develop obesity and impaired glucose intolerance and/or diabetes in later life. Diabetic women who become pregnant are not included in this category.

Several drugs such as biguanides and sulfonylureas are presently available to reduce hyperglycemia in diabetes mellitus. These drugs have side effects and thus searching for a new class of compounds is essential to overcome these problems. Management of diabetes without any side effects is still a challenge to the medical community. There is continuous search for alternative drugs. The large number of plants described in this review clearly demonstrated the importance of herbal plants in the treatment of diabetes.

Costus igneus is native to Southeast Asia, especially on the Greater Sunda Islands in Indonesia. It is a relatively new entrant to Kerala and India. The plant is characterized by large fleshy looking leaves. The undersides of these large, smooth, dark green leaves have light purple shade. The leaves are spirally arranged around the stem, forming attractive, arching clumps arising from undergroundroot.



FIG. 1. *Costus igneus*

The maximum height of these plants is about two feet. The flowers are orange in color and are beautiful, 1.5-inch diameter. Flowering occurs during the warm months. And they appear to be cone-like heads at the tips of branches. 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. The plant grows very quickly. Propagation of this plant is by stem cutting. It needs sunshine but it also grows in slightly shady areas. *Costus* does not have a problem with pests and diseases. Outdoor plants might be chewed by caterpillars, and in indoors plants might be affected by red spider mite. In Traditional Medicine it is also used to Promotes longevity, Treats rash, Reduces fever, Treats asthma, Treats bronchitis and Eliminates intestinal worms. In Ayurvedic treatment diabetes patients are advised to chew down the *Costus igneus* plants leaves for a month. The patient has to take two leaves per day in the morning and evening for one week. The leaves must be chewed well before swallowing. 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 too recommend it and it is found to be effective in bringing blood sugar levels under completely under control.

MATERIALS AND METHODS:**Plant Collection & Identification:**

Fresh Roots were collected from Maathiravedu village, Thiruvallur district. The flowers, roots and plants were authenticated by Prof. Dr.Jayaraman. Director, Plant Anatomy Research Institute, Tambaram, Chennai.

Preparation of Seed Extract:

The plant materials were air-dried at room temperature (26°C) for two weeks, after which it was ground to a uniform powder. The powdered root(100gm) was extracted three times by cold percolation method with 300 ml of Ethanol, Methanol and Acetone at room temperature for 72 hrs the filtrates were concentrated under reduced pressure at 40°C and stored in refrigerator at 2-8°C for use in subsequent experiments.

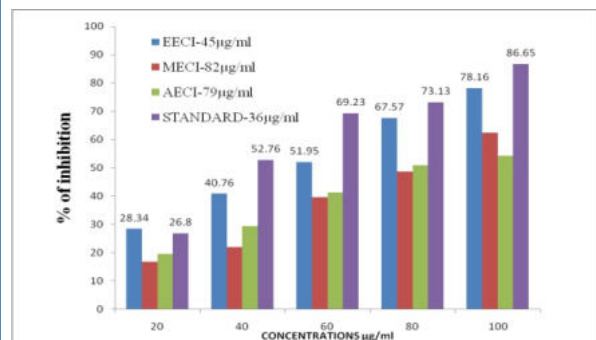
Invitro Antidiabetic Effect:

Alpha- Amylase Inhibition Assay Procedure: Alpha-amylase activity can be measured in-vitro by hydrolysis of starch in presence of α -amylase enzyme. This process was quantified by using iodine, which gives blue colour with starch. The reduced intensity of blue colour indicates the enzyme- induced hydrolysis of starch in to monosaccharides. α -Amylase was premixed with the M.pudica flower extracts at various concentrations (20-100 µg/ml) and 0.5% starch solution was added at 37°C for 5 min to start the reaction and terminated by addition of 2 ml of 3,5-dinitrosalicylic acid (Holecheck et al. 1982). The reaction mixture was heated for 15 min at 100°C and diluted with 10 ml of distilled water in an ice bath α -Amylase activity was determined by measuring spectrum at 540 nm and IC50 value was measured.

Inhibition of Alpha-Glucosidase Enzyme: The inhibitory activity was determined by incubating a solution of starch substrate (2% w/v maltose or sucrose) 1 ml with 0.2 M Tris buffer pH 8.0 and various concentration of plant extract for 5 min at 37°C. The reaction was initiated by adding 1ml of alpha-glucosidase enzyme (1U/ml) to it followed by incubation for 40 min at 35°C. Then the reaction was terminated by the addition of 2 ml of 6N HCl. Then the intensity of the colour was measured at 540nm.

RESULTS AND DISCUSSION:

There was a dosage-dependent increase in percentage inhibitory activity against alpha amylase enzyme. It showed 50% inhibition at a concentration of EECl-45µg/ml, AECl-79µg/ml, MECl-82µg/ml. **The order of α -glucosidase inhibitory activity** was Acarbose> EECl> AECl> MECl (Fig.2).



Alpha-amylase catalyses the hydrolysis of alpha-1, 4-glycosidic linkages of starch, glycogen and various oligosaccharides. Alpha-glucosidase is a glucosidase located in the brush border of the small intestine that acts upon 1, 4-alphabonds. This is in contrast to beta-glucosidase. Alpha-glucosidase breaks down starch and disaccharides to glucose. Alpha-glucosidase inhibitors are work by preventing the digestion of carbohydrates (such as starch and table sugar) by inhibition of enzyme alpha glucosidase. Carbohydrates are normally converted into simple sugars (monosaccharides), which can be absorbed through the intestine. Hence, alpha-glucosidase inhibitors reduce the impact of carbohydrates on blood sugar Alpha-glucosidase further breaks down the disaccharides to simple sugars, readily available for intestinal absorption. The inhibition of their activity in the digestive tract of humans is considered to be effective tool to control diabetes. The ethanol extracts of Costus igneus roots have exhibited potent inhibition of alpha-amylase and alpha-glucosidase enzyme activity. In addition, EECl was able to inhibit both the enzymes at lower concentration. glucosidase inhibitory activity. Further studies are required to elucidate whether Costus

igneus have antidiabetic potential by in vivo for validating the traditional claim of the plant.

CONCLUSION:

In this present study we evaluated in vitro alpha amylase and alpha glucosidase activity of crude ethanol, methanol and acetone Costus igneus extract of roots. The plant showed significant inhibition activity, so further the compound isolation, purification and characterization which is responsible for inhibiting activity, has to be done for the usage of antidiabetic agent.

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