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IN-VITRO ANTIDIABETIC ACTIVITY OF SIDDHA POLYHERBAL DRUG MARUTHAMPATTAI KUDINEER

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ABSTRACT

Diabetes mellitus is characterized by hyperglycaemia and disturbances of carbohydrate, protein and fat metabolisms, secondary to an absolute or relative lack of the hormone insulin. The number of people in the world with diabetes has increased dramatically over recent years. It is also predicted that by 2030, India, china and the United States will have the largest number of people with diabetes. Siddha is an indigenous medical system of india. It encompasses a broad range of therapies for efficiently managing *Madhumegam*, a clinical entity that correlates with diabetes mellitus. A wide range of siddha medicines has long been used with success for treating this disease and one such medicine is *Maruthampattai kudineer*. The present study was carried out to investigate the inhibitory effect of *Maruthampattai kudineer*, on alpha –amylase, which serves as major a digestive enzyme.

KEYWORDS: Siddha, Diabetes mellitus, Maruthampattai kudineer, Alpha Amylase inhibitory activity.

INTRODUCTION

Siddha system is one of the ancient traditional system of medicine in India which is formulated by siddhars. Siddhars are the persons who gained knowledge about body, mind, soul and the ways to maintain the state of purity which is necessary for achieving the positive health. They taught preventive and curative methods for the diseases under the roof of *vadham*, *vaidhiyam* and *yogam*.

WHO defines diabetes as "a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces"

According to siddha system diabetes can be correlated with *Madhumegam*. *Madhumegam* is a chronic metabolic disorder commonly known as "*Neerizhivu*" characterized by increased and frequent urination, which is sweet in odour, resulting in gradual diminition of body constitution.

India is the second most populous country in the world in the global diabetes epidemic. As per international Diabetes federation (2013), approximately 50% of Indian population (65.1 million) are affected by diabetes.

The Tamil Nadu results of the first phase INDIAB study supported by the Indian Council of Medical Research indicates there are about 42 lakhs individuals with diabetes and 30 lakhs people with pre-diabetes.

Many plants and their products have been widely prescribed and used for diabetic treatment all around the world with less known mechanistic basis of their functioning. Thus, these natural products need to be evaluated scientifically in order to verify for their anti-diabetic properties.

Maruthampattai kudineer is a polyherbal preparation mentioned in the siddha classical text Agathiayar 2000. The In-vitro & In-vivo studies of most of the individual ingredients like *Syzygium cumini*, *Strychnos potatorum*, Triphala, *Terminalia arjuna* shows potent anti-diabetic activity. The present study investigates the antidiabetic activity of *Maruthampattai kudineer* by in vitro enzyme inhibitory activity.

MATERIALS AND METHODS

Ingredients

1. Maruthampattai (*Terminalia arjuna)*
2. Navalpattai *(Syzygium cumini)*
3. Karuvellampattai *(Acacia nilotica)*
4. Athipattai *(Ficus racemosa)*
5. Avaraithol *(Cassia auriculata)*
6. Kadalalinjilpattai *(Salacia reticulata)*
7. Thetrankottai *(Strychnos potatorum)*

8. Kalipakku *(Areca catechu)*
9. Kadukkai thol *(Terminalia chebula)*
10. Nellivatral *(Phyllanthus emblica)*
11. Thandrikai thol *(Terminalia bellirica)*

Preparation of trail drug

The required raw drugs for preparation of *MARUTHAM PATTAI KUDINEER* was purchased from a well reputed country shop. The raw drugs were authenticated by the Botanist, National institute of siddha. The raw drugs were purified and ground into coarse powder.

Preparation of the extract

For the aqueous extraction 50 gm of powdered trial drug was stirred in 200 mL of distilled water. It was placed in a rotary shaker for 24 hr. Thereafter it was subjected to centrifugation at 8000 rpm for 10 min. The resultant supernatant was filtered using Whatman No. 1 filter paper. The crude extract was subsequently oven dried at a temperature of 35^{o}C to form a powdery residue. The powdered dried crude extract was dissolved in solvents for further studies.

***α-amylase* inhibition**

This study was performed by a modified starch iodine protocol. In short, plant extract or standard of different concentration (10, 20, 40, 80, 160, 320 µg/mL) was taken in pre-labeled test tubes. A volume of 20µL of α-amylase was added to each test tube and incubated for 10 min at 37 °C. After incubation 200µL of 1% starch solution was added to each test tube and the mixture was re-incubated for 1 h at 37°C. Then 200 µL of 1% iodine solution was added to each test tube and after that, 5 mL distilled water was added. Absorbance of the mixture was taken at 565 nm. Blank were undertaken under the same conditions. IC_{50} value was calculated by using regression analysis.

$$\% \ inhibition = \frac{As - Ac}{As} \times 100$$

Where **Ac** is the absorbance of the control and **As** is the absorbance of the sample.

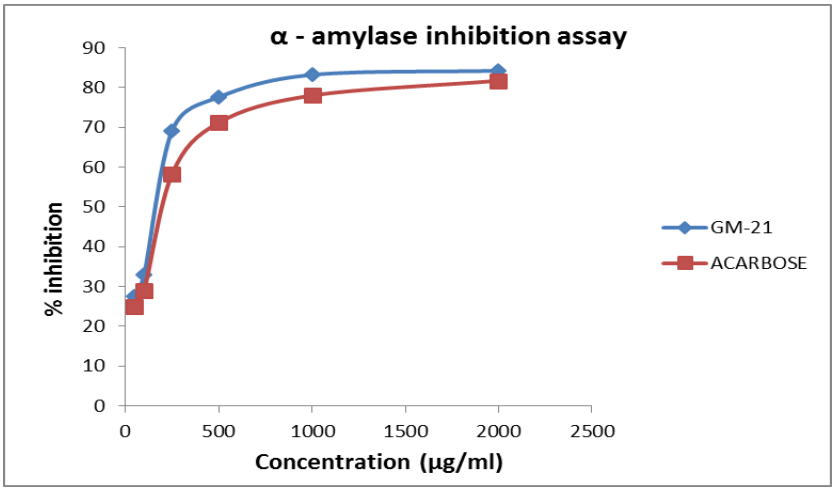
RESULTS

It was observed from the results of the present investigation that the formulation MP has shown significant inhibition of alpha amylase enzyme with the percentage inhibition ranging from 27.54 to 84.202% at the concentration of 50 µg/ml to 2000µg/ml. The finding of

inhibitory activity of *maruthampattai kudineer* is represented in the table 1. The IC50 value of *maruthampattai kudineer* (MP) was 160.017µg/ml for on α-amylase enzyme (Fig 1). The standard drug Acarbose exhibited 50% inhibition on α-amylase enzyme at 58.26 µg/ml.

Table 1: Percentage inhibition of alpha-amylase on Marutham pattai kudineer and Acarbose.

Conc. (µg/ml)	% inhibition by MP	IC50 (µg/ml)	% inhibition by Acarbose	IC50 (µg/ml)Acarb.
50	27.5147929		24.84662577	
100	32.87671233		28.98550725	
200	69.14357683	160.017	58.26235094	216.804
500	77.56410256		71.14252061	
1000	83.17307692		77.9676259	
2000	84.20373952		81.68908819	



DISCUSSION

Drugs that inhibit carbohydrate hydrolyzing enzymes have been demonstrated to decrease postprandial hyperglycemia and improve impaired glucose metabolism without promoting insulin secretion of NIDDM patients. Mainly two carbohydrate hydrolyzing enzymes (α-amylase and α-glucosidase) are responsible for postprandial hyperglycemia. α-amylase begins the process of carbohydrate digestion by hydrolysis of 1, 4-glycosidic linkages of polysaccharides (starch, glycogen) to disaccharides and α-glycosidase catalyses the disaccharides to monosaccharaides, which leads to postprandial hyperglycemia. Hence, inhibitors of α-amylase and α-glucosidase are useful in the control of hyperglycemia as they delay carbohydrate digestion, which consequently reduce the postprandial plasma glucose level.

Human pancreatic α-amylase (HPA) inhibitors offer an effective strategy to lower postprandial hyperglycemia via control of starch breakdown It was observed from the results of the present investigation that the formulation MP has shown significant inhibition of alpha amylase enzyme with the percentage inhibition ranges from 27.54 to 84.202% at the concentration of 50 µg/ml to 2000µg/ml. The corresponding IC50 was found to be 160.017µg /ml, which reveals the anti-diabetic potential of the formulation.

CONCLUSION

The ancient Indian literature reports more than 800 plants with antidiabetic properties while ethnopharmacological surveys indicate that more than 1200 plants can be used for hypoglycemic activity. The use of plant based drugs as a complementary approach in the management of diabetes mellitus is growing in developing countries. The results of this study indicated that *Maruthampattai kudineer* showed appreciable antidiabetic activity. This study strongly supports the use of Maruthampattai kudineer.

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