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Research Article

Anti-hyperglycemic activity of methanolic extract of *Salacia fruticosa* leaves in alloxan induced diabetic rats

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ABSTRACT

The aim of the present study was to evaluate the anti hyperglycemic activity of methanolic extract of leaves of *Salacia fruticosa* (Family:Hippocrataceae) in alloxan induced diabetic rats. The hyperglycemic rats were divided into different groups and were treated with methanolic extract of *S. fruticosa* at a dose of 125 & 250mg/kg. Treatment with extract produced a significant dose dependent reduction in blood glucose levels and this anti hyperglycemic activity was comparable with the reference standard, metformin. The results of the present study revealed the anti-diabetic activity of methanolic extract of leaves of *Salacia fruticosa* in alloxan induced diabetic rats.

Keywords: *Salacia fruticosa;* diabetic; antihyperglycemic; alloxan

INTRODUCTION

Diabetis mellitus is a heterogeneous metabolic disorder characterized by hyperglycemia resulting from defective insulin secretion, resistance to insulin action or both [1]. Type 2 diabetes usually occurs in obese individuals and is associated with hypertension and dyslipidemia. Thus, the treatment aims to reduce insulin resistance and to stimulate insulin secretion. Herbal medicines have been used for the treatment of diabetic patients since long and they are currently accepted as an alternative therapy for diabetic treatment [1, 2]. However, in the indigenous Indian system of medicine good number of plants was mentioned for the cure of diabetes and some of them have been experimentally evaluated and active principle were isolated [3]. WHO (1980) has also recommended the evaluation of the effective of plants in conditions where there are no safe modern drugs [4]. The ethnobotanical information reports state that about 800 plants may possess antidiabetic potential [5]. Recently the medicinal values of various plants extracts have been studied by many scientists in the field of diabetic research [6, 7]. The plant *Salacia fruticosa (Family:*Hippocrataceae) is widely distributed throughout the India. The family Hippocretacea has number of species with Medicinal and commercial value, they have been used in Ayurvedic, Siddha and Folklore for various diseases.

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EXPERIMENTAL

Extraction of plant material

The fresh leaves of *Salacia fruticosa*, were collected from Kanyakumari District of Tamil Nadu and the plant was taxonomically identified and authenticated as *Salacia fruticosa Heyne ex Lawson* by Dr. V. Chelladurai (Research Officer of Botany) Government Siddha Medical College, Palayamkottai, Tamil Nadu. The leaves were dried under shade and ground to a fine powder in a mechanical blender. The powder of the plant was initially extracted in a *Soxhlet apparatus* using methanol as a solvent for about 18hrs to get the methanol extract of *S. fruticosa* (MESF).

Phytochemical screening

The methanolic extract of *S.fruticosa* was screened for the presence of various phyto-constituents like steroids, alkaloids, terpenoinds, glycosides, flavonoids, phenolic compounds and carbohydrates [8,9].

Preparation of test samples

The test samples were suspended in 25% Tween 20 in distilled water. Metformin (0.5mg/kg) was used as reference control during the study. All the test samples were administered through oral

Table 1: Effect of methanolic extract of *Salacia fruticosa* leaves on blood glucose levels in diabetic rats (single dose study)

Groups	Dose (mg/kg)	Blood glucose levels (mg/dl)					
		0h	1h	2h	4h	8h	10h
Control	-	86.8±2.85	86.6±3.41	85.2±3.51	84.2±4.72	82.3±4.48	80.38±4.29
Diabetic Control	-	284.6± 9.24	282.4±9.79	278.2±8.69	276.7±9.57	268.9±8.37	260.5±10.55
Diabetic+Metformin	0.5	289.3±9.52	266.9±8.51*	249.8±7.95**	220.3±8.35**	149.9±7.56**	160.2±6.54**
Diabetic+Extract	125	281.5±7.52	271.7±7.14*	259.8±7.45*	239.1±7.47*	206.2±7.42**	192.6±5.84**
Diabetic+Extract	250	284.8±8.26	269.6±8.27*	255.2±8.15*	231.5±8.72**	189.6±8.68**	170.9±6.23**

*Values are mean±S.D. (n = 6); * p < 0.01; ** p < 0.001 Vs diabetic control.*

route.

Animals

Wistar albino adult male rats of either sex, weighing 200-275g were selected and housed in polypropylene cages in a room where the congenial temperature was 27°C ±1°C and 12 hrs light and dark cycles were maintained. The animals were allowed to acclimatize to the environment for 7 days and supplied with a standard pellet diet (Hindustan Lever Ltd., Bangalore) and water *ad libitum.*

Induction of diabetes

Rats of either sex weighing (200-275 g) were selected and fasted for 18 hours prior to experiment and water supplied *ad-libitum.* The rats were administered with single intraperitoneal injection of 120mg/kg body weight of alloxan monohydrate (Sigma, USA), dissolved in normal saline [10]. After 3 days, the blood samples were collected and analyzed for blood glucose levels. Rats showing serum glucose levels above 200 mg/dl were considered as hyperglycemic.

Screening for anti diabetic activity

The hyperglycemic rats were randomly divided into four groups of 6 animals each. Group I served as diabetic control and received only vehicle (2 ml/kg, *p.o*). Group II diabetic rats treated with a standard oral hypoglycemic agent, metformin (0.5mg/kg) while group III and IV diabetic rats received 125 mg/kg and 250 mg/kg, *p.o.* of methanolic extract of SF. Blood glucose level of each rat was estimated in all untreated and treated groups at 1, 2, 4, 8 and 10 h, respectively.

Collection of blood samples and estimation of glucose levels

The blood was collected from orbital plexus in heparinized tubes and serum was separated by immediate centrifugation of blood samples using remi ultra cooling centrifuge at 3000 rpm for 5 minutes at room temperature. The serum directly used for estimating serum glucose levels by GOD/POD method using Glucose estimation kit from M/s. Excel Diagnostics Pvt. Ltd., Hyderabad, India and serum glucose levels were expressed in mg/dl.

Statistical Analysis

The results were expressed as mean ± SD. Statistical analysis were carried out using paired t-test and one-way ANOVA followed by Bonferroni's test. Differences below $P<0.05$ implied statistically significance.

RESULTS

Preliminary phytochemical screening of the methanolic extract of *S. fruticosa* reveals the presence of alkaloids, carbohydrates, phytosterols, glycosides, saponins, and phenolic compounds.

The antihyperglycemic effect of methanolic extract of *S. fruticosa* in alloxan induced rats was shown in table 1. A significant reduction ($P < 0.05$) in blood glucose levels was observed at 1 hr post-administration of methanolic extract (100 mg/kg and 200 mg/kg b.w.) of *S. fruticosa* in the diabetic rats; this was further lowered after 2, 4, 8 and 10th hr of treatment. The methanolic extract showed a dose dependent reduction in blood glucose levels and this hypoglycemic effect was comparable with that of standard oral hypoglycemic agent, metformin.

DISCUSSION

Herbal medicine has been long used for the treatment of diabetic patients and continues to be currently accepted as an alternative therapy. More than 1200 plants have been described in the scientific and popular literature exhibiting antidiabetic properties. Considerably large number of hypoglycemic/antidiabetic plants and herbs are known through folklore but their introduction into modern therapy waits pharmacological testing by modern methods. The study of such medicines might offer a natural key to unlock a diabetologist's pharmacy for the future.

The present study results suggest that the methanolic extract of SF leaves exhibited significant antihyperglycemic activity in alloxan induced diabetic rats. Fasting blood glucose level in diabetic rats is an important basal parameter for monitoring diabetes [11] and it has shown that the MESF causes the antihyperglycemic effect by reducing the fasting blood glucose level (table1). The significant decrease in the levels of fasting blood glucose in diabetic rats treated with the MESF may be by stimulation of the residual pancreatic mechanism, probably by increasing peripheral utilization of glucose [12].

Alloxan causes diabetes through its ability to destroy the insulin producing beta cells of the pancreas [13, 14].In vitro Studies have shown that alloxan is selectively toxic to pancreatic beta cells, leading to the induction of cell necrosis[15,16]. The Cytotoxic action of alloxan is mediated by reactive oxygen species, with a simultaneous massive increase in cytosolic calcium concentration, leading to a rapid destruction of beta cells [17].

In conclusion, the methanolic extract of *S. fruticosa* produced significant antihyperglycemic activity in alloxan induced diabetic rats. Further studies are needed to identify the chemical constituents of the methanolic extract of *S. fruticosa* that may be responsible for anti diabetic activity.

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