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ORIGINAL ARTICLE **OPEN ACCESS**

Therapeutic potential of *Paspalum scrobiculatum linn.* in alloxan induced diabetes in albino rats

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ABSRACT

The present study was aimed to evaluate the antidiabetic potentials of the aqueous extract Paspalum scrobiculatum Linn. On alloxan induced diabetic rats as a dietary regulation for controlling diabetes and the objectives were to prepare an aqueous extract of the selected plant and to screen the in-vivo antidiabetic effect of the plant. The rats were divided into six groups: Group I- Normal control, Group II- Alloxan induced group (150 mg/kg; bw), Group III- Alloxan + Paspalum scrobiculatum Linn. (100 mg/kg;bw), Group IV- Alloxan + Paspalum scrobiculatum Linn. (200 mg/kg; bw), Group V- Plant treated (200 mg/kg; bw), Group VI- Glibenclamide (200 mg/kg; bw) respectively. After the experimental period of 45 days, the blood and the tissue samples were collected and preclinical trials were carried out. Alloxan induced disease control group (Group II) showed significant increase in plasma glucose, glycosylated haemoglobin, and serum marker enzymes viz AST, ALT and ALP. It also showed significant decrease SOD, CAT. Light microscopic studies of pancreatic tissues showed profound regeneration of beta cells of islets which proved the antidiabetic activity of Paspalum scrobiculatum Linn. extract.

***Key words**: antidiabetic potentials ,Paspalum scrobiculatum ,Linn, diabetic, alloxan, rats,SOD, pancreatic tissues,beta cells.*

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INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by carbohydrate, protein and lipid metabolism by complication like retinopathy, micro angiopathy and neuropathy. It is also associated with an increased risk for developing premature atherosclerosis due to independent risk factors such as hypertension hyperglyceridemia. It is also characterized by polyuria, albuminuria, renal enlargement and an increase in serum creatinin value. Currently available synthetic antidiabetic agents produce. Serious side effects like hypoglycemic coma and hepatorenal disturbances moreover they are not safe for use during pregnancy. Hence the search for safer and more effective hypoglycemic agent has continued following the WHO's recommendation for search on the beneficial uses of medicinal plants in the treatment of diabetes mellitus, investigations on hypoglycemic agents derived from medicinal plants have also gained momentum[1]. Several investigations have been conducted and many plants have shown a positive actively 1. Through the active principles have been isolated from some plants, some still remain to be identified.

Paspalum scrobiculatum Linn. has been chosen for the present study to evaluate the antidiabetic activity in alloxan induced diabetic albino rats. There is scientific evidence to support the antidiabetic effect of *Paspalum scrobiculatum* Linn.. The objective of this study was to ascertain the scientific basis for the use of this plant in the management of diabetes using alloxan induced diabetic rats.

MATERIALS AND METHODS

Plant source selected for the present study was *Paspalum scrobiculatum* Linn**.**. Aerial parts of the selected plant were collected from in and around Trichy, identified with the help of Flora of Presidency of Madras and authenticated with the specimen deposited at RAPINAT Herbarium, Department of Botany, St. Joseph's college, Trichy.

DETERMINATION OF EXTRACTION VALUE

A known quantity of the air dried, crushed drug was transferred to an extraction thimble and extracted with various solvents in the order of increasing polarity by using glass wares (conical flask and beaker). The extract was filtered into a beaker and evaporated off the solvent on a water bath[2].
The residue was dried at 105^{o} C to constant weight of hexane, chloroform, ethyl acetate, alcohol and water. The percentages of extractive values for various solvents were calculated with reference to the air-dried drug.

PREPARATION OF PLANT EXTRACTS

The plant materials were shade dried and coarsely powdered with electrical blender. 200 mg of *Paspalum scrobiculatum* Linn. was mixed with 1200 ml of water. Then it was boiled until it was reduced to one third and filtered. The filterate was evaporated to dryness. Paste form of the extract obtained was subjected to pre-clinical screening.

EXPERIMENTAL ANIMALS

Healthy adult wistar strain of albino rats of both sexes, two to three months old and weighing 150g-200g were obtained from Tamilnadu Veterinary and Animal Sciences University, Chennai. The animals were allowed to acclimatize to laboratory conditions for a period of 10 days prior to the experiment[3]. Animals were housed in standard polypropylene cages. Six animals were housed per cage, so as to provide them with sufficient space, and to avoid unnecessary morbidity and mortality. Animals were maintained under standard condition of 12-hours light/ dark cycle and at an ambient temperature at 23 ± 2°C, with 65 ± 5 % humidity. Animals were fed with standard rat chow pellet obtained from Sai Durga Foods and Feeds, Bangalore, India and water *ad libitum[4]*. All the studies were conducted according to the ethical guidelines of CPCSEA after obtaining necessary clearance from the committee (Approval No: 790/03/ac/CPCSEA).

EXPERIMENTAL DESIGN

Animals were divided into six groups of six rats (both sex) each. The experimental design given below has been followed for the present study.

Group I : Normal control - Saline

GroupII : Disease control received intraperitoneal injection of alloxan (150mg/kgbw) as a single dose.

Group III : Alloxan induced diabetic rats treated with aqueous extract of ***Paspalum scrobiculatum*Linn.** 100mg/kg body weight for 45 days

Group IV : Alloxan induced diabetic rats treated with aqueous extract of ***Paspalum scrobiculatum*Linn.** 200mg/kg bodyweight for 45 days

Group V : Alloxan induced diabetic rats treated with Glibenclamide 200mg/kg bodyweight for 45 days

GroupVI : Normal rats received aqueous extract of the ***Paspalum scrobiculatum* Linn.**200 mg/kg body weight for 45 days

After the experimental period animals were sacrificed by cervical decapitation. Blood was collected and serum was separated by centrifuging at 3000 rpm for 10 minutes. Liver and pancreas were dissected out and washed in ice-cold saline[5]. Liver tissues were homogenized in 0.1M phosphate buffer, pH 7.4 and used for studying various parameters. Pancreas were used for histopathological studies.

INDUCTION OF DIABETES IN RATS

Diabetes mellitus was induced in normoglycemic albino rats, starved for 16 hours. 150mg /kg body weight of alloxan monohydrate[6]was dissolved in physiological saline and injected intraperitoneally. This dose of alloxan produced persistent hyperglycemia after 4 days as revealed by determination of urine sugar level by Benedict's test[7]. The diabetes induced rats were chosen and grouped for further studies.

BIOCHEMICAL PARAMETERS

After the 30th treatment, blood was collected from the wistar rats of overnight- fasted rats. Glucose was estimated in blood plasma by Folin-Wu method. The hepatic marker enzymes such as ALT, AST and ALP activities were assayed using King method[8]. The sample was separated using centrifugation (serum) and homogenization (tissue) lipid profile such as HDL, TG, CHO, FFA, Phospholipids and total protein levels were determined. The glycogen content in the liver was estimated by Morales method[9]. Enzymatic and non enzymatic antioxidant were SOD in the liver was estimated by misra and Fridovich method[10], liver catalase was estimated by the method described sinha, Reduced glutathione in the liver was estimated by Beutler method, glutathione reductase in the liver estimated by Carlberg method and glutathione peroxidase was estimated by Rotruck method[11]. LPO in the liver was estimated by Ohkawa method[12].Glucose-6-phosphatase was estimated by Fiske and subbarow method, Glucokinase was estimated by Brandstrup method and protein (serum/tissue) the method of lowry's [13].

STATISTICAL ANALYSIS

All the results were expressed as mean ± S.E. The data were statistically analyzed by one –way analysis of variance (ANOVA) and P values <0.01 were considered as significant.

RESULT AND DISCUSSION

The study was undertaken to evaluate the antidiabetic activity of *Paspalum scrobiculatum* Linn[14-15]. in alloxan induced diabetic rats. The currently available drug regimens for management of diabetes mellitus have certain draw backs and therefore there is a need find safer and more effective antidiabetic drugs.

Table 1 Estimation of Plasma Glucose

Units	Group I	Group II	Group III	Group IV	Group V	Group VI
mg/dl	86.3±1.01	248.21±0.66*	140±0.71	118.19±0.17	85.6±0.16**	91.74±0.62#

Values are mean ± S.E.M. (n=6)

*p<0.05 Statistically significant when compared with normal control.

**p<0.05 Statistically significant when compared with alloxan treated group.

#p<0.05 Statistically non-significant when compared with normal control.

Table-1 clearly indicate a significant increase in the blood glucose level in alloxan induced diabetic rats. The animals treated with the plant extract (Groups III and IV) showed a decrease in the plasma glucose level, which was comparable to the glibenclamide (Group V) treated groups[16]. The group VI animals did not show any marked variation in the blood glucose level. The results indicated the hypoglycemic activity of *Paspalum scrobiculatum* Linn. extract.

Table 2 Estimation Of Fasting Glycosylated Haemoglobin

Units	Group I	Group II	Group III	Group IV	Group V	Group VI
%	4.9±0.21	3.8±1.12*	3.75±0.28**	7.24±1.12	5.30±0.27	3.79±0.21#

Values are mean ± S.E.M. (n=6)

*p<0.05 Statistically significant when compared with normal control.

**p<0.05 Statistically significant when compared with alloxan treated group.

#p<0.05 Statistically significant when compared with normal control.

Table-2 depicted a significant increase in glycosylated haemoglobin in alloxan induced diabetic rats was compared with normal control group. Aqueous extract of *Paspalum scrobiculatum* Linn. group (III and IV) showed a profound decrease in glucokinase level. The effect of test drug was also compared to that of standard drug, glibenclamide. The plant treated group VI show slight variation, which was shown in table-2

Table 3 Assay of Sreum Narker Enzymes

Parameters	Group I	Group II	Group III	Group IV	Group V	Group VI
AST	7.12±0.28	94.34±2.41*	39.84±1.01	7.11±0.99**	8.09±0.22	8.1±0.81#
ALT	12±0.29	109.91±1.82*	46.61±0.22	14.71±0.73	12.3±0.21**	13.1±0.31#
ALP	9.94±0.96	83.59±0.87*	43.65±1.01	11.46±0.86	9.98±0.62**	10.77±0.59#

UNITS: U/L

Values are mean± S.E.M. (n=6)

*p<0.05 Statistically significant when compared with normal control.

**p<0.05 Statistically significant when compared with alloxan treated group.

#p<0.05 Statistically non-significant when compared with normal control.

The serum AST, ALT and ALP levels were represented in table-3respectively. The alloxan induced diabetic rats were treated with aqueous extract of *Paspalum scrobiculatum* Linn. groups (III and IV) and glibenclamide (group-VI), a significant (p<0.05) reduction in the elevated levels of AST, ALT and ALP were observed. *Paspalum scrobiculatum* Linn. lowered the serum enzyme levels, which show the protective effect and normal functioning of liver in reversing the organ damage due to diabetes.

Table 4 Assay Of Antioxidant Enzymes

Parameters	Group I	Group II	Group III	Group IV	Group V	Group VI
SOD	2.77±0.11	0.83±0.14*	1.58±1.09	2.24±0.16	2.60±0.24**	2.63±0.43#
CAT	68.24±0.68	46.21±1.17*	51.75±0.63**	59.92±0.51	65.13±1.01	59.80±1.02#

Units: CAT, GR, Gpx=U/g of tissue, SOD=mm epinephrine oxidised/ml/min/mg/ptn

Values are mean ± S.E.M. (n=6)

*p<0.05 Statistically significant when compared with normal control.

**p<0.05 Statistically significant when compared with alloxan treated group.

#p<0.05 Statistically non-significant when compared with normal control.

The aqueous extract of *Paspalum scrobiculatum* Linn. groups (III and IV) showed a profound increase

activity in SOD, CAT, glutathione peroxidase and gluatathione reductase (table-4) level when compared to disease control (group II) .The effect of test drug was also compared to that of standard drug, glibenclamide.

CONCLUSIONS

In conclusion, the present experimental findings of both biochemical, enzymatic and non enzymatic and histopathological studies suggested that *Paspalum scrobiculatum* Linn. is a promising anti diabetic activity in the management of diabetes in the dose dependent manner of therapeutic range. Thus, it is a evidence that *Paspalum scrobiculatum* Linn. Was found to be an anti diabetic agent.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

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