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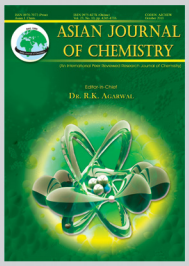

Antidiabetic Effect of the Roots of *Streblus asper* in Alloxan-induced Diabetes Mellitus

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The extract of the roots of *Streblus asper* Lour. (Family-Moraceae) was tested for antidiabetic activity by glucose tolerance test in normal mice and alloxan induced diabetic mice. Petroleum ether extract had shown significant protection and lowered the blood glucose levels to normal in glucose tolerance test. In alloxan induced diabetic mice the maximum reduction in blood glucose was observed after 4 h at dose level of 250 mg/kg of body weight. The percentage protection by petroleum ether extracts 30 and 48 % respectively. In long term treatment (sub acute study) of alloxan induced diabetic mice, the degree of protection was determined by measuring blood glucose levels on 0, 1, 7, 14, 21 and 28 th day. The extract showed a significant antidiabetic activity comparable with that of glibenclamide. The results indicate that the *Streblus asper* root possess significant antidiabetic activity.

Key Words: Antidiabetic activity, *Streblus asper*, Alloxan, Glibenclamide and Diabetic mice.

INTRODUCTION

Diabetes mellitus is a serious, complex chronic condition that is a major source of ill health all over the world[1]. In traditional practice medicinal plants are used in many countries to control diabetes mellitus. Herbal drugs are gaining popularity in the treatment of diabetic mellitus[2]. The major advantages of herbal medicine seem to be their efficacy, low incidence of side effects.

Streblus asper, popularly known as Shakhotaka belonging to the family Moraceae, growing wild throughout in drier parts of South India and Odisha. Its root bark is traditionally used as antipyretic, antidysentric, analgesic and sedative properties. Extract of *Streblus asper* is reported to possess several pharmacological activities that include anticancer activity[3], antifilarial effect[4], antimalarial[5] and antimicrobial activity[6]. Echitamine, an indole alkaloid extracted from the bark was found to exhibit anticancer activity.

Screening plants with ethno medical uses is believed to increase the odds in discovering new medicines. The roots of *Streblus asper* Lour., are considered to be used in diabetes by the tribes of Odisha, India. Based on the above perspective, an effort was made to ascertain the possible role of *Streblus asper* Lour., in alloxan-induced diabetes mellitus.

EXPERIMENTAL

Plant material and extraction procedure: *Streblus asper* were collected in the month of November, from the SimLipal biosphere in the district of Mayurbhanj, Odisha, India. The collected plant was authenticated at Botanical survey of India, Central National Herbarium, Botanical garden, Kolkata, India, vide letter no CNH/1-1/(231)/2008/Tech. II/261.

The roots was dried under shade and powdered to coarse particles. The powdered material (2 kg) was defatted with petroleum ether (60-80 ºC) and successively extracted with chloroform and methanol in a Soxhlet apparatus. The percentage yields of the petroleum ether, chloroform and ethanol extracts were found to be 1.31, 0.81 and 6.09 %, respectively. Petroleum ether extract of *Streblus asper* was selected for the present study.

Animals: Male Swiss albino mice weighing 20 ± 2 g were used for the present investigation. They were housed in clean polypropylene cages and were fed with standard pellet diet (Hindustan Lever, Kolkata, India) and water *ad libitum*. The animals were acclimatized to laboratory condition for 1 week before proceeding of the experiment.

Test drug and chemicals: Alloxan, glibenclamide (Prudence Pharma Chem, India), were used. Other chemicals and reagents used for the study were of analytical grade.

TABLE-1
EFFECT OF PET. ETHER ROOTS EXTRACT OF *STREBLUS ASPER* ON SERUM GLUCOSE LEVEL IN ALLOXAN INDUCED DIABETIC MICE (ACUTE STUDY)

Drug	0 h (mg/dl)	2 h (mg/dl)	4 h (mg/dl)	6 h (mg/dl)	8 h (mg/dl)	24 h (mg/dl)
Control	203.5 ± 1.378	190.0 ± 2.449	181.0 ± 1.414	175.8 ± 3.189	194.5 ± 1.378	227.2 ± 1.472
Standard (Glibenclamide)	209.3 ± 2.160*	179.5 ± 1.871*	192.0 ± 1.414*	227.2 ± 1.472*	181.7 ± 1.862*	211.2 ± 1.472*
Test-1 (100 mg/kg)	223.0 ± 1.414*	210.2 ± 2.317*	193.7 ± 1.633*	218.2 ± 1.472*	210.8 ± 1.472*	205.8 ± 1.472
Test-2 (250 mg/kg)	240.0 ± 1.414*	200.3 ± 1.633*	181.2 ± 2.137	192.8 ± 1.722*	190.8 ± 1.169*	181.2 ± 1.722*
Test-3 (500 mg/kg)	211.0 ± 2.366*	204.3 ± 2.160*	213.8 ± 1.472*	203.7 ± 1.033*	201.2 ± 1.472*	198.7 ± 1.211*
Test-4 (750 mg/kg)	250.8 ± 2.2*	234.7 ± 1.506*	199.8 ± 1.472**	192.5 ± 1.378*	220.3 ± 2.503*	218.0 ± 1.789*

Values are mean ± SD (n = 6), *P < 0.01 considered significant in comparison with control

TABLE-2
EFFECT OF PET. ETHER ROOTS EXTRACT OF *STREBLUS ASPER* ON SERUM GLUCOSE LEVEL IN ALLOXAN INDUCED DIABETIC MICE (SUBACUTE STUDY)

Drug	Day 0 (mg/dl)	Day1 (mg/dl)	Day 7 (mg/dl)	Day 14 (mg/dl)	Day 21 (mg/dl)	Day 28 (mg/dl)
Control	202.5 ± 1.871	228.8 ± 1.472	271.0 ± 1.414	278.8 ± 1.472	292.2 ± 1.472	298.2 ± 1.472
Standard (Glibenclamide)	207.7 ± 1.211*	212.5 ± 1.871*	163.5 ± 1.871*	138.0 ± 1.414*	120.5 ± 1.871*	111.2 ± 1.472*
Test-1 (100mg/kg)	223.5 ± 1.871*	227.3 ± 1.633	213.3 ± 2.160*	238.0 ± 1.414*	194.3 ± 1.633*	188.8 ± 1.472*
Test-2 (250mg/kg)	238.5 ± 1.049*	181.5 ± 1.871*	172.8 ± 1.722*	174.7 ± 1.751*	155.0 ± 2.828*	130.2 ± 1.169*
Test-3 (500mg/kg)	211.8 ± 1.472*	219.5 ± 1.871*	193.7 ± 1.211*	202.3 ± 1.633*	177.5 ± 1.871*	155.8 ± 1.472*
Test-4 (750mg/kg)	252.0 ± 1.414*	233.3 ± 2.160*	222.5 ± 1.871*	220.5 ± 1.871*	182.5 ± 1.871*	170.8 ± 1.472*

Values are mean ± SD (n = 6), *P < 0.01 considered significant in comparison with control group

Acute toxicity test: Acute toxicity study was performed for the extract according to the acute toxic classic method as per the method of Litchfield and Wilcoxon[7]. The animals were divided into six groups containing 10 animals each. Petroleum ether extract suspension was administrated orally in increasing dose up to 1500 mg/kg, body wt. These animals were observed for mortality and toxicity for 72 h.

Drug administration: Petroleum ether extract of root of *Streblus asper* was dissolved in normal saline and administered orally through orogastric tube at the following doses of 100, 250, 500 and 750 mg/kg body wt.

Experimental induction of diabetes in mice: Diabetes was induced in Swiss Albino mice of either sex by a single intraperitoneal injection of alloxan monohydrate (150 mg/kg body wt.) by the method described by Kameswara Rao *et al.*[8]. After 8 days of administration the animals whose glucose levels are above 200 mg/mL are selected for further study.

Experimental design: The method described by Dunn *et al.*[9] was adopted. The diabetic mice were fasted overnight and divide into six groups each having six mice.

Group-I-Vehicle (distilled water, 10 mL/kg body wt); Group-II-Glibenclamide (5 mg/kg body wt); Group-III-*Streblus asper* extract (100 mg/kg body wt); Group-IV-*Streblus asper* extract (250 mg/kg body wt); Group-V-*Streblus asper* extract (500 mg/kg body wt); Group-VI-*Streblus asper* extract (750 mg/kg body wt).

For Acute antihyperglycaemic study, blood samples are collected at 0, 2, 4, 6, 8 and 24 h, after administration of vehicle, glibenclamide and petroleum ether extract extract of *Streblus asper*.

Subacute study involved administration of vehicle, glibenclamide and petroleum ether extract of *Streblus asper*. At different concentrations the blood glucose levels were estimated on 1, 7, 14, 21 and 28th day. Mean change in blood glucose levels were calculated.

Statistical analysis: The results are expressed as mean ± SD. Comparison between the groups with control was made by one way analysis of variance (ANOVA), followed by Dunnett's test. The values of $P < 0.01$ and $P < 0.05$ were considered as statistically significant.

RESULTS AND DISCUSSION

Acute toxicity study: In the acute toxicity assay it was found that no mortality was observed up to doses 1500 mg/kg, orally and were considered as safe and no lethality or any toxic reaction were found up to the end of the study period.

Effect of chloroform extract roots of *Streblus asper* on serum glucose level in alloxan-induced diabetic mice: Administration of petroleum ether extract roots of *Streblus asper* (100, 250, 500,750 mg/kg p.o.) in diabetic Swiss Albino mice showed reduction in serum glucose level after 2, 4, 6, 8 and 24 h interval. Maximum reduction in serum glucose level was seen at dose of (100, 250, 500, 750 mg/kg p.o.) from 223.0 ± 1.414 to 205.8 ± 1.472 mg/dl, 240.0 ± 1.414 to 181.2 ± 1.722 mg/dl, 211.0 ± 2.366 to 198.7 ± 1.211 and 250.8 ± 2.2 to 218.0 ± 1.789 mg/dl respectively, after 4 h. Glibenclamide (100 mg/kg p.o.) showed maximum reduction from 209.3 ± 2.160 to 192.0 ± 1.414 mg/dl after 4 h as shown in Table-1.

On repeated administration subacute treatment of glibenclamide and petroleum ether extract extract of *Streblus asper* for 28 days, a significant ($p < 0.01$) decrease in serum level of glucose of the diabetic mice were seen at a dose of (100, 250, 500 and 750 mg/kg p.o.) in dose dependent manner as compared with vehicle treatment group as shown in Table-2. On the other hand, glibenclamide showed a significant ($p < 0.01$) decrease in serum glucose level at a dose of (10 mg/kg p.o.) as compared with vehicle treated group.

Conclusion

The results of the current study showed that the extracts of the roots of *Streblus asper* has antihyperglycemic activity as it lowers serum glucose level in diabetic mice. As a result, it may be concluded that the *Streblus asper* extracts were more

useful effective in comparison with glibenclamide in attenuating the increased serum glucose level resulting from damage of alloxan-induced diabetic rats and that the triterpenoids containing extract treatment may be of use as an antidiabetic supplements. Further research regarding the isolation of active constituents responsible for such activity is under progress. Overall, our report from the present analysis should be ground data for undertaking further study and it is useful information for investigating new plant materials for food additives and human health.

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