

EVALUATION OF THE EXTRACTS OF *LEUCAS ASPERA* ON BIOCHEMICAL PROFILES IN EXPERIMENTAL MODEL OF DIABETES MELLITUS (TYPE-I) IN RATS

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ABSTRACT

The study was conducted to evaluate the effect of *Leucas aspera* leaves on experimental diabetes mellitus (type I) in rats in terms of alterations in biochemical profiles. Thirty rats were randomly divided into six groups of 5 rats in each. Group-I were fed on basal diet without any treatment, group-II induced diabetic models (type-I) (Alloxan monohydrate dissolved in sterile normal saline (150 mg/kgBW, ip)), group-III, IV, V and VI were induced diabetics and treated with extract of *Leucas aspera* (30,100,150 and 300mg/kg BW respectively, PO) twice daily in the morning and evening post prandially for thirty days respectively. The blood samples were collected on day 0, 10, 20 and 30 and were used for the analysis of biochemical profiles.

The blood glucose (mg%) were consistently increased significantly ($P<0.01$) in groups II,III, IV V and VI till day 20 while in groups V and VI there was a significant ($P<0.01$) decline in the values on day 30. There was found to have profound effect in lowering the blood glucose levels in dose dependent manner. The study revealed that experimental diabetes mellitus (type-I) induced patho-biochemical changes were ameliorated more effectively by ethanolic extract of *Leucas aspera* in dose dependent manner.

KEYWORDS: *Leucas aspera*, Diabetes mellitus, antidiabetic activity, wistar rats

INTRODUCTION

Diabetes mellitus is the most common disease associated with deranged carbohydrate metabolism, affecting about 200 million people worldwide¹. Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion or insulin action². Insulin therapy and oral hypoglycemic agents offer effective glycemic control, but, Insulin therapy has shortcomings such as ineffectiveness on oral administration, short shelf life, and requirement of constant refrigeration and, in the event of excess dosage fatal hypoglycemia limit its usage³. Due to the ineffectiveness of insulin through oral route in the treatment of diabetes, search was made for compounds, which would prove effective if taken orally; the oral hypoglycemic agents that are capable of reducing blood sugar level belong to two chemical classes, sulfonylureas and biguanides⁴. The use of oral drugs is limited due to adverse side effects including hematological, cutaneous and gastrointestinal reactions, hypoglycemic coma and disturbances of liver and kidney functions; in addition, they are not suitable for use during

pregnancy⁵. Plants are reputed in the indigenous systems of medicine for their hypoglycemic activities, the available literature shows that there are more than 800 plant species showing hypoglycemic activity⁶. The world Health organization has also recommended the evaluation of the effectiveness of plants in conditions where we lack safe modern drugs. Studies have shown that phytochemical isolated from plant sources have been used for the prevention and treatment of cancer, heart disease, diabetes mellitus, and high blood pressure⁷. Extracts of various plant materials with a potential of decreasing the blood sugar have been tested in experimental animal models and their effects confirmed⁸. Many unknown and lesser known plants are used in folk and tribal medicinal practices in India. The medicinal values of these plants are not much known to the scientific world.

In the recent past, the scientific revalidation of medicinal herbs is being conducted across the globe at a rapid rate. Certain of the plant principles have been reported to possess insulin-like effects. *Leucas aspera* is one such herb that has been reported to reduce the metabolic effects of sugar and hence it is being used in traditional

medicine, though the exact mechanisms of anti-diabetic actions are not yet completely understood. Keeping the above facts in view, an insulin dependant diabetes (IDDM) model was created in rats by alloxan administration and the effect of the extracts of *Leucas aspera* (ethanolic and aqueous) leaves was evaluated against this model in terms of histo-pathological examination to address the possibility of pancreatic regeneration or insulin like action of the herb.

MATERIALS AND METHODS

Experimental Design

A total of 30 male albino rats were procured for the study. Twenty rats having similar body weights were randomly divided into six groups consisting of 5 rats in each group. The rats were fed with normal basal diet for 10 days and water was provided ad libitum in order to acclimatize the rats to laboratory conditions.

Preparation of extracts

The fine powdered leaves of *Leucas aspera* were weighed 5g each and thimbles were prepared using a thimble paper and the weighed amount of leaves were kept inside the thimble and the mouth of the thimble was closed by a non-absorbent cotton. Six such thimbles were prepared. The prepared thimbles were then kept in the extraction funnels of soxhlet's apparatus (one thimble in each extraction funnel). Then the funnels were with absolute ethanol (150 ml in each) and then running the soxhlet's apparatus at 68° C continuously for 16 hours did extraction process. The temperature selected was based on the boiling point of ethanol.

Experimental induction of diabetes mellitus in rats

Male albino rats weighing about 120 – 140 g were used in this study. The rats were injected with alloxan monohydrate dissolved in sterile normal saline in a dose of 150 mg/ kg body weight, intraperitoneally. Since, alloxan is capable of producing total hypoglycemia as a result of massive pancreatic insulin release, rats were treated with 20% glucose solution (15 – 20 ml) intraperitoneally after 6th hour. The rats were then kept for the next 24 hours on 5% glucose solution bottles in their cages to prevent hypoglycemia⁹.

Group 1. Normal Control: Rats of this group were fed on basal diet without any treatment.

Group 2. Diabetic control: Rats of this group were induced diabetic models and were served as diabetic controls through out the experiment with out therapy.

Group 3. Diabetic models of rats treated with extract of *Leucas aspera* (30mg/kg, P.O)

Group 4. Diabetic models of rats treated with extract of *Leucas aspera* (100mg/kg, P.O)

Group 5. Diabetic models of rats treated with extract of *Leucas aspera* (150mg/kg, P.O)

Group 6. Diabetic models of rats treated with extract of *Leucas aspera* (300mg/kg, P.O)

After 72 hours, rats survived with moderate diabetes having hyperglycemia with blood glucose range of 250 – 300 mg / 100 ml were used for the experiment.

Drug administration

Rats of the treatment groups were administered with the drug at a dose rate mentioned above. All the doses were selected based on the preliminary work. The drug was given to all the groups 2 times morning and evening post prandially by oral route.

Statistical analysis

All the values of fasting blood sugar were expressed as mean \pm standard error mean (SEM) and analyzed using one way ANOVA.

RESULTS AND DISCUSSION

The blood glucose (mg%) were consistently increased significantly ($P < 0.01$) in groups II, III, IV V and VI till day 20 while in groups V and VI there was a significant ($P < 0.01$) decline in the values on day 30. There was found to have profound effect in lowering the blood glucose levels in dose dependent manner. The probable mechanism of action of the drug (extract of *Leucas Aspera*) could be the triggering or potentiation of the lipolysis in adipose tissue, subsequently resulting in elevated levels of free fatty acids which were utilized by the liver in the production of triacylglycerol, which in turn leads to formation of VLDL and LDL. However, the rate by which all these actions occur is probably slow. In addition to these, the drug probably limits the rate of secretion of triglyceride-rich VLDL from liver¹⁰. As shown in Table 1, a significant increase in blood glucose were observed in diabetic control rats when compared to normal control rats ($P < 0.05$). Administration of Ethanolic extract of *Leucas aspera* to diabetic rats significantly decreased the levels of blood glucose to near normal control levels.

CONCLUSION

The results of this investigation indicate that the Ethanolic extract of *Leucas aspera* have hypoglycemic effect on alloxan-induced diabetic rats, one possible mechanism of action is due to insulin secretion and improvement of glycogenesis process.

REFERENCES

1. Nickavara B, Mosazadeha G. Influence of Three Morus Species Extracts on α -Amylase Activity. Iran J Pharm Res 2009; 8:115-9.
2. Schoenfelder T, Cirimbelli TM, Citadini-Zanette V. Acute effect of *Trema micrantha* on serum glucose levels in normal and diabetic rats. J Ethnopharmacol. 2006; 107: 456-459.
3. Anuradha K, Hota D, Pandhi P. Investigation of central mechanism of insulin-induced hypoglycemic convulsions in mice. Indian J Exp Biol. 2004; 42: 368-372.
4. Trejo-Gonzalez A, Gabriel-Ortiz G, Puebla-Perez AM, Huizar-Contreras MD, Mungui-Mazariegos MR, Mella- Arreguin S, Calva

E. A purified extract from prickly pear cactus (*Opuntia fulginosa*) controls experimentally induced diabetes in rats. *J Ethnopharmacol.* 1996; 55: 27-33.

5. Alarcon-Aguilara FJ, Jimenez-Estrada M, Reyes-Chilpa R, Roman-Ramos R. Hypoglycemic effects of extracts and fractions from *Psacalium decompositum* in healthy and alloxan diabetic mice. *J Ethnopharmacol.* 2000; 72: 21-27.

6. Rajagopal K, Sasikala K. Antihyperglycaemic and antihyperlipidaemic effects of *Nymphaea stellata* in alloxan-induced diabetic rats. *Singapore Med J.* 2008; 49: 137-141.

7. Waltner-Law ME, Wang XL, Law BK. Epigallocatechin gallate, a constituent of green tea, represses hepatic glucose production. *J Biol Chem.* 2002; 277: 34933-34940. University Press, Ames, USA.

8. Bopanna KN, Rathod SP. Antidiabetic and antihyperlipaemic effects of neem seed kernel powder on alloxan diabetic rabbits. *Indian J Pharmacol.* 1997; 29:162-7.

9. Gupta N P, Solis N G, Avella M E, Sanchez E. Hypoglycaemic activity of *Neuroleena lobata*. *Journal of Ethnopharmacology.* 1984; 10: 323-327.

10. Shanmugasundaram E R B, Gopinath K L, Shanmugasundaram K R and Rajendran V M. Possible regeneration of the islets of Langerhans in streptozotocin diabetic rats given *Leucas aspera* leaf extracts. *Journal of Ethnopharmacology.* 1990; 30: 265-279.

Table 1: Changes in blood glucose in control and alloxan diabetic rats treated with *L.Aspere* bark extract and glibenclamide

Time in hr	Group-I	Group-II	Group-III	Group-IV	Group-V	Group-VI
0	110	116	0	0	0	0
2	92	94	15.24±2.53	11.31±1.84	8.38±0.95	8.66±0.84
4	88.5	97	17.48±0.90	22.97±2.26	16.23±1.48	21.36±3.16
8	96	100	18.70±5.45	27.80±0.97	30.84±1.37	37.66±2.09
12	104	97	12.60±3.58	20.72±4.36	16.03±2.69	30.52±2.21
20	116	102	6.73±6.10	5.73±0.69	3.23±2.13	20.39±2.40
24	124	117	7.46±3.48	1.88±1.39	5.18±0.69	2.70±2.32