International Journal of Current Research in Applied Chemistry & Chemical Engineering
Vol. 2, Issue 1- 2018

ACTIVITY OF *TERMINALIA SERICEA* BARK METHANOLIC EXTRACT AGAINST DIABETIC IN ALLOXAN INDUCED DIABETIC ALBINO RATS

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ABSTRACT

In normal and alloxan induced diabetic rats the antidiabetic activity of bark methanolic extract of *Terminalia sericea* was investigated. The present study of animals was divided in to normal control, diabetic control, diabetic treated and control treated group. The effects of oral supplement of *T. sericea* (100 mg/kg and 200 mg/kg) for 30 days on the level of blood glucose, total cholesterol, total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), very low density lipoprotein (VLDL), high density lipoprotein (HDL), histological studies and statistical analysis in normal and alloxan-induced diabetic rats were calculated. Comparing the values of *T. sericea* bark methanolic extract treated group with the control diabetic group, the result found that the bark methanolic extract of *T. sericea* significantly decreased the elevated blood glucose level, cholesterol, triglycerides, phospholipids, LDL, VLDL and it showed a significant increase in liver HDL level. These results indicated that bark methanolic extract of *T. sericea* possesses anti-diabetic effect in diabetic rats.

KEYWORDS: *T. Sericea*, Anti-Diabetic, Alloxan, Blood Glucose, Lipid Profile.

INTRODUCTION

Diabetes mellitus is an endocrine disorder more than 100 million people worldwide affected [1]. It is a heterogeneous metabolic disorder characterized by altered carbohydrate, lipid and protein metabolism [13]. It is a common endocrine disorder occur increased food and water intake [14]. Diabetes mellitus is a major public health problem in the developed as well as developing countries. It is ranked seventh among the leading causes of death, and third when it's fatal complications are taken in to account [22]. Traditional anti diabetic plants might provide a useful source of new oral hypoglycemic compounds for development as pharmaceutical entities or as simple dietary adjunct to existing therapies [5]

Herbal treatments are increasingly becoming popular as the herbal preparations have no or least side effects [28]. To combat diseases medicinal plants are valuable sources [25]. *Terminalia sericea* is an important medicinal plant widely used in the preparation of Ayurvedic formulations used against several ailments.

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The use of *Terminalia* bark in the management of hypercholesterolemia has been widely reported [20]. The pharmacological studies have shown antiviral [2] anti mutagenic [10] antiplaque formation [17] anticancer [4] and hypotensive properties [19] and abnormal platelet activity [8] diabetes in human trial [11][29]. *Terminalia* bark is a well-known medicinal plant used in ayurvedic medicine; particularly as cardiac tonic [26]. Present investigation aims to study the regulation of carbohydrate metabolism in normal and alloxan induced diabetic rats.

MATERIALS AND METHODS

PLANT MATERIAL AND PREPARATION OF PLANT EXTRACT

The wet *Terminalia sericea* bark was used in the form of crude methanol extract and this extract was prepared in accordance to the traditional system of medicine. The shade dried and coarsely powdered stem bark (1kg) was extracted with methyl alcohol in the cold for 48 hours. The extract was filtered and distilled with the help of water bath. Under rotatory evaporator, obtained reddish brown syrupy mass was dried at low temperature under reduced pressure. The normal and alloxan induced diabetic rats were administered orally and were evaluated for antidiabetic effects by the extract.

ANIMALS

For the study the albino rats weighing around 180 – 200 g were collected and fed with the standard rat pellet diet and water was provided *adlibitum.* Laboratory were maintained under conditions of 24-28°C with the relative humidity 60 - 70%. Rats were fasted and distitute for 16 hours but water as a free access.

INDUCTION OF DIABETICS

Diabetes was induced by a single IP injection of 120 mg/kg of alloxan monohydrate (Explicit Chemicals Pvt. Ltd., India), in sterile saline [16]. Then the alloxan injected diabetic rats were separated after 72 hours (glucose level > 250 mg/dl) and used for the study [15].

EXPERIMENTAL GROUPING OF ANIMALS

Based upon the dosages the rats were seperated into 5 groups, in an each group 5 rats each. Group I is served as normal healthy control whereas group II is alloxan induced diabetic control, group III diabetic rats given with *T. sericea* bark extract of 100mg/kg body weight, group IV diabetic rats given with *T. sericea* bark extract of 200mg/kg body weight and group V treated with glibenclamine of 5mg/kg is served as reference standard. The treatment continued for 30 consecutive days and the extract was administrated intra peritoneal.

COLLECTION OF BLOOD SAMPLES

The collected blood serum was separated by centrifugation at 2000rpm for 20 minutes used for biochemical analyses.

BIOCHEMICAL PARAMETERS

By GOD-POD method [21] using a commercial kit (Span Diagnostics, India) boold glucose level were estimated. Total Cholesterol, Triglycerides and High Density Lipoprotein were analyzed by kits (Roche Diagnostics, GmbH, D-68298 Mannheim, Germany) on Hitachi auto analyzer. Eventhought the Low Density Lipoprotein and Very Low Density Lipoprotein [7] were evaluated.

HISTOLOGICAL ANALYSIS

After dissection of rats the pancreases were collected from various groups. Then they are fixed in paraffin and histological preparations, which were made 5 µ thick sections cut and stained with haematoxylene and eosin.

STATISTICAL ANALYSIS

The data was analyzed with the Student's t – test statistical methods and the results were analysed with statistically significant at $P<0.001$. All the values are expressed in Mean ± SEM.

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RESULTS

BLOOD GLUCOSE

The effect of *T. sericea* bark extract on serum glucose level in alloxan induced diabetic rats presented in Table -1. Oral administration of *T. sericea* (100 and 200 mg/kg body weight) for 30 days showed significant (P< 0.001) reduction in glucose.

Table 1.The effect of *T. sericea* bark extract on serum glucose level in control and experimental rats

Groups	Treatment(Days)(Mean ± SE, n=6)		
	1	15	30
Control (Normal saline)	91.6 ± 7.4	91.8 ± 8.5	92.0 ± 7.9
Diabetic control (Alloxan)	218.2 ± 15.4	220.6 ± 16.9	215.4 ± 17.2
T. sericea bark extract (100 mg/kg)	220 ± 16.6	196.7 ± 16.8*	127.9 ± 11.6*
T. sericea bark extract (200 mg/kg)	214.7 ± 19.2	161.5 ± 13.1*	98.5 ± 7.2*
Glibenclamide (Standard drug) (5mg/kg)	207.6 ± 14.8	109.4 ± 7.9*	96.8 ± 6.5*

n=6 data expressed as mean ± SE; *P<0.001 vs control by students 't' test

LIPID PROFILE

The effect of *T. sericea* bark extract on lipid profile in alloxan induced diabetic rats showed in Table-2. Serum TG, serum LDL, serum VLDL levels were decreased significantly by Glibenclamide (P< 0.001) and *T. sericea* bark extract (P< .001) compared with diabetic control.

Table-2.The effect of T*. sericea* bark extract on lipid profile in control and experimental rats

Treatment	TGL mg/dl	HDL mg/dl	VLDL mg/dl	LDL mg/dl	Total C (Cholesterol)
Control (Normal saline)	76.7 ± 5.7	48.2 ± 2.5	15.34 ± 1.14	23.0 ± 2.88	86.54 ± 6.52
Diabetic control (Alloxan)	121.15 ± 10.3	82.47 ± 2.7	24.23 ± 2.06	189.9 ± 12.64	246.6 ± 17.4
T.sericea bark extract (100 mg/kg)	115.6 ± 9.4	35.47 ± 2.7	23.12 ± 1.88	112.01 ± 7.92	180.6 ± 12.6
T.sericea bark extract (200 mg/kg)	103.28 ± 8.4	37.57 ± 3.1	20.65 ± 1.68	105.28 ± 5.72	163.5 ± 12.3
Glibenclamide (Standard drug) (5mg/kg)	113.58 ± 6.7	39.82 ± 2.79	22.71 ± 1.34	95.77 ± 2.66	158.33 ± 6.79

Values are expressed as mean ± S.E, n=6; *P<0.01 Vs control; **P<0.001 Vs control by students't' test

HISTOLOGICAL ANALYSIS

Histological analysis states that results are normal while analysing the islets of langerhans in pancreas of control (fig a). Extensive damage to the islets of langerhans in alloxan induced diabetic rats (fig b) and Glibocalamine revealed that the restoration of normal cellular population in islets of langerhans with hyperplasia (fig c). Bark extract of *T. sericea* (100 & 200 mg/kg) showed that the partial restoration of normal Cellular population and enlarged size of beta cells (fig d).

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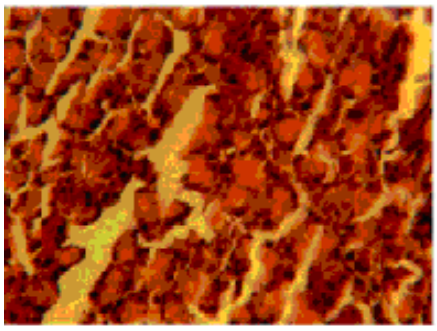

Figure a.Normal saline Injected Group

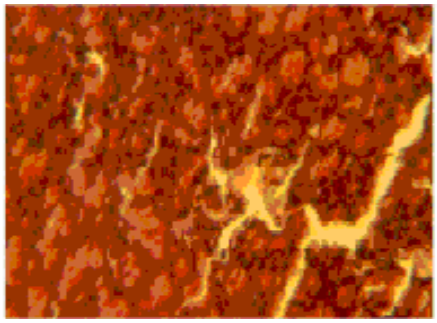

Figure b.Alloxan induced Diabetic rats

Figure c.Diabetic rats treated with *T.sericea* leaves extract (100mg/kg)

Figure d.Diabetic rats treated with *T.sericea* leaves extract (200mg/kg)

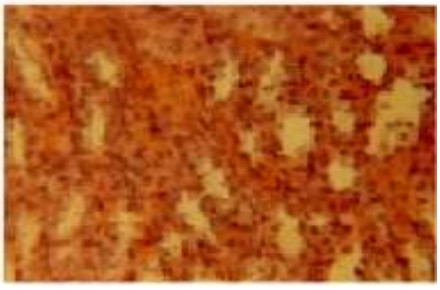

Figure e.Diabetic rats treated with Glibenclamide (5mg/kg)

Figure 1.Photomicrograph of Islet of rats stained with Haematoxylene and Eosin X40

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DISCUSSION

Diabetic mellitus is one among the world largest emergent metabolic disease and knowledge on the heterogeneity of this disorder is advanced, need appropriate therapy increases [5]. Many traditional medicines were used throughout the world to overcome the diabetic complications.

Alloxan, a betacytoxin causes a massive destruction of β-cells of the islets of langerhans resulting in reduced synthesis and release of insulin [12]. Secretion of insulin from pancreas induce hypoglycemia by sulphonyl ureas and those compounds are active in mild alloxan induced diabetes whereas they are not much activated in intense alloxan diabetics [24].

Botanical products can improve glucose metabolism and over all condition of person worth diabetics not only by hyperglycemic effect but also improving lipid metabolism, anti-toxin status and capillary [6]. Since the present study showed that Glibenclamide (standard drug) reduce blood glucose levels in hyperglycemide animals, state of diabetics not severe.

Alloxan treated animals receiving the bark extract of *T. sericea* showed rapid normalization of blood glucose level and TGL, LDL, HDL, VLDL and cholesterol level in comparison to control and this could be due to the possibility that some β cells are still surviving to act upon *T.sericea* bark extract.

The renewal of β cells in diabetics has been studied in several animal models. It suggests that regeneration of islet β cells following destruction by alloxan may be the primary cause of the recovery of alloxan induced from the effects of the drugs. In alloxan induced diabetics, epicathin [27] and *Vincarosea* extract [9] have also shown to act by β cells regeneration. Similar effect in streptozotocin treated diabetic animals also were reported in the pancreas tonic [3], ephedrine [23] and *Gymnema sylvestre* leaf extract [18].

In our study, damaged in pancreas in alloxan treated diabetic control (Fig b), and regeneration of β cells by Glibenclamide (Fig c) were observed. A equivalent regeneration was also exposed by bark Methanolic extract of *T. sericea* bark (100 & 200 mg/kg) (Fig c, d) photo micrographical dated in our studies confine healing of pancreas by *T. sericea* bark extracts as a plausible mechanism of their anti-diabetic activity.

ACKNOWLEDGEMENTS

The authors would like to thank the DMI - St. Eugene University of Chipata for providing facilities for the research activities.

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