Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Spl Issue [5] 2022 : 782-786

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Studies on Hypoglycemic and Hypolipidemic Activity of Ethanolic Extract of *Shorea Robusta* bark in Normal and Alloxan Induced Diabetic Rat

P. Shobana Devi*, R. Vallipriya[1], M.Devi[2], Umadevi Pongiya[3], K.Subasankari[4], Suriya M.[5] and Prateek Asthana[6]

**Department of Biochemistry, Dhanalakshmi Srinivasan college of Arts and Science for women, Perambalur.*
[1,2]Department of Biochemistry, Muthayammal college of Arts and Science, Rasipuram,
[3,5] Department of Biochemistry, Dhanalakshmi Srinivasan college of Arts and Science for women, Perambalur.
[4] Department of Biotechnology, Dhanalakshmi Srinivasan college of Arts and Science for women, Perambalur.
[6] Sr. Lecturer, Babu Banarasi Das University, Lucknow, U.P., INDIA)
***Email:**Shobirose2013@gmail.com*

ABSTRACT

The present investigation was aimed at evaluating the hypoglycemic and hypolipidemic properties of the Shorea robusta bark extract have been screened for their protective effect against reactive Alloxan induced diabetes rats. They have been found to be effective antioxidant when administered in combination. The purpose of the study was to investigate the effect of administration (500mg/kgb.wts) for 15 days of the ethanol extract of Shorea robusta. The increase in Alloxan induced diabetes Group II LPO, GSH, Glucose, Hb, GlyHb & lipid profile (mg/dl) comparing to Group I &Group III. It is suggested to changes initially contract the oxidative stress in diabetes however; a gradual decrease in the antioxidative process may be one of the factors with result in chronic diabetes. These results indicate that the plant extract have shown antidiabetic activity& also reduced oxidative stress in diabetes. The results were statistically analyzed & indicate Shorea robusta bark extract showed better efficiency.

***Keywords**: Shorea robusta, Alloxan, Diabetes, Hypoglycemic, Hypolipidemic*

Received 22.10.2022 *Revised 20.11.2022* *Accepted 16.12.2022*

INTRODUCTION

Type 2 diabetes is caused by the failure of beta cells to compensate for insulin resistance. This leads to hyperglycemia, which can in turn exert deleterious effects on β cells. A diabetic is a major health problem approximately 15% of the world's population suffering from diabetes. Independent forecasters however suggested that the global prevalence of the disease would increase from 150 million in 2000 to 220 million in 2010 and to 300 million by 2030. Diabetes is a disease where the body produces little insulin / ceases to produce insulin, or becomes progressively resistance to its action [24].

There are estimated 143 million people worlds wide suffering from diabetics [11] almost five more than the estimates ten years ago. This number may probably double by the year 2030 [9]. Reports from the WHO indicate that mellitus is one of the major killers of our time, with people in South – East Asia & Western pacific begin most at risk [12]. There are two main categories of this disease Type 1 diabetes mellitus also called Insulin dependent & Type 2 diabetes mellitus also called non Insulin dependent.

In folk -tribal medicinal practice many plant are used to treat diabetic's mellitus in South India. Most of these medicinal plants are not scientifically validation for their therapeutically efficient & safety. Scientific studies on these plants are likely to provide invaluable anti – diabetic's drugs. The objective of the present study was to evaluate the hypoglycemic and hypolipidemic activity of an ethanol extract of the *Shorea robusta* bark in normal and alloxan-induced diabetic rats.

MATERIALS AND METHODS

Plant Material

Shorea robusta is a large deciduous tree 18-30m in height with smooth or longitudinally fissured reddish brown or grey bark. Base cordate, 12-14 pans of lateral veins; stalks 2- 2.5 cm long. Flowers yellow, in large showy branched clusters. Fruit ovoid, with five wings, three long and two short the longer up to 7.5 cm long. The bark used as astringent, acrid, cooling, antihrlmintic, alexeteric and tonic [17].

Plant Material & Drug Preparation

The barks of *Shorea robusta* was purchased from local Traditional medical shop at Thanjavur, Tamil Nadu. The bark was dried & soaked with ethanol (70%) for 48 hours. A semisolid extract was obtained after complete elimination of alcohol under reduced pressure. The extract was stored in refrigerator until used. The extract contained polar & non – polar phytocomponents of the plant medical used. The *Shorea robusta* bark extract was dissolved in distilled water just before oral administration.

Animals

Male albino rats weighing about 120 – 180g were obtained from the Indian Institute of Bangalore. The animals were housed in polypropylene cages & maintained in controlled temperature with 12 hours period of light or dark & fed with standard rat feed & water were provided *adlibitum.*

Drug administration

Diabetic was induced by the intra peritoneal injection of Alloxan monohydrate (120mg/kg) dissolved in distilled water for 3 consecutive days. Diabetics was confirmed 2 days after the blood glucose concentration, treatments were started after confirmation of diabetic in rats.

Experimental Designs

Body weight of animals was recorded & they were dividing into 3 groups of 6 animals each as follows.

Group I : Normal animal received normal diet & water *adlibitum*

Group II: Alloxan induced diabetic rats.

Group III : Alloxan & also *Shorea robusta* treatedwith (500mg/kgb.wts) for 15 days.

On completion of the experimental period, animals were anaesthetized with thiopentone sodium (50mg/kg). The blood was collected with & without EDTA as anticoagulant, Serum was separated by centrifuge.

Biochemical Estimations

S.No	Experiment	Methods
1.	Estimation of Glucose	Trinder (1969)
2.	Estimation of Malondialdehyde	Nichans & samulson (1968)
3.	Estimation of Glutathione.	Ellman's (1959)
4.	Estimation of Triglycerides.	Werner *et al* (1981)
5.	Estimation of HDL Cholesterol.	Allain *et al* (1974)
6.	Estimation of Serum Cholesterol.	Allain (1974)
7.	Estimation of Haemoglobin.	Cyanomethemoglobin Dacie & Lewis(1968)
8.	Estimation of Glycosylated Haemoglobin	Trivelli *et al*(1971)

Statistical analysis

The results were presented at the mean ± SD. Data were statistically analyzed using student "t" test. P values lower than were considered as statistically significant.

RESULT

The Present study was carried out to evaluate the modulatory effect of *Shorea robusta bark* on alloxan induced diabetic mellitus. The observations made on different groups of experimental animals and control animals were compared as follows.

Table – I Effect of *Shorea robusta* on LPO & GSH in normal & experimental Rats

Parameters	*Group I*	*Group II*	*Group III*
LPO(mg/dl)	49.32±2.41	85.41±3.71*	53.41±2.91
GSH(mg/dl)	37.9±6.4	26.9±4.5*	37.9±3.2

Values were expressed as Mean ± SD

*significantly different from Group I & Group II rats ($P < 0.05$)

Table I: Represents the levels of LPO and GSH in the serum and normal and experimental rats.

Group II Alloxan intoxication rats showed a significant increased in the level of LPO when compare to Group I rats. Group III rats treated with *Shorea robusta* significantly decreased the level of LPO when compared to Group II. Group II Alloxan intoxicate rats showed the significant decrease in the level of GSH when compared to Group I rats. Group III rats treated with *Shorea robusta* significantly increases the level of Glutathione as compare to Group II.

Table – II Effect of *Shorea robusta* on Glucose, Hb & GlyHb in normal & experimental Rats

Parameters	*Group – I*	*Group –II*	*Group –III*
Glucose (mg/dl)	78.6±9.6	295.6±10.3*	87.8±15.5
Hb(mg/dl)	12.65±0.55	9.2±0.40*	12.25±0.59
GlyHb(mg/dl)	0.22±0.02	0.87±0.06*	0.25±0.04

Values were expressed as Mean ± SD

*significantly different from Group I & Group II rats (P< 0.05)

Table II: Denotes the levels of Glucose and Hb in serum of normal and experimental rats.

Group II Alloxan intoxicated rats showed a significant increase in the level of Glucose when compared to Group I rats. Group III rats treated with *Shorea robusta* significant decrease the level of Glucose when compared to Group II. Group II Alloxan intoxicated rats showed a significant decrease in the level of Hb when compared to Group I rats. Group III rats treated with *Shorea robusta* significantlyincreased the level of Hb compared to Group II. Group II Alloxan intoxicated rats showed a significant decrease in the level of GlyHb when compared to Group I rats. Group III rats treated with *Shorea robusta* significantlydecrease the level of GlyHb compared to Group II.

Table – III Effect of *Shorea robusta* on barks extracts on lipid profile in experimental Rats

Parameters	Group I	Group II	Group III
Cholesterol (mg/dl)	79.32±15	159.55±15.68*	104.47±13.87
Triglycerides (mg/dl)	131.78±11.45	272.45±15.45*	144.85±12.45
HDL C (mg/dl)	29.52±2.72	19.12±1.5*	24.55±1.94
LDL (mg/dl)	44.68±4.64	144.13±4.88*	50.32±4.18
VLDL (mg/dl)	53.77±1.72	78.34±1.23*	52.31±1.14

Values are expressed as Mean ± SD for six rats

*significantly different from Group I & Group II rats (P<0.001)

Table III : Depicts the levels of Total cholesterol and HDL Cholesterol in serum of normal and experimental rats.

Group II Alloxan intoxicated rats showed a significant increase in the level of Cholesterol, Triglyceride, VLDL & LDL-C when compare to Group I rats. Group III rats treated with Alloxan *Shorea robusta* significantly decrease the level of Cholesterol, Triglyceride, VLDL & LDL- C when compare to Group II. Group II Alloxan intoxicated rats showed a significant decrease in the level of HDL – Cholesterol when compare to Group I rats. Group III rats treated with *Shorea robusta* significantly increase in the level of HDL when compare to Group II.

DISCUSSION

Diabetes mellitus is a growing health concern worldwide. The latest WHO Publication estimates diabetes in adults to be around 173 million [25] and around two thirds of these live in developing countries. Diabetes mellitus is a metabolic disorder of the endocrine system. The disease occurs worldwide and its incidence is increasing rapidly in most parts of the world. People suffering from diabetes are not able to produce or properly use insulin in the body, so they have a high level of blood glucose. Diabetes is becoming the third 'Killer' of mankind, after cancer and cardiovascular diseases, because of its high prevalence, morbidity and mortality [13].

Oxidation stress is increased in Diabetics because of multiple factors. Dominant among these factors is glucose antioxidation leading to the production of free radicals glycation of protein alters protein & cellular function & binding of AGEs to their receptors can lead to modification in cell signaling & further production of free radicals [16].

Oxidation Stress Marker

LPO

Alloxan has been shown to induce free radicals production and has tissues injury (Halliwell & Gutteridge, 1985) free radicals damage to the cell membranes lipid peroxidtion is one of the characteristic feature of chronic diabetics. It has been observed that insulin secretion is closely associate with dipoxygenase derived peroxide the reduction of to electrons from alloxan gives dialuricacid, which under goes oxidation & leads to generation of O_2 , H_2O_2& OH . Dialuricatied has been observed to stimulate lipid per oxidation in vitro. In this context a marked increase in the concentration of MDA was observed in diabetic's rats. But at the same time administration of *Shorea robusta* significantly decreased the levels of MDA diabetic rats. Thus it has anti lipid peroxidative effect.

GSH

Glutathione a tripeptide present in all the cells is an important antioxidant. Decreased glutathione levels in diabetics have been considered to be an indicator of increased oxidative stress. GSH also function as free radicals scavenger & in the repair of radicals caused biological damage (Nicodera & Orrenius, 1986) of decrease level of GSH was observed in diabetic rats. The decreased in GSH level represents increased utilization, due to oxidative stress administration of *Shorea robusta* increased the content of GSH in diabetic rats.

Diabetic's markers of as Glucose

Diabetes mellitus is a disorder characterized by hyperglycemic at due to an absolute or relative deficiency of insulin & of insulin resistance. It affects 1-2% of the population worldwide hyperglycemia person important role in the pathogenesis of long – term complication. All action induced diabetics has been observed to cause a massive reduction of the β – cells of the islet of the pancreases lading to hyperglycemia [5].

In our study we have found that decrease blood glucose in alloxan diabetic rats treated with the possible mechanism by which *Shorea robusta* bring about its hypoglycemic action may be potentiating the insulin effect of serum by increasing either the pancreatic secretion of Insulin from the β – cells of islet of langerhans or its release from bound insulin. In this content a number of other plants have also observed to have hypoglycemic effects [5].

Cardiovascular risk in diabetic

we have noticed elevated serum in alloxan diabetic rats lipids play an important Role in the pathogenesis of diabetic mellitus the level of serum lipids is usually raised in diabetics & such elevation represent a risk factor for coronary heart disease [18] the abnormal high concentration of serum lipids in diabetics is mainly due to the increase in the mobilization of free fatty acid from the peripheral departs , science insulin inhibits the hormone sensitive lipase, on the other hand. Glucagon's, Catecholamine's, & other hormones enhance lipolysis. The marked hyperlipidemic that characterized the diabetic state may be regarded as a consequence of the uninhibited actions of biolytic hormones on the deports [1].

In our study, we have also observed an increase in the concentration of Triglyceride, Cholesterol, VLDL, LDL – C & decrease in the HDL – Cholesterol in alloxan diabetic rats. Hyperlipidemia is a recognized consequence of diabetes mellitus [19]. Administration of *Shorea robusta* normalizes serum lipids. Diabetes induced Hyperlipidemia is attributable to excess mobilization of fats from adipose due to the under utilization glucose.

Hemoglobin& GlyHb

In uncontrolled or poorly controlled diabetes is an increased glycosylation of a number of proteins including hemoglobin & α – crystalline of lens[3]. Glycosylated hemoglobin HbA_1 C was found to be increase in patients with the diabetic mellitus to approximately 16% (Koenig *et al.,* 1976) & the amount of increase is directly proportional to the fasting blood glucose level (Jackson *et al.,* 1979). Amongst the various markers of glycemic control, glycated hemoglobin (GlyHb) has now been established as he most reliable, through many other proteins are also glycated in the diabetic (Chandalia & Krishnaswamy, 2002). In the present study, the lower of Hb & increase GlyHb content were observed in alloxan diabetics rats. During diabetics, the excess glucose present in the blood reacts with hemoglobin to form glycosylated Hemoglobin. So the total hemoglobin level is lowered & increased GlyHb in alloxan diabetic rats [20]. Administration of *Shorea robusta* reversed the total Hb & GlyHb content in alloxan diabetic rats.

CONCLUSION

Diabetes mellitus is the common endocrine disorder that affects more than 100 million people worldwide and in the next 10 years it may affect about five times more than it does now. In India the prevalence rate of diabetes estimated to be 1-5% complications are the major cause of morbidity and mortality in diabetic mellitus. There is an increasing demand by the use of natural products due to side effects associated with use of Insulin and oral hypoglycemic agents. Oral administration of *Shorea robusta bark* extract on alloxan induced diabetic rats exerts the following results.Restored the level of glycogen in experimental rats, improved the status of GSH and Heamoglobin content, Normalized the lipid profile in experimental rats, Reduced Gly Hb.

Administration of *Shorea robusta to* alloxanized rats, restore the level of glucose, Hb, lipids, and reduce Gly Hb. Administration of *Shorea robusta* to alloxanized rats, restore the level of glucose, Hb, lipids and reduce Gly Hb. Oxidative stress markers as MDA and GSH also reduced. These confirm the hypoglycemic and hypolipidemic activity of *Shorea robusta* in alloxan rats.

ACKNOWLEDGEMENT

The authors acknowledgement Chancellor Shri.A.Srinivasan , Dhanalakshmi Srinivasan College of Institutions for the Financial support of this work.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

REFERENCES

1. Al – Shamon LA., Al – Khazraji SM., Twaij HA.(1994). Hypoglycemic effects of *Artemisia herba alba.* II.Effect of a valuable extract on some blood parameters in diabetics animals. J Ethnopharmacol ., 43: 167 – 171.
2. Allain CC., Poon LS., Chan CSG., Richmond W & Fu PC., (1974). Enzymatics determination of total serum cholesterol . C*lin chem., 20,*470.
3. Chandalia H.B. & Krishnaswamy P.R. (2002). Glycated heamoglobin. Current science, 83 (12) .p1522 – 33.
4. Chattopathyay, RR., Medd C ., Das S ., Balu TK., Podder G., (1993). Hypoglecimic & antihyperglycemic effect of *Gymnema syivestre* leaf extract in rats. Fitoterapia., 64: 450 – 454.
5. ChattopathyayRR ., Chattopadhyay R.N Nandasy, A.K., Poddar., G ., Maitra,S.K., (1987). A preliminary reports on anti – hyperlipidimic effects of an fraction of fresh leaves of *Azadichta indica* (Beng Neem),Bwletin of the Calcutta school of tropical medicine 35., 29 – 33.
6. Dacie J.V & Lewis. S.M., (1968). Practical Heamo, 4 th edition, J & A , Churchill, UK pp:37.
7. Ellman, G.L., (1959), Tissue sulphydryl groups Arch. Priophy 82., 70 – 77.
8. Halliwell B & Gutteridge JMC., (1985). Free radicals , antioxidants & human disease : where are we now , *Lab clin med.,* 119: 598 – 620.
9. Harris MI., Flegal KM., Cowie CC., Eberhardt MS., Goldstein DE., Little RR., Wiedmeyer HM., Byrd-Holt DD., (1998). Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults: the Third National Health and Nutrition Examination Survey, Care., 21:518–524
10. Jackson R.L., England J.D.,(1979). Heamoglobin A_1C values in children with over diabetes maintained in varying degree of control. Diabetes Care 2., 391 – 395.
11. Kingh H., Rubert R.E and HermanW.H.,(1998). Diabetics care, 21., 1414 – 1431.
12. Koenig R.J., Peterson,C.M., Jones R.L., Saudek C., Lehrman M., Cerami A., (1976). Correlation of glucose regulation & Heamoglobin A_1C in diabetes mellitus. New Engl.J.Med.295., 417 – 420.
13. Li WL., Zheng HC., Bukuru J., De Kimpe N., (2004). Natural medicines used in the traditional Chinese medical system for therapy of diabetes mellitus.J. Ethanopharmacol. 92., 1-21.
14. Nichans & samulson.B., (1968). Formation of malondialdehyde from phospholipids arachidonate during microsomal lipid peroxidation *Eur. J. Priochem.,* 126 – 130.
15. Nicotera, P., and Orrenius, S., (1986). Role of thiols in protection against biological reactive intermediates. Advances in Experimental Medicine and Biology, 197., 41-51.
16. Penckofer S., Schwertz D., Florczak K., (2002). Oxidation stress & cardiovascular disease in type 2 diabetes: the role of antioxidants & prooxidants. J CArdiovasc Nurs., 16(2): 68 – 85.
17. Prajapati ND., Purohit SS., Sharma and kumar T., (2006). A hand book of Medicinal Plants. A complete source book 3rd edition. Published by Agrobios (India) Jodhpur.
18. Shanmugasundaram KR., Panneerselvam C., Samudram P., Shanumugasundram R., (1983). Enzyme changes & glucose utilization in diabetic rabbits. The effects of gymnema Sylvester, R.Br.*Journal of Enthnopharmacology* 7(2)., 205 – 234.
19. Sharmal SR., Dwivedi SK., Swarup D., (1997). Hypoglycemic, antihyperglycemic & hypolipidemic activity of *CAesalpinia bonducella* seeds in rats. J Ethnopharmacol., 58; 39 – 44.
20. Sheela C.G., & AugustiK.T., (1992). Antidiabetic effects of garlic,*Allium sati_um* Linn.J.Exp.Biol.30., 523 – 526.
21. Trinder P., (1969). Determination of glucose in blood using glucose oxidase with an alternative oxygen acceptor. Ann. Clin. Biochem. 6., 24 – 28.
22. Trivelli LA., Ranney HM & Lai HT., (1971). Hemoglobin components in patients with Diabetics mellitus. New England Journal of Medicine.248: 353 – 357.
23. Werner M., Gabrielson DG & Eastman G., (1981). Ultramicro determination of serum triglycerides by bioluminescent assay. Clinical chemistry. 27., pp268 – 271.
24. Wild S., Roglic G., Green A., Sicree R., King H., (2004). Golbal prevalence of diabetics: estimate for the year 2000 & projection for 2030. Diabetic care., 27: 1047 – 53.
25. Wild S., Roglic G., Sicree Green A., King H., (2003). Global burden of diabetes mellitus in the year 2000, Global burden of Disease, Geneva.

CITATION OF THIS ARTICLE

P. Shobana Devi, R. Vallipriya, M.Devi, Umadevi Pongiya, K.Subasankari, Suriya M. and Prateek Asthana: Studies on Hypoglycemic and Hypolipidemic Activity of Ethanolic Extract of Shorea Robusta barkin Normal and Alloxan Induced Diabetic Rat. Bull. Env.Pharmacol. Life Sci., Spl Issue [5]: 2022: 782-786