

EFFECT OF *TINOSPORA CORDIFOLIA* SUPPLEMENTATION ON BLOOD GLUCOSE AND LIPID PROFILE LEVEL OF STREPTOZOTOCIN INDUCED DIABETIC RAT

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ABSTRACT

Antidiabetic therapy with drugs from natural origin is preferred over commercial drugs with long term usage, for their adverse side effects. In the present study the efficacy of different doses of *T.cordifolia* on blood profile was investigated in streptozotocin induced diabetic rats. Standard methodology was adopted to assess the blood biochemistry after obtaining institutional ethical committee clearance. Fasting blood glucose (FBG), lipid profile, urea and creatinine were found to decrease significantly ($p < 0.05$) with increasing dose till 400mg/kg body weight. HDL-C level increased favourably. A significant decrease in creatinine, urea and blood urea nitrogen were also observed. These results indicate the ameliorative effect of *T. cordifolia* in the treatment of diabetes mellitus.

KEYWORDS: *Diabetes Mellitus, Streptozotocin, T. cordifolia.*

INTRODUCTION

Anti diabetic drug therapy of diabetes mellitus includes use of insulin and oral hypoglycemic drugs with various mechanisms of control. Variety of drugs as well as insulin are used for treatment of diabetes but some of them cause side effects like thiazolidinedione is a drug with lack of cardiovascular safety, pioglitazone, a popular antidiabetic drug causes water retention. Use of these antidiabetic drugs for long time may results in haematological and gastrointestinal reaction, brain damage and disturbances in the functioning of vital organs.^[1] So, World Health Organization advocated exploring herbal remedy and naturally occurring medicinal plant for the treatment of diabetes in a better way with minimum side effects. Medicinal plants have been used in the traditional herbal medicine worldwide since ancient time as many plants have therapeutic potential.^[2] Most of the herbs contain high amount of phytochemicals including polyphenols, alkaloids, tannin, flavonoids, terpenoids, carotenoids etc and these are acknowledged as herbs with anti-diabetic potential when treated singly.^[3] Herbal medicines serve as alternative source of treatment with lesser side effects and hence are gaining popularity.

Tinospora cordifolia is a herb used from ancient times as medicine in the treatment of many diseases.^[4,5] *Tinospora cordifolia* (*T. cordifolia*) is known by the common name Guduchi or gulancha, belongs to the

family Menispermaceae and is indigenous to the tropical areas of India.^[6] It is used in ayurvedic medicine as a hepatoprotectant, and the hepatoprotecting property from damage that may occur following exposure to toxin is established.^[6] It possesses antihyperlipidemic activity.^[7] A combination of *T. cordifolia* and turmeric extract was found to be effective in preventing the hepatotoxicity which is otherwise produced as a side effect of conventional pharmaceutical treatments for tuberculosis using drugs.^[8] Its fruit is used in the treatment of jaundice and rheumatism.^[9,10] In the present study the main objective was to assess the efficacy of *T. cordifolia* in different doses in the treatment of diabetes mellitus.

MATERIALS AND METHODS

1.1. Selection of experimental animal, induction and treatment of diabetes

Healthy adult Wistar albino rats of 90-120 gram weight were used for the study. They were fed with a standard diet and water. As rats are mammals, their system reacts to these chemicals in a similar way as it reacts in the humansystem.^[11] In the present study twenty five rats were made diabetic by intraperitoneal injection of freshly prepared streptozotocin (STZ), 40 mg/kg body weight. Streptozotocin (STZ) was obtained from Spectrochem Pvt. Ltd. Mumbai, India. Five rats were taken as non-diabetic healthy controls. Then after 7 days, 2nd dose was given. The diabetic rats were divided into following four groups given in table1,^[12] each having five rats.

Fresh stem of *T. cordifolia* was soaked for overnight. An aqueous extract was produced by grinding and extracted in distilled water. The rats were fed with the extract by means of feeding tube at a dose mentioned in the table 1.

The dosing schedule used was once per day. The aqueous solution was fed through oral gavage for 21

days.^[13] Time of dosage was at 10:00 a.m. to 10:30 a.m. Oral gavage was performed using a ball ended feeding needle. The animals were monitored after the procedure to ensure that there are no adverse effects. The blood glucose level and body weight were measured once in every week.

Table 1: Group no and dose detail.^[14]

Groups	Dose of <i>T. cordifolia</i> (mg /kg body weight)
T ₀ (Diabetic untreated)	00
T ₁ (low dose)	100
T ₂ (medium dose)	200
T ₃ (high dose)	400

1.2. Collection of blood sample and estimation of biochemical parameters

Blood was collected on 0th day, 7th and 14th day, retro-orbitally from the inner canthus of the eye using capillaries (Mucaps) in EDTA vial and at the end of the experiment on 21st day. They were sacrificed by cervical dislocation under light ether anesthesia and blood was collected. All the kits for biochemical estimations were obtained from Span diagnostic.

Glucose was estimated at the beginning, on 7th, 14th day and at the end of the experiment on 21st day. Total cholesterol (TC), high-density lipoprotein cholesterol, (HDL-C) and triglycerides (TG) were estimated by enzymatic methods employing kits from Span diagnostics. LDL cholesterol was estimated by using Friedewald (1972) formula as follows.^[11]

LDL in mg % = total cholesterol – (HDL-C +1/5 triglycerides). Urea and creatinine were estimated by enzymatic methods employing kits from Span diagnostics. BUN was calculated by the standard formula as follows:

BUN concentration mg/dl= Urea concentration mg/dl X 0.467.^[15]

1.3. Statistical analysis

The results were analysed using mean \pm SD for all experiments and represented graphically. The significance of difference between data pairs was evaluated by analysis of variance (ANOVA).

RESULT AND DISCUSSION

The effects of oral administration of aqueous extract of *T. cordifolia* stem extract in diabetic rat are shown in Fig 1. In diabetic untreated rat (STZ control T₀) plasma glucose increases from 220 \pm 24 mg/dl to 243 \pm 14.1mg/dl after 14days, and 244.67 \pm 44mg/dl after 21days. With low dose *T. cordifolia* treatment (T₁), plasma glucose level increases from after 7days. Then there was a mild non significant decrease in the blood sugar level, after 14th day and 21st day respectively. When treated with medium dose (T₂) and high dose (T₃) plasma glucose level decreases significantly ($p < 0.05$) from the beginning of the experiment after 7th, 14th and 21st day respectively.

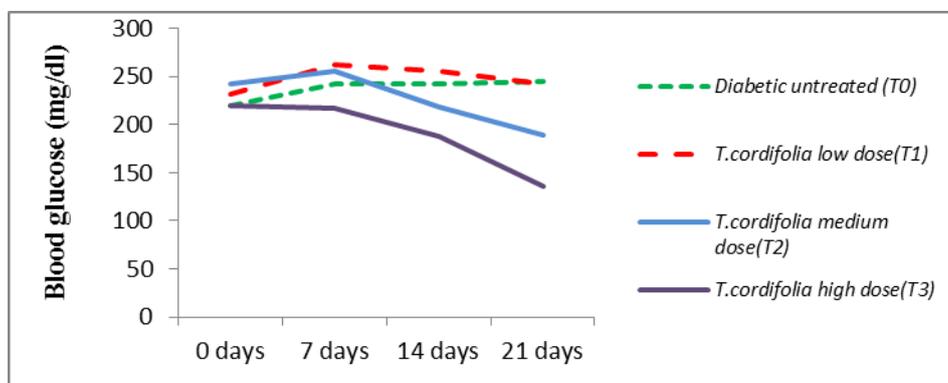


Fig. 1: Blood sugar level decreases significantly ($p < 0.05$) after treatment with *T. cordifolia* (T₂ & T₃) in streptozotocin induced diabetic rats.

Figure 2 shows the effect of aqueous extract of *T. cordifolia* stem on lipid profile in different doses, measured at the end of experiment in diabetic untreated and treated rats. Study revealed that HDL-C level was 19.07 \pm 1.29mg/dl for untreated rat whereas after

treatment with *T. cordifolia* stem extract HDL-C level increases upto 44.17 \pm 3.17mg/dl, 33.34 \pm 5.88 mg/dl and 24.16 \pm 2.41 mg/dl for high (T₃) dose ($p < 0.05$), medium (T₂) dose ($p < 0.05$), and low (T₁) dose respectively. A significant reduction in the total cholesterol was

observed with *T.cordifolia* stem extract with high dose (T₃). Moreover a significant decrease was observed in

TG ($p < 0.05$), and LDL% ($p < 0.05$) with all the three doses.

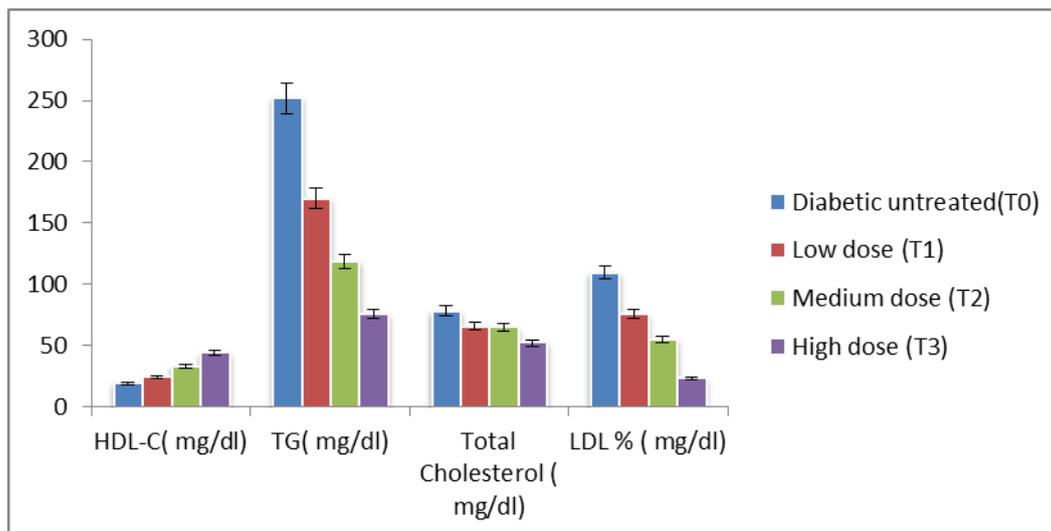


Fig. 2: Lipid profile changes significantly ($p < 0.05$) after treatment with *T.cordifolia* in high and medium dose in streptozotocin induced diabetic rats.

The effect of aqueous extract of *T.cordifolia* stem extract in different dose, on the value of urea, creatinine and blood urea nitrogen measured at the end of experiment in diabetic untreated and treated rats are shown in Figure 3 A and B. A significant reduction ($p < 0.05$) in creatinine and urea were observed at the end of 21 days with medium (T₂) dose and high dose (T₃). At the end of the experiment creatinine level was 1.28 ± 0.13 mg/dl for diabetic untreated rat whereas after

treatment with *T.cordifolia* it was 0.86 ± 0.04 mg/dl ($p < 0.05$) and 0.49 ± 0.06 mg/dl ($p < 0.05$) for medium and high dose respectively. Urea level was found to be 66.4 ± 4.1 mg/dl for diabetic untreated rat and decreased upto 58.9 ± 1.92 mg/dl ($p < 0.05$) and 49.33 ± 6.09 mg/dl ($p < 0.05$) for medium and high dose (T₂ and T₃) respectively. A significant decrease ($p < 0.05$) in blood urea nitrogen level was found with high dose (T₃).

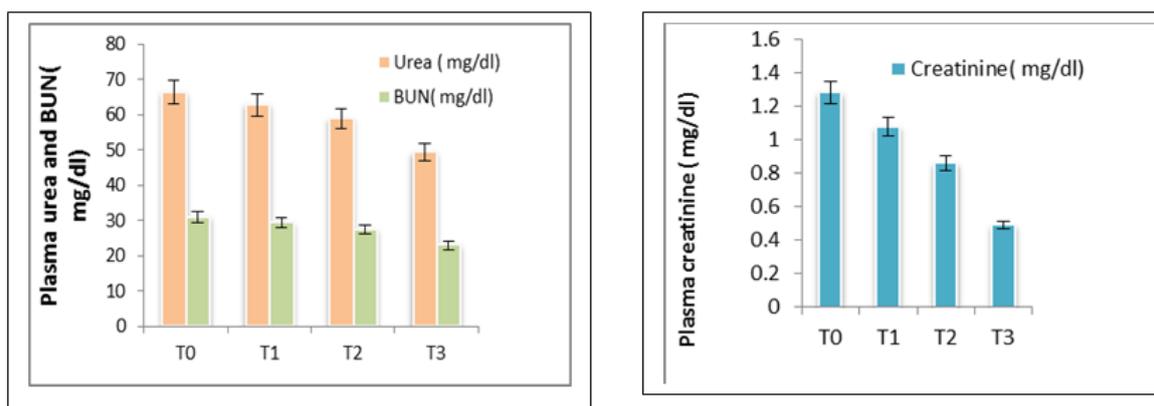


Fig. 3: A, 3B: Effect of aqueous extract of *T.cordifolia* on creatinine urea and BUN in control, and streptozotocin induced treated diabetic rat.

CONCLUSION

In the present study the effect of herbal preparation of *T.cordifolia* on diabetes was studied in adult Wister albino rats. Experimental result showed the anti-diabetic and antihyperlipidemic potential of the herbal preparation of *T.cordifolia* with medium and high dose on streptozotocin induced diabetic rats. Treatment of the diabetic animals with *T.cordifolia* for 21 days showed reversal of blood glucose level. A significant reduction in

lipid profile levels was observed in the study. Study result revealed that the HDL-C level increases significantly after treatment with the *T.cordifolia* preparation at high and medium dose which is an important part of the study because diabetes is often associated with cardiovascular diseases and elevation in HDL-C level indicates lowering the chance of cardiovascular diseases. Reduction in TG, total cholesterol and LDL% also accounts for its antihyperlipidemic activity. Parameters like urea, creatinine

and BUN that are closely associated with diabetic complication were also found to decrease significantly with high dose treatment. From the above study it can be concluded that *T.cordifolia* has anti-diabetic and anti-hyperlipidemic activity when given in high dose and medium dose.

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