

# ANTIDIABETIC ACTIVITY OF METHANOLIC EXTRACT OF SMILAX ZEYLANICA LINN IN STREPTOZOTOCIN INDUCED DIABETIC RATS

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## Abstract

**Object:** To evaluate antidiabetic activity of methanolic extract of Smilax zeylanica leaves in streptozotocin induced diabetic rats. **Materials and methods:** The alcoholic extract of Smilax zeylanica was studied for antidiabetic activity in streptozotocin induced diabetic rats by oral administration of extract 400mg/kg body weight for 15 days. The effect was compared with oral dose of 0.5mg/kg Glibenclamide. **Results:** The alcoholic extract of smilax zeylanica leaves significantly lowered the blood glucose of hyperglycaemic rats. From the toxicity study it was observed that methanolic extract of Smilax zeylanica was nontoxic upto 5g/kg body weight and phytochemical study showed the presence of phytosterols, flavonoids and glycosides. **Conclusion:** It is concluded that Smilax zeylanica Leaf extract has significant antidiabetic activity, which lowered the fasting blood glucose level in Streptozotocin induced diabetic rats

## INTRODUCTION

Diabetes is a metabolic disorder of the endocrine system. It is considered to be one of the most serious endocrine syndrome. The disease occurs worldwide and its incidence is increasing rapidly in most part 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 disease of mankind, after cancer and cardiovascular diseases, because of its high prevalence, morbidity and mortality. Approximately 4% population worldwide suffering from diabetes is expected to increase by 5.4% in 2025.

In modern medicine no satisfactory effective therapy is still available to cure the diabetes mellitus. Though insulin therapy is used for the management of diabetes mellitus, but there are several drawbacks like insulin resistance, anorexia nervosa, brain atrophy and fatty liver after chronic treatment. Recently there has been increasing interest in use of medicinal plants<sup>(1,2)</sup> In many countries traditional plants are used to control diabetes.

The synthetic hyperglycaemic agents used in clinical practices have serious side effects like haematological

effects, coma, disturbance of the function of liver and kidney. In addition they are not suitable for use during pregnancy. Compared with synthetic drug, drugs derived from plants are frequently considered to be less toxic with fewer side effects. Therefore the search for more effective and safer antidiabetic agents has become an area of active research.

Smilax zeylanica Linn is important medicinal plant belongs to the family Smilacaceae, commonly known as Kalthamari, in Tamil and Indian Smilax. In English It has long history of use in the traditional medicine for the treatment of syphilis, gonorrhoea, swelling, abscesses and boils. It is widely distributed in tropical forest in India<sup>4</sup>. However no scientific study on antidiabetic activity of the plant has been reported. The present investigation was undertaken to study the antidiabetic activity of Smilax zeylanica leaves in Streptozotocin induced diabetic rats.

## MATERIALS AND METHODS

**Plant material:** Fresh leaves were collected from tropical area in Yercaud and authenticated by G.V.S Moorthy, Joint director, Botanical survey of India, Coimbatore ( NO.BSI/SRC/5/23/09-10 ) was submitted to department of pharmacology for further reference.

**Extraction:** The leaves, shade dried, Powdered in a grinder mixture to obtain coarse powder and then passed through 60 mesh sieve. The powdered leaves were extracted using continuous hot extraction method by gradient extraction technique. The extracts were evaporated to dryness and phytochemical screening were performed.

**Animals:** Swiss albino mice of female sex weighing 20-25gms were employed for toxicity study. Albino wistar rats of male sex weighing 200-250 gms were employed for antidiabetic study. They were housed in standard environment condition and fed with standard rodent diet with water and ad libitum. Ethical clearance for the animal study was obtained from Institutional Animal Ethical Committee ( 09MP03AUG2009 ) of CPCSEA (887/ac/CPCSEA ).

### **TOXICITY STUDY**

An acute oral toxicity study was performed as per OECD guidelines 423. by Acute toxic class method Swiss albino mice of female sex weighing 20-25gms were used for the study. Acute toxic class method is a stepwise procedure with use of three animals of a single sex per step<sup>12</sup>. Depending on mortality or morbidity status of the animals. average 2-4 steps may be necessary to allow judgement on the acute toxicity of the substance. Three animals were used for each step. The animal were placed individually and observed for any sign of toxicity, morbidity or mortality during the first 24hrs, with special given attention during the first 4 hours and daily thereafter for a total of 14 days.

**INDUCTION OF DIABETES:** All the rats were fasted overnight before the administration of Streptozotocin. Diabetes was induced in rats by intra peritoneal injection of streptozotocin dissolved in 0.1M sodium citrate buffer pH4.5 at the dose of 50mg/kg body weight. After the injection they had free access to food and water. The animals were allowed to drink 5% glucose solution overnight to overcome hypoglycaemic shock. The development of diabetes was confirmed after 48hrs of Streptozotocin injection<sup>(6,14)</sup>. The animals having fasting blood glucose level more than 200mg/dl were considered as diabetic rats and used for the experimentation. Diabetic animals were grouped five days after induction of diabetes Effect Of Methanolic Extract Of Smilax Zeylanica In Streptozotocin Induced Diabetes In Rats **EXPERIMENTAL DESIGN:** In the experiment rats were divided into the following groups with six animals each

Group I: Normal control received 1% w/v gum acacia

1ml/kg for 15 days orally.

Group II: Diabetic control received 1% w/v gum acacia 1ml/kg for 15 days orally.

Group III: Diabetic rats received methanolic extract of Smilax zeylanica leaf 400mg/kg body weight once a day orally for 15 days.

Group IV: Diabetic rats treated with Glibenclamide 0.5mg/kg orally once a day for 15 days.

Rats were fasted overnight and the blood was withdrawn from the orbital sinus of the eye on the 5<sup>th</sup> day, 15<sup>th</sup> day and 20<sup>th</sup> day post induction to determine blood glucose by GOD-POD kit method. The change body weight was observed throughout treatment period in experimental animals<sup>11</sup>.

### **STATISTICAL ANALYSIS**

All values were expressed as Mean  $\pm$  S.D. The differences between control and treatment groups were tested for significance using ANOVA followed by Dunnet's t test. P<0.05 were considered significant.

### **RESULTS**

The preliminary phytochemical studies indicate the presence of phytosterols, Flavonoids and glycosides in methanolic extract of Smilax zeylanica leaf. In acute toxicity study the methanolic extract of Smilax zeylanica did not produce lethality up to the dose level of 2000mg/kg.

# ANTIDIABETIC ACTIVITY OF METHANOLIC EXTRACT OF SMILAX ZEYLANICA LINN IN STREPTOZOTOCIN INDUCED DIABETIC RATS

**Figure 1**

Table- 1: Effect of Smilax zeylanica leaf extract on body weight in Streptozotocin induced diabetic rates

Values are expressed as Mean  $\pm$  S.E. n=6

Groups	Body weight in gms (mean $\pm$ SEM)		
	Post induction days		
	5 <sup>th</sup> day	15 <sup>th</sup> day	20 <sup>th</sup> day
Control	166.2 $\pm$ 3.25	172 $\pm$ 3.54	180 $\pm$ 3.34
Diabetic control	162.8 $\pm$ 3.34	135.8 $\pm$ 2.10*	124.3 $\pm$ 2.39*
Diabetic rats + extract	163.3 $\pm$ 1.98	169.3 $\pm$ 1.764*	174.8 $\pm$ 1.47*
Diabeticrats+ Glibenclamide	164.1 $\pm$ 2.77	169.8 $\pm$ 82.62*	177.5 $\pm$ 2.37*

P\* $<$ 0.05 Experimental groups were compared with diabetic control

P\* $<$ 0.05 Diabetic groups were compared with control group.

In the antidiabetic activity, the effects of Smilax zeylanica leaf extract on body weight is measured on 5<sup>th</sup>, 15<sup>th</sup> and 20<sup>th</sup> day of post induction and were compared with normal and diabetic control groups. The values are shown in Table No-1. Streptozotocin induced diabetic rats showed a significant decrease (P $<$ 0.05) in body weight compared to normal rats. Oral administration of leaf extract at the dose of 400mg/kg showed a significant increase (P $<$ 0.05) in body weight on 15<sup>th</sup> and 20<sup>th</sup> day of post induction when compared to untreated diabetic rats.

**Figure 2**

Table- 2: Effect of smilax zeylanica leaf extract on blood sugar level in streptozotocin induced diabetic rats.

Values are expressed as mean  $\pm$  S.E. n = 6.

Groups	Blood Glucose level in mg/dl (Mean $\pm$ SEM)		
	Post induction days		
	5 <sup>th</sup> day	15 <sup>th</sup>	20 <sup>th</sup>
Control	61.2 $\pm$ 1.22	61.05 $\pm$ 1.11	60.45 $\pm$ 1.10
Diabetic control	271.46 $\pm$ 14.7	259.2 $\pm$ 13.4*	268.8 $\pm$ 11.88*
Diabetic rats + extract	270.0 $\pm$ 17.04	134.4 $\pm$ 13.94*	70.61 $\pm$ 2.24*
Diabetic rats + Glibenclamide	262.0 $\pm$ 3.59	127.06 $\pm$ 8.07*	69.06 $\pm$ 1.28*

P\* $<$ 0.05 Experimental groups were compared with diabetic control

P\* $<$ 0.05 Diabetic groups were compared with control group.

The effect Smilax zeylanica leaf extract on fasting blood glucose level is measured on 5<sup>th</sup>, 15<sup>th</sup> and 20<sup>th</sup> day of post induction and compared with normal and diabetic control groups. The values are shown in table No-2. Streptozotocin induced rats showed a significant increase (P $<$ 0.05) in fasting blood glucose level compared to normal rats. Oral administration of leaf extract at the dose of 400mg/kg body weight showed a significant decrease (P $<$ 0.05) in blood glucose level in 10 and 15 days of treatment. The fasting blood glucose level on 15<sup>th</sup> day of post induction ( 10 days of treatment ) was 134.4 $\pm$  13.94 mg/dl compared to fasting blood glucose of diabetic control animal 259.2 $\pm$  13.4 mg/dl. The group treated with Glibenclamide 0.5 mg/kg showed fasting blood glucose level of 127.06  $\pm$  8.07 mg/dl. On 20<sup>th</sup> day of post induction ( 15days of treatment ), the leaf extract treated group showed a fasting blood glucose level of 70.61  $\pm$  2.24 mg/dl, compared to untreated diabetic animal which showed a fasting blood glucose level of 268.8  $\pm$  11.88 mg/dl. The group treated with Glibenclamide 0.5 mg/kg orally showed fasting blood glucose level of 69.06 $\pm$  1.28 mg/dl.

## DISCUSSION

In the present study the hypoglycaemic activity of methanolic extract of Smilax zeylanica leaves was evaluated in Streptozotocin induced diabetic rats. The continuous treatment of leaf extract for a period of 15 days produced a significant decrease in blood glucose level in diabetic rats

which is comparable to that of standard drug Glibenclamide which is used in treatment of type II diabetes mellitus. The standard drug Glibenclamide stimulates insulin secretion from beta cells of islets of langerhans. From the study, it is suggested that the possible mechanism by which the plant extract decreases the blood glucose level may be by potentiation of insulin effect either by increase in pancreatic secretion of insulin from beta cells of islets of langerhans or by increase in peripheral glucose uptake.

## CONCLUSION

The methanolic extract of *Smilax zeylanica* leaf exhibited significant hypoglycaemic activity in streptozotocin induced diabetic rats. From the phytochemical analysis it was found that the major chemical constituents of the leaf extract were flavonoids and glycosides. On the basis of above evidence it is possible that the presence of flavonoids may be responsible for the observed antidiabetic activity. Further pharmacological and biochemical investigations are underway to find out the active constituents responsible for antidiabetic activity and to elucidate its mechanism of action.

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