



ANTIDIABETIC ACTIVITY OF METHANOLIC EXTRACT OF PLANT *SIDA CORDATA* IN ALLOXAN INDUCED DIABETIC RATS

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ABSTRACT

India has rich heritage of use of medicinal plants in clinical practices since ancient times. Diabetes mellitus is a group of syndromes characterized by hyperglycemia, altered metabolism of lipids, carbohydrates and proteins, and an increased risk of complications from vascular disease. More than 400 species of plants have been reported to display hypoglycemic effects, but only a few of them have been investigated. Although many drugs are available to control the diabetes but has several adverse effects. The plant *Sida cordata* was reported to have activities such as Antibacterial, Antitumor, Antifungal, Antiulcer, Antitussive, Anti-inflammatory, Anti-malarial, Antioxidant, Analgesic, Antidepressant, Antihyperglycemic, Hepatoprotective in ayurvedic system of medicine. This study was undertaken to investigate the anti-diabetic activity of methanolic extract of *Sida cordata*. The two doses (100 and 200 mg/kg) methanolic extract of *Sida cordata* used for treatment of Alloxan induced diabetic rats. The glucose level was significantly ($p < 0.01$) high in Alloxan control rats when compared with normal control. But the level of glucose was significantly ($p < 0.01$) decreased after 7th day in diabetic rats treated with methanol extract (200 mg/kg) as compared with diabetic control rats.

KEYWORDS: *Sida cordata*, Diabetes mellitus, Alloxan induced

INTRODUCTION

In India, various plants are commonly used in treatment of various diseases known as Ayurvedic system of medicine. Homeopathic, Siddha, Naturopathy, Unani like alternative medicine systems also comprise various products obtained from plants. There are thousands of plant species which may be employed in clinical practices. Various plant parts like roots, stem, bark, leaves, flowers, fruits, seeds & whole plants are used in various forms of medicines. They may be used alone or in combination with other plant parts. There are very clear ancient references for utilization of these plants in clinical treatments.^{1,2}

Herbal medicine is the use of herbs for their medicinal and therapeutic or medicinal value. According to the world health organization (WHO), herbal medicine refers to health practices, approaches knowledge and beliefs incorporating plant, animal, and mineral based medicine, spiritual therapies, manual technique and exercises applied singularly or in combination to treat, diagnose and prevent illnesses or to maintain well-being.^{3,4}

Diabetes mellitus is a group of syndromes characterized by hyperglycemia, altered metabolism of lipids, carbohydrates and proteins, and an increased risk of complications from vascular disease. More than 400 species of plants have been reported to display hypoglycemic effects, but only a few of them have been investigated. Although many drugs are available to control the diabetes but has several adverse effects.^{5,6}

Sida cordata is highly reputed plant in ayurvedic system of medicine for the treatment of various ailments. This study was undertaken to investigate the anti-diabetic activity of methanolic extract of *Sida cordata*. Diabetes in rats is induced by injecting Alloxan. Rats with blood glucose level above 250mg/dl were

taken for the experiment. Glibenclamide 5mg/kg was used as a standard drug. The two dose (100 and 200 mg/kg) methanolic extract of *Sida cordata* used for treatment of Alloxan induced diabetic rats. Blood glucose level was checked at 1st, 7th, 14th and 21st day through the tail vein puncture method using digital Glucometer.^{7,8,9,15}

MATERIAL AND METHODS

Plant collection:

The whole plant *Sida cordata* (Burm. F.) Borss. was collected in the month of December from Tirupati hills, A.P., India. The plant material was taxonomically identified, confirmed and authenticated by Dr. K. Madhava Chetty, M.Sc., M.Ed., M.Phil., Ph.D., Assistant Professor, Department of Botany, Sri Venkateswara University, Tirupati-517502, A.P., India.

Preparation of extract:

The plant was dried under shade with occasional shifting and then powdered with a mechanical grinder and stored in an airtight container.

The dried coarse powder of *Sida cordata* (Burm. F.) Borss. extracted (at 65°C) in Soxhlet apparatus for 72 hrs. by using the 4 liter of Methanol solvent. The extract is then filtered through Whatman filter paper 45# and concentrated by evaporation till dry powder.

Phytochemical analysis:

Phytochemical screening of the crude leaf extract was carried out employing standard procedures and tests, to reveal the presence of chemical constituents such as alkaloids, flavonoids, tannins, terpenes, saponins, anthraquinones, reducing sugars, cardiac glycosides among others.^{13,14}

Antidiabetic Activity

Test animals:

Wister albino rats weighing between 150-200 gm were used in this study. The animals were placed at random and allocated to treatment group in propylene cages with paddy husk as bedding. Animals were housed at a temperature of 24°C and relative humidity 30-70%. A 12:12 dark: light cycle. All the animals were allowed to free access to the water and feed with standard commercial pellet rat chew. All the experimental procedure and protocols used in this study were reviewed by Institutional Animal Ethics Committee (IAEC), proposal number NCP/IAEC/NO: 15/2011-12 and were in accordant with guidelines of the IAEC.

Chemicals:

1. Alloxan monohydrate.
2. Diethyl ether.
3. Carboxy methyl cellulose.

Drugs:

1. Methanol extract of *Sida cordata* (Burm. F.) Borss.
2. Glibenclamide 5mg/kg.

Biochemical Parameters:

The blood sample was obtained from all the animals by puncturing retro orbital puncture of eye of animal. The blood sample was allowed to clot for 5 mins at room temperature. Serum was separated by centrifugation at 2500rpm at 30°C for 15 mins and utilized for the estimation of various biochemical parameters namely glucose, cholesterol, triglycerides, total proteins, alkaline phosphatase.

Experimental Protocols:

Rats weighing 150-200g, fasted overnight and used for induction of diabetes. Alloxan monohydrate solution of 10 mg/ml was prepared in normal saline and was administered to the rats within 5 min at a dose of 150 mg/kg body weight i.p. After 48 hrs. of Alloxan monohydrate administration, rats with blood glucose level above 250mg/dl were taken for the experiment. Rats were divided into six groups each with six animals.

Group I received normal diet and served as normal control.

Group II consists of Alloxan-induced rats receiving normal diet and serving as diabetic control.

Group III consists of Alloxan induced rats receiving Glibenclamide 0.5 mg/kg body weight once a day orally.

Group IV consists of Alloxan-induced rats receiving 100mg/kg *Sida cordata* methanolic extract once a day orally.

Group V consists of Alloxan-induced rats receiving 200mg/kg *Sida cordata* methanolic extract once a day orally.

All group animals were treated for 21 days. Blood glucose level was checked at 1st, 7th, 14th and 21st day through the tail vein puncture method using digital Glucometer.

Statistical Analysis

The collected data were subjected to appropriate statistical test including one-way ANOVA, followed by an appropriate Dunnett's t-test, P-value of less than 0.05, 0.01 and 0.001 were considered as less significant, significant and more significant respectively. The analysis was carried out using graph pad prism software.

Table 1: Effect of methanol extract of *Sida cordata* (burm. F.) Borss. on blood glucose level

Group	Description	1 st day	7 th day	14 th day	21 st day
Group I	0.5 % CMC	100.83 ± 2.482	101.00 ± 1.844	101.33 ± 2.028	101.5 ± 2.012
Group II	150 mg/kg of Alloxan.	286.16 ± 3.591	291.83 ± 3.361	289.166 ± 3.582	284.66 ± 3.938
Group III	0.5 mg/kg/Day Glibenclamide	299.00 ^{ns} ± 2.733	270.16 ^{**} ± 2.742	210.16 ^{**} ± 3.410	138.5 ^{**} ± 4.667
Group IV	Methanolic extract of plant 100 mg/kg.	294.16 ^{ns} ± 4.254	285.00 ^{ns} ± 4.655	261.00 [*] ± 4.219	195.00 ^{**} ± 2.997
Group V	Methanolic extract of plant 200 mg/kg.	291.5 ^{ns} ± 3.216	278.66 ^{**} ± 3.062	222.5 ^{**} ± 3.294	145.66 ^{**} ± 4.080

Data represents mean ± S.D. (n=6).

*p< 0.05 Significant as compared to Alloxan control. **p< 0.01 Significant as compared to Alloxan control.

***p< 0.001 Significant as compared to Alloxan control. ns: non-significant compared to normal control.

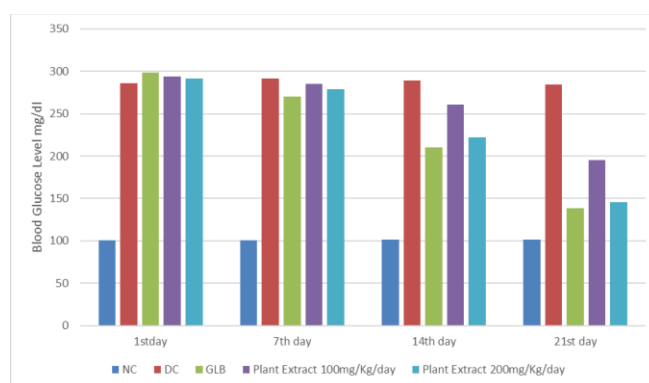


Fig. 1 Effect of methanol extract of *Sida cordata* (burm. F.) Borss. on blood glucose level.

NC= Normal control. DC= Diabetic control.

GLB = Standard drug T1= Plant extract 100mg/Kg/Day.

T2= Plant extract 200mg/Kg/Day.

RESULTS & DISCUSSIONS

The plant *Sida cordata* (Burm. F.) Borss. Belonging to the family of Malvaceae was selected for the phytochemical and biological activities. The plant was collected in the month of December 2011 from Tirupati hills, A.P., India, and authenticated by the botanist for confirmation. Methanol extract was subjected to phytochemical analysis. Results were shown the presence of the Flavonoids, Tannins, Sterols, Tri-terpenoids, Alkaloids and Glycosides. The anti-diabetic activity of methanolic extract of *Sida cordata* (Burm. F.) Borss. was compared with that of standard drug, it shows the significant anti-diabetic activity in dose dependent manner as shown in Table 1. The glucose level was significantly ($p < 0.01$) high in Alloxan control rats when compared with normal control. But the level of glucose was significantly ($p < 0.01$) decreased after 7th day in diabetic rats treated with methanol extract (200 mg/kg) as compared with diabetic control rats.

From the results obtained we conclude that the methanolic extract of the plant *Sida cordata* (Burm.F.) Borss. possess the potential anti-diabetic activities. Therefore, this medicinal plant can be considered effective and alternative treatment for the diabetes.

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