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Anti-Diabetic activity of biscuits containing ethanolic extract of whole plant of *Cissus quandrangularis Linn*. in Alloxan-Induced Diabetic Rats

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ABSTRACT

The purpose of this study was to investigate the anti-diabetic activity of biscuits containing ethanolic extract of whole plant of *Cissus quadrangularis linn*. in diabetic rats induced by alloxan. Alloxan-induced diabetic rats received ethanolic extract (EECQ) and biscuits (BEECQ) containing ethanolic extract of *Cissus quadrangularis linn.* and glibenclamide via oral administration. The plasma glucose level was assessed at 0, 3, 6, 9 and 12 h after drug administration. The EECQ and BEECQ (30 mg/kg) showed critical decrement in plasma glucose level as compare to vehicle treated group. Results revealed that ethanolic extract of whole plant of *C. quadrangularis linn.* has anti-diabetic activity.

Keywords: Diabetes mellitus, Alloxan induced diabetes, *Cissus quadrangularis linn.*, Ethanolic extract, Plasma glucose level.

INTRODUCTION

Diabetes mellitus (DM), commonly referred to as diabetes, is a chronic metabolic disorder characterized by high blood sugar levels over a prolonged period. It occurs when the body either doesn't produce enough insulin or doesn't use it effectively. Insulin is a hormone produced by the pancreas that helps regulate glucose (sugar) levels in the blood, allowing cells to use glucose for energy. (Davis SN, 2006).

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DM is considered as heterogeneous gathering of sicknesses described by significant causes influencing to cardiovascular, renal, neurological and ophthalmic frameworks (Chakkarwar and Manjrekar, 2005).

One of India's most common plants is *C. quadrangularis L.*, which belongs to the *Vitaceae* family. In Hindi, it is prominently known as harjora; other normal names incorporate bone setter (English), hathjod (Urdu), habhanga (Bengali) etc. (The Ayurvedic Pharmacopoeia of India, 2001).

In a study, antidiabetic effect of stem fraction of *C. quadrangularis L* was observed with extract doses 100 and 200 mg/kg body weight. CQSF at a dose of 100 mg/kg body weight significantly decreased the altered levels of blood glucose by about 56%. (Lekshmi RK *et al.*, 2015)

Chaudhari Rl *et al.,* in their study found antihyperglycemic effect of ethanolic extract of C. quadrangularis. Ethanolic extract at 400 mg/kg resulted in lowered serum glucose at 24 h.(Chaudhari Rl *et al.*,2013)

Selvaraj J *et al.,* in their research work found C. quadrangularis has more antidiabetic potential than Cinnamomum tamala when tested *in vitro* by α-glucosidase inhibitory activity and α-glucosidase inhibitory activity. (Selvaraj J *et al.*,2022)

MATERIALS AND METHODS

Collection and Authentication of Plant Material

C. quadrangularis whole plant was collected from local area of Indore district, Madhya Pradesh, India in the months of July-October. This plant was identified, authenticated and voucher specimens No. HD/PPHY/615 have been kept in Department of Plant Physiology, Jawahar lal Nehru Krishi Vishwa vidyalaya, Jabalpur, India.

Procurement of raw material

Ragi flour, wheat flour, salt, sugar, baking powder were purchased from local market of Indore.

Formulation of biscuits

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Mix 80g Ragi flour and 20g whole wheat flour together into a bowl. Add 20g clarified butter and 20g sugar into another bowl to make a smooth syrup. Mix syrup into flour and then add 500mg salt and 2g baking powder. For preparation of antidiabetic biscuits, separately add 30mg ethanolic extract of *Cissus quadrangularis linn.* into mixture. Spread both the bisciuts mixture (with and without extract) on a sheet and bake it at 200°C for 10 min. Allow to cool at room temperature and pack this biscuits in a air tight container.

Extraction and Preliminary Phytochemical Analysis

The plant material were dried under the shade and made to fine powder using a laboratory mill. The powdered plant material was extracted with ethanol (95%) using soxhlet apparatus for 24 hours. The solvent was then removed under reduced pressure and controlled temperature (40 - 50°C) in a rotary evaporator. Final crude extract was obtained (Kokate *et al.*, 2001).

Animals

Adult wistar rats weighing between 150-180 g were involved and accustomed to research center circumstances for multi week. All of the animals were kept in well-ventilated polypropylene cages at 25°C, 55–65 percent relative humidity, and a 12:12 h light/dark schedule. The creatures had taken care of with business pellet rodents chow and water not indispensable as a standard eating regimen. Experimental convention was approved by institutional animal ethics committee as per CPCSEA (Approval No.1227/PO/Re/S/08/CPCSEA)

Experimental model

Alloxan monohydrate was first weighed individually for each animal according to their weight and then solubilized with 0.2 ml saline just prior to injection. Diabetes was induced by injecting it at a dose of 120 mg/kg body weight intraperitonially. After 1 hour of Alloxan administration, the animals were given feed ad libitum, and 5% dextrose solution was also given in a feeding bottle for a day to overcome the early hypoglycemic phase. The animals were kept under observation and after 72 hours blood glucose was measured by One-touch glucometer. The diabetic rats (glucose level 200-300 mg/dl) were separated and divided into five different groups for experimental study, with each group containing five animals.

Requirements:

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Alloxan, Glibenclamide, 2% gum acacia solution, 5% dextrose solution, 0.2 ml saline, water, rat feed.

The rats were divided into five groups each consisting of five rats.

Group-I: Alloxan (120mg/kg body weight) induced diabetic animals received in suspension of 2.0 % w/v Gum acacia.

Group-II: Alloxan (120mg/kg body weight) induced diabetic animals received Glibenclamide 5mg/kg body weight orally with suspension of 2.0 % w/v Gum acacia.

Group-III: Alloxan (120mg/kg body weight) induced diabetic animals received ethanolic extract 30mg/kg

Group-IV: Alloxan (120mg/kg body weight) induced diabetic animals received ethanolic extract (biscuit) 30mg/kg, body weight per orally.

Group-V: Alloxan (120mg/kg body weight) induced diabetic animals received normal biscuit with no extract.

Blood samples (0.1 ml) were collected from the tail vein of the rat at 0, 4, 8, 12 hr. respectively after oral administration. The blood Sugar level was determined by Glucometer.

RESULTS AND DISCUSSION

Biscuits containing ethanolic extracts of whole plant of *C. quadrangularis linn* and extract alone showed more significant reduction in blood glucose level in alloxan induced diabetic rats as compared to control and glibenclamide treated rats.

Anti-diabetic activity of ethanolic extract of *C. quadrangularis* may probably be due to the presence of several bioactive components like polyphenols, flavonoids, terpenoids etc.

Table no. 1: Plasma glucose concentration

Plasma Glucose Con. (mg/dL)					
Hours	Group-I (Diabetic through alloxan)	Group-II (Glibenclamide)	Group-III (Ethanolic extract)	Group-IV (biscuit with extract+ diabetic)	Group-V (diabetic + biscuit with no extract)
0	149	151	154	143	148

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3	149	142	145	147	156
6	148	124	139	140	169
9	147	109	127	119	165
12	145	105	115	114	150

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