



Evaluation of Antidiabetic Potential of *Ficus religiosa* Leaf Extract in Streptozotocin-Induced Rats

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Article Info

Received: 31-10-2023

Revised: 20-12-2023

Accepted: 31-12-2023

ABSTRACT

Background: It is projected that the incidence of diabetes is rising yearly. Many people, including those in India, which is regarded as the world's diabetes capital, practice traditional medicine. Disturbances in the metabolism of fats, carbohydrates, and proteins are hallmarks of diabetes, a metabolic disease. The goal of this research is to assess coriandrum sativum's potential as an antidiabetic. Linn fruit methanolic extract in a model of diabetic wistar albino rats caused by streptozocin. **Techniques:** Streptozocin (50 mg/kg, i.p.) in citrate buffer is used to induce diabetes in wistar albino rats. Five groups (A, B, C, D, and E) of thirty wistar albino rats were created. Group B was the diabetic control, Group C was the methanolic coriandrum sativum, and Group D was the normal control. Group E was administered the conventional medication Glibenclamide (0.5 mg/kg) orally at doses of 100 and 200 mg/kg of Linn. fruits extract (CSFME). Blood sugar levels were monitored at regular intervals until the study's conclusion, and all groups received treatment for 14 days in a row. **Findings:** This investigation demonstrates that the test drug compound CSFME exhibits persistent oral hypoglycemic action that is statistically significant ($p \leq 0.05$) and equivalent to that of the common medication Glibenclamide. The study's findings support the antidiabetic effects of CSFME in wistar diabetic albino rats produced by streptozocin. It may be a new antidiabetic medication and a dietary supplement for the treatment of type 2 diabetes and its complications. To verify the antidiabetic effects of certain phytochemical components of Coriandrum sativum, further research is needed. **Keywords:** Glibenclamide, methanolic extract, diabetic wistar albino rats, Coriandrum sativum, blood glucose, and antidiabetic

INTRODUCTION

Nearly 2,000 years ago, diabetes was first mentioned. It has been mentioned in the history of contemporary medicine for the last 200 years and is a condition that is defined by abnormal metabolism and unwarranted hyperglycemia brought on by either insufficient insulin secretion or a combination of insulin resistance and

insufficient insulin secretion to make up for it. One According to a global study, around 10% of people worldwide suffer with diabetes. According to the International Diabetes Federation, the number of people with diabetes is expected to rise from around 135 million in 1995 to 350 million in 2030. 2, 3

The artificial antidiabetic medications Some of the worst adverse effects of the currently available medications include hepatorenal abnormalities and hypoglycemia coma. 4,5 As a result, people are turning to herbal remedies, which have a few mild adverse effects and may be able to treat complex conditions like diabetes and its complications. 6. Research on hypoglycemic medications made from medicinal herbal plants has also accelerated in response to the World Health Organization's strong recommendations for studies on the advantageous use of these plants in the treatment of diabetes. Since ancient times, doctors and laypeople have used traditional medicinal plants with a range of biological active principles and qualities to cure a wide range of human illnesses, including cancer, diabetes, and coronary heart disease (CHD). Herbal medicine formulation has received a lot of attention, and antidiabetic medications derived from medicinal plants may be the finest source for therapeutic development. 7. The hypoglycemia properties of therapeutic herbal plants are well-known in traditional herbal medicine, and the literature currently in publication shows that over 800 species of medicinal plants exhibit hypoglycemic properties. Because of their accessibility, affordability, and little adverse effects, medicinal herbal plant products with antidiabetic properties have seen a rise in demand. Consequently, the hypoglycemic impact of medicinal plant components is constantly being examined and investigated and investigated. One such plant that has been utilized to treat diabetes in the Indian traditional medical system is *Coriandrum sativum*. One of the most significant medical herbs in the Apiaceae family, coriander (*Coriandrum sativum* Linn.) is also one of the most valued flavoring and medicinal plants. This plant is cultivated almost everywhere in the globe and is truly native to the Mediterranean area. The fruit of the coriander plant and its essential oil are used medicinally. 8, 9 In traditional herbal therapy, coriandrum is often used to treat burns, headaches, anxiety, fever, edema, digestive issues, allergies, and respiratory conditions. 10, 11 Astringent, emollient, anthelmintic, antibilious, appetizer, digestive, constipating, antipyretic, refrigerant, diuretic, anodyne, tonic, expectorant, dyspepsia, and antidiabetic are some of the uses for coriander fruits. According to the results of the phytochemical component screening, coriander contains phenolics, sterols, fatty acids, glycosides, reducing sugars, flavonoids, alkaloids, terpenoids, tannins, and essential oil. Carbohydrates, proteins, fats, fibers, and a plethora of vitamins, minerals, and trace elements are among its many nutrients. Coriander has been shown to have depressive, anticonvulsant, anxiolytic, memory-enhancing, sedative-hypnotic, orofacial dyskinesia-improving, antioxidant, neuroprotective, antibacterial, antifungal, and insecticidal

properties in prior pharmacological research. a variety of pharmacological actions, including detoxifying, gastrointestinal, dermatological, deodorizing, reproductive, hepatoprotective, analgesic, anticancer, diuretic, anthelmintic, anti-inflammatory, hypolipidemic, cardiovascular, antidiabetic, and mutagenic. 12–17 Using aqueous and methanolic extracts of *Coriandrum* fruit, coriander silver nanoparticles were created, and their antioxidant properties were documented. 18 Given the above details, the current study was conducted to assess the antidiabetic potential of *Coriandrum sativum* fruit using a model of wistar diabetic albino rats caused by streptozocin (STZ).

METHODS

Chemicals

Streptozocin (Hi-media labs Pvt. Ltd. (India). Tab glibenclamide, 5mg (Aventis Pharma Ltd, Ankles war), Diagnostic Kits (Roche, Mumbai), methanol, citrate buffer (pH 4.5).

Animals

In this experiment, 30 Wistar Albino rats of both sexes weighing 150–200 grams were employed. The animals were kept in groups of six (6) in polypropylene cages with a 12-hour light-dark cycle, a regulated ambient temperature of $25\pm 2^{\circ}\text{C}$, and a relative humidity of 55%. Throughout the trial, the animals were given a conventional food pellet diet and unlimited access to water. The wistar albino rats were given water at will and fasted for precisely 12 hours before being weighed in preparation for this experiment. The Institutional Animal Ethical Committee (IAEC) of Mamata Medical College in Khammam, Telangana state, authorized all research procedures after receiving approval from CPCSEA.

Plant material and preparation of plant extract

Coriandrum sativum Fruit were collected from local market in Khammam city at rotary nagar in the month of October - November and authenticated by Assistant Professor and Head, Department of Botany, Govt. SRBJNR PG College, Khammam. Coarsely powdered *Coriandrum sativum* fruits 200g was extracted with 75% methanol [1500 ml] in a soxhlet extraction apparatus till the complete exhaustion, filtered. The methanolic extract was then concentrated by a rotary vacuum evaporator and evaporated to dryness. The solvent is then evaporated at room temperature to obtain reddish brown extract. This obtained extract was stored nearly at $2-8^{\circ}\text{C}$ till further use.

Experimental diabetes induction

Wistar albino rats were fasted overnight and blood is collected from the tail vein of each groups rats before the treatment i.e., on 0 day(initial) and on 7th day and on the 14th day of the treatment. Blood serum was separated from

the collected blood sample by centrifugation and was used for the blood sugar estimation.

Animals were fasted for a exact period of 12 hrs. before Diabetes induction. Diabetes induction in wistar albino rats was done by administration of freshly prepared streptozocin (50mg/kg, i.p.). in citrate buffer. A freshly prepared single dose of streptozocin (50 mg/kg, i.p.) was dissolved in citrate buffer and was used for type -2 diabetes induction in rats after overnight fasting. After 1 h of streptozocin administration, the wistar albino rats were fed with the standard food pellets and water ad libitum. The wistar albino rats were stabilized for a week and animals showing blood sugar levels more than 200 mg/dL were selected for this study.

Experimental design

30 wistar albino rats were divided in five (5) groups whereas group A remained non-diabetic and group B consist diabetic and group 3 and 4 consisting diabetic plus treated:

- Group A: Rats received saline (only saline 10 ml/kg/day) orally for an exact period of 14 days.
- Group B: Rats received streptozocin single dose (50mg/kg, b.w., i.p.) (Hi-media laboratories Pvt. Ltd. (India)) dissolved in citrate buffer was used for type 2 diabetes induction in rats after overnight fasting.
- Group C: Rats received streptozocin single dose (50 mg/kg, b.w., i.p.) plus coriandrum sativum fruits methanolic extract suspension (100mg/kg b.w. in citrate buffer orally for an exact period of 14 days.
- Group D: Rats received streptozocin single dose (50 mg/kg, b.w., i.p.) plus coriandrum sativum fruits methanolic extract suspension (200mg/kg b.w. in citrate buffer orally for an exact period of 14 days.
- Group E: Rats received streptozocin single dose (50 mg/kg, b.w., i.p.) plus Glibenclamide suspension

Table 1: Effect of Coriandrum sativam Linn. Fruit methonolic extract on fasting blood sugar level in streptozocine induced diabetic wistar rats.

Treated groups	Fasting blood glucose (mg/dl)		
	0 day (initial)	7 th day	14 th day (final)
Normal control (only saline 10ml/kg/day) orally	97.3±5.0	99.5±3.2	96.5±5.3
Diabetic control streptozocin (50mg/kg) in a single i.p. dose	97.±7.7	283.8±5.1	277.3±4.5
Diabetic+ CS Linn. fruits methanolic extract (100mg/kg/day) orally	98.33±7.1	282.±5.4*	197±2.5.7**
Diabetic+ CS Linn. fruits methanolic extract (200mg/kg/day) orally	100.33±3.2	276.7±3.4*	180.3±5.9**
Diabetic+glibenclamide 0.5mg/kg/day orally	97.67±4.3	266.5±5.6*	145.7±4.1**

All values are expressed in Mean±SD. Analyzed by one way ANOVA followed by Dunnet's test for multiple comparison tests. * = p<0.05 when compared to the normal control group (significant p value)

** = p<0.00 when compared to diabetic control group (Highly significant p value)

DISCUSSION

The impact on blood sugar of repeatedly administering 75% of the methanolic extract of C. sativum (CS) fruits orally

(0.5mg/kg b.w. in citrate buffer orally for an exact period of 14 days.

After 30 minutes of the treatment, the rats of each group were given glucose (5gm/kg) in distilled water orally and blood is collected before the experiment day i.e. on (0 day (initial day), on the 7th day of the given test drug coriandrum sativum fruit methanolic extract and on 14th day of treatment from rats of each group and blood sugar values were observed.

Statistical analysis

Results of biochemical analysis parameter like levels of blood glucose are reported as Mean±SD of six (6) animals in each group (n=6). The data were subjected to ANOVA (one-way analysis of variance) for the multiple comparisons followed by Dunnett's test was applied for determining the statistical significance of difference in blood glucose. P values of less than 0.05 (p<0.05) were considered as statistically significant.

RESULTS

This present research investigation has revealed and confirms that the antidiabetic activity of coriandrum sativum fruits methanolic extract on intraperitoneal injection of streptozocin at the dose of 50mg/kg b.w. caused significant increase in blood sugar levels in untreated groups (diabetic rat group) when compared to the control group was shown in (Table 1). Treatment of diabetic wistar albino rats with coriandrum sativum fruits methanolic extract for the period of 14 days caused a dose dependent steep drop in the blood sugar levels in diabetic wistar albino rats. Glibenclamide treated diabetic rats also showed significant (P <0.00) steep drop in blood sugar levels after 14 days of treatment as shown in (Table 1).

Table 1 displays the values in streptozotocin-induced diabetic wistar albino rats. For the first and second weeks, treatment with a methanolic extract of coriandrum sativum fruits at doses of 100 and 200 mg/kg body weight showed a substantial

Streptozotocin-induced diabetic wistar albino rats showed a significant ($p<0.05$) decrease in fasting blood glucose levels when compared to the diabetic control group (Table 1). Diabetic wistar albino rats' blood sugar levels began to drop during the first week of the medication's administration and remained stable until the second week, when they were equivalent to glibenclamide 0.5 mg/kg.



Figure 1: Coriandrum sativum linn. Fruit.

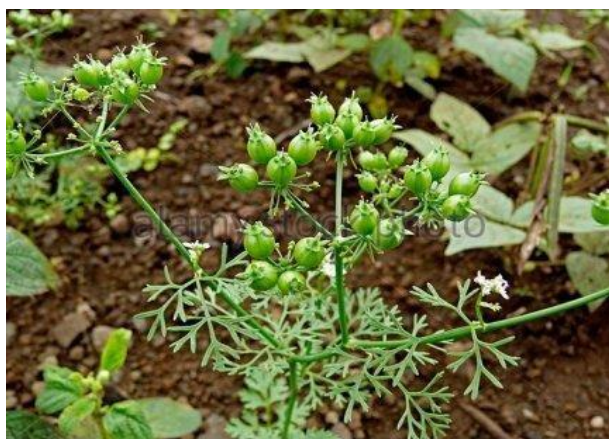


Figure 2: Coriandrum sativum linn. plant.

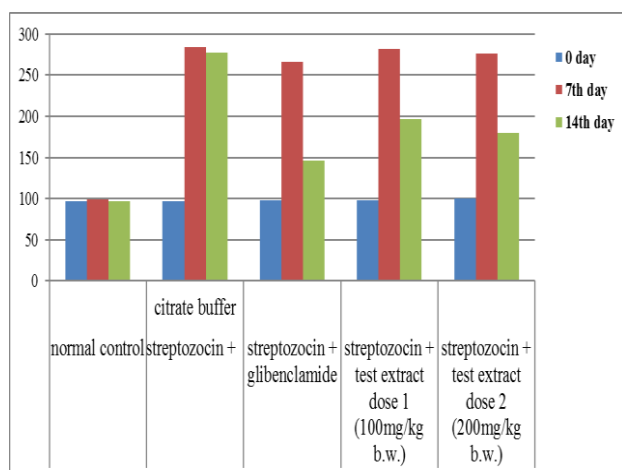


Figure 3. Blood glucose levels during experimental period (All treated groups).

Given these findings, our study unequivocally shows and validates that the fruits of *Coriandrum sativum* Linn. have a strong antihyperglycemic impact in wistar albino rats that have been given Streptozotocin (STZ) to produce hyperglycemia. The destruction of the pancreatic β -cells by streptozotocin has been reported to produce selective pancreatic islet β -cell cytotoxicity, which is mediated by the generation of nitric oxide (NO), methyl cations, methyl radicals, and reactive oxygen species (ROS). The pyridine nucleotide concentration in the pancreatic islet will rapidly drop as a consequence, and β -cell necrosis will follow. Complications from diabetes mellitus are caused by SOD anions, which are produced when STZ acts on mitochondria. 19–21

As a derivative of sulfonylurea, glibenclamide is often employed as a standard antidiabetic medication in STZ-induced diabetes to assess the effectiveness of other antihyperglycemic medication molecules. By blocking ATP-sensitive K^+ ATP channels in the plasma membrane, glibenclamide has been implicated in promoting insulin production from pancreatic β -cells. In our investigation, the diabetic control group's blood glucose levels were significantly higher than those of the normal albino rats. In contrast to the diabetic control group, albino rats in the CS1 (coriandrum sativum 100 mg/kg b.w.) and CS2 (coriandrum sativum 200 mg/kg b.w.) treatment groups showed a significant reduction in fasting blood sugar levels.

CONCLUSION

Our experimental data results in this work unequivocally demonstrated and validated the strong antidiabetic action of our test extract, which is a methanolic extract of coriandrum sativum linn fruit at doses of 100 mg/kg and 200 mg/kg b.w. The fruit of the coriandrum sativum linn plant may thus be employed as a possible antidiabetic. It may be a new antidiabetic medication and dietary supplement for the treatment of type 2 diabetes and its aftereffects. However, it is uncertain exactly how the methanolic extract of *Coriandrum sativum* linn. fruits has antidiabetic effects. To prove its antidiabetic effect, further confirmatory research is still needed to determine the likely mechanism of action. To determine the active ingredient in coriandrum sativum and linn fruit, as well as the function of these herbal medications in managing diabetes and its consequences, further human confirmatory research is required.

ACKNOWLEDGEMENTS

The authors express their gratitude to the Chairman of Mamata Medical College in Khammam, Telangana, for his support and direction. Her kind heart encouraged them to digest this research study correctly and finish the assignment. Additionally, they express their gratitude to the Mamata Medical College, Khammam team, as well as their parents, siblings, and sister, as well as the secretary, principal, and head of the pharmacy department. Sincere gratitude is extended to Mr. D. Ramadasu, technician of Mamata Medical College, Khammam, experimental pharmacology. Finally, they would like to thank the animals that were employed in this research.

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