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Original Article

Modulatory effect of dianthrone rich alcoholic flower extract of *Cassia auriculata* L. on experimental diabetes

Syed Zameer Ahmed Khader[a,*], *Sidhra Syed Zameer Ahmed*[a], *Senthil Kumar Balasubramanian*[b], *Thanga kumar Arunachalam*[c], *Geetha Kannappan*[d], *Mohamed Rafi Mahboob*[e], *Ponmurugan Ponnusamy*[a], *Kishore Ramesh*[a]

[a] *Department of Biotechnology, K.S. Rangasamy College of Technology, Tiruchengode, India*
[b] *Department of Zoology, Thiruvalluvar University, Vellore, India*
[c] *Department of Chemistry, Abdul Hakeem College, Melvisharam, India*
[d] *Department of Chemistry, Muthurangam Government Arts College, Vellore, India*
[e] *Department of Science and Humanities, Kingston Engineering College, Vellore, India*

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ABSTRACT

Background: Diabetes is rapidly rising all over the world at an alarming rate and has changed from a mild disorder to major causes of mortality and morbidity in the youth and middle-aged people, and the prevalence is seen especially in six inhabited continents of the globe. The present study aims to explore the antidiabetic, lipid lowering effect of *Cassia auriculata* L. flowers in alloxan-induced diabetes.

Methods: Diabetes was induced using alloxan monohydrate in experimental rats and subsequent therapeutic effects of *C. auriculata* extract and standard drug glibenclamide were monitored. Bioassay-directed fractionation using silica gel column chromatography was performed until pure fractions were isolated. The effect of the treatment was analyzed by hematological parameters and enzyme assays. The pure compounds were confirmed with thin layer chromatography and high performance liquid chromatography pattern and further subjected for characterization.

Results: The alterations in blood glucose were monitored throughout the study. There was a gradual fall in blood glucose and significant changes were observed in lipid profile and metabolic enzyme after treatment with *C. auriculata*. Bioassay fractionation represented that the C2 subfraction produced a dose-dependent fall in blood glucose and lipid profile and upon further purification yielded two pure compounds. The structure of the pure compound was elucidated using Fourier transform infrared, ^{1}H nuclear magnetic resonance, ^{13}C nuclear magnetic resonance, and mass spectral data.

* *Corresponding author*: Department of Biotechnology, K.S. Rangasamy College of Technology, K.S.R. Kalvinagar, Tiruchengode 637 215, Tamil Nadu, India.
E-mail addresses: zameerkhader@gmail.com, zameerkhader@yahoo.com (S.Z.A. Khader).
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Conclusion: The present study clearly indicated the significant antidiabetic effect of *C. auriculata* and lends support for its traditional usage without evident toxic effects.

1. Introduction

Diabetes mellitus is a chronic disease in humans caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin action, associated with chronic hyperglycemia and alteration of carbohydrate, protein, and lipid metabolism. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.[1]

The use of medicinal plants for the treatment of diabetes mellitus dates back from the Ebers Papyrus of about 1550 BC. Across the globe, about 1200 plants species are used in treating diabetes mellitus and most of them after laboratory testing showed effective hypoglycemic activity.[2] Ayurvedic treating methodology has been practiced in rural India as a traditional system of medicine.

Cassia auriculata L. (Family: *Caesalpiniaceae*) is a shrub with large bright yellow flowers found growing wild in central and western India and cultivated in other areas of the country. The root cures tumors, skin diseases, and asthma; leaves are anthelmintic, good for ulcers, diarrhea, and leprosy; and the flowers are used in the treatment of urinary discharge, diabetes, and dysentery.[3] *C. auriculata* is also one of the major components of a beverage called "kalpa herbal tea" which has been widely consumed by people suffering from diabetes mellitus, constipation, and urinary tract diseases.[4] An alternative preparation for diabetes medication is a mixture called "avarai panchaga choornam" which is prepared from dried and powdered plant parts and commonly used for opthalmia, conjunctivitis, diabetes, and urinary infections (equal amount of leaves, roots, flowers, bark, and unripe fruits).[5]

Despite the occurrence of some published preliminary work describing the phytochemical content of the plant, a systematic activity-directed isolation study on *C. auriculata* has not yet been carried out. The present study was carried out in rats to test the efficacy of methanol flower extract and column fractions of *Ca* on hyperglycemia and serum lipid profile changes associated with alloxan-induced diabetes mellitus in male albino rats.

2. Methods

2.1. Collection of plant material

The flowers of *Ca* (*Caesalpineceae*) were collected in and around Vellore District, Tamil Nadu, India. The plant materials were cleaned with distilled water, shade dried at room temperature, and authenticated by Dr A. Annadurai, Department of Botany, C. Abdul Hakeem College, Melvisharam, Vellore District, Tamil Nadu, and voucher specimens (CAHC-09/2009) were kept at the Department of Botany, C. Abdul Hakeem College, Melvisharam, Vellore District., Tamil Nadu, India. The dried flowers were coarsely powdered by using an electric blender and stored separately in an airtight container for further use.

2.2. Preparation of extract

Some 100 g of the dried powdered flowers of *C. auriculata* were taken separately and mixed with 500 mL of methanol and then magnetically stirred in a separate container overnight at room temperature. The residue was removed by filtration. The filtrate was concentrated under reduced pressure in a rotary evaporator at $60 \pm 10^{\circ}$C to yield 10 g of crude extract (10%) and the resultant extract was used for further studies.

2.3. Chemicals and solvents

Alloxan was procured from SD Fine Chem. Limited, Mumbai, India, for the present investigation. All other chemicals and solvents were of analytical grade and obtained from S.D. Fine Chemicals and Fischer Inorganic and Aromatic Limited, Chennai, India.

2.4. Experimental animals

Adult male albino rats weighing around 180–200 g were purchased from Tamil Nadu Veterinary and Animal Sciences University, Chennai, India. The animals were kept in polypropylene cages (3 in each cage) at an ambient temperature of $25 \pm 2^{\circ}$C and 55–65% relative humidity. Animals were maintained in the animal house, acclimatized to the laboratory conditions, and were fed with commercially available rat chow (Hindustan Lever Ltd., Bangalore, India). They had free access to water. The experiments were designed and conducted in accordance with the institutional guidelines (Reg. No: 1011/c/06/CPCSEA).

2.5. Acute toxicity studies

The acute oral toxicity study was carried out according to the guidelines set by the Organization for Economic Co-operation Development (OECD).[6]

2.6. Experimental induction of diabetes

Diabetes was induced in the rats by the administration of a single intraperitoneal dose of alloxan monohydrate (150 mg/kg) in normal saline.[7] Two days after alloxan injection, rats screened for diabetes having glycosuria and hyperglycemia with blood glucose level above 250 mg/dL were taken for the study.