

## Effect of Cassia Fistula Bark Hexane Extract on Lipid Parameters in Male Diabetic Rats

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### Abstract

**Objective:** To evaluate and compare the effects of Cassia fistula bark on serum lipids in high fat diet and streptozotocin instigated diabetic albino rats.

**Method:** Randomized controlled trial (RCT) carried out in Physiology department of Services Institute of Medical Sciences, Lahore from August 2017 to April 2018. Ninety male albino rats were randomly divided into two equal groups (n=45). Firstly, rats in both groups were fed on high fat diet. Secondly streptozotocin was injected to induce type 2 diabetes. The diabetic control group was designated as group-1 and kept on normal saline only. The Diabetic experimental group was fed on Cassia fistula bark (0.45g/kg body weight once a day) respectively for 30 days. Subsequently, blood samples (4-5ml intracardiac) were collected from each group member on the 31st day to evaluate the biochemical parameters of serum lipids.

**Results:** The hexane-based extracts of Cassia fistula lead to highly significant ( $p < 0.001$ ) reduction in lipid profile of group-2.

**Conclusion:** Cassia fistula bark can significantly lower serum lipid parameters.

**Keywords:** Cassia fistula, Lipid Lowering Effect.

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### Introduction

The incidence of diabetes mellitus is predicted to increase globally from an estimated 382 million in 2013 to 592 million by 2035.<sup>1</sup> Type 2 diabetes has already attained epidemic level, while the incidence of type 1 diabetes is also increasing. It initially emerges as a group of disorders with defective or deficient insulin secretory process culminating in glucose underutilization, hence, leading to hyperglycemia and increase mobilization of fats from adipose tissue and used as fuel instead of glucose.<sup>2</sup> Patients with diabetes may suffer with wide range of microvascular complications such as stroke,

ischemic heart disease especially if related with hypertension, diabetic retinopathy and nephropathy.<sup>3</sup> Dyslipidemia associated with diabetes typically consists of raised triglycerides, cholesterol, LDL and low HDL levels which increases the risk of coronary artery disease. Others complications include periodontitis, neural disorders, gastro-enteritis, delayed gastric emptying, renal disorders, dermatological manifestation, erectile dysfunction and diabetic macular edema.<sup>4</sup> Medicinal herbs have played a significant role in treating and preventing a variety of diseases worldwide for centuries. Herbal remedies are tried globally to treat diabetes mellitus proactively or to delay any further complications. They are considered a significant source of antioxidants which help in preventing or delaying many diseases and their adverse outcomes.<sup>5</sup> Such remedies not only seem to increase the insulin secretion and cellular glucose uptake but also decrease the intestinal glucose absorption and hepatic glucose production.<sup>6</sup> One of the conventional herb used to treat diabetes mellitus is Cassia fistula commonly known as amaltas. It's found in abundance

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in asian subcontinent. Many pharmacological and biological effects are attributed to various parts and extracts of this plant, including anti-diabetic, hypolipidemic, anti-inflammatory, antioxidant,<sup>7</sup> antiplasmodial, anti-trypanosomal, anti-cancerous, antimicrobial, anti-helminthic, anti-infertility, immunomodulating, nematocidal, immune-contraceptive and insect repellent effects.<sup>8,9</sup>

Therefore, The present study is the experimental type and aims to add value to future research in elaborating the protective properties of hexane extract of amaltas bark specifically on serum lipid profile. Although many researches have been carried out that uses amaltas as their subject of interest to study blood pressure, obesity, and hyperlipidemia but our study is different as we used hexane extract of amaltas bark on diabetic grounds to assess the fluctuation in lipid parameters including serum triglyceride, cholesterol, VLDL, LDL and HDL.

### Materials and Methods

Randomized controlled trial (RCT) carried out in Physiology department of Services Institute of Medical Sciences, Lahore from August 2017 to April 2018 Adult and healthy male albino rats (ninety) were housed in groups of 45 per cage for minimally one-week prior to the commencement of experiment. Dwelling environment was kept at 26±2°C with 12-hour light/dark cycle. The rats were divided in two groups of 45 each. Initially all rats were given high fat diet for two weeks. On the 14<sup>th</sup> day injection streptozotocin was given to induce diabetes, confirmed by blood glucose levels > 200 mg/dl. Group 1: Diabetic control provided with normal saline orally. Group 2: Diabetic experimental was given cassia fistula extract of dose 0.45g/kg body weight for thirty days. On 31<sup>st</sup> day, intracardiac blood sample (4-5ml) was obtained to evaluate the effects of plant extract on lipid profile.<sup>10</sup> Freshly matured bark (5kg each) of cassia fistula were fetched locally from Lahore. Botanical identification of the bark was completed in the Botany Department, Punjab University. An 80% hexane extract of the air-dried and coarsely ground cassia bark was obtained via standardized Soxhlet extractor in Applied Chemistry Research Centre, PCSIR Labs, Lahore. The extract thus acquired, was subjected to filtration and ethanol (solvent) evaporation in a rotary evaporator in a vacuum. A dark brown concentrate, obtained post-evaporation, was then preserved at 4°C. Preceding to every dose, the crude extract was liquefied in sterilized distilled water and diluted to the required concentration.

Initial blood sample was drawn aseptically from tail vein

72-hours after streptozotocin injection to confirm hyperglycemia. Sampling was repeated on the 31<sup>st</sup> day of the experiment after ensuring the animals were fasting overnight. Each rat was anesthetized using ether before drawing 5-milliliter blood from their intracardiac sampling.<sup>11,12</sup> Four ml of each sample was allowed to coagulate at room temperature in the test tube for 30 minutes followed by centrifugation at 5000 rpm for 20 minutes. Post-centrifugation, the serum was collected and preserved in labeled tubes. It was kept at -20°C, to be tested for serum cholesterol, triglycerides, VLDL, LDL and HDL, later on. PASW (formerly SPSS) was used to conduct data analysis. The student t test was carried out for descriptive analysis to find the arithmetic mean± SD values of obtained data. The values were appraised highly significant when the p-value was less than 0.001.

### Results

In this randomized controlled trial, the effects of Cassia fistula (amaltas) bark on the serum lipid profile of a total of 45 male diabetic rats was evaluated. The serum cholesterol, triglyceride, LDL, and VLDL in diabetic experimental group was found to be highly significant (p=0.00) greater in both groups after inducing diabetes (Table-1). Similarly, serum HDL level was also significantly higher in both groups (Table-1). After administering amaltas bark extract, the mean difference showed a highly significant (p=0.00) drop in cholesterol, triglyceride, LDL, and VLDL levels; and highly significant (p=0.00) rise in serum HDL level in treated group compared to the untreated diabetic control group.

**Table 1:** Comparison of Serum Lipid Profile between Diabetic Control and Diabetic Experimental Groups

Parameters	Group I (n=45)	Group II (n=45)	p-value
Serum triglyceride(mg/dl)	100.82±5.30	80.53±4.62	0.00**
Serum cholesterol(mg/dl)	214.57±6.88	100.15±5.67	0.00**
Serum HDL (mg/dl)	16.57±2.82	18.06±4.09	0.05*
Serum LDL (mg/dl)	178.56±8.13	31.58±7.18	0.00**
Serum VLDL (mg/dl)	20.13±1.06	16.08±1.01	0.00**

Values are expressed as Mean ± SD

\* p-value is significant

\*\* p-value is highly significant

### Discussion

Recently, more research is being focused on unveiling

the antidiabetic properties of cassia fistula in search of some harmless herbal alternative to allopathic medicines. For this purpose, meta studies are being carried out to assess the effects of various aqueous, ethanolic, methanolic and petroleum extracts from all parts of the plant on blood pressure, hyperlipidemia and obesity.<sup>13,14</sup>

The current study is focused to evaluate and compare the lipid lowering outcomes of hexane extract of amaltas bark in HFD-streptozotocin induced diabetic rats. When induced with high fat feeding and streptozotocin, both rat groups showed a rise in serum triglyceride, total cholesterol, VLDL, LDL levels ( $p=0.001$ ). Also, serum HDL levels were lower in both groups ( $p=0.000$ ). The serum triglyceride, total cholesterol, & VLDL- cholesterol reduced; and HDL-cholesterol increased in the experimental groups treated with the hexane extracts of amaltas (cassia fistula) bark versus the untreated diabetic controls. Similar results were obtained by Rizwana et al,<sup>15</sup> when high fat diet induced hyperlipidemia rats were treated with three different doses i.e 100, 300 and 500 mg/kg of ethanolic extract of CF fruit for 30 days and obvious hypolipidemic as well as antioxidant outcomes were seen by measuring lipid parameters include serum triglyceride, cholesterol, VLDL, LDL and HDL. Therefore, the administration of high dose of CF extract 500 mg/kg showed exceptional good results which was comparable to the effects of standard drug atorvastatin.<sup>16,17</sup> Meanwhile, the earlier report of Guruprasad et al, has reported that administration of aqueous and methanolic leaf extracts of *C. fistula* L. at 200 and 400 mg/kg b.w. reported significantly reduction in lipid parameters in rats which were fed with atherogenic diet for 21 days.<sup>18</sup> Hence, the results of our study indicate the potential lipid lowering benefits of using the cassia fistula in herbal medicine and warrants further research and human trials.

## Conclusion

Hexane based extract of cassia fistula bark is a potent lipid lowering agent.

**Conflict of Interest:** *None*

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### **Authors Contribution**

**NZ:** Conceptualization of Project

**NZ, ME, NK:** Data Collection

**NI:** Literature Search

**NZ, FA:** Statistical Analysis

**NZ, FA:** Drafting, Revision

**NZ, ZF:** Writing of Manuscript