



Protective Role of Coffee Beans in Diabetes Mellitus Model of Rats

Shradha Bisht*, S.S.Sisodia.¹

Department of Pharmacology, B.N.(PG) College of Pharmacy Udaipur, Rajasthan, India

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ABSTRACT

Objective: Effects of *Coffea arabica* seed extract on blood glucose level and serum lipid profile changes in normal and streptozotocin -induced diabetic rats have been studied with a view to elucidate its possible effect on diabetes and diabetes associated cardiovascular disease.. **Materials and methods:** Experimental animals were divided into four groups. Diabetes was induced in II,III,IV group by a single intravenous injection of streptozotocin (50 mg/kg body weight). Group I and II were kept as control and diabetic control respectively and were given 0.5 ml of 5% Tween 80 only, daily, once a day. Group III rats were further treated with ethanolic extract of *Coffea arabica* (200 mg/kg body weight, orally) for a period of 40 days. Group IV rats were treated with Glibenclamide at the dose of 500 µg/kg. Oral glucose tolerance test was performed before starting the experiment. **Results:** Treatment of diabetic animals with crude ethanolic extract of seeds of *Coffea arabica*, significantly lowered blood glucose level, and maintained body weight and lipid-profile parameters towards near normal range. **Conclusion:** The results demonstrated that the *coffea arabica* seed ethanol extract exhibited antidiabetic and antidyslipidemic effect. To find out the exact mechanism of action ,chemical and pharmacological studies are required to be carried out further . Active principal responsible for such effects should be also isolated.

Key words: Cardiovascular disease. *Coffea arabica*; Serum lipid profiles; Streptozotocin induced diabetes

INTRODUCTION

Diabetes mellitus is a complex group of endocrine disorder that imbalance the carbohydrates, fat and protein metabolism. Lack or shortage of insulin secretion or reduced sensitivity of the tissue to insulin are the main factors responsible for diabetes.. Several drugs such as biguanides and sulfonylureas etc. are available to reduce raised blood sugar level in diabetes mellitus presently. These drugs have several side effects like hypoglycemia with sulfonyl urea and lactic acidosis with biguanides and all these drugs may cause liver and kidney damage,^[1] thus searching for a new class of compounds is essential to overcome diabetic problems. Now a days people are inclining towards herbal medicines. Herbal medicines has been long used effectively in treating many disease in different communities through out the world. Many traditional plant are available to treat diabetes also but the mechanism of most of the herbs has not been well defined. Further lucid knowledge of beneficial effect of herbs is also needed. Traditional used antidiabetic plants may help to provide new oral hypoglycemic agents, which can counter the high cost and side effects of the medicines presently used.

Diabetes mellitus is a major endocrine disorder affecting nearly 10% of the population all over the world.^[2] It is one of the leading causes of death in humans and animals. Diabetes increases the risk for the development of cardiovascular disease in a greater extent.. About 70-80% of deaths in diabetic patients are due to vascular disease. By altering vascular cellular metabolism, vascular matrix molecules and circulating lipoproteins the primary clinical manifestation of diabetes, hyperglycemia thought to contribute to diabetic complications. For instance hyperglycemia increases diacylglycerol levels and activates protein kinase C activity in the aorta of streptozotocin (stz.) induced diabetic animals.^[3] Hyperlipidemia is a feature of drug induced diabetic animals^[4] Many minor components of foods, such as secondary plant metabolites, have been shown to alter biological processes which may reduce the risk of chronic diseases in humans.

A number of investigations, of oral antihyperglycemic agents from plants used in traditional medicine, have been conducted and many of the plants were found to possess good biological activity.^[5] The World Health Organisation (WHO) has also recommended the evaluation of the plants effectiveness in conditions where we lack safe modern drugs.^[6] This has lead an increasing demand of research on antidiabetic natural products which produces minimal or no side effects. In the indigenous Indian system of medicine, good number

of plants was mentioned for the cure of diabetes and some of them have been experimentally evaluated and the active principles isolated.^[7] However search for new antidiabetic drugs is continues.

Streptozotocin (STZ) is a naturally occurring nitrosourea produced by *Streptomyces achromogenes*. Usually, the intraperitoneal injection of a single dose (60 mg/kg body weight) of STZ is used which exerts direct toxicity on β cells as it causes necrosis within 48-72 h, resulting in permanent hyperglycemia. STZ breaks nuclear DNA strand of the pancreatic islet cells.^[8]

Coffea arabica (LINN.) is a medium- size tree of Rubiaceae family. The plants can live upto 25 yrs and grows to a height of 6-15m. In the first century it was cultivated in Arabic countries later in Iran and India. Main producers currently are Brazil and Columbia.^[9]

Traditionally, in Brazil decoction of the seed is taken orally for influenza.^[10] Hot water extract of the seed is taken orally by males as an aphrodisiac in Cuba.^[11] In Haiti decoction of the grilled fruit and leaf is taken orally for anaemia, edema, asthenia and rage. For hepatitis and liver troubles, the fruit is given orally.^[12] The soaked fruit is used externally for nervous shock. The leaves are made into a poultice and used to treat fever^[13] and Hot water extract of the roasted seed is taken orally by nursing mothers to increase milk production in Mexico.^[14] In Peru hot water extract of the dried fruit is used as a stimulant for sleepiness and drunkenness,^[15] and as antitussive in flu and lung ailment.^[16] Hot water extract of the dried seed is taken orally as a cardiogenic and neurotonic in Thailand. In West Indies hot water extract of the seed is taken orally for asthmas. Juice of roots for scorpion sting is taken orally.^[14] Pharmacological and clinical trial showed that coffee has antioxidant, antimicrobial, antiasthmatic properties. The effects of coffee on the gastrointestinal (GI) tract, the liver, and the biliary tract are well-documented and have been attributed to the effects of caffeine and chlorogenic and caffeic acids. According to outcomes of recent findings, consumption of few cups of coffee in a day can strengthen information processing and enhance the ability to monitor for erroneous outcomes.^[17] Several studies have shown that coffee consumption can decrease the incidence or risk of Parkinson's disease.

Several recently published cohort studies suggest a significant reduced risk of type 2 diabetes in coffee drinkers.^[18] As similar results have been found with decaffeinated coffee^[19], compounds in coffee other than caffeine have been proposed as being potentially responsible for the reduced risk.^[20]

Seed extract of above plant was used in the present study to clarify their effect in the treatment of STZ induced diabetes, A comparison was made with the Glibenclamide (GBC), a standard drug used in treating diabetes mellitus. Further knowledge on the effects of different coffee constituents may aid the development of new drug to improve overall health effects.

***Corresponding author.**
Shradha Bisht,
Department of Pharmacology,
B.N.(PG) college of Pharmacy,
Udaipur , Rajasthan,India