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# Anti-Hyperglycaemic and Anti-Dyslipidaemic Effect of *Ocimum sanctum* Leaf Extract in STZ-Induced Diabetes Mellitus

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**Abstracts:** *Ocimum sanctum*, an Indian medicinal plant, has been studied for its role in diabetes and its effect on lipid profile. This study was conducted to elucidate whether treatment of *Ocimum sanctum Leaf extract* after streptozotocin (STZ) - induced diabetes has anti-hyperglycemic and anti-dyslipidaemic action or not. The experiment involved four groups of rat; one group was control group, second diabetic control, third diabetic group received alcoholic extract of OS and fourth diabetic group received glibenclamide as a reference standard. Oral glucose tolerance test was performed before induction of diabetes. Blood was collected by retro-orbital puncture for glucose estimation, and to evaluate serum triglyceride, total cholesterol, HDL-cholesterol, LDL-cholesterol levels. The results show that blood glucose level rather than decreasing, were significantly elevated after the treatment. Serum lipid profile parameters such as total-cholesterol, triglyceride, low-density lipoprotein and very low-density lipoprotein cholesterol were also elevated, whereas, the level of high-density lipoprotein-cholesterol was reduced significantly ($P<0.05$) in diabetic rat. Ethanolic extract of OS after induction of diabetes, normalized lipid profile. It can be concluded that STZ-induced hyperglycaemia can not ameliorated by treatment with ethanolic extract of OS. OS ethanolic leaves extract after diabetic induction, reverses dyslipidaemia and partially protects liver function.

**Key Words:** diabetes mellitus, serum lipid, Streptozotocin, *Ocimum sanctum*

## INTRODUCTION

Diabetes mellitus (DM) is a serious metabolic disease which has several complications including diabetic nephropathy, diabetic neuropathy, coronary heart disease and hypertension.[1] It has been estimated that by the year 2010, the prevalence of DM worldwide will reach approximately 240 million.[2] Patients with DM are more likely to develop and die from microvascular and macrovascular complications than the nondiabetic population.[3] There is usually an association between coronary heart disease or atherosclerosis and dyslipidaemia.[4,5] Dyslipidaemia is a frequent complication of DM and is characterized by low levels of HDL-cholesterol and high levels of LDL-cholesterol and triglyceride. Several groups of hypoglycaemic drugs are currently available to treat DM. However, their toxic side effects and sometimes diminution in response after prolonged use are problematic. Management of DM to avoid these problems is still a major challenge. There is an ongoing search for natural products with antihyperglycaemic and anti-dyslipidaemic activities with minimal side effects. There are several kinds of medicinal plants in India which have been reported to exert antihyperglycaemic and/or anti-dyslipidaemic actions.[6] Among them, *Ocimum sanctum* (OS) is very promising since it is routinely used as a vegetable and also for the treatment of DM by local people in various countries including India and Burma. Different parts of this plant have been claimed to be valuable in a wide spectrum of diseases.[7] It has been observed that tulsi leaves exert hypocholes-terolemic, hypotriglyceridemic and hypophospho-lipidemic effects in the normal rabbits.[8] Ethanolic extract (50%) of leaves showed hypoglycemic effects in normal as well as streptozotocin induced diabetic rats.[9] Basil leaf powder has been found to cause reduction in fasting blood sugar and postprandial glucose level in NIDDM patients.[10] Leaves of *Ocimum sanctum* are rich in essential oils. The presence of eugenol in it, in considerable amount has been shown to possess significant antioxidant property and to efficiently inhibit lipid peroxidation.[11] Several other studies have also demonstrated that OS possesses anti-hyperglycemic and/or anti-dyslipidemic effect in normal and DM animals.[12-15] Preliminary studies have shown that white OS exerts hypoglycemic action in normal rats whereas red OS was without this effect. We have investigated weather alcoholic extract of OS can retard dyslipidemia and hyperglycemia in diabetes or not.

## MATERIAL AND METHODS

### Animal Preparation

**STZ- Induced Model** –Male Wistar rats weighing between 180-220g were used in the study with the approval of the animal ethical committee of Bhopal Nobels college of pharmacy, Udaipur, Rajasthan. Rats were housed in a 12-hr light-dark cycle at 25 ± 2 °C . The animals were provided standard rat pellet feed and tap water *ad libitum*. All animals were cared for in accordance with the principles and guidelines of the Institutional Animal Ethics Committee of B.N.College of pharmacy, Udaipur. Diabetes was induced in rats by tail vein injection of streptozotocin (50 mg/kg, *i.v.*) (Sigma chemicals) dissolved in normal saline. (One group of identical rats was kept without streptozotocin administration as normal control, group I). Forty eight hours after streptozotocin administration blood samples were drawn by retroorbital puncture and glucose levels determined to confirm diabetes. The diabetic rats exhibiting blood glucose levels in the range of 275 to 300 mg/100 ml were selected for the studies.[16] Glibenclamide (500 µg/kg) was used as reference standard. The dose of Glibenclamide was selected based on previous reports.[17]

Following four groups of rats, were taken.

Group I: normal control (NC)

Group II: diabetic control (DC) -given (untreated rats) 0.5 ml of 5% Tween 80.

Group III: diabetic rats given (200 mg/kg) ethanolic extract of OS (ET) in 0.5 ml 5% Tween 80

Group IV, diabetic rats treated with glibenclamide (500 µg/kg) (GT) in 0.5ml 5% tween 80 (GT)

### Preparation of *Ocimum Sanctum* Leaf Ethanol Extract

Fresh leaves of OS obtained from the local market of Jaipur, were washed in tap water and then left to dry at room temperature for 2-3 days. The dried leaves were then ground to fine powder in a mixer. The dried leaf powder was then extracted with 95% ethanol using a soxhlet apparatus for 15 hr. after filtration through cotton wool; the filtrate was concentrated at 65$^0$C by a rotavapor. The concentrate was the freeze dried to yield dried powder and was designated as *O.sanctum* leaf ethanol extract.[18]

### Experimental Design

### Oral Glucose Tolerance Test[19]

The oral glucose tolerance test was performed in overnight fasted (18-h) normal animals. Rats divided into three groups were administered 2% gum acacia solution, ethanolic extract of OS (200 mg/kg), and glibenclamide (0.25 mg/kg), respectively. Glucose (2 g/kg) was fed 30 min after the administration of samples. Blood was withdrawn from the retro-orbital sinus at 0, 30, 60, 90 and 120 min of samples administration.[19] Fasting blood glucose levels were estimated by glucose oxidase-peroxidase reactive strips (Accu-check, Roche Diagnostics, USA).[20]

### Biochemical Estimation in STZ- Induced Model

The diabetic rats exhibiting blood glucose levels in the range of 275 to and 300 mg/100 ml were selected for the studies. The

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