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Effect of Different Doses of Black Caraway (*Carum carvi* L.) Oil on the Levels of Serum Creatinine in Alloxan Induced Diabetic Rats

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The effect of different doses of black caraway (*Carum carvi* L.) oil on the levels of serum creatinine in alloxan induced-diabetic rats was studied. Forty white male albino rats of the Winster strain weighing between 125 and 215 g were used. Diabetes was induced in the experimental rats with alloxan (70 mg kg^{-1}) body weight. Five rats were randomly assigned into each group (Group I – VIII). Group I rats served as the normal control, Group II served as the caraway control, whereas, Group III rats served as the diabetic control. Groups IV to VIII were the test groups. The test group rats were administered different doses of the black caraway oil thus; 5, 10, 20, 40 and 80 mg kg^{-1} body weight , respectively. The experiment lasted for a period of 10 weeks. The blood glucose and serum creatinine levels in the different groups were assayed. There was a statistically significant increase ($p<0.0001$) in the levels of blood glucose and serum creatinine in the diabetic control (Group III). These levels were significantly reduced by the administration of 10 mg kg^{-1} wet weight of the black caraway oil group (Group V) compared to the diabetic control (Group III) and the other treatment groups (Groups IV, VI-VIII). It can be concluded that the black caraway oil significantly lowers the serum creatinine levels in the diabetic rats, but its effect can be said to be dose dependent.

Key words: Black caraway oil, Alloxan, diabetes, renal damage, albino rats

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INTRODUCTION

Diabetic nephropathy is one of the major complications of Non-insulin Dependent Diabetes Mellitus (NIDDM) which is a common cause of death in diabetic patients (Deekert and Grenfel, 1991). The severity of renal disease in diabetic patients correlates with the levels of serum creatinine. Diabetic nephropathy accounts for considerable morbidity and mortality even in patients with well controlled blood sugar value (Grenfel, 1991). Many indigenous drugs have been reported to lower blood sugar levels in diabetic individuals (Ajgaonkar, 1984; Upadhyay and Pandey, 1984). Black caraway oil is one of such indigenous drug which has been reported to have hypoglycaemic properties which makes it potent in the management of diabetes mellitus (Modu *et al*., 1997). The caraway plant is known scientifically as *Carum carvi* L. The plant is indigenous to Europe and western Asia and is also known to have been cultivated since prehistoric times (Kochlar, 1981). The plant is now being cultivated in Marte local government area of Borno State, Nigeria. The young leaves of the caraway plant are an important condiment and medicinal agent. It is official in the Indian Pharmacopoeia (1955) and the volatile oil prepared from it is a valuable ingredient of gripe water and the other carminative preparation. The volatile oil extracted from the plant has been shown to decrease the arterial blood pressure and heart rate in a dose-dependent manner (El-Tahir *et al*., 1994). Chemical analysis reveals that the plant contains proteins, essential amino acids, calcium, phosphorous, potassium, magnesium, sodium, petroselinic acid and polyunsaturated fatty acid. The major fatty acids present are oleic and linoleic acid (A'bdel A.-al *et al*., 1993). While the effect of black caraway oil on blood sugar has been tried, no studies have been conducted regarding the effects on renal impairment in diabetic nephropathy. In the present study, black caraway oil has been studied in alloxan induced diabetes and renal damage in rats and the effect on blood glucose and serum creatinine was studied.

MATERIALS AND METHODS

Forty white male albino rats of the Winster strain weighing between 125 and 215 g were used. The rats were randomly assigned into eight groups of five rats each. The rats were maintained on standard feed and water *ad libitum* throughout the experiment. Diabetes was induced in the rats in Groups III to VIII by injecting them with 70 mg kg^{-1} body weight Alloxan administered through the tail vein after fasting the animals for 24 h (Ajabnor and Tilmisany, 1988). Twenty four hours after the administration of Alloxan, diabetes was confirmed by 2 h postprandial blood glucose test. Then, 5, 10, 20, 40 and 80 mg kg^{-1} body weight of black caraway oil were administered gastrointestinallly by intubation to the rats in Groups IV to VIII, respectively. Group III rats served as the diabetic control. Group II rats which were non-diabetic were given 10 mg kg^{-1} body weight of black caraway oil (caraway control group), while Group I rats served as the normal control. The treatment continued for a period of 10 weeks. The rats were sacrificed 24 h after the last treatment by decapitation. The blood was collected into clean and dry centrifuge tubes, allowed to stand for 1h to clot. It was centrifuged for 10 min at 3, 000 rpm. The clear serum was aspirated into clean and dry test tube and used for the estimation of serum creatinine levels using the method of Brod and Sirota (1948).

Whole blood was also obtained from rats through bleeding from the tail veins prior to decapitation in to fluoride bottles. The blood was used for the estimation of blood glucose levels using the method of Trinder (1969).

Statistical Analysis: All data generated were entered into EpiInfo6 statistical package and Student t-test used to compare the variables. The level of p-value less than or equal to 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

A general increase was observed in the levels of blood glucose and serum creatinine in the diabetic control group of rats (Table 1). The increase was observed to be statistically significant ($p<0.0001$), compared to the normal control (Group I), normal rats fed with caraway oil (Group II) and the diabetic rats treated with caraway oil (Group IV-VIII). This increase which is as a result of the destruction of the beta cells of the pancreas by alloxan was brought to near normal in the diabetic rats treated with various concentrations of the black caraway oil.

Table 1: Blood glucose and serum creatinine levels in normal and diabetic rats treated and untreated with black caraway oil

	Fasting blood glucose (μmol L^{-1})	Serum creatinine (μmol L^{-1})
Group I	5.40 ± 0.57^{cd}	90.00 ± 0.21^{e}
Group II	4.50 ± 0.58^{d}	$96.00\pm13.42_{e}$
Group III	14.52 ± 2.08^{a}	190.00 ± 21.21^{a}
Group IV	8.44 ± 1.15^{b}	140.80 ± 11.37^{cd}
Group V	7.08 ± 1.15^{bc}	102.00 ± 3.46^{d}
Group VI	7.90 ± 0.80^{b}	170.00 ± 17.32^{ab}
Group VII	7.83 ± 0.73^{b}	158.00 ± 3.46^{bc}
Group VIII	7.30 ± 1.50^{bc}	176.67 ± 15.28^{ab}

Values are Mean ± standard deviation (n=5)
All groups were compared to each other at $p<0.0001$
Values with different letter(s) (superscripts) vertically are significantly different

It would be suggested that the oil could promote the utilization of blood glucose in the synthesis of fatty acids since caraway oil contains medium chain fatty acids (Hamilton and Bahti, 1987).

The serum creatinine level was found to decrease with the administration of the black caraway oil. This decrease was observed to be lowest in the group administered with 10 mg wet weight concentration of caraway oil, compared to other groups (Modu *et al*., 2001).

CONCLUSIONS

Since 10 mg concentration of the black caraway oil significantly reduced the levels of blood glucose and serum creatinine more than the 5, 20, 40 and 80 mg wet weight concentrations, therefore, a dose of 10 mg kg^{-1} body weight of caraway oil can be considered as safe for the management of diabetes mellitus.

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