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Anti-Diabetic Effect of Occimum Gratissimum on Blood Glucose Level in Alloxan Induced Diabetic Rats

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Abstract: *In The Present Study, The Anti Diabetic Effect Of Occimum Gratissimum On Alloxan Induced Diabetic Rats Was Investigated Using Standard Methods. The Result Revealed That The Blood Glucose Levels Of The Rats Were Reduced Following Treatment With The Aqueous Extract Of Occimum Gratissimum. From The Result, At 400mg/Kg, The Blood Glucose Level Reduced Down To 50.0±3.16mg/Dl Compared To Those Treated With Insulin At 99.5±2.69, While At 200mg/Kg, The Blood Glucose Level Was At 105.25±55.54mg/Dl. Those That Were Neither Treated With Occimum Gratissimum Or Insulin Had A Glucose Level Of 108±5.10mg/Dl. The Result Of The Percentage Recovery Rate After Treatment Shows That, At 400mg/Kg, The Recovery Rate Was 84.7 %, 67.2 % At 200mg/Kg And 68.9 % For Those Treated With Insulin. The Result Therefore Revealed The Importance Of The Plant As An Anti Diabetic Agent.*

Keyword: *Anti-Diabetes, Occimum Gratissimum, Alloxan, Diabetes, Blood Glucose Level.*

I. Introduction

In Nigeria, especially in southern part, there is a correlation between phytotherapy and consumption of plants extracts. People consume a lot of vegetables in their native diets; some of these plants are believed to ameliorate some ailments. Many minor components of foods such as secondary plant metabolites have been shown to alter biological processes which may reduce the risk of some chronic diseases in human such as diabetes.

Diabetes is an age long, serious metabolic disorder with complications that result in significant morbidity and mortality rate, increasing economic burden and disease condition among infected people. According to Chukwuma [1], chronic hyperglycemia during diabetes has shown to cause glycation of body protein, which in turn leads to secondary complications that affects the eyes, kidneys nerves and arteries. Diabetes mellitus has its other complications, especially diabetic acidosis due to excessive production of ketone bodies, low resistance of infections especially those involving extremites, increase in incidence of toxemia in pregnancy and cardio vascular disorder, disturbance in electrolyte balance, retinopathy and others causing boils, carbuncles, loss of weight, emaciation, weakness and debility.

Ocimum gratissimum is an herbaceous plant which belongs to the Lamiaceae family. The plant is indigenous to tropical areas especially India and it is also in West Africa. In Nigeria, it is found in the Savannah and coastal areas. It is cultivated in Ceylon, South Sea Islands, and also within Nepal, Bengal, Chittagong and Deccan. *Ocimum gratissimum* L. (Family Lamiaceae) commonly called basil, is a culinary herb with pungent sweet smell. Propagation of basil is through seeds and also reliably from cuttings. [2,3]. The foliage is commonly used fresh in cooked recipes or added at the last moment, as cooking quickly destroys the flavour [4]. Studies have established that compounds in basil oil have potent antioxidant, anticancer, antiviral and antimicrobial properties [5,6,7].

The essential oil of *Ocimum gratissimum* contains eugenol and shows some evidence of antibacterial activity. Leaf extract of *O. gratissimum* showed antidiabetic properties in streptozocin-induced in diabetic rats. A test on guinea pigs found evidence that the essential oil relaxes the muscles of the small intestine, consistent with the traditional use of the plant to treat gastrointestinal disorders. Antitumor and anti-cancer effects have been reported in *in vitro* experiments. A study on rats also found evidence that a leaf extract of the plant prevented diarrhea. *Ocimum gratissimum* has anti-fertility effects in male mice. *Ocimum gratissimum* ethanolic extracts showed a hepatoprotective effect in rats. The study aimed at investigating the anti-diabetes effect of *Ocimum gratissimum* in Alloxan induced diabetic albino rats.

II. Method and material

Extract preparation

The fresh leaves collected were dried under the shade and ground into powder. The powder (100 g) was boiled in 1.5 L of distilled water for 20 min. The extract was cooled, filtered using a What man No.1 filter paper and evaporated to dryness in water bath of 60oC. The residue was obtained and kept in air tight bottles in a refrigerator until use.

Phytochemical screening

The aqueous extracts obtained were subjected to preliminary phytochemical screening to identify the chemical constituents. The methods of analysis employed were those described by Brain and Turner [8].

Animals

Wistar strain albino rats of both sexes weighed between 150 – 200g were obtained from the Animal house, Department of Biology/ Microbiology, Abia state Polytechnic Aba. The animals were kept and maintained under laboratory condition of temperature, humidity and light. The animals were divided into extract treated groups and the control groups. All the animals were fasted for 12 h, but were allowed access to water at will, before commencement of the experiments.

Induction Of Diabetes

Diabetes mellitus was induced by single intraperitoneal dose of 150 mg/kg of alloxan dissolved in 0.9% normal saline into 12 h-fasted rats. On the third day of alloxan-injection, the rats were fasted for 6 h and blood was taken from tail artery of the rats [9]. Rats with moderate diabetes having hyperglycemia (that is, with blood glucose of 250 – 400 mg/dl) were taken for the experiment. The diabetic rats were then divided randomly in the different groups.

Experimental Design

In the experiment, a total of 20 rats were used, the rats were divided into 4 groups of 5 rats each. Group 1 has normal rats; Group 2 rats were given Biphasic Isophane insulin 6 i.u/kg, while Groups 3, and 4 were extract treated group at 200 and 400 mg/kg bodyweight, respectively.

Determination Of Blood Glucose Levels

Blood samples were collected from the tail artery of the rats at interval. Determination of the blood levels was done by the glucose-oxidase principle [8] using the one touch Basic and the result were expressed as mg/dl. [10]

III. Result

From the result of the present study, it was seen that the blood glucose level of the diabetic rats reduced considerably after treatment with the plant extract. Table one shows the blood glucose level before and after treatment with Alloxan.

Table 2 shows the blood glucose level after treatment with *Ocimum gratissimum* leaf extract at 400mg/kg and 200mg/kg and insulin. Here, the group treated with 400mg/kg had a greater reduction in the blood glucose level (50.0 ± 3.16mg/dl) compare to the group treated with insulin (99.5 ±10mg/dl).

Table 3 shows the percentage recovery rate at different interval. Group 4 had the highest recovery rate of 84.7%, group 3 shows at 67.25 and group 2 at 68.9%.

Table 1: Mean Blood glucose level (mg/dl) before and after induction of Diabetes.

Animal Grouping	Mean body weight	Blood glucose level (mg/dl) initial	Blood glucose level after induction (mg/dl)
Group 1	164	108.3	-
Group 2	175.8	201.9	319.8
Group 3	170.9	107.7	303.3
Group 4	168.4	93.2	333.7

Table 2: Blood glucose level (mg/dl) of alloxan induced diabetic rats after treatment with insulin and plant extract

Animal Grouping	Blood glucose level (mg/dl) after induction.	Blood glucose level (mg/dl) after 3days	Blood glucose level (mg/dl) after 6days	Blood glucose level (mg/dl) after 9days
Group 1	108.3±5.43	107.2±1.30	108±4.81	108±5.10
Group 2	319.75±20.03	195.25±6.34	120±2.72	99.5±2.69
Group 3	303.25±14.95	214±9.27	153.75±13.05	105.25±55.54
Group 4	327.5±25.71	153.25±16.11	95.25±5.25	50.0±3.16

Table 3: Percentage recovery rate after treatment

Animal Grouping	Recovery rate (%) / Day interval		
	After 3days	After 6days	After 9days
Alternate Group	38.9	62.5	68.9
Low dose group (200mg/kg)	29.5	49.4	67.2
High dose group (400mg/kg)	53.2	70.9	84.7

IV. Discussion

It is estimated that over 4.93 % of the populations within the sub-Saharan African countries suffered from diabetes. In this area, diabetes mellitus has been associated with a high prevalence of complications. In the present study, the anti-diabetes effect of *Ocimum graticimum* on alloxan induced diabetic rats was investigated, the result revealed that the blood glucose level in the diabetic rats was reduced at concentrations of 200mg/kg and 400mg/kg (Table 2). The results of this study support earlier reports by Asuquo *et al*.[11], Okokon *et al*. [12] and Abdulazeez *et al,* [13] who demonstrated the hypoglycemic effect of the combined extract of *Ocimum gratissimum* and *Vernonia amygdalina* on liver lipid profile of streptozotocin-induced diabetic rats. The significant increase in blood glucose level upon treatment with alloxan is evident that diabetes was induced in the rats. The diabetic effect of alloxan can be attributed to some specific cytotoxic action mediated by some chemical compounds present in it. Also, it has been reported that some herbs or plants reduce absorption of carbohydrates in the digestive system causing progressive entry of glucose into the blood and prevent sudden increase in blood glucose after food intake. [14] These important factors may be attributed to some phytochemical, mineral of chemical compounds present in this plant. Treatment of diabetic rats with the aqueous extract of *O. gratissimum* showed that the blood glucose level reduces after treatment within three to nine days which indicates the anti diabetic effect of the plant.

Diabetes without proper treatments can lead to complications such as hypoglycaemia, diabetic ketoacidosis or non-ketotic hyperosmolar coma. More serious complications associated with long term diabetes include cardiovascular diseases, chronic renal failure, renal damage and neuropathy with damage to extremities. Adequate treatment is therefore important. However, population increase, inadequate drug supply, exorbitant cost of treatment and side-effects of several conventional drugs have increased the dependence on plant materials as source of medicine for a variety of ailments, many of which are yet to be scientifically validated [15]. However, according to Simon and James, [16] and Seung-Jo-Lee *et al*., [17] *O. gratissimum* has been used traditionally as a medicinal plant in the treatment of headache, diarrhea, wart, worms and kidney function.

V. Conclusion

From the research findings, it is seen that the hypoglycemic activities exhibited by *O. gratissimum* were effective enough to alleviate alloxan induced rat at different concentration comparable to the control drug (insulin). However, further study is recommended to ascertain the effect on other hepatological indices.

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