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Effects of Prolonged Administration of Aqueous Extract of *Ocimum gratissimum* (Scent Leaf) on Weight in Alloxan-induced Diabetic Albino Rats

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ABSTRACT

This study was aimed at comparing the antidiabetic and antihyperlipidemic activities of various doses (1.0, 2.0ml and 3.0ml) of aqueous extract of *Ocimum gratissimum* and glibenclamide (a reference hopoglycemic drug). Ninety (90) male wistar albino rats were used. The rats were divided into six groups (A, B, C, D, E and F) of five rats each. The experiment was replicated three times. The first group, A was non diabetic while B to F were made diabetic using alloxan. The result obtained showed that there was a significant difference ($p<0.05$) in body weight gain of the diabetic control group (-46.65±2.53g) when compared with the normal control group (20.96±4.52g), 3.0ml extract treated group (2.00±0.59g) and the reference drug treated group (3.48±0.23). These results suggest that the leaf aqueous extract of *Ocimum gratissimum* at 3.0ml dosage has antidiabetic and antihyperlipidemic effect and would be of benefit in the treatment and management of diabetes mellitus, controlling the blood sugar level as well as in preventing or delaying the onset of diabetes mellitus.

Keywords: Albino rats, *Ocimum gratissimum* and weight.

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INTRODUCTION

Diabetes mellitus is a metabolic disorder in which a person has a high blood sugar level, either because the body does not produce enough insulin, or because body cells do not properly respond to the insulin that is being produced [1]. Diabetes mellitus is a serious chronic condition which has several complications including diabetic nephropathy, diabetic neuropathy, coronary heart disease and hypertension. These complications may be delayed, lessened or prevented by maintaining blood glucose level close to normal.

Symptoms of diabetes mellitus include polyuria (production of large volume of urine), polydipsia (abnormally intense thirst) polyphagia (increased appetite) general fatigue and weight loss [1]. Long standing diabetes has been documented to cause structural and functional cardiac impairment, which was found to lead to ischemic heart diseases, cardiomyopathy and congestive heart failure [2].

Dyslipidemia (a condition when lipid levels in the bloodstream are too high or low) is common in diabetes, as both insulin deficiency and insulin resistance affects enzymes and pathways of lipid metabolism [2].

Type 1 diabetes results from the body's failure to produce insulin. It is partly inherited and triggered by certain infections. Type I diabetes mellitus is also called insulin dependent diabetes mellitus (IDDM).

Type 2 diabetes mellitus which is also called Non-insulin dependent diabetes

mellitus (NIDDM) or adult-onset diabetes is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. Gestational diabetes mellitus occurs when a pregnant woman who has never had diabetes before, have a high blood glucose level during pregnancy. About 20-50% of affected women develop type 2 diabetes later in life [3].

World Health Organization (WHO, 2001) identified diabetes as an epidemic underway since about 164 million people worldwide were affected in 2000 and a possible increase to 366 million by 2030 has been projected [4].

In Nigeria, the prevalence of diabetes mellitus according to a national survey reveals that 2.2 percent, that is 2-3 in every 100 persons are suffering from the disease (National Diabetes Association, 2000). The populations of people with this disease are found mostly in urban areas due to their sedentary life style.

Insulin therapy affords glycaemic control in type I diabetes, yet its shortcomings such as ineffectiveness on oral administration, short shelf life, the requirement of constant refrigeration, fatal hypoglycemia in excess dosage, resistance due to prolonged administration, limits its usage. Again, oral hypoglycaemic agents currently used in clinical practice have characteristic profiles of serious side effects such as weight gain, gastrointestinal discomfort and nausea, liver failure and diarrhea [5]. Hence, search for a drug with low cost, more potency and without adverse side effects is being pursued in several laboratories around the world.

In the recent years, there has been renewed interest in plant medicine [6]. Herbal medicines however appear to be a potent alternative with less side effects from various studies reviewed. Today, a large number of drugs in use are derived from plants. For example, morphine from *Papaver somniferum,* Ephedrinei from *Ephedra vulgaris,* atropine from *Atropa belladonna,* reserpine from *Roulphia serpentine* [7].

Ocimum gratissimum is among the traditionally used herbal plants to treat different ailments. It is a plant belonging to Lamiceae family known in Nigeria as *Nchuanwu* (Igbo), *Efinron* (Yoruba) and *Dan doya tugida* (Hausa). In eastern Nigeria, it serves as a source of stimulation and condiment in soup due to its minty aromatic flavor [7]. Traditionally, *Ocimum gratissimum* has been used for the treatment of headache, diarrhea, kidney infections, cough, convulsions, gastric ulcer, conjunctivitis and wart worms.
The major constituents of *Ocimum gratissimum* include: aromatic and volatile oil, linolenic acid, oleic acid, alkaloid, flavonoid and saponin [5].

Considering the phytochemical constituents of *Ocimum gratissimum* and its array of uses in traditional medicine therefore necessitated the investigation into this study of effects of aqueous extract of *Ocimum gratissimum* leaves (scent leaf) on blood glucose, weight, and lipid profile in alloxan induced diabetic wistar albino rats.

MATERIALS AND METHODS

Experimental Animals

Ninety healthy adult male wistar albino rats weighing between 160-200g were used for the experiment. The rats were randomly assigned into 6 groups with five (5) rats in each group. They were all fed with guinea chick mash. They were allowed to acclimatize with the environment for one week before the commencement of the experiment.

Experimental Treatments

The experimental rats received an intraperitoneal injection of 1.0ml of alloxan (Sigma LTD, USA) except group A.

After 48 hours of alloxan injection, blood was collected and their glucose level was checked using one touch glucometer and test strips. Their blood glucose level was observed to be far much higher than normal (above 200mg/dl).

The administration of aqueous extract of *Ocimum gratissimum* and glibenclamide (a standard hypoglycemic drug) was done orally to their effect on the diabetic rats. Group A served as the control (Non diabetic) this group received 2.0ml of distilled water daily. Group B (untreated Diabetic) were administered 2.0ml of distilled water daily. This served as the diabetic control. Group C (Diabetic) received oral dose of 1.0ml extract daily. Group D (diabetic) received oral dose of 2.0ml extract daily. Group E (Diabetic) received oral dose of 3.0ml extract daily. Group F (Diabetic). This group received glibenclamide (a standard hypoglycemic drug) at a dose of 1.0ml daily. The experiment lasted for four weeks and was replicated three times. The body weights were measured weekly.

DATA ANALYSIS

The body weight of each of the animals was measured weekly using a top loader weighing balance. The result of the experiment was analyzed using Analysis of variance (ANOVA). The comparison of mean was separated using a post Hoc test (Least Significant Difference), [8].

RESULTS

The weekly mean body weights (g) of diabetic and non diabetic albino rats subjected to various treatments (*Ocimum gratissimum,* glibenclamide and distilled water) for four (4) weeks is presented in Table 6.

Table 6: Weekly mean weight and gain (g) of diabetic and non diabetic albino rats subjected to various treatments (*Ocimum gratissimum,* glibenclamide and distilled water) for four (4) weeks

Treatment groups	Initial Weight	Weight at wk 1	Weight at wk 2	Weight at wk 3	Wight at wk 4
A (Normal Control)	173.98 ±3.95	178.35±2.96	181.64±2.69	186.91±2.31	194.94±2.90
B (Diabetic Control)	187.64±3.28	168.99±3.98	159.44±2.14	148.80+1.54	140.98±0.87
C (1.0ml Extract)	180.95±4.90	165.13±5.21	161.59±4.91	165.72±0.55	172.33±4.64
D (2.0ml Extract)	176.49±3.59	160.02±3.58	160.23±3.01	167.32±3.40	173.80±3.79
E (3.0ml) Extract)	182.96±2.78	167.08±2.60	171.47±2.36	178.16 ± 2.99	184.96±2.53
F (Gliben clamide)	185.13±3.14	172.92±3.56	177.08±3.85	184.40±2.59	188.61±2.92

The mean body weight of the normal control group (A) kept increasing throughout the experimental period. Also, the mean body weight of the diabetic control group (B) kept on dropping throughout the experimental period. Group C (1.0ml extract treated), exhibited a decrease in body weight at weak 1and 2, but later picked up weight at week 3 and 4. At week 1, groups D, E and F experienced a drop in body weight but later picked up at week 2, 3 and 4.

Table 7: Mean weight gain (g) of diabetic and non diabetic Albino rats subjected to various treatments (*Ocimum gratissimum,* glibenclamide and distilled water) for four (4) weeks.

Treatment Groups	Initial mean weight	Final mean weight	Weight Gain (Final - Initial)
A (Normal Control)	173.98±3.95	194.94±2.90	20.96±4.52[1]
B (Diabetic control)	187.64±3.28	140.98±0.87	-46.65±2.53[2]
C (1.0ml Extract)	180.95±4.90	172.33±4.64	-8.62±0.33[3]
D (2.ml Extract)	176.49±3.59	173.80±3.79	-2.69±0.96[3]
E (3.0ml Extract)	182.96±2.78	184.96±2.53	2.00±0.59[4]
F (Glibenclamide)	185.13±3.14	188.61±2.92	3.48±0.23[4]
F. Pr	0.227	<0.001	<0.001
$LSD_{0.05}$	12.61	10.01	6.514

Columns with the same superscript are significantly the same while those with different superscript are significantly different.

Table 7 above show the mean weight gain (g) of diabetic and non diabetic Albino rats subjected to various treatments (*Ocimum gratissimum,* glibenclamide and distilled water) for four (4) weeks. There was a significant (P<0.05) difference in the body weight of the diabetic control group (B) compared to the normal control group (A), 3.0ml extract treated group (E) and the group that received glibenclamide (F). There were also body weight losses in the 1.0ml and 2.0ml extract treated groups but not as high as that seen in the diabetic control group.

DISCUSSION

Ocimum gratissimun in traditional medicine, the leaves have been used as a general tonic and anti-diarrhea agent and for the treatment of conjunctivitis by inserting directly into the eyes [9].

The hypoglycemic action of the *Ocimum gratissimum* extract seen in this

experiment may be attributed to one or a combination of the following: the active principle(s) may have enhanced the activity of residual insulin in the alloxanised animals or promoted glucose uptake by peripheral tissues, by other means; it is also possible that the extract slowed down glucose absorption in the gastrointestinal tract (GIT) or regulated the metabolism of glucose by the liver [11, 12, 13]. These qualities of Ocimum gratissimum made it possible for it to enhance weight gain the the diabetic rats that were treated with compared with rats that did not receive any treatment.

CONCLUSION

In conclusion, the aqueous leaf extract of *Ocimum gratissimum* administered orally for a period of four (4) weeks reduced the weight loss associated with diabetes mellitus in albino rats. The plant has a hypoglycemic effect and may be safe when taken orally. If the results obtained with rats can also apply to man, *Ocimum gratissimum* will be highly recommended for diabetic patients.

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