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Antioxidant and Hypoglycaemic Effects of *Cocos nucifera* Husk Extracts in Streptozocin- Induced Diabetic Albino Rats.Muhammad, Y.^{1*}, Alhassan, A.J.², Wali, U.³, Haruna, A.S.⁴ and Maryam, Z.⁵Chemical Pathology Unit, Laboratory Department, Rasheed Shekoni Teaching Hospital Dutse¹, Department of Biochemistry Bayero University, Kano²,Department of Chemical Pathology, School of Medical Laboratory Science, Usmanu Danfodiyo University Sokoto³, Department of Biochemistry, Kano University of Science and Technology, Wudil. PMB 3244⁴, Faculty of Science, Department of Microbiology Ahmadu Bello University Zaria⁵.Author for Correspondence *: yahyoukhan@gmail.com; +234-806-473-1241**Abstracts:**

Diabetes mellitus is a disease syndrome promoting increased production of free radicals that are implicated in its complications. **The aim of this study is to investigate the antioxidant and hypoglycaemic effects of *Cocos nucifera* Husk Extracts in Streptozocin- Induced Diabetic Albino Rats.** The inverse relationship between antioxidant and free radicals' generation within the biological system has long been documented. A total of 21 rats were randomly divided into 3 groups of 7 rats each as follows; Diabetic control, Non-Diabetic control and Diabetic treated with 200mg of *Cocos nucifera* husk extracts. Malondialdehyde (MDA) was determined as marker for oxidative stress in accordance with a standard method of Nadigar and Colleagues while glucose was determined by Glucose oxidase method. The result of the current study shows a statistical decrease ($p < 0.005$) in the MDA levels in diabetics rats treated with 200mg of *C. nucifera* extracts compared to the untreated Diabetic controls. The serum levels of blood glucose significantly reduced after supplementation of the extract in the Diabetic treated with 200mg of *Cocos nucifera* husk extracts compared to the untreated Diabetic controls. *Cocos nucifera* husk extract according to the findings possess both hypoglycemic and antioxidant capabilities.

Keywords: *Antioxidant, Cocos nucifera Diabetes, Free Radicals, Malondialdehyde*

Introduction

Diabetes mellitus refers to a metabolic disorder

in which glucose is underutilized as a result of defects in insulin secretion, action or both (Murray, 2000; Orr, 2000). Diabetes mellitus is a lifelong disorder with multiple complications such as defects in nervous system, kidneys, eyes and reproductive organs (Nwangwa, 2012; Victor, 2012). It afflicts about 10 million of the global population and is one of the leading causes of morbidity and mortality (Salihu *et al.*, 2009). Hyperglycaemic state of diabetics results in oxidative stress, alteration in enzyme activities, protein glycosylation and several structural changes leading to diabetic complications (Akpan *et al.*, 2007). The measures taking in diabetic treatment such as insulin injection, use of hypoglycemic agents, exercise is found to have several disadvantages (Kabra *et al.*, 2012). Several plants have been investigated purposely to obtain newer, cheaper, effective and safer agents for diabetic treatments. These includes; *Ficus hispida*, *Ipomoea batatas*, *Aegle marmelos* etc (Kabra *et al.*, 2012), *Piralima nitida* (Salihu *et al.*, 2009), *Cocos nucifera* (Kabra *et al.*, 2012; Victor, 2012), *Citrullus lanatus* (Muhammad *et al.*, 2015) etc. Streptozocin (STZ) acts by changing the structural and functional characteristics of the B-cells of pancreas leading to abnormal carbohydrate metabolism and finally high glucose levels in the blood (Nweze, 2009). Diabetes is a disease of increased free radicals generation causing imbalance between radicals and antioxidants hence, oxidative stress (Wali *et al.*, 2011). Malondialdehyde (MDA) is the by-product of lipid peroxidation that has been widely used as a convenient marker of lipid peroxidation (Esterbaner and Cheeseman,

1990). *Cocos nucifera* husk was formally known to have no medicinal value but industrial, commercial, household and agricultural benefits (Victor, 2012). Later, hypoglycaemic and antioxidant capabilities of its water fruit and flower were reported. The present study was designed to determine the antioxidant and hypoglycaemic activity of *Cocos nucifera* husk extract in STZ induced diabetic albino rats.

Materials and Methods

Plant material: The plant specimens for the present study were collected from central market Dutse, Nigeria and authenticated by specialist at the department of Botany, Federal university Dutse.

Preparation of extract: About 100g of dried powdered material was added to 1000 ml of water. The container was kept in a shaker for a period of 48 hours. The extract was then filtered and concentrated. The resultant viscous material obtained was used for the analysis. The solution was filtered using filter paper and concentrated at 50°C with rotary evaporator, then freeze-dried prior to usage.

Experimental animals: Adult albino rats weighing about 100-120g were obtained from the animal house of Bayero University Kano, Nigeria. The Rats were housed in polycarbonate cages in a room with a 12 hrs day-night cycle, at constant temperature of 22°C and humidity of 45-64%. During the study, the rats were feed on pellets (Gulmohur Rat Feed, Lipton India and Bengaluru) with free access to tap water. The rats received humane care according to the criteria outlined in Principles of Laboratory Animal Care, 1985. They were allowed to stay for a period of 10 days for acclimatization before diabetes induction.

Induction of diabetes: Rats were injected with (55 mg/kg body weight of Streptozocin in 0.1 M citrate buffer pH 4. Diabetes was identified in rats by moderate polydipsia and marked polyuria. After 48 hrs of STZ administration, blood glucose levels were estimated in rats

following overnight fasting. Rats with a blood glucose level ranging between 250 and 300 mg/dl were considered diabetic and used for the experiments.

Experimental Design

The experiment was conducted using a total of twenty-one rats (21), randomly divided into three groups of seven rat each (n=7).

Group 1: Non-Diabetic Control.

Group 2: Diabetes induced rats (55mg/kg of streptozotocin)

Group 3: Diabetic rats treated with 200 mg/kg of *Cocos nucifera* shell extract

Specimen Collection: The rats were anesthetized and blood was collected by cardiac puncture via left ventricle using a 21-gauge needle, blood was slowly withdrawn to prevent the heart from collapsing. The blood was delivered into plain container and separated after centrifugation at 5,000 rpm for 10 minutes to obtain serum; the separated sera were stored at -20°C until used for analyzed (Paulose and Dakshinamurti, 1987).

Biochemical Determination:

Blood glucose estimation was done by one touch electronic glucometer (Accu-Check Active 444, Roche Diagnostic GmbH, Germany) using glucose test strips according to the method of Giordano et al., (1989), while MDA was measured in accordance with the method of Nadigar *et al.* (1986). Blood glucose

Statistical Analysis

All samples were tested and analyzed in triplicates. Results were presented as Mean±SD (standard deviation). Statistical analysis was done with one-way analysis of variance (ANOVA) using SPSS version 16.0 and the individual comparisons were obtained by the Duncan Multiple Range Test. The significant difference was judged to exist at a level of $p < 0.05$.

Results

All the results were presented as Mean±Standard deviation.

Table 1.0: Serum levels of Fasting blood glucose in STZ induced Diabetic Albino Rats treated with *Cocos nucifera*.

Parameters	Week 1	Week 2
NDC (mmol/l)	5.5±0.47	5.3±0.38
DC (mmol/l)	10.3±1.47	8.9±0.82
D+C N(mmol/l)	5.9±1.31	4.5±0.82

Key: NDC; Non-Diabetic Control; DC=Diabetic Control; D+CN= Diabetic+200mg of *Cocos nucifera*.

Table 2.0: Serum levels of MDA in STZ induced Diabetic Albino Rats treated with *Cocos nucifera*.

Parameters	Week 1	Week 2
NDC (nmol/dl)	1.6±0.3	1.5±0.3
DC (nmol/dl)	3.9±0.4	3.9±0.2
D+CN (nmol/dl)	3.3±0.4	2.6±0.3

Key: NDC; Non-Diabetic Control; DC=Diabetic Control; D+CN= Diabetic+200mg of *Cocos nucifera*.

Discussion

Evidence is accumulating regarding the use of medicinal plants in the treatments of metabolic maladies such as diabetes mellitus (Muhammad, *et al.*, 2015), Hyperlipidaemia (Lima, *et al.*, 2015), hypertension (Lima, *et al.*, 2015), etc. throughout the world, and the percentage of the people in the population using plant and dietary supplements containing phenolic compounds to prevent the onset and progression of the disease are currently gaining momentum (Naczka and Shahidi, 2004). Persistent fluctuations of glucose in diabetic subjects represent the hallmark of its complications (Sies, 1997). Reduction of serum glucose to near or within reference interval and minimizing its fluctuation is one of the classical and clinical targets of any forms of diabetes treatment. According to the results obtained from the present study, *Cocos nucifera* husk extract significantly reduces the serum glucose compared to the diabetic untreated. The antidiabetic activity may be due to the presence of flavonoids. It has been documented that flavonoids constitute the active biological principle of most medicinal plants with hypoglycaemic and anti-diabetic properties. Preetha *et al.* (2013) and Renjith *et al.* 2013 both demonstrated hypoglycaemic effects of mature *cocos nucifera* using alloxan induced diabetic. Diabetes is a disease of increased free radicals generation contributing immensely to

complications affecting the renal, eyes and cardiovascular system (Slatter, 2000). Radicals are generated as results of glucose auto-oxidation due to sustained hyperglycaemia (Vasudevan and Sreekumari, 2010). MDA was assayed as a marker for oxidative stress, the findings of this research revealed a statistically significant decrease in the MDA of diabetic rats treated with *cocos nucifera* husk extract compared to untreated diabetic controls. Increased MDA in untreated diabetic controls is as results of lipid peroxidation due to increased free radicals production. *Cocos nucifera* significantly ($p < 0.005$) alleviate oxidative damage by scavenging and counteracting the negative effects of radicalized molecules. The present study is in line with the previous work of Loki and Rajamohan (2003) and that of Boger *et al.* (1995). The antioxidant property imparted by *cocos nucifera* may be due to its phenolic compound contents (Das *et al.*, 2001; Salil and Rajamohan 2001).

Conclusion

In conclusion, *Cocos nucifera* husk extract possess both hypoglycaemic and antioxidant activity in STZ induced Diabetic albino rats. It's therefore recommended that further studies should focus on the toxic effects of *Cocos nucifera* husk extract before being considered possibly for diabetes treatment.



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