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ANTIDIABETIC POTENTIAL OF KHAYA ANTHOTHECA METHANOLIC LEAVES EXTRACT IN STREPTOZOTOCIN DIABETES INDUCED RATS

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Abstract

This research evaluated antidibetic potential of methanolic leaves extracts of Khaya anthotheca in streptozotocin induced albino rats. Khaya anthotheca a member of Meliaceae family is traditionally used for treating several ailments. Diabetes is a chronic condition that develops when the pancreas is unable to secrete sufficient amounts of insulin or when the body fails to utilise the insulin that is produced. The leaves were harvested in Sukundi road Wukari and air dried for four weeks, the leaves were pulverized into powder using manual blender and stored in an air tight container. Extraction was done with absolute methanol; the extract was filtered using mesh and the filtrate was concentrated at 68oC. two grams of the filtrate were used for the study; the remainder was used to treat the animals. Using 40 mg/kg body weight of

streptozotocin, the animals were divided into 5 groups of 4 each. Following a fourteen-day course of treatment, the animals were sacrificed; the blood was drawn through heart puncture and tested for blood sugar using a glucometer. One-way analysis of variance (ANOVA) was used for statistical analysis. Result of blood sugar level showed significant reduction in all the test groups ($p<0.05$) except group 2 which showed no significant reduction when compared to the normal control. Conclusion: This study therefore suggests the use of Khaya anthotheca as a diabetic agent and for treatment of diabetes. Further studies are needed to discover the bioactive constituent of the plant responsible for this anti-diabetic activity as well as other pharmacological activities in clinical trials.

Keywords: Khaya Anthotheca, Methanolic Extract, Anti-Diabetes, Albino Rats, Streptozotocin

INTRODUCTION

Diabetes is a chronic disorder that can be caused by either inadequate insulin synthesis by the pancreas or inadequate insulin uptake by the body. On the other hand, high blood sugar levels are brought on by the pancreas' insufficient beta cell production and inadequate insulin release. Uncontrolled diabetes frequently causes hyperglycemia, or high blood sugar, which gravely harms a number of organs, including nerves and blood vessels; renal failure; liver; heart; and retinopathy [1]. According to [2], high blood sugar over the long term promotes general oxidative stress, retinopathy, foot damage, hearing loss, and skin diseases (bacterial and fungal infections).Most studies indicate that diabetes mellitus is a significant contributor to hepatopathy, a condition that threatens the lives of patients with diabetes [3]. According to [4], diabetes mellitus is the primary cause of renal failure today, which leads to vascular disorders like heart failure, strokes, and circumferential vascular illnesses. Diabetic retinopathy is a significant cause of blindness due to damage to the tiny capillary blood vessels [5]. Free radicals also accelerated liver illness and ultimately cause hepatocyte destruction, which resulted in liver fibrosis [6,7]. The most popular forms of treatment for diabetes mellitus right now are insulin and oral treatments [8]. According to [9], over 35% of type 2 diabetic patients use alternative therapies to manage their

condition. Numerous well-known herbs have recently been utilized to treat diabetes. Drugs created from chemicals are more dangerous than remedies made from plants [10]. By enhancing insulin secretion in the pancreatic cells and enhancing the sensitivity of cell receptors to insulin, these traditional botanicals have been utilized as an antihyperglycemic, which regulates blood sugar levels [11]. According to [12], over 85% of the inhabitants of developing nations still use herbal treatments.

African traditional medicine use the herb *Khaya anthotheca*as remedyto a variety of conditions, including helminthiasis, malaria, gonorrhoea, stomach discomfort, and migraine [13,14]. According to [15], the *Khaya* species can be use to treat dermatomycosis, rheumatism, fever, cough, stomach discomfort, and convulsions. *Khaya anthotheca* aqueous extract is empirically used in Cameroonian traditional medicine to treat postmenopausal women's vaginal dryness and anxiety [16]. Anxiety, memory loss, and diseases in mouse brain and ovaries caused by vanadium are likewise lessened by *Khaya anthotheca* [17].

METHODS

Materials

Mortar and pistle, beakers, Conical flask, Spatula, Filter paper (Whatman No.1), Masking tape, Hand gloves, Cotton wool, face mask, Separating funnel, Digital analytical weighing balance (OHAUS: PA-4120), Refrigerator (HTF-146F), Thermostatic Water Cabinet (MODEL: HH-W420), Micro pipette, Test tubes and Test tube racks, and sample bottles, Glucometer (Accu chek)

Chemicals and Reagents

Methanol, distilled water, 75% of alcohol, streptozotocin (STZ) were purchased from Justlab Nigeria Limited 140 Isolo road Egbe - Okotun, Lagos - Nigeria. All chemicals used were of highest quality.

Plant collection and identification

The *Khaya anthotheca* Leaves was rinsed under running water and air dried. To prevent ultraviolet light from eliminating the active ingredients, the leaves were air-dried under shade [18,19]. Using a mortar and pestle, the dried leaves were ground into a fine powder and kept in an airtight container until required.

Experimental animals

Thirty-five (35) wistar albino rats weighing 100-200g (male) are separated into five groups, each group containing seven animals (n=7) and kept in aluminium cages based on standard of keeping laboratory animals of federal umiversity Wukari. After which it is allowed to fast for 24hours diabetes was induced by administration of streptozotocin (40mg/kg) intraperitoneally to all animal except normal control animal. Treatment with the plant extract was administered daily for 14 days via oral route.

Determination of % yield of extract

The percentage yield of the extract of *Khaya anthotheca* was determined by weighing the coarse sample before extraction and the *Khaya anthotheca* ethanol leaves extract after concentration and then calculated using the formula.

Experimental model for induction of diabetes

A single dose of 40 mg/kg streptozotocin (STZ) was administered intraperitoneally to the animals to induce diabetes. To eliminate impurities that can have detrimental biologic actions, STZ was formulated at a pharmaceutical-grade level by Zanosar Teva Pharmaceuticals in Irvine, California.

Experimental design

The rats were randomly allocated to five groups, each of the group containing seven rats.

The rats were given various treatment via oral route accordingly;

Group I: Diet/water (Normal control).

Group II: Induced diabetes streptozotocin 40mg/kg body weight + diet/water (Negative control)

Group III: Treated with 50mg/kg body weight *Khaya anthotheca* leaves extract

Group IV: Treated with 150 mg/kg body weight *Khaya anthotheca* leaves extract

Group V: Treated with 300 mg/kg body weight *Khaya anthotheca* leaves extract

Estimation of levels of fasting blood glucose

Using an accu-check active glucometer, the rats' fasting blood glucose levels were determined. To measure blood glucose concentration in mg/dL for each rat in each group at the end of 14 days, feed was withheld from the rats the night before the blood glucose check to measure fasting blood glucose, the tail vein was pricked, and blood from the tail was made to drop on the strip, which was then inserted in the glucometer.

Random Blood Glucose of Rats Administered Crude Methanolic Extract of Leaves of Khaya Anthotheca

Table 1: Result of random blood glucose of rats administered crude methanolic extract of Leaves of *Khaya anthotheca*

Parameter	**Group 1** **Normal control**	**Group 2** **Negative control 40 mg/kg bwt. streptozotocin**	**Group 3** **50 mg/kg bwt. Methanolic extract of Leaves of *Khaya anthotheca***	**Group 4** **150 mg/kg bwt. Methanolic extract of Leaves of *Khaya anthotheca***	**Group 5** **300 mg/kg bwt. Methanolic extract of Leaves of *Khaya anthotheca***
RBG(mg/dL)	76.67±4.51[a]	182.67±12.42[d]	132.67±3.51[c]	98.67±3.51[b]	80.67±5.69[a]

Results are expressed as mean ± standard deviation (N=7) Means with same superscript are not statistically significant, while means with different superscript are statistically significant. Legend: RBG = Random blood glucose

Parameters	Control	Diabetic control	glibenclamide	**Treatment Groups with leaves Khaya anthotheca methanol extract**				
				100	200	300	400	500
Creatinine	1.00±0.34	1.35±1.45*	0.86±1.47	0.63±1.67	1.21±0.05	1.08±0.04	0.98±0.11	0.78±0.13*
Urea	35.67±6.56	47.88±2.41	38.24±1.57	34.14±2.21	32.89±1.26	31.11±2.88	30.04±1.78	33.62±2.19
Protein	5.77±7.63	7.98±0.27	6.22±0.69	5.58±0.47	5.42±0.55	5.89±0.77	6.11±0.23	6.34±0.31
Albumin	3.55±0.68	4.52±0.43	4.18±0.22	3.59±0.58	3.49±0.51	3.46±0.32	3.22±0.53	3.14±0.16
AST(U/L)	22.35±3.79	30.4±1.56	27.41±0.33	27.18±2.33	23.12±1.22	24.44±1.78	24.63±1.78	24.98±1.87
ALT(U/	12.89±0.	18.59±1.	23.73±0.26	19.47±3.	17.22±4.	19.22±2.	19.58±2.	23.66±2.

L)	86	23		37	01	32	32	31
ALP (U/L)	27.67±1.18	36.51±1.39	26.46±1.19	22.75±3.11	21.36±3.41	22.25±4.66	22.64±4.16	24.12±5.66

RESULTS AND DISCUSSION

Result of random blood glucose showed that blood glucose was raised significantly (p<0.05) upon induction with 40 mg/kg streptozotocin in group 2 (negative control) when compared to normal control (group 1). Administration of 50 mg/kg methanolic extracts of *leaves Khaya anthotheca* after induction was able to lower blood glucose significantly (p< 0.05) when compared to negative control and was above normal control significantly (p<0.05). Administration of 150 mg/kg methanolic extracts of *leaves Khaya anthotheca* lowered blood glucose significantly (p< 0.05) to a level close to normal. Administration of 300 mg/kg methanolic extracts of *leaves Khaya anthotheca* lowered blood glucose significantly (p< 0.05) when compared to negative control, and to a level that showed no significant difference (p> 0.05) when compared to normal control. This showed that methanolic extracts of *leaves Khaya anthotheca* has a potential to be use as hypoglycemic agent, it also showed that the methanolic leaves extract is dose dependent.

Table 2: didn't show any significant alteration in the plasma creatinine urea, protein, and albumin, ALT, AST and ALP measurements of the diabetic rats compared to the control. However, the plasma creatinine measurements were significantly (p <0.05) elevated in diabetic rats not treated.

CONCLUSION

According to the findings in this study, the Khaya anthotheca leaves fraction has antihyperglycemic. This is due to the treated rat's significant drop in blood glucose levels as compared to the diabetic animals left untreated. Khaya anthotheca leaf fraction may be used as a potential effective agent for the management of diabetes that is less expensive, easily accessible, and site-harming due to the antihyperglycemic activity displayed by methanolic extract of Khaya anthotheca leaves. This research suggests that long-term treatment with Khaya anthotheca methanolic leaves extract may achieve long-term regulation of blood glucose. Identification and isolation of the active ingredient is

responsible for lowering blood glucose in Khaya anthothecaleaves extract should be done. Further study on mechanism of action of Khaya anthothecaleaves extract in treatment of diabetes should be considered. However, no significant changes or alteration was observed on the biochemical parameters tested.

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