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Effect of *Momordicacharantia* L. (Bitter gourd) Methanol Leaves extract on Hematological parameters, Lipid Profile and Antioxidant Vitamins in Alloxan Induces Diabetic Albino Rats

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Abstract

Diabetes mellitus is a metabolic disorders characterized by persistent hyperglycemia and disturbances in the metabolism of fuel molecules as a result of absolute deficiency in insulin secretion or/and insulin action. MomordicacharantiaL. popularly known as bitter gourd or balsam pear belongs to a family Cucurbitaceae. It is one of the important vegetablesthatenrich in nutrition and medicinal properties. The bitter gourd vegetable is widely grown in Africa because of its medicinal application and also for the ornamental value. In this study alloxan induced diabetic rats were used, which were treated with different concentration (100, 200 and 300) of bitter gourd leaves extract. Theserum glucose concentrationwas showed significant decreases in the entire treated group regime (100, 200 and 300mg/kgMCMLE) when compared with the diabetic control group. The study alsoshowed a significant increase in PCV and MCHC haematological parametersanda significant decrease in lipid profile and antioxidant vitamins when compared with the diabetic control groupthis signified that the plant extract may contains numerous pharmacologically active that could be responsible for the observed glucose lowering potentials and strong antioxidant activities.

Keywords: *Bitter gourd (MomordicacharantiaL.) Leaves, haematological parameter, lipid profile maker, antioxidant vitamins.*

INTRODUCTION

Diabetes is a chronic disease and one of the major causes of disability and probably deathin both developed and underdeveloped countries [6]. The abnormalities of diabetes mellitus may occur due toa relative deficiency of insulin, whichabsolute affects the liver, kidney- muscle, adipose tissue and some other body tissues. Insulin resistance increases the activity of hormone sensitive lipase, which hydrolyses triacylglycerol into fatty acid and glycerol, this lead to increase fatty acid production. Haematological changes in diabetes can cause by several factors including increase in the production of reactive oxygen species (ROS) and the formation of advance glycated end product(AGEs)as a result of long term hyperglycemia.This is common in type 1 diabetes causing overproduction of ketones bodies in the blood (ketonemia) and in urine (ketouria). Lowering the blood pH (acidosis). An increased hepatic production of glucose and decreased glucose uptake by tissue results in hyperglycemia. All causes of diabetes ultimately lead to hyperglycemia (a state of elevated blood glucose) which is the hallmark of the disease [11].

This incidence has increase dramatically in recent decades and many diabetic medications such as metformin (glucophade and glumetza) are costly and may compromise some haematological parameters, [5].

Medicinal plants have been used since the beginning of civilization for the treatment and management of diabetic mellitus in traditional medicine systems of many cultures globally [9]. Plant extracts play an important role in the management of diabetes mellitus, especially in developing countries, where many people do not have access to the drugs(orthodox) management option [12].Ethnobotanical surveys revealed that a large number of plants extract used as traditional medicine systems for the treatment of diabetes with their hypoglycemic activity evaluated and confirmed. In some cases, the bioactive principles of the medical plants have been isolated and identified [12].

Momordicacharantia L. is otherwise called bitter gourds that are belong to the family of *Cucubitaceae* and genus *Momordica*. The plant is cultivated as medicinal as well as vegetable leave crop widely in Asian countries [10].It has a higher nutritional value than other cucurbits such as

pumpkin, cucumber and squash owing to its high mineral and vitamin content [3].

RESEARCH METHODS

RESEARCH STUDY AREA

The experiment was conducted in the Department of Biochemistry and Molecular Biology, Faculty of Science, Sokoto State University, Sokoto.

EXPERIMENTAL ANIMAL

A total of tarty (30) rats weighing 130 g was purchased fromUsmanuDanfodiyo University teaching hospital Faculty of Pharmaceutical Sciences Sokoto, rats were housed in well cages under hygienic conditions in the Biochemistry department, Sokoto State University, Sokoto.

PLANT COLLECTION AND IDENTIFICATION

*Momordicacharantia L.*Used for this study was collected from Zuru local government, Kebbi State, Nigeria and it was identified by a Botanist in Biology department. Sokoto State University, Sokoto

PLANT EXTRACTION

The sample were dry using oven and then letter it was motored in to a powder form, the powdered sample was soak into methanol and then letter be filtered and evaporate.

DIABETES INDUCTION

Diabetes was induced byintraperitoneal injection of 180 mg/kg body weight of alloxan monohydrate in normal saline water in a volume of about 3mL. After some hours of injection, the diabetic rats (glucose level >7.5 mmol/L) werethen separated and used for the study.

ANIMAL GROUPING

Group A-Not induced diabetic and untreated, fed only with normal rat diet (Normal control).
Group B–Diabetic induced rats but untreated, fed with normal rat diet (Negative control).
Group C -Diabetic induced rats but treated with standard drugs (Positive control).
Group D-Diabetic induced ratsbut treated with 100mg/ per kg of body weights *Momordicacharantia L.*
Group E-Diabetic induced treated with 200mg/ per kg of body weights *Momordicacharantia L.*
Group F -Diabetic induced treated with 300mg/ per kg of body weights *Momordicacharantia L.*
The animal was anesthetized with chloroform and killed by surgical dislocation of the neck 24 hrs after the last treatment.

BLOOD SAMPLE COLLECTION AND PROCESSING:

Blood samples were then collected using 5ml syringe and then transferred into well labelled EDTA bottle container.

DETERMINATION OF BLOOD GLUCOSE

This determination was based on the glucose oxidase method of [10]

PROCEDURE

Pipette into three labelled test tubes: blank, standard and sample as follows:

Test tubes	Blank (µL)	Standard (µL)	Sample (µL)
Glucose Working reagent	1000	1000	1000
Sample (serum)	-	-	10
Glucose Standard	-	10	-

The contents were then mixed and incubated for 10minutes at 37°C. The absorbance of the sample and standard were measured using spectrophotometer at the wavelength of 520nm against the reagent blank.

DETERMINATION OF HAEMATOLOGICAL PARAMETERS

The haematological parameters were analysed using a haematology analyser according the methods of [7].

DETERMINATION OF LIPID PROFILE PARAMETERS

Serum LDL, HDL, TAG and total cholesterol were estimated by enzymatic method using Randox kit [8].

DETERMINATION OF ANTIOXIDANTS VITAMINS (VITAMIN A, C and E)

The concentration vitamins A, C and E were determined according to the method of [2]

RESULT

Table 1: Serum Blood glucose levels of rats treated with Momordicacharantia L Methanol Extract

Dose administered mg/kg	Serum Blood Sugar (mg/kg)
Normal control (Distilled H2O 5ml/kg)	50.25 ± 1.26^{f}
Diabetic Control (120mg/kg)	215.95 ± 7.59^{a}
Glabinclamide	64.02 ± 4.79^{e}
MCMLE(100mg/kg)	141.40 ± 7.76^{c}
MCMLE(200mg/kg)	85.80 ± 1.02^{d}
MCMLE(300mg/kg)	178.52 ± 6.24^{b}

Results are expressed as mean ± SEM (n=4) value having different superscript are significantly different at ($P<0.05$) using one-Way ANOVA analyser,
KEY: MCMLE= *MomordicacharantiaL.* methanol leave extract.

Table 2: Haematological parametersof rats treated with Momordicacharantia L Methanol Extract

Dose administered mg/kg	PCV	Hb	RBC	WBC	MCHC
Normal control (Distilled H2O 5ml/kg)	36.50±0.28[b]	12.30±0.00[a]	5.72±0.01[a]	11.35±0.51[a]	33.70±0.26[a]
Diabetic Control(120mg/kg)	36.75±0.47[b]	12.50±0.16[a]	5.70±0.01[a]	14.48±0.91[a]	23.79±5.53[b]
Glabinclamide	40.75±0.25[a]	13.70±0.00[a]	6.70±0.02[a]	14.00±0.34[a]	33.58±0.22[a]
MCMLE(100mg/kg)	38.50±1.55[a]	13.05±0.48[a]	6.11±0.33[a]	13.98±1.96[a]	33.92±0.58[a]
MCMLE(200mg/kg)	38.75±1.70[a]	12.45±0.55[a]	5.75±0.39[a]	13.06±1.83[a]	32.98±0.39[a]
MCMLE(300mg/kg)	39.00±1.58[a]	12.69±0.49[a]	5.53±0.36[a]	14.90±1.17[a]	33.88±1.10[a]

Values are expressed as mean ± SEM (n=4) value with different superscript down the column are significantly different at (P<0.05) analysed using one-Way ANOVA.
KEY: PCV= packed cell volume,
Hb=haemoglobin,
RBC= Red blood cell,
WBC= White blood cell,
MCHC=Mean corpuscular haemoglobin.
MCMLE= MomordicacharantiaL. methanol leave extract.

Table 3: Lipid profiles parametersof rats treated with Momordicacharantia L Methanol Extract

Dose administered mg/dL	LDL	HDL	TAG	CHOLESTROL
Normal control (Distilled H2O 5ml/kg)	42.50±1.70[b]	60.30±1.10[a]	77.2±2.70[c]	85.35±2.30[c]
Diabetic Control	83.75±0.47[a]	25.50±2.16[c]	132.70±2.61[a]	186.48±2.91[a]
Glabinclamide	40.75±0.25[b]	42.70±0.00[b]	90.70±0.02[b]	140.00±2.34[b]
MCMLE(100mg/kg)	38.50±1.55[b]	44.05±1.48[b]	96.11±0.33[b]	146.98±2.96[b]
MCMLE(200mg/kg)	41.75±1.70[b]	44.45±1.55[b]	95.75±0.39[b]	144.06±1.83[b]
MCMLE(300mg/kg)	40.00±1.58[b]	45.69±1.49[b]	95.53±0.36[b]	146.90±1.17[b]

Values are presented as mean ± SEM (n=4) value having different superscript down the column are significantly different at (P<0.05) analysed using Duncan multiple comparison test with SPSS version 20.7. L
KEY: MCMLE= Momordicacharantia L. methanol leave extract, LDL=low density lipoprotein, HDL=high density lipoprotein and TAG= triacylglycerol.

Table 4: Antioxidants vitamins concentration of rats treated with Momordicacharantia L Methanol Extract

Dose administered mg/kg	Vitamin A (mg/dl)	Vitamin C (mg/dl)	Vitamin E (mg/dl)
Normal control (Distilled H2O 5ml/kg)	30.44±0.33[b]	301.52±1.08[b]	178.27±2.59[c]
Diabetic Control(120mg/kg)	36.94±0.99[a]	320.86±0.35[a]	203.84±7.75[a]
Glabinclamide	20.15±0.08[d]	301.91±0.61[b]	114.27±0.64[e]
MCMLE(100mg/kg)	30.68±0.99[b]	187.82±2.63[e]	196.52±3.84[b]
MCMLE(200mg/kg)	25.93±1.24[c]	289.99±1.15[d]	158.77±29.52[d]
MCMLE(300mg/kg)	28.11±0.48[c]	258.91±1.08[d]	196.64±11.44[b]

Values are expressed as mean ± SEM (n=4) value with different superscript down the column are significantly different at (P<0.05) analysed using one-Way ANOVA.
KEY: MCMLE= Momordicacharantia L. methanol leave extract.

Discussion

Diabetes result due to insufficient availability or absent of insulin within the biological system, which probably preventing blood glucose from entering in to the cell to use as fuel molecules, When this occurs, the body system will starts burning fats stored in muscles adipose tissue for energy,this causes a reduction in overall body weight, production of reactive oxygen species and other metabolic diseases, however antidiuretic drugs plays vital role in reviving oxidative stress, body weight lost and other relative stress markers. In the present study, the effect of *MomordicacharantiaL.* methanol leaves extract to maintaining body weight, oxidative stress markers and other related diseases of animals might attributes to the plants antidiabetic potential.Table: 1 revealed that the blood glucose concentration was showed significant (P>0.05) decreases in the entire treated group regime (MCMLE 100mg/kg, MCMLE 200mg/kg, and MCMLE 300mg/kg) when compared with the diabetic control group this signified that the plat extract may have good antidiabetic potential.

The study alsoshowed a significant increase in PCV and MCHC haematological parameter (table: 2) and significant decrease in lipid profile and antioxidant vitamins when compared with the diabetic control group this signified that the plant extract may contains numerous pharmacologically active that could be responsible for the observed glucose lowering potentials and strong antioxidant activities.Vitamin E plays an important role as a free radical scavenger whichprevents the by-products of chemical-cell interaction that cause cell damage. Free radicals are normallyresponsible for most of the degenerative diseases within the biological system. Vitamin E may eventually alsoprove to be helpful in the prevention and treatment of diabetes because of the roles its plays in body`s production of glucose [3].

Vitamin C is a potent antioxidant usesprevention cellular DNA, lipid and protein damage.It's also known that vitamin C supplements help in lower blood glucose levels in diabetics' patient[1].

Conclusion

Results have shown that administration of *Momordicacharantia L.* (better gaud) leave extract at the following (100, 200 and 300 mg/kg body weight) concentration likely possess antidiabetic and antioxidants properties. These antidiabetic and antioxidants properties may be attributed to the high content of phytonutrients which may be responsible for the effect of show by the plant extract on diabetes and haematological parameters in this research.

It is hereby recommended that more work should be done on the ethyl acetate and butanol fractions to isolate and identify the components responsible for their hepatoprotective antidiabetic and antioxidant property.

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