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## ALTERATIONS IN ANTI-OXIDANT AND SERUM LIPID PROFILE IN ADMINISTRATION OF METHANOL EXTRACT OF *DENNETTIA TRIPETALA* ON DIABETIC MICE

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### ABSTRACT

In in-vivo experiments, one of the fastest killers of metabolic processes is prolonged accumulation of free radicals, which are often accomplices of lipid peroxidation reactions. In this wise, though numerous studies have advocated its managements with anti-oxidants, research on antioxidants from herbal source remain inconclusive. Thus, current study determined the anti-antioxidant and lipid lowering tendencies of methanol leaf extract of *Dennettia tripetala* on alloxan induced diabetic mice. Sixty five (65) mice were procured and randomly assigned into thirteen (13) groups of five mice each. Following period of acclimatization (2 weeks), animals were fed with various treatment as follows; Group 1 (normal control), group 2 (diabetic control), group 3 (received 5 mg/kg of Glibenclamide, a known anti-diabetic agent) and groups 4 -13 were given 250 and 500 mg/kg doses of Methanol Extract [ME], N-Hexane Fraction [NH], Ethyl Acetate Fraction [EAF], Butanol [BF] and Water [WF] Fractions respectively. At the end of six (6) weeks treatment period, animals were subjected to overnight fast, with Fasting blood glucose (FBG) levels obtained by means of a glucometer, serum lipid profile levels were assayed (using a spectrophotometer) after obtaining blood samples by cardiac puncture. In the end, obtained data were subjected to statistical comparisons of mean differences, using the one way analysis of variance (ANOVA). Study observed a statistically significant decrease ( $p < 0.05$ ) in FBG levels of extract treated group [ME] within 10 hours of acute treatment and 14 days short term treatment. Also, Administration of various treatments evoked a significant decrease ( $p < 0.05$ ) in serum levels of total cholesterol, triglyceride and low density lipoproteins, with a preponderant significant elevation ( $p < 0.05$ ) of high density lipoprotein (HDL-cholesterol) levels when compared with diabetic control.

**Keywords:** Anti-Oxidant, Lipoproteins, Lipid profile, *Dennettia tripetala*

## INTRODUCTION

The body is constantly exposed to the negative and sometimes lethal effects of oxidants during normal physiological processes. On a daily basis, up to 5% of inhaled oxygen may be converted to reactive oxygen species (ROS). These ROS have the ability to bind to cellular structures, such as deoxyribonucleic acid (DNA), ribonucleic acid (RNA), proteins and the cell membrane [1]. The damage is cumulative and may be the trigger for diseases such as arteriosclerosis, cancer and even Parkinson's disease in man [2].

To help curtail the menace due to free radical damage, antioxidants need to be supplied via normal dietary intake. This includes compounds such as vitamin A, C, E, carotenoids and the polyphenols, that is, phytochemical compounds abundant [with a higher bioavailability and therefore higher protective efficacy than synthetic antioxidants] within fruits and vegetables [3]. In addition to this ability to neutralize harmful oxidative reactants, the antioxidants may also be protective against neoplastic growth and proliferation, via other mechanisms.

Medicinal plants have been of great usefulness as alternatives to synthetic anti-diabetics, anti-oxidant, and in lipid lowering. Studies had shown that plants are used in the management of serum lipoprotein and glucose levels. For this reason, exploration of these properties in *Dennettia tripetala* would be an avenue for the development of natural molecules of herbal sources for

managing ailments related to lipid peroxidation with huge spike in serum levels of free radicals.

*Dennettia tripetala*, also known as pepper fruit tree belongs to the Annonaceae family, a tree that grows up to 30 m high and often shrubby [4]. It is a tropical plant that is mostly dominant in the West African region especially Nigeria, Ivory Coast and Cameroon. It is locally called "Nkarika" in Calabar, ako in Edo, *opipi* in Idoma, *omako Imako* by the Niger Deltans and *Urhobo/Isoko*, *nkarika* in Ibibio, *mmimi* in Igbo and *ata igbere* in Yoruba. The young leaves and fruits have instinctive spicy taste with a characteristic aroma and fragrance [5]. It is a pungent, pepperish, spicy medicinal plant that is characterised by greenish appearance when unripe but tends to be reddish or pinkish in colour when ripe. Pepper fruit tree thrives mainly in the Savannah and rainforest zones while the fruit usually ripens between April and May [6]. The fruit is edible and rich in vitamin C. The leaves are used in folk medicine by some communities in parts of Southern Nigeria for the treatment of fever, cough, asthma catarrh, diarrhea and rheumatism. The leaves and roots are also commonly used by the local herbalist in folk medicine in combination with other medicinal plants to treat various ailments including fever, infantile convulsion, typhoid, worm infestation, vomiting and stomach upset [7]. The leaf extract had been demonstrated to possess antimicrobial activity against *Staphylococcus aureus* [7], anti-nociceptive and anti-

inflammatory activities, antioxidant and antimicrobial activities. The essential oil of *D. tripetala* fruits has been found to possess analgesic effects. The oil also relieved inflammation in rodents [8]. Pepper fruit has antinociceptive effects and as such can be used for reducing sensitivity to painful stimuli [8].

The essential oil and phenolic acid extract inhibit the growth of food-borne microorganisms such as *Staphylococcus aureus*, *Salmonella* sp., *Escherichia coli* [9]. This point a role for pepper fruit in the preservation of food substances such as meat which is prone to rapid decomposition. The leaves were found to be effective in inhibiting the growth of the rot-causing fungus *Sclerotium rolfsii* in cocoyam both *in vitro* and *in vivo* [10]. Several other reports showed the antimicrobial activity of *D. tripetala* [7&8].

Anosike *et al.*, (2016) evaluated the anti-ulcer ability of ethanol extract from pepper fruit seed extract. Their findings showed that the ethanol extract of pepper fruit seed have potent and dose-dependent anti-ulcer effect against

aspirin-induced ulcer. According to these researchers, this anti-ulcer effect of pepper fruit can be attributed to its flavonoid content.

### Aim of Study

Current study evaluated the antioxidant and lipid lowering properties of *Dennettia tripetala* extract on alloxan induced diabetic mice. Specifically, study determined the effect of different fractions of *Dennettia tripetala* on lipid profile level and body weight. Study also investigated the in-vivo free-radical scavenging (antioxidant) effect of various fractions of *Dennettia tripetala* on diabetic mice.

### Materials and Method

#### Study Design:

Sixty five (65) mice were procured and randomly grouped into thirteen (13) of five mice per group as follows;

Groups	Mice Condition	Treatments	Dose (Mg/Kg)
Group 1	Normal control	5% Tween 80	
Group 2	Negative Control (Diabetic)	5% Tween 80	
Group 3	Positive Control (Diabetic Treated)	Glibenclamide	5mg/kg
Group 4	Diabetic	Methanol Crude Extract	250mg/kg
Group 5	Diabetic	Methanol Crude Extract	500mg/kg
Group 6	Diabetic	Ethyl Acetate Fraction	250mg/kg
Group 7	Diabetic	Ethyl Acetate Fraction	500mg/kg
Group 8	Diabetic	N-hexane Fraction	250mg/kg

<b>Group 9</b>	Diabetic	N-hexane Fraction	500mg/kg
<b>Group 10</b>	Diabetic	Butanol Fraction	250mg/kg
<b>Group 11</b>	Diabetic	Butanol Fraction	500mg/kg
<b>Group 12</b>	Diabetic	Aqueous Fraction	250mg/kg
<b>Group 13</b>	Diabetic	Aqueous Fraction	500mg/kg

### Animals:

A total of 100 male albino mice of between 18-35g were procured from the Laboratory Animal Facility of the Department of Veterinary Physiology and Pharmacology, University of Nigeria, Nsukka. Animals were then housed in wooden cages with full access to portable water and standard feed *ad libitum*, following which they were acclimatized for two weeks in compliance with guidelines from the National Institute of Health on the care and handling of laboratory animals.

### Collection and Authentication of Plant Materials

Fresh *Denettia tripetala* leaves were obtained from Irri town, somewhere in Isoko South Local Government Area of Delta State, Nigeria; following which it was authenticated by an expert Taxonomist from the Department of Botany, Nnamdi Azikiwe University, Awka. A voucher number of PCG/UNIZIK/0631 was issued just after identification.

### Preparation of Plant Extract

Fresh leaves of *D. tripetala* were washed in a running tap to remove dust and other debris, and air dried for two weeks. Dried leaves of *Dennettia tripetala* were pulverized with electrical blender

and kept in clean air tight amber bottle. 750 g of the powdered material was cold macerated in 80% ethanol. The mixture was agitated continually for two days (48 hours). The filtrate was recovered and concentrated to dryness using water bath at 40°C. The extract was stored in a refrigerator before use. The percentage yield of the extract was calculated using the following formula.

$$\% \text{ yield} = \frac{\text{Mass of Dry Extract}}{\text{Weight after extraction}} \times 100$$

### Fractionation of methanol crude extract

Fractionation was carried out using N-hexane, Ethyl Acetate and Butanol following the method described by Ihekwereme *et al.*, (2016). One hundred grams of crude extract was dispersed in 500 ml of distilled water then poured inside a separating funnel. N-hexane 500ml was added to funnel and shake thoroughly to mix. The mixture was allowed to separate into two distinct layers. The n-hexane portion, (upper layer) was separated and the other portion was subjected to fresh n-hexane until the n-hexane portion was clear completely. After the n-hexane phase, the other portion was subjected to ethyl

acetate and butanol successively using the same process as described for n-hexane. The various fractions were filtered and concentrated to dryness using water bath set at 40°C. The fractions were stored in a refrigerator before use [11].

### LD<sub>50</sub> Determination

Acute toxicity, LD<sub>50</sub> test was carried out using the method of Lorke (1983) [8]. A total of 13 mice, weighing 28-30g were used in the two phases. In the first stage, the animals were divided into 3 groups of 3 mice each, and the extract was administered at three dose level (10, 100 and 1000 mg/kg) body weight. The animals were then monitored for 24 hours. Absence of deaths in the first phase led to the use of 2000, 3000, 4000 and 5000 mg/kg dose of extract for 4 groups of 1 animal each. Animals were examined again for another 24 hours. The number of death (s) was noted for each group and the LD<sub>50</sub> was calculated as follows;  

$$LD_{50} = \sqrt{(D_0 \times D_{100})}$$

Where: D<sub>0</sub> = Highest dose that gave no mortality

D<sub>100</sub> = Lowest dose that produced mortality.

### Yields of extract and fractions

The methanol leaf extract of *D. tripetala* was dark green in colour after concentration to dryness. Two hundred gram (26.67% w/w) of extract was recovered from powdered leaves of 750 g. Weight of fractions and their yields calculated from 100g of the crude extract are: n-hexane fraction (24 g, 25%

w/w), ethyl acetate fraction (28 g, 30% w/w), butanol fraction (21 g, 21% w/w), water fraction (18 g, 19% w/w).

### Dosage selection:

Dosage of extract administered to animals was determined from 1/10<sup>th</sup> and 1/20<sup>th</sup> of the estimated LD<sub>50</sub> as described by Neharkar and Galkwad (2011) [13]

### Biochemical Assays

#### Determination of serum total cholesterol

Serum total cholesterol (TC) was evaluated using Randox commercial assay kits following the methods described by Ezeigbo, (2016). One millilitre (1 ml) of the working cholesterol reagent was added into tubes labelled blank, standard and test groups. Ten microlitres of standard cholesterol reagent, and samples were added into their respective tubes. They were mixed and allowed to stand for 10 minutes at room temperature. Absorbance of samples and standard were read with the aid of a spectrophotometer at 500 nm. Total cholesterol level in sample was calculated using the formula

Total cholesterol in sample (mg/dl) =  $\frac{\text{Absorbance of sample}}{\text{Absorbance of standard}}$  x Concentration of standard.

#### Determination of serum triglyceride

Serum triglyceride was evaluated according to the methods described by Tietz, (2014). One millilitre (1 ml) of the working triglyceride reagent was added into tubes labelled blank, standard and



test groups. Ten microlitres of standard triglyceride reagent, and samples were added into their respective tubes. They were mixed and allowed to stand for 10 minutes at room temperature. Absorbance of samples and standard were read with the aid of a spectrophotometer at 500 nm. Total cholesterol level in sample was calculated using the formula;

Total triglyceride in sample (mg/dL) =  $\frac{\text{Absorbance of sample}}{\text{Absorbance of standard}}$  x Concentration of standard

#### Determination of serum high density Lipoprotein cholesterol (HDL-cholesterol):

Serum HDL-cholesterol was evaluated according to the methods developed by National Institute of Health Consensus Development Conference Statement (NIHCDCS). One hundred microliters (100 ul) of samples and standard cholesterol reagent were dispensed into test tubes containing 250 ul of HDL cholesterol precipitate (R1). The mixture was centrifuged at 4000 rpm for 10 minutes. Thereafter, 100 uL of samples and standard supernatants were added to another set of test tubes labelled samples and standard containing cholesterol reagent. The mixture was incubated for 10 minutes at room temperature and absorbance of standard and samples were measured against reagent blank at 500 nm within 60 minutes using Spectrophotometer. HDL-cholesterol level in sample was calculated using the formula below;

HDL cholesterol in sample (mg/dL) =  $\frac{\text{Absorbance of sample}}{\text{Absorbance of Standard}}$  x Concentration of standard.

#### Determination of serum low density Lipoprotein cholesterol (LDL-cholesterol):

Low density lipoproteins (LDL) cholesterol in serum was calculated using the equation described by Friedewald's *et al.*, (1972). The Friedewald's equation estimates the value of HDL-C using the values of total cholesterol, triglyceride and HDL-cholesterol

LDL cholesterol (mg/dl) = Total cholesterol -  $\frac{\text{Triglycerides}}{5}$  - HDL cholesterol.

#### Estimation of the antioxidant activity

The methanol leaf extract and fractions of *Dennettia tripetala* were screened for DPPH radical scavenging activity according to the method described by [14]. Two millilitre of methanol was added to 0.2 ml of different concentration, 7.81, 15.63, 31.25, 62.5, 125, 250, 500 and 1000 µg/ml of the crude extract and fractions. Then, 0.2 ml of 0.6 mMol of DPPH was added to the mixture. After incubation in the dark for 30 minutes at room temperature, the absorbances of the mixture were measured at 517 nm against methanol as blank using spectrophotometer. Ascorbic acid was used as a standard and absorbance measurements were done in duplicate. Free radical scavenging activity of the extract and fractions was obtained using the relationship shown below:

DPPH scavenging activity = 100 x (AC - AS)/AC)

**AC** = Absorbance of control

**AS** = Absorbance of sample

A graph of percentage inhibition against concentrations of extract and fractions was plotted and the IC<sub>50</sub> was extrapolated from regression equation [15].

### Statistical Analysis

Data obtained from the study were analysed with the Statistical Package for Social Sciences (SPSS-20). Results were presented as Mean  $\pm$  Standard error of mean (SEM) of sample replicates. Raw data were subjected to one way analyses of variance (ANOVA) followed by post hoc Tukey's test. P-values < 0.05 was considered to be statistically significant.

### Results

**Table I: Comparative Effects of various treatments on serum lipid profile**

Treatment	Dose	Total cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL-Cholesterol (mg/dl)	LDL-Cholesterol (mg/dl)
Normal control	D.H <sub>2</sub> O	169.93 $\pm$ 6.72	81.96 $\pm$ 2.87	93.77 $\pm$ 4.32	59.77 $\pm$ 10.31
Diabetic control	D.H <sub>2</sub> O	290 $\pm$ 0.79	185.19 $\pm$ 8.88	43.77 $\pm$ 4.69	108.55 $\pm$ 6.65
Glibenclamide	D.H <sub>2</sub> O	176.28 $\pm$ 5.58	127.58 $\pm$ 5.03	87.74 $\pm$ 3.39	63.02 $\pm$ 2.12
Methanol Extract	250mg/kg	171.72 $\pm$ 2.34	88.38 $\pm$ 3.59	79.31 $\pm$ 2.95	74.74 $\pm$ 2.27
	500mg/kg	170.91 $\pm$ 1.71	104.41 $\pm$ 6.14	87.85 $\pm$ 3.93	62.18 $\pm$ 4.85
Ethyl acetate fraction	250mg/kg	150.35 $\pm$ 10.37	114.39 $\pm$ 4.19	82.16 $\pm$ 3.60	82.31 $\pm$ 9.75
	500mg/kg	164.07 $\pm$ 3.44	133.28 $\pm$ 11.78	66.60 $\pm$ 2.28	70.82 $\pm$ 3.75
n-hexane fraction	250mg/kg	175.63 $\pm$ 5.33	119.38 $\pm$ 4.71	85.22 $\pm$ 2.63	66.53 $\pm$ 5.58
	500mg/kg	173.35 $\pm$ 0.96	66.64 $\pm$ 5.98	84.57 $\pm$ 1.81	75.46 $\pm$ 0.94
Butanol fraction	250mg/kg	175.05 $\pm$ 3.44	83.75 $\pm$ 3.03	81.06 $\pm$ 3.43	95.24 $\pm$ 4.38
	500mg/kg	155.89 $\pm$ 6.77	116.89 $\pm$ 8.43	78.43 $\pm$ 2.44	77.08 $\pm$ 7.73
Water fraction	250mg/kg	173.35 $\pm$ 0.81	101.92 $\pm$ 3.79	84.57 $\pm$ 1.17	68.40 $\pm$ 2.18
	500mg/kg	170.68 $\pm$ 2.85	65.23 $\pm$ 0.91	80.40 $\pm$ 3.93	80.23 $\pm$ 6.18

*Values are presented as mean  $\pm$  Standard error of mean (SEM), n = 5*

**Table II: Effect of various treatments on body weight**

Treatments	Dose	Weight Before Alloxan induction	Weight after Alloxan induction	Weight After treatment	Change in body weight (%)
Normal control	D.H <sub>2</sub> O	25.18±1.33	17.46±0.67	27.60±1.21	36.74
Diabetic control	D.H <sub>2</sub> O	26.88±1.64	18.00±1.05	19.20±1.07	6.25
Glibenclamide	5 mg/kg	23.72±3.05	18.06±1.14	20.20±2.59	10.59
Extract	250 mg/kg	24.22±2.87	17.94±0.73	22.20±2.63	19.19
	500 mg/kg	28.00±1.52	17.60±0.75	24.40±1.60	27.87
Ethyl acetate fraction	250 mg/kg	30.80±1.24	18.40±1.03	27.00±1.82	31.85
	500 mg/kg	24.40±2.23	19.00±1.08	22.20±2.46	14.41
n-hexane fraction	250 mg/kg	23.60±1.69	18.74±0.56	23.60±1.72	20.59
	500 mg/kg	26.20±2.89	19.00±1.58	22.20±2.15	14.41
Butanol fraction	250 mg/kg	25.80±1.77	17.60±0.69	21.80±1.39	19.27
	500 mg/kg	27.80±2.40	18.20±0.66	22.60±2.84	19.47
Water fraction	250 mg/kg	26.00±1.61	19.20±0.66	22.00±1.58	12.73
	500 mg/kg	28.00±1.70	18.80±0.96	22.60±2.16	16.8

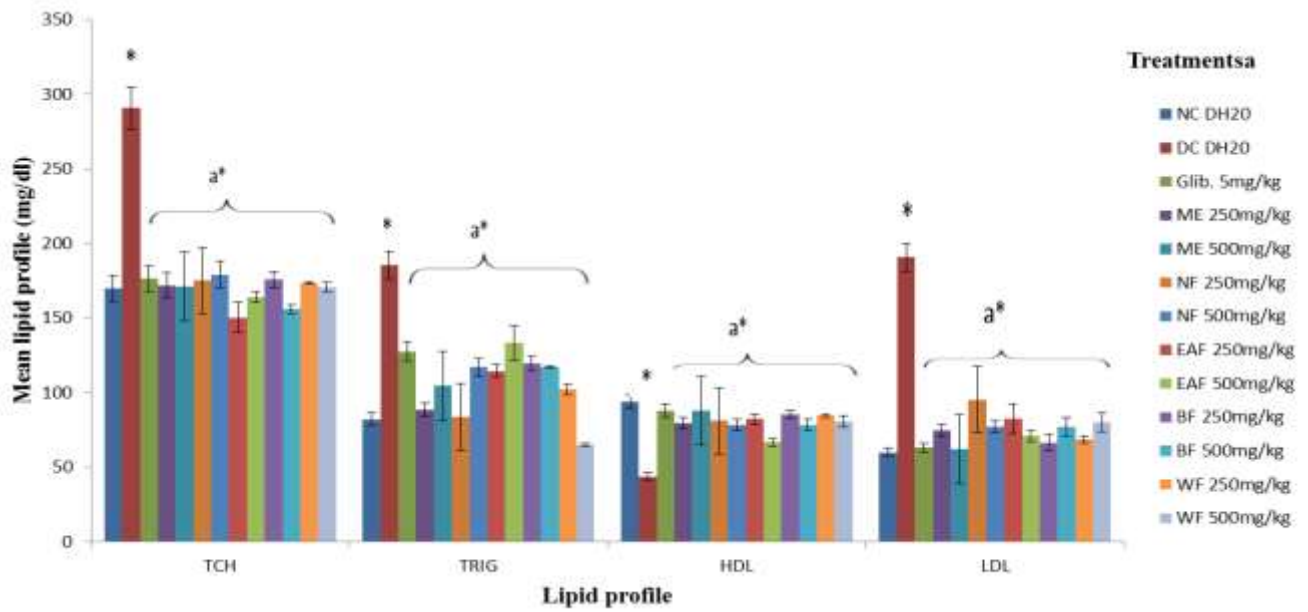
*Values are presented as mean ± Standard error of mean (SEM), n =5.*

**Table III: Comparative Changes of various treatments on Antioxidant Assay**

Sample	IC <sub>50</sub> (ug/ml)
Methanol Extract	32.03
N-Haxane fraction	30.04
Ethyl acetate	30.05
Butanol fraction	29.13
Water fraction	40.16
Ascorbic Acid	3.00

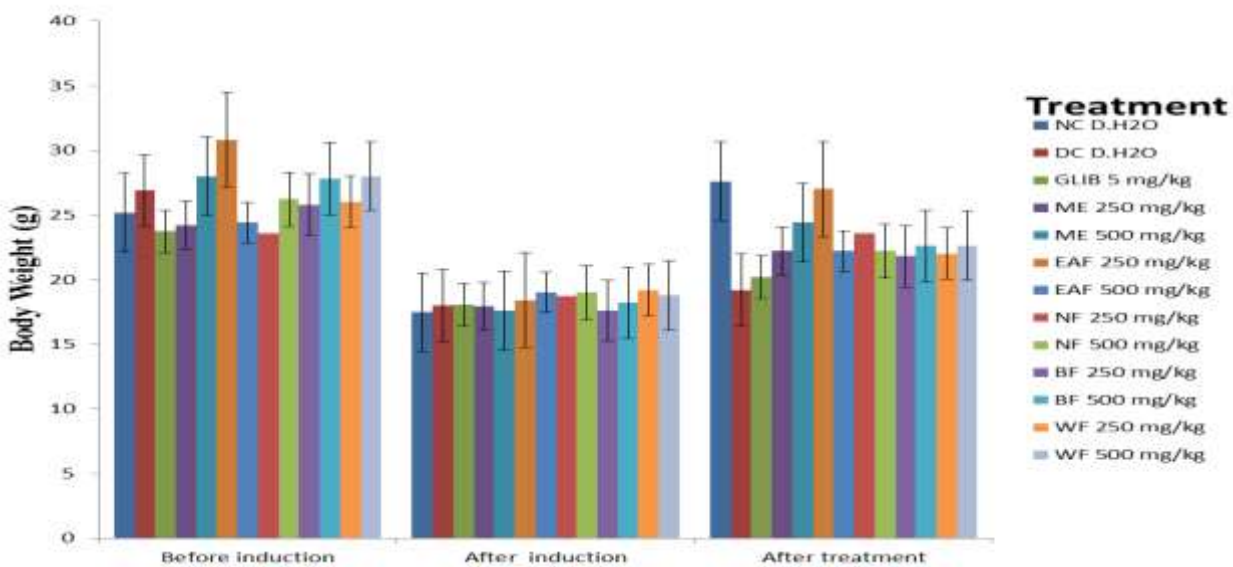
**Figure I: Comparative Effects of various Treatments on Lipid Profile**





[TCH, TRIG and LDL significantly reduced ( $a^*p<0.05$ ). HDL significantly increased ( $a^*p<0.05$ )] when compared to diabetic induced (\*). Above figure shows the Effect of the oral administration of various treatments on serum Total cholesterol (TCH), Triglycerides (TRIG), Low density lipoproteins (LDL) and High density lipoproteins (HDL). Following daily administration of Methanol extract of *Denettia Tripetala* and its fractions. NC: Normal control, DC: Diabetic control, ME: methanol extract, NF: N-Hexane fraction, EAF: Ethyl acetate, BF: Butanol fraction, WF: Water fraction and D. H<sub>2</sub>O: Distilled Water.

**Figure II:** Final Change in body weight of mice for different treatment groups



## Discussion

Results from figure I of current study represent the effect of the oral administration of the various treatments on serum total cholesterol, triglycerides, low density lipoproteins and high density lipoproteins. The levels of triglyceride, total cholesterol and LDL-C were significantly elevated and the level of serum HDL-C was decreased in the diabetic control group as compared to normal control. After supplementation with methanol extract and fractions of *Dennettia tripetala*, the alteration in lipid metabolism were significantly affected as evidenced by decreased serum triglyceride (TG), total cholesterol (TC) and LDL-cholesterol levels and increased HDL cholesterol concentration for both 250mg/kg and 500mg/kg.

Also from current study, diabetic dyslipidaemia was marked by alloxan in diabetic mice by elevated triglycerides, total cholesterol, LDL-C and decreased HDL-C; these constitute important cardiovascular risk factors [14]. These effects may be due to low activity of cholesterol biosynthesis enzymes and or low level of lipolysis which are under the control of insulin [15]. The leaf extract of methanol and fractions *Dennettia*

*tripetala* supplementation gave significant attenuation in the level of serum lipid profile after supplementation with the leave extract of methanol and fractions *Dennettia tripetala*.

The alteration in lipid metabolism was significantly attenuated as evidenced by decreased serum triglyceride (TG), total cholesterol (TC), and LDL-cholesterol levels and increased HDL-cholesterol concentration in diabetic mice. Total cholesterol less than 200mg/dl is considered to be good. In the present study, the total cholesterol of the untreated mice was 290mg/dl. The extract and fractions of DT was considered effective since it was able to cause a remarkable reduction when compared to the diabetic control group and the standard drug Glibenclamide. 250mg/kg Ethyl acetate fraction was considered to cause the highest reduction (150.35mg/dl). 500mg/kg of Butanol fraction was considered to next in the reduction rate with a value of (155.89mg/kg). The least in the order of reduction rate was N-hexane fraction 250mg/kg with a value of (175.63mg/dl). Triglyceride less than 149mg/dl is considered to be good.

For TG, water fraction had the lowest reduction rate with a value of (65.23mg/dl). This result was followed by N-hexane fraction 500mg/kg, with a value of (66.64mg/dl) and the least was Ethyl acetate fraction 500mg/kg with a value of (133mg/dl). HDL-Cholesterol above, 40-45 is considered to be good. From results obtained from HDL-C, 500mg/kg methanol extract had the highest increase compared to the other fractions, with a value of (87.85mg/dl).

This result was followed by N-hexane 250mg/kg with a value of (85.22mg/dl) and the least was Butanol 500mg/kg with a value of (78.43mg/dl). LDL- cholesterol less than 100mg/dl is considered to be good. Butanol fraction 250mg/kg shown to have the highest reduction rate with a value of (95.24mg/dl), followed by Ethyl acetate 250mg/kg with a value of (82.16mg/dl) and the least was methanol 500mg/kg with a value of (62.18mg/dl). The findings are in agreement with Kaleem and others who revealed that ethanoic extract of *Nigella sativa* seeds produced significant decreased in serum lipid profile (total cholesterol, LDL- C and triglyceride) and increased HDL-cholesterol level [16].

Similar findings were reported on *Raphia hookeri* seed extract on diabetic rats [17]. According to Luo *et al*, 2013, Mayilvaganan *et al.*, 2014 and Ogbunugafor *et al.*, 2012 reported that various doses of ethanol extract of *Cajanus cajan* showed a significant ( $P < 0.05$ ) increase in the level of high density lipoprotein cholesterol (HDL – C) and significant ( $p < 0.05$ ) decrease in total cholesterol (TC), low density lipoprotein cholesterol (LDL – C) and triacylglycerol after four weeks of treatment in albino rats. The results which correspond to the reports of Luo *et al*, 2013 also revealed a significant ( $< 0.05$ ) decrease in the level of triacylglycerol and thus infer the importance of the extract in weight and cardiovascular risk management. Offor *et al.*, 2014 earlier reported that total cholesterol, triacylglycerol and LDL-cholesterol levels were significantly ( $p < 0.05$ ) reduced by ethanol leaf-extracts of *Vernonia amygdalina* and *Azadirachta indica* while HDL-cholesterol levels were increased significantly. Aja *et al.*, (2015) reported no significant ( $P < 0.05$ ) increase in total cholesterol (TC), high density lipoprotein cholesterol (HDL – C) and low density lipoprotein – cholesterol (LDL – C)

levels in rats administered ethanol extract of *Cajanus cajan* leaves.

High blood cholesterol concentration is one of the important risk factors in heart disease [17]. Thus, the reduction in serum total cholesterol concentration produced by the extract is beneficial and may reduce the risk of cardiovascular disease because agents that have been reported to function. Elevated HDL-C is very significant in human health because it improves the transportation of cholesterol from plasmas to the liver for biotransformation and excretion, thereby preventing asthma formation and blood vessel occlusion [18]. In support of this study other studies had reported a significant change in lipid profile parameters following induction of diabetes with alloxan monohydrate [19&20].

## Conclusion

From current study, after supplementation with the leaf extract of methanol and fractions *Dennettia tripetala*, the alteration in lipid metabolism was significantly attenuated as evidenced by decreased serum triglyceride (TG), total cholesterol (TC), and LDL-cholesterol

levels and increased HDL-cholesterol concentration in diabetic mice.

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