Global Journal of Biotechnology & Biochemistry 10 (4): 126-130, 2015
ISSN 2078-466X

DOI: 10.5829/idosi.gjbb.2015.10.04.101117

Comparative Effect of Ethanolic Extract of *Gongronema latifolium* (Utazi) and *Vitex doniana* (Uchakiri) Leaves on the Body Weight and Lipid Profile of Wistar Albino Rats

[1]Nwaka Andrew C., [2]Amu Pascal A., [2]Ikeyi Pauline A. and [2]Okoye Domitilla C.

[1]Department of Biochemistry,
Chukwuemeka Odumegwu Ojukwu University, Uli Campus, Anambra State, Nigeria
[2]Department of Science Laboratory Technology,
Institute Of Management And Technology (IMT), Enugu, Enug State, Nigeria

Abstract: Comparative effect of ethanolic extracts of *Gongronema latifolium* (Utazi) and *Vitex doniana (*Uchakiri) leaves on the body weight and lipid profile of 35 male Wistar albino rats were evaluated. The rats were randomly separated into 7 groups of five (5) rats each in seven (7) different aluminum cages as follows: A - rats orally administered 100 mg/kg body weight of normal saline daily (Control), B - rats orally administered 100 mg/kg b.wt of Utazi extract daily, C - rats orally administered 100 mg/kg b.wt. of Uchakiri extract daily, D - rats orally administered 100 mg/kg b.wt. of mixture of Utazi and Uchakiri extracts, E - rats orally administered 200 mg/kg b.wt. of Utazi extract daily, F - rats orally administered 200 mg/kg b.wt. of Uchakiri extract daily, G - rats orally administered 200 mg/kg b.wt. mixture of Utazi and Uchakiri extracts. All the groups had free access to feed and drinking water *ad libitum*. The body weights of rats were taken at weekly intervals with electronic weighing balance, while at the end of the 28 days, the rats were bled and serum obtained from the blood were used for lipid profile assays using standard biochemical methods. Results revealed that rats administered 200 mg/kg b.wt. mixture of Utazi and Uchakiri extracts (Group G) had highest reduction (P<0.05) in their total cholesterol, LDL and triglyceride levels when compared to those of the control group and to all other groups. Results also indicated that the groups treated with Uchakiri extract had higher reduction in their total cholesterol, LDL and triglyceride concentrations than those of the groups treated with Utazi extract. Results further revealed decrease in the percentage body weight gain of the rats treated with either Utazi or Uchakiri extracts when compared to those of the control group. Results of this study therefore suggest that mixture of Utazi and Uchakiri extracts could be useful in prevention of atherosclerosis and in body weight reduction.

Key words: *Gongronema latifolium* · *Vitex doniana* · Lipid Profile · Body Weight · Atherosclerosis

INTRODUCTION

Plant-derived substances have recently become of great interest due to their versatile applications [1-3]. Medicinal plants are rich bioresources of drugs [4]. *Vitex doniana* (*Uchakiri)* is a common medicinal plant in Southern Nigeria. It is commonly known as black plum or Africa olive, *Dinya* in Hausa, *Oori-nla* in Yoruba, *Uchakiri* in Igbo. *Vitex doniana* is extremely wide spread in tropical Africa, occurring from Senegal to Somalia and to South Africa. It occurs in rain forest, deciduous and secondary forest. It is occasionally cultivated elsewhere for instance in Mauritius *et al*. [5].

Vitex doniana is propagated by seed or root suckers. Its chemical constituents include glycosides, flavonoids, alkaloids, essential fatty acid [6].

Gongronema latifolium (Utazi) in family of Asclepiadaceae, is a climbing shrub with broad, heart-shaped leaves that has a characteristic sharp, bitter and slightly sweet taste, especially when eaten fresh [7]. It is wide spread in Tropical Africa and can be found in Senegal, Nigeria, Sierra Leone, Ghana, etc. Its chemical constituents include essential oil, alkaloids, saponins and tannin, various minerals, vitamins and some essential amino acids. The common name for *G. latifolium* is "Amaranth globe". In Nigeria, *G. latifolium* flowers in July

Corresponding Author: C. Nwaka Andrew, Department of Biochemistry,
Chukwuemeka Odumegwu Ojukwu University, Uli Campus, Anambra State, Nigeria.
E-mail: okechukwup.cugwu@gmail.com.

and August. The Efik/Ibibo people in Eastern part of Nigeria call the leaves "UTASI", the Igbos call it "UTAZI" and the Yorubas call it "AROKEKE" or "MADUMORO" [8]. In Ghana, the Akan-asantis know it as "Kurutunsurogya". They are sharp-bitter and sweet and are widely used as leafy vegetables and as a spice for sauces, soups and salads. The leaves are used to spice locally brewed beer in Sierra Leone; the pliable stems are used as chewing sticks. The bark contains much latex and has been tested for exploitation. The plant has also been widely used in folk medicine for maintaining healthy blood glucose levels [9, 10]. The plant leaves have been found very efficacious as an anti-diarrhea and anti-toxic agent [11].

Cholesterol and triglycerides are the major blood/serum lipids of clinical significance in humans and animals [12-14]. Cholesterol is an essential component of mammalian cell membranes which play major roles in membrane permeability and fluidity and also as precursor of bile acids, steroid hormones and fat soluble vitamins [15]. Triglycerides play important role in metabolism as energy sources and transporters of dietary fat. Though cholesterol and triglycerides are physiologically important in the body, high levels of them in the blood have been found to be a major risk factor for the development of atherosclerosis [16-18]. The possible pathological consequences of atherosclerosis include myocardial infarction (Heart attack), cerebral infarction (Stroke), aortic aneurysms, peripheral vascular disease, sudden cardiac death, chronic ischaemic heart disease etc. The consumption of food items that will significantly reduce the overall blood levels of cholesterol and triglyceride and / or those components of cholesterol that have been associated with increased risk of atherosclerosis is one of the major strategies at prevention and management of atherosclerosis [19]. Hence the present study, which evaluated the comparative effects of ethanolic extracts of *Gongronema latifolium* and *Vitex doniana* leaves on the body weight and lipid profile of Wistar albino rats.

MATERIAL AND METHODS

Collection of Plant Materials: *Gongronema latifolium* leaves and *Vitex doniana* used in this research work were freshly obtained from Nsukka, Enugu state Nigeria and were botanically identified and authenticated as *G. latifolium and Vitex doniana* at the Botany Department, University of Nigeria, Nsukka before usage in this study.

Extraction of Plant Materials: The collected plant samples were rinsed in clean water and spread under ambient temperature for 24 hours. The fresh plant samples were ground into powder using mortar and pestle, the powder obtained were then used to prepare the extract.

Preparation of Plant Extracts: One hundred grams (100 g) of each of the powdered leaves were weighed with electrical weighing balance into sterilized conical flask and 500 ml of distilled water was poured into the flask, the content of the flask was shaken and the top were covered with aluminum foil and kept at ambient temperature for 48 hours after which the extract was obtained by filtering using clean cloth with fine pores. The extract was then concentrated in crucible using water bath set at temperature of 45°C. The weight of concentrated extract was taken and then stored in air-tight sample bottle in refrigerator till it was time to be analyzed.

Experimental Design: Thirty five (35) male Wistar albino rats weighing 150 - 200g were used for this study. The rats were obtained from the animal house of Faculty of Veterinary Medicine, University of Nigeria Nsukka, Enugu state, Nigeria. The animals were housed at the animal garden, Institute of Management and Technology(IMT) Enugu, Enugu State, Nigeria.

The rats were randomly separated into 7 groups of five rats each in seven different aluminum cages as follows: A - rats orally administered 100 mg/kg body weight of normal saline daily (Control), B - rats orally administered 100 mg/kg body weight of Utazi extract daily, C - rats orally administered 100 mg/kg body weight of Uchakiri extract daily, D - rats orally administered 100 mg/kg body weight of mixture of Utazi and Uchakiri extracts, E - rats orally administered 200 mg/kg body weight of Utazi extract daily, F - rats orally administered 200 mg/kg body weight of Uchakiri extract daily, G - rats orally administered 200 mg/kg body weight of mixture of Utazi and Uchakiri extracts. All the groups had free access to feed and drinking water *ad libitum*, while the rat feed used in this study was the Growers mash of Vital® feed limited, Jos, Plateau State, Nigeria. The body weights of

rats were taken at weekly intervals with electronic weighing balance, while the experiment lasted for 28 days. All the protocols as approved by Institutional Animal Ethics Committee (IAEC) were observed in this study.

Blood samples were collected from the animals from the retro-bulbar plexus of the medial canthus of the eye. Serum sample was separated from the clot by centrifugation at 3000 revolution per minute for 10minutes using bench top centrifuge (MSE Minor, England). Serum samples were separated into plain tubes and stored in the refrigerator for analyses. All the analyses were completed within 24hours of sample collection.

Biochemical Analysis of Serum Lipid Profile: The serum lipid profile was assayed using Quimica Clinica Aplicada (QCA) test kits (QCA, Spain). The serum total cholesterol (TC) was determined by the enzymatic colorimetric method Allain *et al*. [20]. The serum high density lipoprotein cholesterol (HDL-C) was determined by the dextran sulphate-magnesium (II) precipitation method Albers *et al*. [21]. The glycerol phosphate oxidase enzymatic method was used to determine the serum triglyceride [22] while the serum low density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald formular [23, 24].

Data generated from the study were subjected to one way analysis of variance and variant of means were compared with the control post hoc using the least significant difference (LSD) method. Significance was accepted at $p < 0.05$.

RESULTS

Table 1 revealed that the weight gain of the rats decreased down the week, from first week to the fourth week when compared to control group (Group A).

Table 1: Percentage Body weight gained at weekly intervals

Group	0 Week	1st week	2nd week	3rd week	4th week
A	0.0	5.0	5.7	5.8	6.1
B	0.0	3.8	3.2	2.7	2.2
C	0.0	3.3	3.5	3.1	3.0
D	0.0	3.1	3.2	2.9	2.6
E	0.0	3.3	3.1	3.1	2.8
F	0.0	2.8	2.5	2.2	1.9
G	0.0	2.6	2.4	2.2	1.4

Table 2: Lipid profile of different groups of rats used in the study

Groups	TC (mg/c)	HDL-C (mg/L)	LDL-C (mg/L)	TG (mg/L)
A	80.58±0.31	20.16±0.02	68.29±0.14	63.08±0.2
B	68.81±0.35	23.24±0.03	57.42±0.13	61.75±0.42
C	61.34±0.35	25.02±6.26	59.28±0.15	58.05±0.25
D	57.53±0.92*	29.67±0.16*	44.25±0.15*	53.15±0.14*
E	59.62±0.16*	26.21±0.02	32.49±0.06*	49.73±0.90*
F	55.90±0.40*	28.83±0.15*	36.36±0.13*	47.87±0.53*
G	43.24±0.11*	30.02±0.07*	32.32±0.06*	35.96±0.05*

Keys:

A- treated with 100 mg/kg of body weight of saline (Control)

B-(Treated with 100 mg/kg of body weight of extract of Utazi)

C-(Treated with 100 mg/kg of body weight of extract of Uchakiri)

D-(Treated with 100 mg/kg of body weight of extract mixture of Uchakiri and Utazi)

E-(Treated with 200 mg/kg of body weight of extract of Utazi)

F-(Treated with 200 mg/kg of body weight of extract Uchakiri)

G-(Treated with 200 mg/kg of body weight of extract mixture of Uchakiri and Utazi)

Results in Table 2 revealed significant decrease ($p < 0.05$) in total cholesterol, low density lipoprotein and triglyceride concentrations of rats administered 200 mg/kg body weight of Utazi or Uchakiri extracts. However, group G rats, administered 200 mg/kg body weight of mixture of Uchakiri and Utazi extracts revealed highest reduction in total cholesterol, LDL and triglyceride concentrations of rats.

DISCUSSION

The lipid profile of albino rats administered different doses of ethanolic extracts of *Gongronema latifolium* (Utazi), *Vitex doniana* (Uchakiri) and the different mixtures of the plants extracts were shown in Table 2. The results obtained showed a significant decrease ($P<0.05$) in serum total cholesterol level of rats administered utazi or uchakiri extract or the mixture of both extracts, especially in higher doses when compared to control groups. However the highest reduction in total cholesterol level was observed in the group administered 200 mg/kg body weight of mixture of Utazi and Uchakiri extracts. The reduction in cholesterol might be due to a decrease in absorption from the intestine by binding with bile acid within the intestine and increasing bile acid secretion. However studies suggest a beneficial effect in pathological conditions, considering the phytochemical constituents of the plants. The reduction in cholesterol level with the plants extract is an indication that it could be used to reduce coronary heart disease and atherosclerosis and other related diseases.

HDL-Cholesterol is known to have a protective effect against cardiovascular disease, since it removes excess cholesterol from circulation and carries it back to the liver where it is degraded into bile acid.

Also HDL-Cholesterol is considered to have anti atherogenic properties. It has also been shown that an increase in HDL-cholesterol correlates, inversely to coronary heart disease [25]. Therefore, the significant increase (P<0.05) in serum level HDL-cholesterol observed in this study suggests that the ethanol leaf extract of the two plants may be used to reduce the risk of atherosclerosis and other cardiovascular related disorders. It also suggests that the extracts of the plants might exert a protective or shielding effect against atherosclerosis. Although the observed decrease in the HDL-cholesterol level of rats treated with 100 mg/kg of *V. doniana* and those treated with mixture of 200 mg/kg of *V. doniana* and *G. Latifolium* respectively (Group G), could be due to the body mechanism of the animal which could not respond to the active nutrient of the extracts.

LDL-cholesterol is often designated "bad" cholesterol since high levels of it in the plasma are linked with increased deposition of cholesterol in the arterial walls [26].

However the observed significant reduction (p< 0.05) in low density lipoprotein (LDL-cholesterol) following the administration of the extracts at all dosages suggest that the extract possess cholesterol lowering ability or is an hypocholesterolemic agent which might be of great benefit in the management of atherosclerosis and other cardiovascular related disorders.

The triacylglyceride level of the rats fed different dosages of the ethanol extract of the two plants decreased significantly (P<0.05) when compared with the control group. The decrease in triacylglyceride by the plant extract could be a good factor in reducing the liver diseases. Results in Table 2 revealed significant decrease (p < 0.05) in total cholesterol, low density lipoprotein and triglyceride concentrations of rats administered with 200mg/kg body weight of Utazi or Uchakiri extracts. However, group G rats, administered with 200mg/kg body weight of mixture of Uchakiri and Utazi extracts revealed highest reduction in total cholesterol, LDL and triglyceride concentrations of the rats when compared with those of the control and those of all other groups in the study. The result of this study seems to be in agreement with the work of Ahalike and Ahaneku [27] who observed significant decrease in total cholesterol, LDL and triglyceride concentrations of adult Nigerians fed with fresh *Gongronema latifolium* leaves. This hypotriacylglyceridemia potential of the extracts might be responsible for its continual usage in folk medicine.

Results of percentage body weight gain at weekly intervals (Table 1) revealed decrease in the percentage weight gain of rats administered with either Utazi or Uchakiri when moving from first week to the fourth week. However the highest reduction in the percentage body weight gain was observed in the group administered with 200mg/kg body weight mixture of Utazi and Uchakiri extracts (Group G).The results of this study suggest that mixture of Utazi and Uchakiri extracts, especially at 200mg/kg body weight and above could be useful in reducing body weight.

CONCLUSION

From the results of the study it was observed that there was a decrease in the body weight of rats supplemented with the extracts of *G. latifolium* and *V. doniana* which may suggest that it could be a good supplement for body weight reduction. The results of this study further revealed significant decrease (p<0.05) in total cholesterol, LDL and triacylglyceride levels of rats administered with Utazi and Uchakiri extracts, especially the mixture of the two extracts at higher doses of 200mg/kg body weight. Therefore, since the level of plasma lipids are elevated in atherosclerosis, which is a risk factor in coronary heart disease, this study suggests that the *G. Latifolium* and *V. doniana* extracts could assist in reducing the incidence of atherosclerosis and hence in the management of cardiovascular diseases.

REFERENCES

1. Nwachukwu, E. and H.O. Uzoeto, 2010. Antimicrobial activities of leaf *Vitex doniana* and *Cajanus cajan* on some bacteria. Researcher, 2(3): 37-47.
2. Baris, O., M. Gulluce, F. Sahin, H. Ozer, H. Kilic, H. Ozkan, M. Sokmen and T. Ozbek, 2006. Biological activities of essential oil and methanol extract of *Achillea biebersteinii* Afan (Asteraceae). Turkey Journal of Biology, 30: 65-73.
3. Andrew, C. Nwaka, Christian, S. Odunze, John, I. Ihedioha, Ugwu, P.C. Okechukwu, Ossai, Emmanuel., Ada, Ikeyi and P.R. Bayim, 2013. Comparative Effects of *Citrullus lanatus* and *Cajanus cajan* Diets on the Lipid Profile and Body Weight of Albino Rats. International Journal of Pharmacy and Biological Sciences, 3(1): 550-556.

4. Hammer, K.A., C.F. Carson and T.V. Riley, 1999. Antimicrobial activity of essential oils and other plant extracts. Journal of Applied Microbiology, 86(6): 985.
5. Morebise, O., O.K. Folanna and M.A. Fafunso, 1998. Antimicrobial and phytotoxic activities of saponin extracts from two Nigeria edible medicinal plants. Biokemistri, 82: 69-77.
6. Arokiyaraj, K., P. Perinbam, R. Agastian and K. Mohan, 2009. Phytochemical analysis and antibacterial activity of Vitex agnus-castus. International Journal of Green Pharmacy, 34: 162-164.
7. Ihesie, G.C., 2015. Health benefits of *Gongronema latifolium*. The Guardian Newspaper, September, 2015.
8. Ugochukwu, N.H. and N.E. Babady, 2002. Antioxidant effects of *Gongronema latifoliumin* on hepatocytes insulin dependent diabetes mellitus. Filoterapia, 73(8): 612-618.
9. Okafor, J.C., 1987. Identification and conservation of plants used in traditional medicines (Lead lecture presented at the International Workshop on Evaluation of Traditional Medicine, University of Nigeria, Nsukka).
10. Okafor, J.C., 1989. Tropical plants in health-care delivery (Guest lecture delivered to Pharmacology Society of Nigeria at the University of Nigeria, Nsukka).
11. Soforowa, E.A., 1970. The Study of Variations in Essential Oil of Cultivated *Ocimum gratissimum*. PlantaMedica, 17: 173.
12. Ononogbu, I.C., 1988. Lipid and Lipoproteins: chemistry, methodology, metabolism, biochemical and physiological importance. New Africa Publishing Co. Ltd. Owerri, Nigeria.
13. Oslon, R.E., 1998. Discovery of the lipoproteins, their role in fat transport and their significance as risk factors. Journal of Nutrition, 128: 439S-443S.
14. Nelson, D.L. and M.M. Cox, 2000. Lehninger, Principles of Biochemistry, 3rd Ed. Worth Publishing, New York.
15. NCEP (National Cholesterol Education Program), 2002. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults – Adult Treatment Panel III, Final Report, NCEP, National Heart, Lung and Blood Institute, National Institutes of Health, USA.
16. Brown, M.S. and J.S. Goldstein, 1992. Koch's postulates for cholesterol. Cell, 71: 187-188.
17. Brunzell, J.D., M. Davidson, C.D. Furberg, R.B. Goldberg, B.V. Howard, J.H. Stein and J.L. Witztum, 2008. Lipoprotein management in patients with cardiometabolic risk – Consensus statement from the American Diabetes Association and the American College of Cardiology Foundation. Diabetes Care, 31: 811-822.
18. Schoen, F.J., 2004. Atherosclerosis. In: Kumar V., Abbas A.K., Fausto N. (eds.), Robbins and Cotran-Pathologic Basis of Disease, 7thed. Saunders, Philadelphia, pp: 515-525.
19. Law, M.R., 1999. Lowering heart disease risk with cholesterol reduction: evidence from observational studies and clinical trials. European Heart Journal: Supplement, 1: S3-S8.
20. Allain, C.C., L.S. Poon, C.S. Chan, W. Richmond and P.C. Fu, 1974. Enzymatic determination of total cholesterol. Clinical Chemistry, 20: 470-475.
21. Albers, J.J., G.R. Warnick and M.C. Cheung, 1978. Quantification of high density lipoproteins. Lipids, 13: 926-932.
22. Bucolo, G. and H. David, 1973. Quantitative determination of serum triglycerides by use of enzymes. Clinical Chemistry, 19: 476-482.
23. Friedelwald, A. and M.B. Dicarnlo, 1972. Measurement of LDL-cholesterol. Clinical Chemistry, 18(12): 1224-1225
24. Friedewald, W.T., R.I. Levy and D.S. Fredrickson, 1972. Estimation of the concentration of low density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clinical Chemistry, 18: 499-502.
25. Ajali, U., 2002. Chemistry of bio-compounds. 1st Edition, RhyceKerex Publishers, Enugu, pp: 60-178.
26. Virella, M.F., 1977. Estimation of High Density Lipoprotein. Clinical chemistry, 23: 882.
27. Ahalike, R.A. and J.E. Ahaneku, 2015. Effects of *Gongronema latifolium* on Blood lipid, lipoproteins and glucose values in adult Nigerians. Int. J. Res. Med. Sci., 3(4): 891-895.