The effect of Methanol Extract of *Rauwolfia vomitoria* on Lipid Profile of Chloroform intoxicated Wistar Albino Rats

Ugwu Okechukwu Paul-Chima, Onwe Sampson Chukwuemeka and Okon Michael Ben.
Department of Biochemistry, Faculty of Sciences, Ebonyi State University, Abakaliki.

ABSTRACT

Medicinal plants from ancient time have been used for preventive and curative measures for different ailments and diseases due to their readily availability and low cost of preparation. Large populations of humans still rely on plants as a source of medicine.The aim of this research was to determine the effect of methanol leaf extract *of Rauwolfia vomitoria* on lipid profile (HDL, LDL and total cholesterol) of chloroform intoxicated wistar albino rats.All the chemicals and reagents used in this research were of analytical grade. The results indicated that, TAG levels of rats in groups 3 and 4 treated with graded doses of 200mg/kg and 300mg/kg b.w of methanol leaf extract of *Rauwolfia vomitoria* decreased significantly ($p<0.05$) when compared with group 5 (positive control) rats. There was no significant difference ($p>0.05$) when TAG levels of rats in group 4 were compared to groups 1 and 6. HDL-C levels of rats in groups 1, 2, 3, 4 and 6 increased significantly ($p<0.05$) when compared to group 5 (positive control) rats. LDL-C levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats. There was no significant difference ($p>0.05$) when LDL-C levels of rats in group 4 were compared to groups 1 and 6. Total cholesterol levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats. There was no significant difference ($p>0.05$) when LDL-C levels of rats in group 4 were compared to groups 1 and 6. In conclusion, results from this research indicated that the methanol leaf extract of *Rauwolfia vomitoria* have hypo-cholesterolaemic and hypo-triacylglycerolaemic effects as the extract decreased the LDL-cholesterol and increased the HDL-cholesterol levels.

Keywords:*Rauwolfia vomitoria,* Lipid profile and Chloroform.

INTRODUCTION

Medicinal plants from ancient time, have been used for preventive and curative measures for different ailments and diseases due to their readily availability and low cost of preparation [1,2,3,4,5,6]. Large population of humans still rely on plants as a source of medicine.[7] has advocated traditional medicine as safe remedies for ailments of both microbial and non-microbial origin. Plants are major source of therapeutic compounds and are the essential foundation of medicine since prehistoric time [8,9,10,11,12]. Medicinal plants are important source of new chemical compounds with potential therapeutic effects [13,14,15]. Medicinal plants are the richest bioresource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates, and chemical entities for synthetic drugs [16,17,18,19].Plants synthesize thousands of chemical compounds possessing different properties like defense against insects, bacteria, fungi, diseases and herbivorous mammals [20]. Herbal and natural products have been used in folk medicine for centuries throughout the world. Some Indian medicines like Ayurveda, Sindha and Unani entirely and homeopathy to some extent, depend on plant materials or their derivatives for treating human diseases [20,21,22]. Medicinal plants are widely used in non-industrialized societies, mainly because they are readily available and cheaper than modern medicines. Medicinal plants have been discovered and used in traditional medicine practices since

prehistoric times [23,24,25]. There has been renewed interest in screening higher plants for novel biologically active compounds, particularly those that effectively intervene in human ailments in the field of chronic diseases [26,27,28,29]. Currently, research is focused on the isolation of pharmacologically active compounds from natural sources in the area of those diseases where presently available drugs are not so effective [26,29,30]. Also herbal medicines are experiencing greater resurgence as many people are turning their attention from modern drugs toward parallel herbal systems which are also known as alternative medicine. Plants have been used for centuries as a remedy for human diseases because they posses phytochemicals of therapeutic values [31,32,33,34]. *Rauwofia vomitoria* is a shrub found mainly in West Africa. The roots, leaves, and stem are used in medicine. It is a small tree or large shrub, growing to 8 m (26 ft) high. The branches grow in whorls, and the leaves grow from swollen nodes in groups of three [35]. The leaf blades are broadly lanceolate or elliptical, tapering to a long point. The small, fragrant flowers are followed by globular red fruit. All parts of the plant, except the mature wood, contain latex [36]. It has been used across its range in traditional medicine. A decoction or extract of the roots is extensively used to treat diarrhoea, jaundice, venereal disease, rheumatism and snake-bites, and is also used to reduce colic or fever, to calm people with anxiety or epilepsy, and to lower blood pressure. The macerated root, or sometimes the pulped fruit, is used to treat a variety of skin conditions, and the bark, twigs and leaves are used as a purgative and emetic [38]. The plant contains a number of compounds used by the pharmaceutical industry which include reserpine, reserpinine, deserpidin e, ajmalicine and ajmaline [39,40,41].

Aim of the study

The aim of this study is to determine the effect of methanol extract of *Rauwolfia vomitoria* on lipid profile of chloroform intoxicated wistar albino rats

Plate 1: The leaves of *Rauwolfia vomitoria*

MATERIALS AND METHODS

Methods

Preparation of Plant Material

The leaves of *Rauwolfia vomitoria* were collected, dried and milled to powder using the grinding machine

Extraction of Plant Material

A known quantity, 500g of ground leaves of *Rauwolfia vomitoria* were macerated in 1500ml of methanol with thorough shaking at regular interval for 72h at room temperature (26-28°C). The resulting solution was filtered using Whatman No. 1 filter paper. The filtrates were concentrated using rotary evaporator to obtain slurry of the extract. The semi-pastry extract was stored in the refrigerator and used for the study.

Assessment of the Lipid Profile

Determination of Lipid Profile was done using a standard method [32].

Experimental Design

Forty eight (48) Wistar albino rats were used in this study. They were randomly distributed into six (6) groups of 8 rats each. Oxidative stress was induced in the rats and this was performed by intraperitoneal injection of chloroform (100 mg/kg b/w). The rats were fed graded doses of ethanol extract of *Rauwolfia vomitoria* through oral intubation method. The groups and doses administered are summarized below:

Group 1: (Negative control rats without Chloroform intoxication): rats were treated with [0.5 ml of normal saline).

Group 2: (Chloroform intoxicated rats): rats were treated with (100 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).

Group 3: (Chloroform intoxicated rats): rats were treated with (200 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).

Group 4: (Chloroform intoxicated rats): rats were treated with (300 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).

Group 5: (Positive control rats with Chloroform intoxication) were treated with (0.5 ml of normalsaline).

Group 6: (Standard control rats with Chloroform intoxication) were treated with (5 mg/kg bodyweight of standard drug Chemiron).

Statistical Analysis

Results were expressed as mean± standard deviations where applicable. The data were subjected to one-way analysis of variance (ANOVA), followed by Post hoc Duncan multiple comparison test using SPSS software version 21 and $p < 0.05$ was regarded as significant.

RESULTS

The results indicated that, TAG levels of rats in groups 3 and 4 treated with graded doses of 200mg/kg and 300mg/kg b.w of methanol leaf extract of *Rauwolfia vomitoria* decreased significantly ($p<0.05$) when compared with group 5 (positive control) rats. There was no significant difference ($p>0.05$) when TAG levels of rats in group 4 were compared to groups 1 and 6 (fig.2). HDL-C levels of rats in groups 1, 2, 3, 4 and 6 increased significantly ($p<0.05$) when compared to group 5 (positive control) rats (fig.3). LDL-C levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats. There was no significant difference ($p>0.05$) when LDL-C levels of rats in group 4 were compared to groups 1 and 6 (fig.4). Total cholesterol levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats. There was no

significant difference (p>0.05) when LDL-C levels of rats in group 4 were compared to groups 1 and 6 (fig.5).

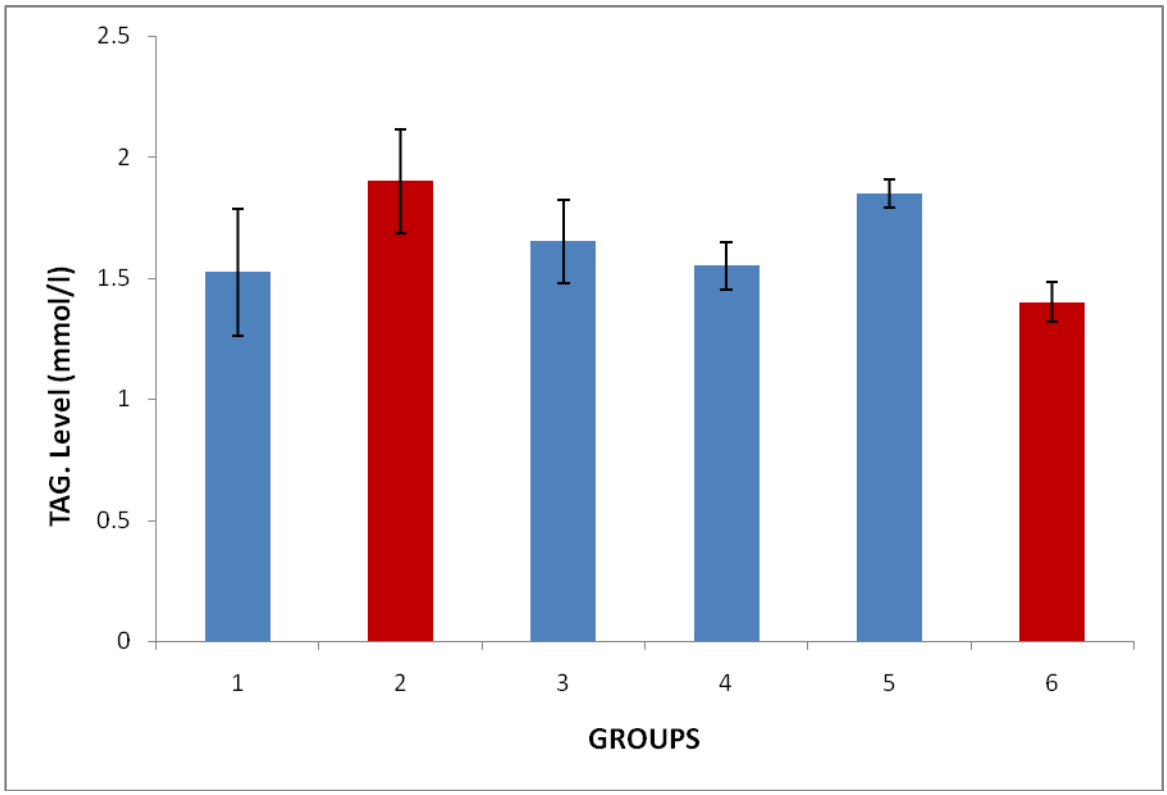

Fig. 2: The levels of TAG in rats treated with methanol extract of *Rauwolfia vomitoria* (Mean±SD)

Legend

Group 1: Rats received [0.5 ml of normal saline).
Group 2: Rats received (100 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 3: Rats received (200 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 4: Rats received (300 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 5: Rats received (0.5 ml of normal saline)
Group 6: Rats received (5 mg/kg body weight of standard drug Chemiron).

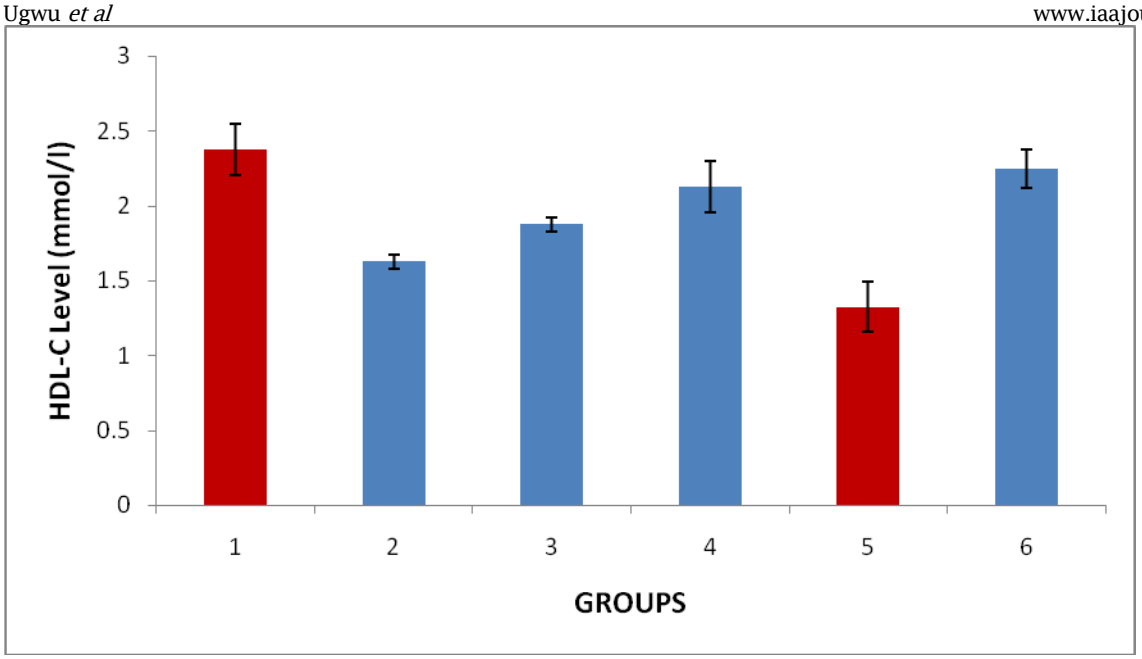

Fig. 3: The levels of HDL-C in rats treated with methanol extract of *Rauwolfia vomitoria* (Mean±SD)

Legend

Group 1: Rats received [0.5 ml of normal saline).
Group 2: Rats received (100 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 3: Rats received (200 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 4: Rats received (300 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 5: Rats received (0.5 ml of normal saline)
Group 6: Rats received (5 mg/kg body weight of standard drug Chemiron).

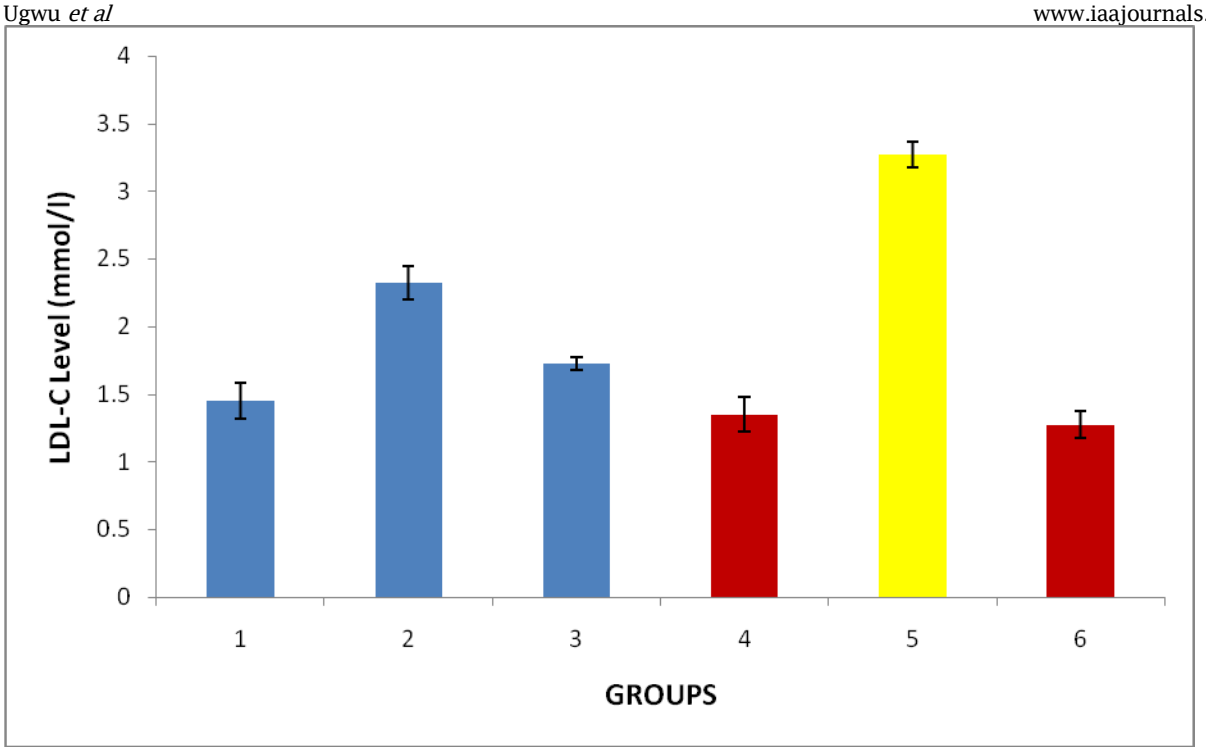

Fig. 4: The levels of LDL-C in rats treated with methanol extract of *Rauwolfia vomitoria* (Mean±SD)

Legend

Group 1: Rats received [0.5 ml of normal saline).
Group 2: Rats received (100 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 3: Rats received (200 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 4: Rats received (300 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 5: Rats received (0.5 ml of normal saline)
Group 6: Rats received (5 mg/kg body weight of standard drug Chemiron).

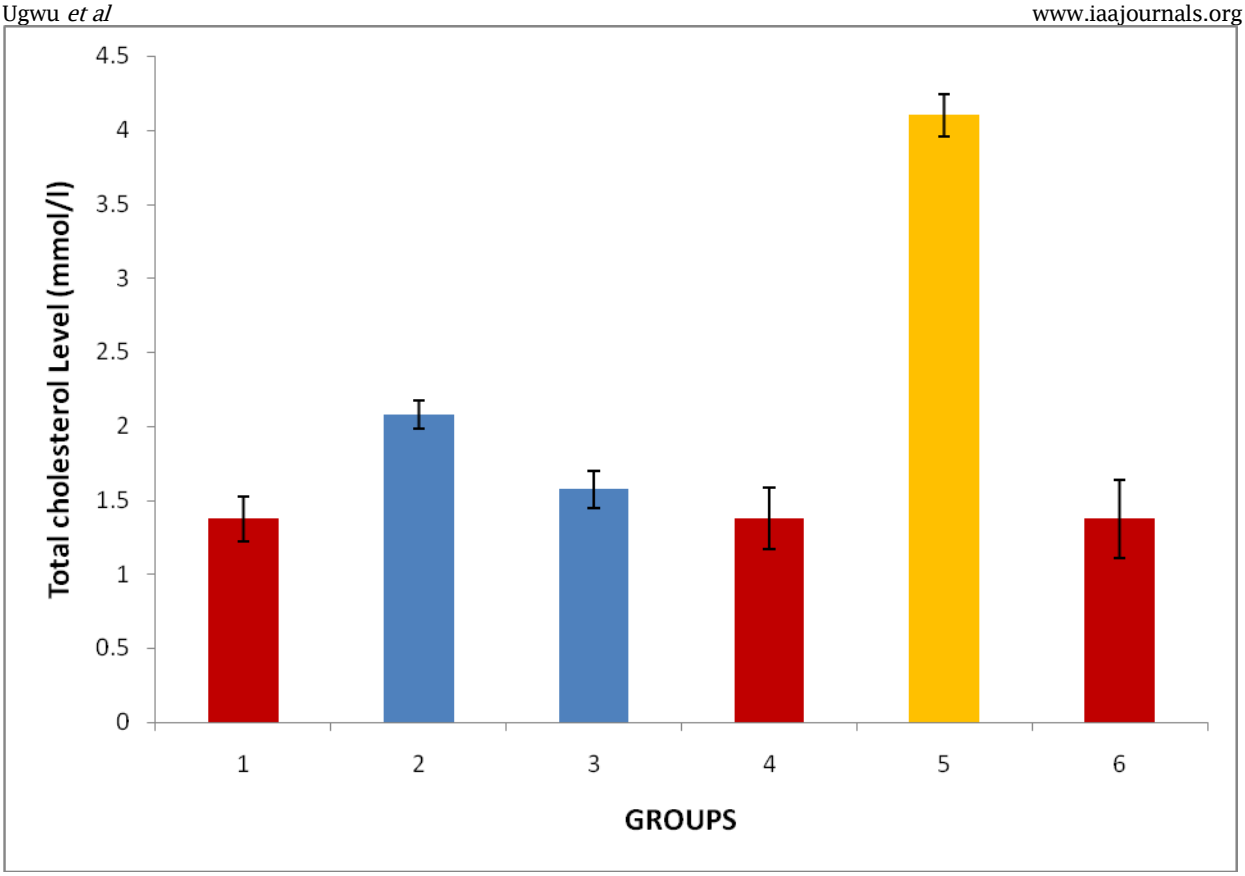

Fig. 5: The levels of Total cholesterol in rats treated with methanol extract of *Rauwolfia vomitoria* (Mean±SD)
Legend
Group 1: Rats received [0.5 ml of normal saline).
Group 2: Rats received (100 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 3: Rats received (200 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 4: Rats received (300 mg/kg b.w. of methanol extract of *Rauwolfia vomitoria*).
Group 5: Rats received (0.5 ml of normal saline)
Group 6: Rats received (5 mg/kg body weight of standard drug Chemiron).

DISCUSSION

The effect of methanol extract of *Rauwolfia vomitoria* on lipid profile of chloroform intoxicated wistar albino rats.

Coronary heart disease and acute myocardial infarction are leading causes of death due to weakening of the muscle of the heart [6]. Cardiac dystrophy is the reduced blood (oxygen) transport to the heart muscle due to the narrowing (stenosis) of the blood vessels of the arteries of the heart [29]. The ubiquity of dyslipidaemia, obesity and hypertension has been gradually escalating and is thought to be the driving influence behind the epidemic of heart disease faced today [6]. The results indicated that, TAG levels of rats in groups 3 and 4 treated with graded doses of 200mg/kg and 300mg/kg b.w of methanol leaf extract of *Rauwolfia vomitoria* decreased significantly ($p<0.05$) when compared with group 5 (positive control) rats. There was no significant difference ($p>0.05$) when TAG levels of rats in group 4 were compared to groups 1 and 6. HDL-C levels of rats in groups 1, 2, 3, 4 and 6 increased significantly ($p<0.05$) when compared to group 5 (positive control) rats. LDL-C levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats.

There was no significant difference ($p>0.05$) when LDL-C levels of rats in group 4 were compared to groups 1 and 6. Total cholesterol levels of rats in groups 1, 2, 3, 4 and 6 decreased significantly ($p<0.05$) when compared to group 5 (positive control) rats. There was no significant difference ($p>0.05$) when LDL-C levels of rats in group 4 were compared to groups 1 and 6. In conclusion, results from this research indicated that the methanol leaf extract of *Rauwolfia vomitoria* have hypo-cholesterolaemic and hypo-triacylglycerolaemic effects as extract decreased the LDL-cholesterol and increased the HDL-cholesterol levels. This result seems to give credence to the claim by herbalists that *Rauwolfia vomitoria* have hypo-lipidaemic effect. Medicinal plants act on both the pancreas and liver/gall bladder, helping to promote the production and release of the pancreatic enzyme lipase and bile, which ensure good digestion of fats and oils and proper functioning of the excretory functions of the liver thereby confering on it hypolipidaemic properties [32].

CONCLUSION

In conclusion, results from this research indicated that the methanol leaf extract of *Rauwolfia vomitoria* have hypo-cholesterolaemic and hypo-triacylglycerolaemic effects as the extract decreased the LDL-cholesterol and increased the HDL-cholesterol levels.

REFERENCES

1. Abdul, W., Mehreen, G., Syed, B. J., Muhammad, N., Ajmal, K., Rukhsana, G. and Asnad (2013).Phytochemical Analysis of Medicinal Plants Occurring in Local Area of Mardan.*Biochemistry and Analytical Biochemistry*, 2 (4): 1-4
2. Agency for Toxic Substances and Disease Registry (ATSDR) (2013). Toxicological Profile for Chloroform, US Department of Health and Human Services: Atlanta, US.
3. Ahmad, N., Rahman, Z., Akhtar, N. and Ali, S. (2011). Medicinal plants in Nigeria. College of Arts, Science and Technology.3(3):121 – 136.
4. Ahn, K. (2017). The worldwide trend of using botanical drugs and strategies for developing global drugs. *BMB Reports*. 50 (3): 111–116.
5. Akpanabiatu M.I., Uboh F.E., Ekanem T.B., Umoh I.B., Eyong E.U., Ukafia S.O. (2009). The effect of interaction of *Rauwolfiavomitaria* root bark extract with Vitamin E on rats' liver enzymes. Turk J Biol 33:189-94.
6. Alese, M. O., Adewole, O. S., Ijomone, O. M., Ajayi, S. A. and Alese, O. O. (2014). Hypoglycemic and hypolipidemic activities of rnethanolic extract of *Sphenocentrumjollyanum*on streptozotocin-induced diabetic wistar rats, *European Journal of Medicinal Plants,* 4(3):353-364.
7. Aniagu, S. O., Nwinyi, F. C., Akumka, D. D., Ajoku, G. A., Dzarma, S., Izebe, K. S., Ditse, M., Nwaneri, P.E.C., Wambebe, C. and Gamaniel, K. (2005). Toxicity studies in rats fed nature cure bitters. *African Journal of Biotechnology,*4(1): 72-78.
8. Aquaisua, N. A., Christopher, C. M., Enobong, I. B., Moses, B. E., Theresa, B. E. and Monday, I. A. (2017).Effects of *Rauwolfiavomitoria* on the cerebellar histology, body and brain weights of albino wistar rats.*Journal of Experimental and Clinical Anatomy*16(1) 41-45
9. Bohn T. (2014) Dietary factors affecting polyphenol bioavailability.*Nutritional Review*.77 (7): 429-452
10. Brito-Arias, M. (2007).Synthesis and Characterization of

Glycosides.*Springer*.ISBN 978-0-387-26251-2.

11. Cheng, F., Melissa, B., Fang, X., Shijun, L. Meghan, D., Hongxiu, L., Weizhu, Y., Kenneth, A, Xinxin, D. and Jun, G. (2008). Mechanism of chloroform-induced renal toxicity: Non-involvement of hepatic cytochrome P450-dependent metabolism. *Toxicology and Applied Pharmacology,* 227 (1): Pages 48-55.
12. Dai, J. and Mumper, R. (2010). Plant phenolics: extraction, analysis and their antioxidant and anticancer properties. *Molecules.*15: 7313-7352.
13. Deepak, K., Rupali, S. and Mahesh K. (2016) An Overerview of Major Classes of Phytochemicals: Their types and role in disease prevention.*Hislopia Journal*9 (1/2)
14. Ehiagbonare E. J. (2004). Regeneration of Rauwolfiavomitoria.*African Journal of Biotechnology*. 6(8): 979-81.
15. *Elumalai, A. and Eswariah, M. C. (2012).*Herbalism - A Review.*International Journal of Phytotherapy.2 (2): 96–105.*
16. Eluwa, M. A., Udoaffah M. T., Vulley M., Ekanem T. B., Akpantah A. O., Asuquo O. A. (2010). Comparative study of teratogenic potentials of crude ethanolic root bark and leaf extract of *Rauwolfiavomitoria* (apocynacea e) on the fetal heart. *North Am J Med Sci*2:592-5
17. Emmanuel C. C., Mike, O. S. and Roseline, T. F. (2015).Traditional medicine and the future of medicinal Plants in Nigeria.*Journal of Medicinal Plants Studies*3(4): 23-29
18. Fapojuwomi O. A. and Asinwa I. O. (2013).Assessment of medicinal values of *Rauwolfiavomitaria* (Afzel) in Ibadan Municipality.*Greener Journal of Medical Sciences* 3:37-41
19. Hevonoja, T., Pentikäinen, M. O., Hyvönen, M. T., Kovanen, P. T. and Ala-Korpela, M. (2000). Structure of low density lipoprotein (LDL) particles: basis for understanding molecular changes in modified LDL. *BiochimicaetBiophysicaActa,* 1488(3):189-210.
20. Hosseinzadeh, S., Jafarikukhdan, A., Hosseini, A. and Armand, R. (2015). The application of Medicinal Plants in Traditional and Modern Medicine: A Review of Thymus vulgaris*. International Journal of Clinical Medicine*, 6, 635-642.
21. International Programme on Chemical Safety (IPCS) (2017).Chloroform. Environmental Health Criteria 163, WHO: Geneva.
22. Koche, D., Shirsat, R., Syed I. and Bhadange, D. G. (2010) Phytochemical screening of eight ethnomedicinal plants from Akola District (MS).*International Journal of Pharma and Biosciences.*1(4): 256- 259.
23. Kornilova, E. S. (2014). Receptor-mediated endocytosis and cytoskeleton.*Biochemistry (Moscow)*, 79(9):865-78.
24. Krishnamoorthi, R. and Bai, V. R. (2015).Phytochemical analysis and antioxidant property of Premnalatifolia.*Open Science Journal of Pharmacy and Pharmacology*. 3(2):6-9.
25. Lacaille-Dubois, M. A. and Wagner, H. (2000).Bioactive saponins from plants.In Studies in Natural Products Chemistry.*Elsevier Science*. 21: 633-687.
26. Mamta, S., Jyoti, S., Rajeev, N., Dharmendra, S. and Abhishek, G. (2013).Phytochemistry of Medicinal Plants.*Journal of Pharmacognosy and Phytochemistry,*1 (6): 168-182
27. Mandal, S. M., Chakraborty, D. and Dey, S. (2010). Phenolic acids act as signaling molecules in plant–microbe symbioses. *Plant Signaling & Behavior*, 5: 359-368.
28. Mora, S. (2016).Nonfasting for routine lipid testing: From

evidence to action. *JAMA Intern Med*. 176 (7): 1005–1006
29. Neffati, M., Najjaa, H., Máthé, Á. (2017). Medicinal and Aromatic Plants of the World - Africa.*Springer*, pp. 253–256.
30. Nelson, D. L. and Cox, M. M. (2000), Lehninger Principles of Biochemistry, 3 edition, worth.
31. Onike R. (2010). Uses of *Rauwolfiavomitoria* (Asofeyeje) in African Traditional Medicine.(2nd Edition); 13.
32. Pejic, R. N. (2014). Familial hypercholesterolemia.*Ochsner Journal*,14(4):669-72.
33. Ping, K. M., Islamiah, M., Hadi, N. and Yusof, H. M. (2019).Phytochemical, antioxidant and anticancer properties of honey and black seed mixture on MCF-7 cell lines.*Asian Journal of Agriculture and Biology*.7(1):49-60.
34. Prajapati, N. D., Purohit, S. S., Sharma, A. K., and Kumar, T. (2003).A hand book of medicinal plants.*Agribios*, p553.
35. Shirsat, R., Suradkar, S. S. and Koche, D. K. (2012) Some phenolic compounds from Salvia plebeia R. Br. *Bioscience Discovery*. 3(1): 61-63.
36. Sidhu, D. and Naugler, C. (2012). Fasting time and lipid levels in a community-based population: A cross-sectional study. *Archives of Internal Medicine*.172 (22): 1–4.
37. Surh, Y. J. (2003). Cancer chemoprevention with dietary phytochemicals.*Nature Reviews Cancer*, 3, 768-780.
38. Teiten, M. H., Gaascht, F., Dicato, M. and Diederich, M. (2013).Anticancer bioactivity of compounds from medicinal plants used in European Medieval traditions.*Biochemical Pharmacology*.86(9): 1239-1247.
39. Trowel, H. (1972).Fibre a natural hypocholesteremic agent.*American Journal of Clinical Nutrition,* 25: 464
40. Ugwu, O. P. C., Edwin, N. and Ogbanshi, M. E. (2015).The Effect of Ethanol Leaf Extract of Jatrophacurcas on Chloroform Induced Hepatotoxicity in Albino Rats.*Global Journal of Biotechnology & Biochemistry*10 (1): 11-15.
41. Ugwu, O. P. C.,Offor, C. E., Ibiam, U. A., Ezugwu, A. L., Uraku, A. J., Igwe, C. N. and Okon, M. B. (2015). The effect of ethanol extract of *Jatrophacurcas* on renal markers of chloroform intoxicated albino Wister rats. *European Journal of Biological Sciences*, 7 (1): 21-25.