

The Effect of Ethanol Leaf Extract of *Jatropha curcas* on Cholesterol Level of Cyclophosphamide Induced Anemia in Wister Albino Rats

¹J.U. Anigbogu, ¹M.E. Onwuzirike, ²P.C. Ugwu Okechukwu,
²K.N. Agbafor, ²I.O. Igwenyi, ³A.L. Ezugwu and ²B.U. Nwali

¹Department of Biochemistry Tansian University Umunya, Anambra State, Nigeria

²Department of Biochemistry Ebonyi State University, Abakaliki, Nigeria

³Department of Biochemistry University of Nigeria, Nsukka, Enugu State, Nigeria

Abstract: The effects of ethanol extract of *Jatropha curcas* on lipid profile of anemic rats were assayed. The leaves of *Jatropha curcas* were collected, dried and extracted with ethanol. Twenty five Wister Albino rats weighing 102-200kg were used. The rats were randomly separated into five groups of five rats each. Groups 2, 3, 4 and 5 were injected with cyclophosphamide to induce Anemia in the rats, while group one served as negative control without anemia. Group1 rats without anemia were treated with 0.5ml of normal saline, Group 2 rats with Anemia was treated with 100mg/kg body weight of ethanol extract of *Jatropha curcas*, Group 3 rats with anemia was treated with 200mg/kg body weight of ethanol extract of *Jatropha curcas*, Group 4 served as the positive control rats with Anemia and was treated with 0.5ml of normal saline. Group 5 which served as the standard control rats with anemia was treated with 5mg/kg body weight of standard drug Chemiron. The feeding lasted for 21days after which the blood samples were collected from each rats via the ocular region for analysis. The parameters analyzed were High density lipoprotein (HDL), Low density lipoprotein (LDL), Triacylglycerol (TAG) and Total cholesterol concentrations. The results showed that ethanol extract of *Jatropha curcas* was able to elevate the concentration of HDL cholesterol and consequently decreased the concentration of LDL cholesterol. This shows that the ethanol extract of *Jatropha curcas* could be used in the treatment of cardiovascular diseases as claimed by traditional herbalists.

Key words: *Jatropha curcas* • Cholesterol level • Cardiovascular diseases and anemia

INTRODUCTION

Medicinal plants have been identified and used throughout human history. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological function and to defend against attack from predators such as insects, fungi and herbivorous mammals. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total [1-4]. Chemical compound in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work [5-7]. This enables herbal medicines to be as effective as conventional medicines, but also gives them the same potential to cause harmful

side effects [7-10]. In 2001, researchers identified 122 compounds used in modern medicine which were derived from “ethnomedical” plant sources; 80% of these have had an ethnomedical use identical or related to current use of the active elements of the plant [10-12]. Many of the pharmaceuticals currently available to physicians have a long history of use as herbal remedies, including aspirin, quinine and opium. The use of herbs to treat disease is almost universal among non-industrialized societies and is often more affordable than purchasing expensive modern pharmaceuticals.

Atherosclerosis is the main cause of mortality and morbidity in western countries and it is progressively increasing in developing countries [1-6]. Low fat diets are often prescribed for the management of atherosclerosis. *Jatropha curcas* is a large coarse annual shrub or small short lived tree which can grow

3.5 to 4.5 meters (8-15 feet) tall. It has thin, often greenish bark which exudes copious amounts of watery sap when cut. *J. curcas* is a poisonous, semi-green shrub or small tree, reaching a height of 6m (20ft) [1-2]. The aim of this study was to determine the effects of ethanol extract of *Jatropha curcas* on the lipid profile of triacylglycerol, high density cholesterol, low density cholesterol and total cholesterol concentrations of anemic rats.

MATERIALS AND METHODS

Plant Materials: The leaves of *Jatropha curcas* were purchased from Oba market in Anambra State and identified by Mr. A. Ozioko of the Department of Plant Science and Biotechnology, University of Nigeria Nsukka. A voucher specimen was deposited in the Department's Herbarium

Animals: Wistar albino female rats (134 -206g) bred in the Faculty of Veterinary Medicine, University of Nigeria Nsukka, were used in the experiment. The animals were kept under Room temperature and were acclimatized in the new environment for a period of 7 days with free access to food and water before the commencement of the experiment.

Preparation of Plant Material: The leaves of *Jatropha curcas* were collected, dried and milled to powder using the grinding machine.

Extraction of Plant Material: A known quantity, 500g of ground leaves of *Jatropha curcas* were macerated in 1500ml of ethanol 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 filtrate was concentrated using rotary evaporator to obtain slurry of the extract. The semi-pastry extract was stored in the refrigerator and used for the study.

Experimental Design: Twenty five (25) Wistar albino rats were used in this study. They were randomly distributed into five (5) groups of 4 rats each. Anaemia was induced in the rats and this was performed by intraperitoneal injection of cyclophosphomide (10 mg/kg b/w). The rats were fed graded doses of ethanol extract of *Jatropha curcas* through oral intubation method. The groups and doses administered are summarized below.

Group 1: (Negative Control Rats Without Cyclophosphomide Induced Anemia): The rats were treated with [0.5ml of normal saline].

Group 2: (Rats with Cyclophosphomide Induced Anemia): The rats were treated with [100mg/kg b.w. of ethanol extract of *Jatropha curcas*].

Group 3: (Rats with Cyclophosphomide Induced Anemia): The rats were treated with [200mg/kg b.w. of ethanol extract of *Jatropha curcas*].

Group 4: (Positive control rats with cyclophosphomide induced anemia): The rats were treated with [0.5ml of normal saline].

Group 5: (Standard control rats with cyclophosphomide induced anemia): The rats were treated with [5mg/kg body weight of standard drug Chemiron].

Determination of Total Cholesterol Concentration: Total cholesterol concentration was determined by the method of Allain *et al.* (1976).

Determination of High-Density Lipoproteins (HDL)-Cholesterol Concentration: High density lipoprotein (HDL) concentration was determined by the method of Albers *et al.* (1978).

Determination of Triacylglycerol Concentration: Triacylglycerol (TAG) concentration was determined by the method of Allain *et al.* (1976).

Determination of Low Density Lipoprotein-Cholesterol Concentration: Low density lipoprotein (LDL) concentration was determined by the method of Assmann *et al.* (1984).

Statistical Analysis: The data obtained from the laboratory tests were subjected to one- way analyses of variance (ANOVA). Significant differences were obtained at $p=0.05$. The results were expressed as mean and standard deviation (SD). This analysis was estimated using computer software known as Statistical Package for Social Sciences (SPSS), version 18.

RESULTS AND DISCUSSION

Lipids are transported in the blood by combination of lipids and proteins complexes called lipoproteins [13-16]. Hyperlipidemia is characterized by increased LDL-cholesterol and reduced HDL-cholesterol [16-20].

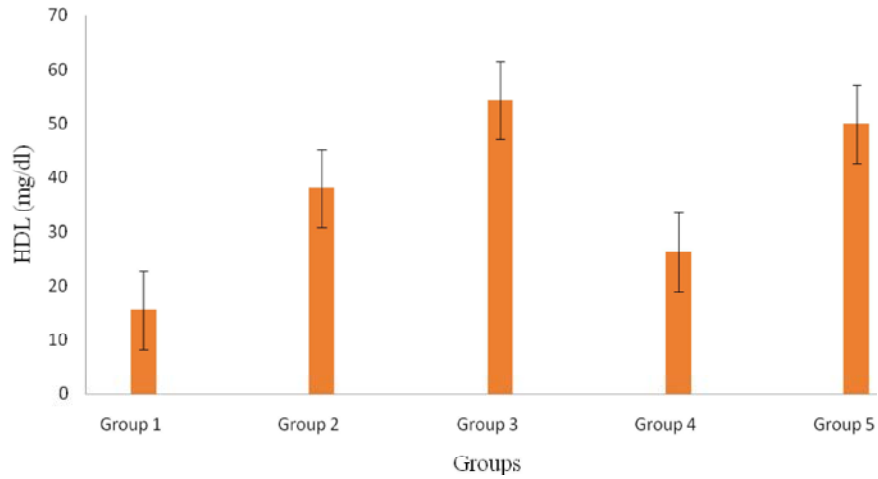


Fig. 1: The Effect of *Jatropha curcas* on HDL level of cyclophosphamide induced Anemia in rats.

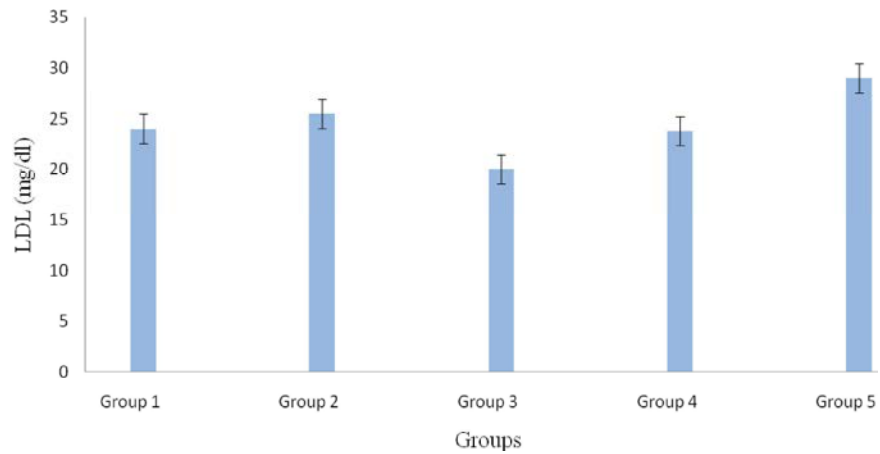


Fig. 2: The Effect of *Jatropha curcas* on LDL level of cyclophosphamide induced Anemia in rats.

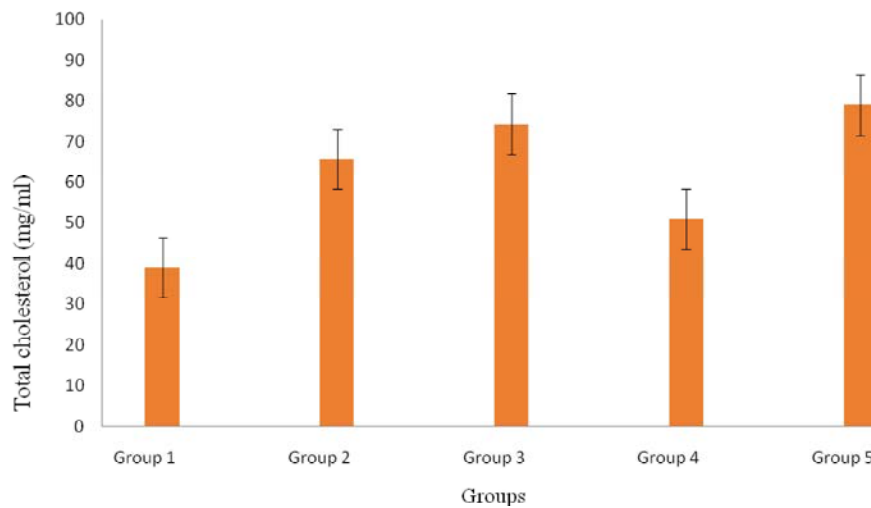


Fig. 3: The Effect of *Jatropha curcas* on Total cholesterol concentration of cyclophosphamide induced Anemia in rats.

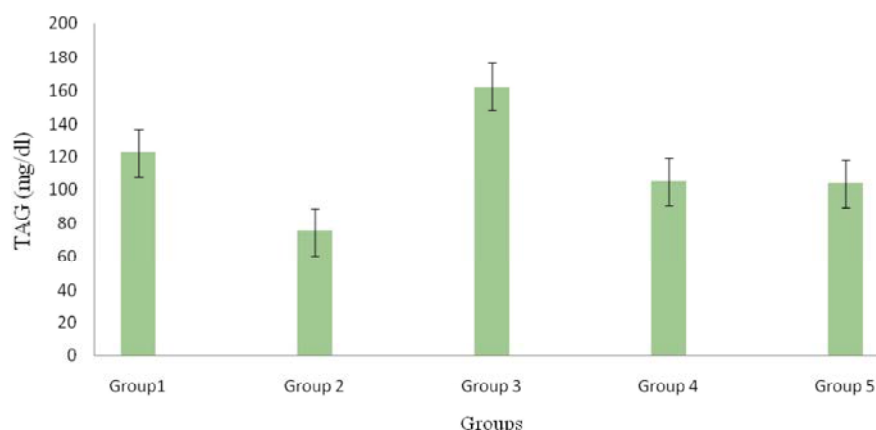


Fig. 4: The Effect of *Jatropha curcas* on Triacylglycerol concentration of cyclophosphamide induced Anemia in rats.

Thus, any attempt to lower serum concentrations of LDL and increase HDL concentration is considered as one of the strategies that can hinder or delay the on-set of chronic disorders that are associated with hyperlipidemia in humans [9] and [17].

Figure 1 showed that ethanol extract of *Jatropha curcas* significantly ($p < 0.05$) increased the concentrations of HDL-cholesterol of groups 2, 3 and 5 rats treated with 100mg/kg body weight of ethanol extract, 200mg/kg body weight of ethanol extract and 0.5mg/kg body weight of standard drug Chemiron respectively when compared with that of group 1 (negative control) rats without anemia treated with 0.5ml of normal saline and group 4 (positive control) anemic rats treated with 0.5ml of normal saline. This shows that graded doses of the extract was able to elevate the HDL cholesterol. The Effect of *Jatropha curcas* on LDL cholesterol concentration of cyclophosphamide induced anemia in rats revealed that group 3 rats treated with 200mg/kg body weight of ethanol extract of *Jatropha curcas* significantly decreased ($p < 0.05$) in LDL cholesterol concentration when compared with that of the negative control rats that were treated with 0.5ml of normal saline. There was no-significant difference ($P > 0.05$) when group 4 (positive control rats) treated with 0.5ml of normal saline was compared to (negative control) group 1 rats. This shows that 200mg/kg body weight of graded dose of the ethanol extract of *Jatropha curcas* was able to lower the bad cholesterol in anaemic rats. The observed decrease in serum concentration of LDL could be due to the presence of certain physiologically active constituents in the extract [8] and [20]. This also indicated that ethanol extract of *Jatropha curcas* could be used in treating cardiovascular diseases.

Figure 3 showed that groups 2, 3 and 5 rats significantly increased ($p < 0.05$) in total cholesterol concentration when compared with that of group 1 rats (negative control). Figure 4 above showed that group 3 rats treated with 200mg/kg body weight of ethanol extract of *Jatropha curcas* significantly increased in TAG concentration when compared with that of the (negative control) group 1 rats.

CONCLUSION

The results of this analysis showed that ethanol leaf extract of *Jatropha curcas* could be used in treating cardiovascular related diseases since it reduced LDL cholesterol and increased HDL cholesterol levels in the experimental anemic rats.

REFERENCES

1. Achten, W.M.J., L. Verchot, Y.J. Franken, E. Mathijs, V.P. Singh, R. Aerts and B. Muys, 2008. *Jatropha* bio-diesel production and use (a literature review). *Biomass and Bioenergy*, 32(12): 12-13.
2. Aladodo, R.A., N.O. Muhammad and E.A. Balogun, 2013. Effects of Aqueous Root Extract of *Jatropha curcas* on Hyperglycaemic and Haematological Indices in Alloxan-induced Diabetic Rats. *Fountain Journal of Natural and Applied Sciences*, 2(1): 52-58.
3. Albers, J.J., G.R. Warmick and M.C. Cheng, 1978. Determination of high density lipoprotein (HDL)-cholesterol. *Lipids*, 13: 926-932.
4. Allain, C.C., L.S. Poon, C.S.G. Chan, W. Richmond and P.C. Fu, 1976. Enzymatic determination of serum total cholesterol. *Clinical Chem.*, 20: 470-475.

5. Assmann, G., H.U. Jabs, U. Kohnert, W. Nolte and H. Schriewer, (1984). Determination of low density lipoprotein (LDL)-cholesterol. *Clinica Chimica Act.*, 140: 77-83.
6. Barter, P., L. Gotto, A.M. Rosa, J. Szarek, S.M. Grundy, J.P. Kastelein and V. Bittner, 2007. HDL Cholesterol, VLDL cholesterol and cardiovascular events. *The New England J. Med.*, 357(13): 1301-1309.
7. Boudjeko, T., J.E. Ngomoyogoli, A.L. Woguia and N.N. Yanou, 2013. Partial characterization, antioxidative properties and hypolipidemic effects of oilseed cake of *Allanblackia floribunda* and *Jatropha curcas*. *BMC Complement Altern. Med.*, 11: 313-352.
8. Enechi, O.C., L.N. Manyawo and P.C. Ugwu Okechukwu, 2013. Effect of ethanol seed extract of *Bucchoziacoriacea* (wonderful kola) on the lipid profile of albino rats. *African Journal of Biotechnology*, 12(32): 5075-5079.
9. Ezekwesili, C.N., O. Obidoa and O.F.C. Nwodo, 2008. Effects of ethanol Extract of *Acalyphatortaleaves* on the Lipid profile and serum Electrolytes of Rabbit, *Niger. J. Biochem. Mol. Biol.*, 23(1): 15-19.
10. Ghasi, S., E. Nwobodo and J.O. Ofili, 2002. Hypocholesterolemic effects of crude extract of leaf of *Moringaoleifera* Lam. in high-fat diet Wistar Rats. *J. Ethnopharmacol.*, 69: 21-25.
11. Hegsted, D.M., R.B. McGandy, M.L. Myers and F.J. Stare, 1965. Quantitative Effects of Dietary Fat on Serum Cholesterol in Man," *American Journal of Clinical Nutrition*, 17(5): 281-295.
12. Khor, H.T. and D.T.S. Tan, 1992. Studies on the LipidemicProperty of Dietary Palm Oil: Comparison of the Responses of Serum, Liver and Heart Lipids to Dietary Palm Oil, Palm Oil Triglycerides, Coconut Oil and Olive Oil," *Nutrition Research*, 12: 4-5.
13. Lorke, D., 1994. A New Approach to Practical Acute Toxicity Testing. *Archives of Toxicology*, 55: 275-287.
14. Momoh Johnson, Longe Adeteju Olufunmilayo, Campbell Charles Adegboyega and Omotayo Mutiat Adetayo, 2014. Evaluation of Antidiabetic and the Effect of Methanolic Leaf Extract of *Jatropha curcas* on Some Biochemical Parameters in Alloxaninduced Diabetic Male Albino Rats. *European Journal of Medicinal Plants*, 4(12): 1501-1512.
15. Nwanjo, H.U., 2005. Efficacy of aqueous leaf extract of *Vernoniaamygdalin* plasma lipoprotein and oxidative status in diabetic rat models. *Niger. J. Physiol. Sci.*, 20: 39-42.
16. Nydahl, M.C., I.B. Gustafsson and B. Vessby, 1994. Lipid Lowering Diets Enriched with MUFA or PUFA but Low in SFA Have Similar Effects on Serum Lipid Concentrations in Hyperlipidemic Patients," *American Journal of Clinical Nutrition*, 59: 115-122.
17. Olantunji, LA, J.O. Adebayo, O.B. Oguntoye, N.O. Olatunde, V.A. Olantunji and A.O. Soladoye, 2005. Effects of aqueous extracts of petals of red and green *Hibiscus sabdariffa* Plasma lipid and hematological variables in rats. *Pharm. Biol.*, 43(5): 471-474.
18. Oyewole, O.I. and P.F. Akigbala, 2011. Phytochemical Analysis and Hypolipidemic Properties of *Jatrophata njorensis* Leaf Extract. *Eur. J. Med. Plants*, 1(4): 180-185.
19. Thaddée Boudjeko, Judith Emery Kanemoto Ngomoyogoli, Alice Louise Woguia and Nicolas Njintang Yanou, 2013. Partial characterization, antioxidative properties and hypolipidemic effects of oilseed cake of *Allanblackia floribunda* and *Jatropha curcas*. *BMC Complementary and Alternative Medicine*, 13: 352.
20. Ugwu Okechukwu, P.C., F.C. Nwodo Okwesili, E. Joshua Parker, E. Odo Christian, C. Ossai Emmanuel, 2013. Effect of Ethanol Leaf Extract of *Moringa oleifera* on lipid profile of mice. *Res. J. Pharm. Biol. Chem. Sci.*, 4(1): 1324-1332.