

Anti-Lipidemic Effects of *Desmodium velutinum* Water Leaf Extract on Albino Wistar Rats Fed with High Fat Diet

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Abstract: The present study evaluated the anti-lipidemic activity of water leaf extract of *Desmodium velutinum* on wistar albino rats that were fed with high fat diet. The results revealed that group 2 rats (treated with 10mg/ml of high fat diet) had the highest level of low density lipoprotein (LDL) cholesterol but the increase was not significant ($p>0.05$) when compared with that of control group rats (group 1) that were fed with only normal feed. Groups 3 and 4 rats administered with 10mg/ml of high fat diet + 5mg/kg of standard drug atorvastatin and 10mg/ml of high fat diet + 5mg/kg of water extract of *Desmodium velutinum* respectively non-significantly decreased ($p>0.05$) the LDL cholesterol of the rats when compared with that of control group 1 (fed with only normal feed) and group 2 (treated with 10mg/ml of high fat diet). Group 4 (rats treated with 10mg/ml of high fat diet+ 5mg/kg of *Desmodium velutinum*) significantly increased ($p<0.05$) in high density lipoprotein (HDL) cholesterol concentration when compared to groups 3 and 2 rats. Total cholesterol concentration of group 2 non-significantly increased ($p>0.05$) when compared with that of group 1 but total-cholesterol concentration of group 3 rats significantly decreased ($p<0.05$) when compared to that of groups 1 and 2 rats. Triacylglycerol concentration of group 2 rats increased significantly ($p<0.05$) when compared with that of group 1 rats. Groups 3 and 4 rats significantly decreased in triacylglycerol concentrations of the rats when compared with that of groups 1 and 2 rats. Hyperlipidemic.

Key words: *Desmodium velutinum* • High Density Lipoprotein • Low Density Lipoprotein • Atorvastatin and Anti-Lipidemic Activity

INTRODUCTION

Lipid and lipoprotein abnormalities play major role in the development and progression of coronary artery disease. Low levels of high density lipoprotein cholesterols have been identified as independent coronary risk factors [1]. High levels of blood cholesterol are responsible for circulatory system disorder. Increased levels of low density lipoprotein (LDL) are also responsible for cardiovascular disease [2].

In developing countries, the occurrence of heart disease increases rapidly [3]. Medical studies have shown that 70% of adults from 50 years old suffer atherosclerosis

[4-9]. A large number of synthetic hypolipidemic drugs are available in market. Long term use of these drugs cause serious side effects and at the same time they are costly. A medicinal plant is any plant that contains substance that can be used for therapeutic purposes or which is a precursor for synthesis of useful drug [10, 11 and 13]. Plant contains a large number of bioactive phytochemicals that are responsible for pharmacological action of plant and used for development of drugs. Many medicinal plants have been shown to possess anti-lipidemic property and recent researches have proved their efficacy in cardiovascular diseases [14-16]. One of such plants used in the management of various diseases by the

traditional medical practitioners of Eastern Nigeria is *Desmodium velutinum* [4, 7, 9, 10]. It is widely distributed in subtropical Asia and tropical Africa [17- 20].

Extracts of *Desmodium velutinum* are used traditionally in some disease conditions particularly aphrodisiac and head ache. Hence, *Desmodium velutinum* may be a source of pharmacological active agent used in the treatment of aches, pains and diarrhoea. In Ghana, native doctors mix the root of *Desmodium lasincarpum* with some hot peppers and use it as enema to treat blood in urine. In Eastern States of Nigeria, the plant is locally known as "Ikeagwuani" [1, 3, 5, 9 and 10]. The aim of this research was to investigate the effect of water leaf extract of *Desmodium velutinum* on the lipid profile of wistar albino rats fed with high fat diet.

MATERIAL AND METHODS

Plant Material-Collection and Identification: Fresh leaves of *Desmodium velutinum* were collected at Umueze-Awkunanaw in Nkanu-West Local Government Area of Enugu State, Nigeria. The plants were indentified and authenticated by a plant taxonomist Prof. J.C. Okafor of the Department of Applied Biology and Biotechnology, Enugu State University of Science and Technology, (ESUT) Enugu, Nigeria.

Extraction: The leaves were dried at room temperature for eighteen (18) days. The dried leaves were later ground into fine powder with the aid of a clean dry electric grinder (Moulinex, Optiblend 2000, France). 130g portion of the fine powder was soaked in 130ml of distilled water for 12h, filtered and then extracted with double distilled water. The solvent was passed in a reservoir for recycling (hot-continuous percolation method). The process was allowed to continue until the desired extraction was then distilled off and evaporated to dryness at 40°C.

Experimental Animal Model: Twenty four (24) apparently healthy male albino wistar rats with mean weight of 1.50 ± 0.60 kg were obtained from the animal house of Veterinary Medicine Department, University of Nigeria, Nsukka, Enugu State, Nigeria. The rats were randomly distributed into four groups (I-IV) of six rats each. They were housed separately and fed with water and growers mash (Guinea feed Nigeria). The experimental rats were acclimatized for 7 days. Group I rats were fed orally with only growers mash and water for seven days. Group II rats were fed orally with 10mg/ml of high fat diet twice a day (morning and evening) for seven days. Rats in group

III were also fed orally with 10mg/ml of high fat for seven days (morning and evening) and later were administered orally with 5mg/kg of Atorvastatin drug for the following three days (once each day) during which growers mash and water was used as their food. Rats in group IV were also fed orally with 10mg/ml of high fat diet for seven days (morning and evening) and later were administered orally with 5mg/kg of *Desmodium velutinum* water Leaf extract for the following three days once daily) during which growers mash and water was used as their food.

Collection of Blood Samples: The collection of blood samples from the rats in each group was simply done by dissection of the rats, followed by cardiac puncture after a mild anesthesia with chloroform. About 5-9mls of blood samples was collected in an EDTA tube from each group using a medical syringe. Serum was separated from the blood after clotting and then used for lipid analysis. Blood samples were collected from group I rats and group II rats on day 7 of oral feeding of the rats with normal feed (growers mash and water) and high fat diet respectively. Blood samples were collected from group III and IV rats on day 3 after oral administration of atorvastatin (Lipitor) and water leaf extract of (*Desmodium velutinum*) respectively.

Lipid Profile Analysis: Lipid profile of triacylglycerol, high density lipoprotein, low density lipoprotein and total cholesterol were determined using the methods of [21- 24] respectively.

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 was estimated using computer software known as Statistical Package for Social Sciences (SPSS), version 18.

RESULTS

The results from Table 1 above showed that group 2 rats (treated with 10mg/ml of high fat diet) non-significantly increased ($p > 0.05$) in LDL cholesterol concentration when compared to LDL cholesterol concentration of group 1 (fed with normal feed). The LDL cholesterol concentrations of group 3 rats (treated with 5mg/kg of Atorvastatin + 10mg/ml of high fat diet) and group 4 rats (treated with 10mg/ml of high fat diet+5mg/kg of *Desmodium velutinum* water Leaf extract) significantly

Table 1: Lipid profile of rats fed with various samples in (mg/dl)

Groups	Cholesterol (mg/dl)	High density lipoprotein (mg/dl)	Low density lipoprotein (mg/dl)	Triacylglycerol (mg/dl)
Group 1(Normal Feed)	140.00±1.41	30.00±1.41	3.60±0.14	95.00±1.41
Group 2 (10mg/ml of high fat diet)	145.00±1.41	20.00±1.41	3.90±0.14	105.00±1.41
Group3 (10mg/ml of high fat diet + 5mg/kg of Atorvastatin)	110.00± 0.00	23.00±1.41	1.20±0.14	39.00±1.41
Group 4 (10mg/ml of high fat diet+5mg/kg of <i>Desmodium velutinum</i> water Leaf extract)	135.00±0.71	35.00±0.00	1.90±0.00	50.00±0.00

Results as Mean±Standard Deviation; p<0.05 as significant; p>0.05 as non-significant and n=6.

decreased (p<0.05) in LDL cholesterol concentration when compared to the LDL cholesterol of group 2 but the increase was not significant (p>0.05) when group 4 was compared with that of control group (group 1) that was administered with only normal feed. Group 4 rats non-significantly increased (p>0.05) in HDL cholesterol concentration when compared with that of group 1 but the increase was statistically significant (p<0.05) when compared with that of groups 2 and 3 rats treated with standard drug atorvastatin and *Desmodium velutinum* respectively.

DISCUSSION AND CONCLUSION

This study evaluated the anti-lipidemic activity of the water leaf extract of *Desmodium velutinum* in albino wistar rats fed with high fat diet. Hyperlipidemia comprises a state of increased concentrations of triacylglycerol and low density lipoprotein and is an important risk factor for the development and progression of atherosclerosis and coronary heart disease [22-28]. The results from table 1 revealed that group 2 rats had the highest level of LDL cholesterol but the increase was not significant (p>0.05) when compared with that of control group (group 1) that was administered with only normal feed. Groups 3 and 4 rats significantly decreased (p<0.05) in LDL cholesterol when compared to that of control group (group1) and group (group2). But (group 4) rats fed with *Desmodium velutinum* significantly increased the HDL cholesterol compared to groups 3 and 2 rats that were significantly decreased in HDL cholesterol when compared with that of group 1 rats.

The data demonstrated that water leaf extract of *Desmodium velutinum* can possibly normalize the Plasma lipid. The study also, suggests that water leaf extract of *Desmodium velutinum* could be effective in reducing lipid plasma, thereby reducing the risk of cardiovascular and atherosclerosis diseases. The findings lend support to the folkloric use of *Desmodium velutinum* in the eastern Nigeria as an anti-lipidemic agent [29-37].

CONCLUSION

The water leaf extract of *Desmodium velutinum* could be a potential anti-lipidemic drug as indicated from its LDL cholesterol lowering effects as shown in the experimental rats.

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