European Journal of Medicinal Plants
1(4): 180-185, 2011

SCIENCEDOMAIN *international*
www.sciencedomain.org

Phytochemical Analysis and Hypolipidemic Properties of *Jatropha tanjorensis* Leaf Extract

Oluwole I. Oyewole[1*] and Peter F. Akingbala[1]

[1]Department of Biochemistry, College of Science, Engineering and Technology, Osun State University, Osogbo, Nigeria.

Research Article

Received 20th July 2011
Accepted 18th August 2011
Online Ready 20th December 2011

ABSTRACT

Aims: This study investigated the phytochemical composition of *Jatropha tanjorensis* leaf and the effect of its methanolic extract on serum lipid profile of albino rats.
Study design: Experimental Animal Model.
Place and Duration of Study: Department of Biochemistry, Osun State University, Osogbo Nigeria, between January and February 2011.
Methodology: Twenty four (24) albino rats divided into four groups and weighing between 130 and 150g were used for the study. Group 1 served as the control, Groups 2, 3 and 4 were administered varying concentrations of methanolic leaf extract of *Jatropha tanjorensis* daily for 14 days.
Results: Phytochemical analysis of the extract revealed the presence of terpenoids, saponins, cardiac glycosides, flavonoids and tannins. Measurement of serum lipid profile in rats administered the extract indicate a significant decrease ($p<0.05$) in the mean values of total lipids, total cholesterol and LDL cholesterol while triglycerides and HDL cholesterol levels were not significantly different from the control.
Conclusion: This study suggests that leaf extract of *Jatropha tanjorensis* posses phytochemical ingredients capable of lowering blood cholesterol level and might be useful in the treatment of cardiovascular diseases caused by hyperlipidemia.

Keywords: Phytochemicals; Jatropha tanjorensis; hypolipidemia; hyperlipidemia; arteriosclerosis.

**Corresponding author: Email: ioluoye@yahoo.com;*

1. INTRODUCTION

Immense benefits have been derived by man from using medicinal herbs in disease management because they are relatively safer, more affordable and sometimes offer better therapeutic value than synthetic drugs (UNESCO, 1998). The increasing discovery of more medicinal plants has demanded for increased scientific scrutiny of their bioactivity so as to provide data that will help physician and patients make wise decision before using them.

Arteriosclerosis or coronary artery disease is a condition characterized by deposits of lipids, mainly cholesterol on the inner walls of the arteries. These deposits narrow the arterial channels and partly block the normal flow of blood through them (Haines, 2001). The decrease in blood flow and oxygen can result in stroke, partial paralysis, loss of speech and sometimes death (Olson, 1998). Atherosclerosis is the main cause of mortality and morbidity in Western countries and progressively increasing in developing countries (Barter et al., 2007). Low-fat diet is often prescribed for the management of arteriosclerosis as there are no specific treatments for the ailment (Meyers, 2004).

Jatropha tanjorensis is a native of Central America and has become naturalized in many tropical and subtropical countries, including India, Africa and North America (Prabakaran and Sujatha, 1999). Its primary use is for fencing while its secondary uses are as a source of edible leafy vegetable and as medicine (O'Hara et al., 1998). The leaf is used as heart tonic and remedy for hypertension in some parts of Nigeria (Iwalewa et al., 2005), however there is no sufficient scientific validation of these claims. Toxicity and histopathological studies of the leaf extract on rats revealed no significant abnormalities in the tissues except for a mild effects on the lungs and liver (Omobuwajo, 2011). In the present study, the phytochemical constituents as well as the effect of the leaf extract on serum lipid profile of albino rats was determined.

2. MATERIALS AND METHODS

2.1 Preparation of Plant Extract

Jatropha tanjorensis leaves were collected in the neighborhood of Osun State University Campus, Osogbo, Nigeria. The leaves were freshly cut and air dried to constant weight at room temperature after which they were ground into powder using an electric blender. 500g of the powdery plant material was dissolved in 3.0 litres of methanol for 14 days after which the extract was filtered through a Whatman filter paper (125mm). Concentrated extract was obtained by the removal of methanol in a water bath and the resulting paste collected.

2.2 Chemicals/Reagents

LDL cholesterol, HDL cholesterol, total cholesterol, total lipids and triglycerides kits are product of Randox Chemicals Hall, England. All other chemicals/reagents are of analytical grade and were obtained from Analar BDH Limited Poole, England.

2.3 Phytochemical Screening

Phytochemical tests were carried out on the aqueous extracts of the sample using standard procedures as described by Harborne (1973).

2.4 Animal Model

The study was performed on twenty four albino rats of both sexes weighing between 130-150g. They were supplied by A.O.Y. Farms Ltd, Ogbomoso, Nigeria and kept in the Animal House of Biochemistry Department, Osun State University, Osogbo. The rats had free access to water and standard rat diet and exposed to 12 h light/dark cycle in an optimum temperature. The animals were randomly divided into four groups of six rats each. Group 1 serves as the control and administered distilled water, groups 2, 3 and 4 were administered 100mg/kg bw, 200mg/kg bw and 500mg/kg bw respectively of plant extract daily for 14days.

2.5 Collection of Blood Samples from Rats

Rats were anaesthetized with chloroform at the end of 14 days and sacrificed by cutting through the jugular vein. Blood was collected in a clean dry beaker and allowed to clot. It was then centrifuged at 3000 rpm for 10 minutes after which the clear supernatant (serum) was separated from the pellet and kept in refrigerator till required.

2.6 Measurement of Serum Lipid Profile

Concentration of total lipids, total cholesterol, triglycerides, HDL and LDL cholesterol in serum were measured using commercial kit as described by the manufacturer (Randox Co. UK).

2.7 Statistical Analysis

All values were expressed as mean $\pm$SD and subjected to statistical analysis using SPSS window version 9.0. Comparison was done using one-way analysis of variance (ANOVA). P values <0.05 were considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1 shows the phytochemical constituents of the plant extract. This result reveals that the extract contain terpenoids, saponins, cardiac glycosides, flavonoids and tannins.

Table 1: Phytochemical composition of *Jatropha tanjorensis* leaf

Phytochemicals	Observation
Flavonoids	+
Tannins	+
Phylobatannins	-
Steroids	-
Terpenoids	+
Saponins	+
Cardiac glycosides	+

+ indicates present; – indicates absent

Results of serum lipid profile in rats administered *Jatropha tanjorensis* leaf extract for 14 days is shown in Table 2. The result shows that leaf extract of *Jatropha tanjorensis* caused significant reduction in serum total lipids, total cholesterol and LDL cholesterol. There was no significant difference in the levels of serum triglycerides and HDL cholesterol between rats in the test groups and the control.

Table 2: Serum lipid profile in rats administered with *Jatropha tanjorensis* leaf extract

Parameters (mg/dl)	Group 1 (Control)	Group 2	Group 3	Group 4
LDL-cholesterol	95.47±3.33[a]	66.67±2.41[b]	68.74±1.98[b]	65.40±2.23[b]
HDL-cholesterol	56.13±2.28[a]	55.51±2.08[a]	60.62±2.13[a]	62.46±2.02[a]
Total cholesterol	175.36±5.53[a]	139.55±4.65[b]	141.59±3.28[b]	147.28±4.13[b]
Triglycerides	129.41±4.35[a]	127.41±5.92[a]	131.27±4.78[a]	132.39±5.12[a]
Total lipids	546.49±5.48[a]	423.28±7.33[b]	431.45±6.43[b]	439.39±6.56[b]

Values are mean of six rats in each group ±SD
Values with different alphabetical superscript in a row are significantly different at P<0.05

3.2 Discussion

Phytochemical analysis of the leaf extract revealed the presence of saponins, cardiac glycosides, flavonoids, terpenoids and tannins. Flavonoids are water soluble polyphenolic molecules with antioxidant activity which has many beneficial effects on the cardiovascular system (Evans, 1989). Epidemiological studies have illustrated that heart diseases are inversely related to flavonoid intake (Boham and Kocipai, 1974). Flavonoids prevent the oxidation of low-density lipoprotein, lowers the blood levels of cholesterol and triglycerides thereby reducing the risk for the development of atherosclerosis (Subramani and Casimir, 2002). Red wine contains high levels of flavonoids. Many studies have confirmed that one or two glasses of red wine daily can protect against heart disease (Brown, 1996). Flavonoids have also been reported to have vaso-dilatory and inhibitory effects on platelet aggregation thereby preventing coronary heart diseases (Okwu, 2001).

Saponins have been reported to have beneficial effects on blood cholesterol levels. They bind with bile salt and cholesterol in the intestinal tract. This binding causes a reduction of blood cholesterol by preventing its re-absorption. The non-sugar part of saponins also has antioxidant activity which may help to reduce risk of heart diseases (Oakenfull and Sidhu, 1990).

Cardiac glycosides have been variously used from time immemorial as diuretics and heart tonics due to their beneficial effects on the heart. Cardiac steroids are widely used in the modern treatment of congestive heart failure and for treatment of atrial fibrillation. They increase the force of contraction of the heart and are very useful for heart failure patients. They act by affecting the availability of intracellular Ca^{2+} for myocardial contraction or increasing the sensitivity of myocardial contractile proteins (Walker et al., 2002).

Tannins are group of polymeric phenolic substances capable of tanning leather or precipitating gelatin from solution. It has been suggested that consumption of tannin containing beverages, especially green teas and red wines can cure or prevent a variety of illness including heart related diseases (Van-Burden and Robinson, 1981).

Terpenoids are synthesized from acetate units, and as such they share their origins with fatty acids. They differ from fatty acids in that they contain extensive branching and are cyclized. Terpenoids occur in nearly every natural food and have been associated with protection from and treatment of heart disease due to their antioxidant properties (Wagner and Elmadfa, 2003).

The observed significant reduction in serum total lipids, total cholesterol and LDL cholesterol by the extract which can be ascribed to the phytochemical constituents of the leaf imply that it can be used to prevent cardiovascular complications arising from hyperlipidemia (Kwiterovich, 2000). This might explain the traditional use of the leaf extract as a natural remedy against heart diseases in the West Africa Sub Region. High levels of LDL cholesterol promote health problems and cardiovascular disease, they are often called “bad cholesterol” as opposed to HDL particles, which are referred to as “good cholesterol” or “healthy cholesterol” (Superko et al., 2002). HDL particles are able to remove cholesterol from within the artery and transport it back to the liver for excretion or re-utilization (Lin et al., 1998). Those with higher levels of HDL cholesterol seem to have fewer problems with cardiovascular diseases, while those with low HDL cholesterol levels have increased rates of heart disease (Clark and Pierce, 2000). These results suggest that the medicinal properties attributed to *Jatropha tanjorensis* as a useful herb in the treatment of heart diseases could be based on the antioxidant properties and positive modulatory effects of its phytochemicals on serum lipid profile in albino rats.

4. CONCLUSION

Jatropha tanjorensis contain phytochemical ingredients that have hypolipidemic properties in the blood of rats. There was significant decrease in the mean values of serum total lipids, total cholesterol and LDL cholesterol while triglycerides and HDL cholesterol levels were not affected. This study suggests that leaf extract of *Jatropha tanjorensis* might be useful in the treatment of cardiovascular diseases caused by hyperlipidemia in human.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Barter, P., Gotto, LaRosa, A.M., Maroni, J.C., Szarek, J., Grundy, M. S.M., Kastelein, J. P., Bittner, V. (2007). HDL Cholesterol, VLDL cholesterol and cardiovascular events. New Engl. J. Med., 357(13), 1301-1309.

Brown, D.J. (1996). Herbal prescriptions for better health. Rocklin, CA: Prima Publishing., 139-44.

Clark, T.A., Pierce, G.N. (2000). Cardiovascular complications of noninsulin-dependent diabetes. J. Pharmacol. Toxicol. Methods, 47, 1-10.

Evans, W.C. (1989). In, Trease and Evans Pharmacognosy, 13th ed. Balliere Tindall, London, pp. 167-235.

Harborne, J.B. (1973). Phytochemical methods, London. Chapman and Hall Limited, pp. 49-88.

Haines, T.H. (2001). Do sterols reduce proton and sodium leaks through lipid bilayers? Prog. Lipid Res., 4, 299–324.

Iwalewa, E.O., Adewumi, C.O., Omisore, N.O., Adebanji, O.A., Azike, C.K. (2005). Pro-antioxidant effects and cytoprotective potentials of nine edible vegetables in Southwest. Nigeria. J. Med. Food., 8, 539-544.

Kwiterovich, P.O. (2000). The metabolic pathways of high-density lipoprotein, low-density lipoprotein, and triglycerides: a current review. The American Journal of Cardiology., 12, 5–10.

Lin, M., Hoke, C., Ettinger, B. (1998). Evaluation of homogeneous high-density lipoprotein cholesterol assay on a BM/Hitachi 747-200 analyzer. Clinical Chemistry., 5, 1050-1054.

Meyers, C.D., Kamanna, V.S., Kashyap, M.L. (2004). Niacin therapy in atherosclerosis. Current Opinion in Lipidology, 15(6), 659–665.

Oakenfull, D., Sidhu, G. (1990). Saponins - A useful treatment for Hypercholesterolaemia. European Journal of Clinical Nutrition, 44, 79-88.

O'Hara, M.D., Kiefer, K. Farrell, T., Kemper, K. (1998). A review of 12 commonly used medicinal herbs. Arch. Family Med., 7, 523-536.

Okwu, D.E. (2001). Evaluation of the chemical composition of indigenous spices and flavouring agents. Global J. Pure Appl. Sci., 7(3), 455-459.

Olson, R.E. (1998). Discovery of the lipoproteins, their role in fat transport and their significance as risk factors. J. Nutr., 128 (2), 439-443.

Omobuwajo, O.R., Alade, G.O., Akanmu, M.A., Obuotor, E.M., Osasan, S.A. (2011). Microscopic and toxicity studies on the leaves of *Jatropha tanjorensis.* Afr. J. Pharm. Pharmacol., 5(1), 12 -17.

Prabakaran, A.J., Sujatha, M. (1999). *Jatropha tanjorensis* Ellis and Saroja, a natural inter-specific hybrid occurring in Tamil Nadu, India. Gen. Res. Crop, 46, 213-218.

Subramani, S., Casimir, C.A.(2002). Flavonoids and antioxidant activity of Georgia grown vidalia onions. Journal of Agricultural and Food Chemistry, 50(19), 5338-5342.

Superko, H.R., Nejedly, M., Garrett, B. (2002). Small LDL and its clinical importance as a new CAD risk factor: a female case study. Progress in Cardiovascular Nursing, 4, 167–173.

UNESCO. (1998). Promotion of ethno botany and the sustainable use of plant resources in Africa. Terminal Report, pp 60.

Van-Burden, T.P., Robinson, W.C. (1981). Formation of complexes between protein and Tannin acid. J. Agric. Food Chem., 1, 77-82

Wagner, K.H., Elmadfa, I. (2003). Biological relevance of terpenoids. Overview focusing on mono-, di- and tetraterpenes. Ann Nutr Metab., 47(3), 95-106.

Walker, A.F., Marakis, G., Morris, A.P., Robinson, P.A. (2002). Promising hypotensive effect of hawthorn extract: a randomized double-blind pilot study of mild, essential hypertension. Phytother. Res., 16(1), 48-54.