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Full Length Research Paper

Effect of ethanol seed extract of *Buccholzia coriacea* (wonderful kola) on the lipid profile of albino rats

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This study investigates the effect of ethanol extract of *Buccholzia coriacea* seeds on the serum lipid profile of albino rats within a period of two weeks of treatments. Twelve (12) Wistar albino rats weighing between 85 to 130 g purchased and randomly divided into three groups were used for this study. The control group received normal saline while the two other groups received graded doses of 100 and 200 mg/kg body weight of the extract, respectively. Measurement of the serum lipid profile in rats administered with extract indicated a significant decrease ($p<0.05$) in the mean values of low density lipoprotein (LDL) cholesterol but there was a significant increase ($p<0.05$) in high density lipoprotein (HDL) cholesterol levels of the rats administered with the same extract. There was no significant difference ($p>0.05$) between the total cholesterol concentration and triacylglycerol concentrations of rats administered with the same extract compared to the control. This study suggests that ethanol extract of *B. coriacea* seeds have active ingredients that are capable of improving the lipid profile and thus, might be useful in the management of cardiovascular diseases caused by hyperlipidemia.

Key words: *Buccholzia coriacea*, triacylglycerol, high density lipoprotein, low density lipoprotein, total cholesterol.

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. The increasing discovery of more medicinal plants have necessitated increased scientific scrutiny of their bioactivity in order to provide data that will help physician and patients make wise decision before using them (Oyewole and Akigbala, 2011).

Atherosclerosis or coronary artery disease is a condition characterized by deposits of lipids, mainly cholesterol on the inner walls of the arteries (Ghasi et al., 2002; Ugwu et al., 2013; Olantunji et al., 2005; Ezekwesili et al., 2008). These deposits narrow the arterial channels and partly block the normal flow of blood through them (Ahman et al*.,* 1992; Ugwu et al., 2013; Ghasi et al., 2002; Olantunji et al., 2005; Ezekwesili et al., 2008). 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 it is progressively increasing in developing countries (Barter et al., 2007). Low fat diets are often prescribed for the management of atherosclerosis.

Buccholzia coriacea (Wonderful cola) is a tropical plant used in traditional medicine. It is grouped under the genus, *Buccholzia.* Over the years, it has been proven to possess pharmacological and cosmetic effects. The plant is a shrub, evergreen, with a dense crown, large glossy and leathery leaves.

In this study, the effects of *B. coriacea* leaf extract on the lipid profile of female Wistar albino rats were evaluated.

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MATERIALS AND METHODS

Plant

Fresh seeds of wonderful kola (*Buccholzia coriacea*) were got from Ibagwa Nkwo market, Igbo-Eze South Local Government Area of Enugu State, Nigeria. The seeds were identified by Mr. A. Ozioko of Bioresource Development and Conservation Programme (BDCP) Research Centre, Nsukka.

Preparation of the extract

Fresh seeds of *B. coriacea* were plucked and washed with distilled water. The sliced seeds were spread on a clean mat in a well-ventilated room with regular turning to enhance even drying and avoid decaying. The sliced seeds were shade-dried for 10 weeks. The shade dried sliced seeds were pulverized with an electric blender and a known weight (800 g) of the pulverized *B. coriacea* seeds were macerated in 70% ethanol (700 ml) and allowed to stand for 24 h. The mixture was separated with Whatman No. 1 filter paper. The filtrate was concentrated using rotary evaporator and water bath. The extract was then weighed and stored in a refrigerator.

Experimental design

Twelve (12) Wistar albino rats were randomly divided into three (3) different groups as follows: Group 1: Normal control rats that were administered 0.2 ml of normal saline; group 2: rats were administered 100 mg/kg body weight of *B. coriacea* extract orally; group 3: rats were administered 200 mg/kg body weight of *B. coriacea* extract orally.

The extracts were administered for two weeks and analyses were done before administration to determine the baselines and also on day 14 of treatment.

Determination of extract yield

The percentage yield of the aqueous extract of *B. coriacea* seeds were determined by weighing the seeds before extraction and the concentrated extract was obtained after extraction and then calculated using the formula:

$$\text{Percentage yields} = \frac{weight\,(g)\,of\ extract}{weight\,(g)\,of\ pulverized\,leaves} X\,100$$

Animals

Adult female Wistar rats of 4 to 6 weeks old with average weight of 85 to 130 g were obtained from the Animal House of the Faculty of Veterinary Medicine, University of Nigeria, Nsukka. The animals were acclimatized for seven days under standard environmental conditions, with a 12-h light and dark cycle maintained on a regular feed and water *ad libitum*.

Chemicals/reagents/samples

All chemicals used in this study were of the analytical grade and products of May and Baker, England; BDH, England and Merck, Darmstadt, Germany. Reagents used for all the assays were commercial kits and products of Randox, USA; QCA, Spain; Teco (TC), USA; Biosystem Reagents and Instruments, Spain; Glucose Analyzer, Accu Chek Active of Germany; alloxanmonohydrate, Sigma St. Louis, MO, USA.

Instruments/Equipment

Water Bath (Gallenkamp, England), Chemical Balance (Gallenkamp, England), Conical Flasks (Pyrex, England), Hotbox (Gallenkamp, England), Centrifuge (3,500 rpm, PIC, England), Digital Photo Calorimeter (EI 312 Model, Japan), Adjustable Micropipette (Perfect, U.S.A.), Refrigerator (Kelvinator, Germany), pH Meter (Pye, Unicam 293, England), multi-well microtiter plate reader (Tecan, Austria), and Glucose Analyzer, (Accu Chek Active of Germany) were used for the study.

Determination of high density lipoprotein (HDL)

High density lipoprotein (HDL) cholesterol concentration was determined using QCA commercial kit according to the study of Albers et al. (1978).

Determination of low density lipoprotein (LDL)

Low density lipoprotein (LDL) cholesterol concentration was determined using the method of Assmann et al. (1984) methods.

Determination of total cholesterol

Total cholesterol concentration was determined using QCA commercial kit according to the study of Allain et al. (1976).

Determination of triacylglycerol (TAG)

Triacylglycerol (TAG) was determined using the method of Allain et al. (1976)

Statistical analysis

Data were reported as means ± SEM, where appropriate. Both one- and two-way analyses of variance (ANOVA) were used to analyse the experimental data and Duncan multiple test range was used to compare the group means obtained after each treatment with control measurements. Differences were considered significant when $p \leq 0.05$.

RESULTS

Percentage yield of extract

Percentage yield of the extract was calculated thus:

Weight of pulverized seed = 800 g

Weight of extract = 87.5 g

$$\text{Percentage yield} = \frac{87.5}{800} X \frac{100}{1} = 10.94\%$$

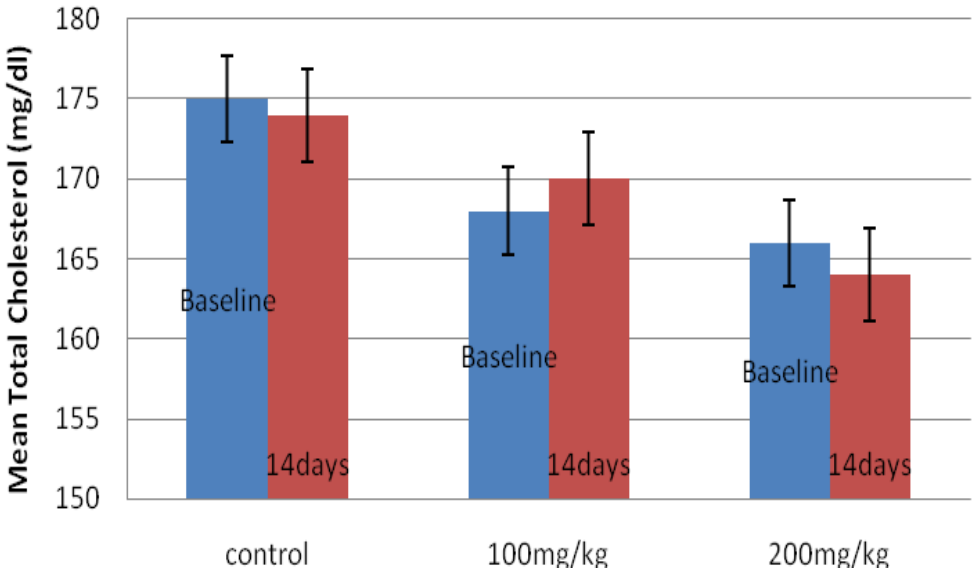

Figure 1. Effect of *Buccholzia coriacea* extract on the total serum cholesterol concentration of rats.

Effect of *B. coriacea* ethanol seed extract on the total serum cholesterol concentration of experimental rats

After daily oral administration of graded doses of 100 and 200 mg/kg b.w. of *B. coriacea* ethanol seed extract for two weeks, there was no significant ($p>0.05$) difference in the total serum cholesterol concentration of the test groups when compared with the control groups as shown in Figure 1.

Effect of *B. coriacea* seed extract on the serum triacylglycerol concentration of experimental rats

After daily oral administration of *B. coriacea* seed extract of 100 and 200 mg/kg b.w. for two weeks, there was no significant ($p>0.05$) difference in the serum triacylglycerol concentration of the test groups when compared with the control groups as shown in Figure 2.

Effect of *B. coriacea* seeds extract on the serum HDL cholesterol concentration of experimental rats

After daily oral administration of *B. coriacea* extract seeds (100 and 200 mg/kg b.w) for two weeks, there was a significant increase ($p<0.05$) in the serum HDL cholesterol concentration of the test groups when compared with the control groups as shown in Figure 3.

Effect of *B. coriacea* seed extract on the serum LDL cholesterol concentration of experimental rats

After daily oral administration of graded doses of *B. coriacea* seed extract (100 and 200 mg/kg b.w.) for two weeks, there was a significant decrease ($p<0.05$) in the LDL cholesterol concentration of the test groups when compared with the control groups as shown in Figure 4.

DISCUSSION

The global world today is challenged with cardiovascular diseases. Some of the key manifestations include coronary heart diseases, stroke and hypertension. Elevated concentrations of plasma lipids are risk factors in cardiovascular problems (Brown and Goldstein, 1992), and important lipids whose elevations are implicated in these conditions are cholesterol and triaglycerides. Lipids are transported in the blood by combination of lipids and proteins complexes called lipoproteins (Nwanjo, 2005).

The main identified determinants of hyperlipidemia are increased LDL-cholesterol and reduced HDL-cholesterol (Ghasi et al., 2002; Ugwu et al., 2013). 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 (Olantunji et al., 2005; Ezekwesili et al., 2008).

In this study, the results obtained on the effect of ethanol extract of *B. coriacea* seed on the lipid profile of normal rats revealed that this plant could improve the lipid profile by increasing the serum HDL-cholesterol level on the 14^{th} day of treatment. This was deduced from the fact that the serum concentration of these fractions in the treated animals were significantly higher ($p>0.05$) on day 14 compared to the baseline values and control animals.

Also, LDL-cholesterol concentration significantly reduced ($p<0.05$). The observed decrease in serum concentration of LDL could be due to the presence of certain

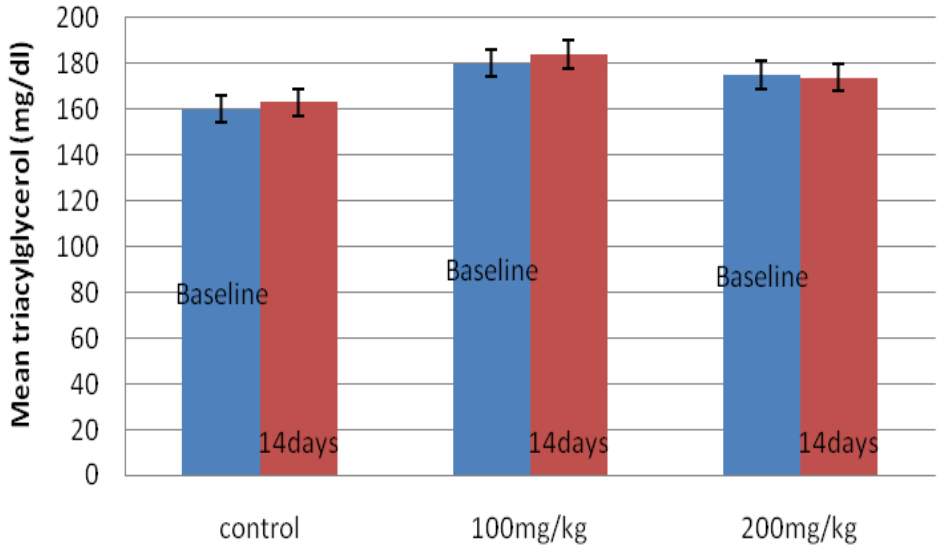

Figure 2. Effect of *Buccholzia coriacea* extract on the triacylglycerol concentration of rats.

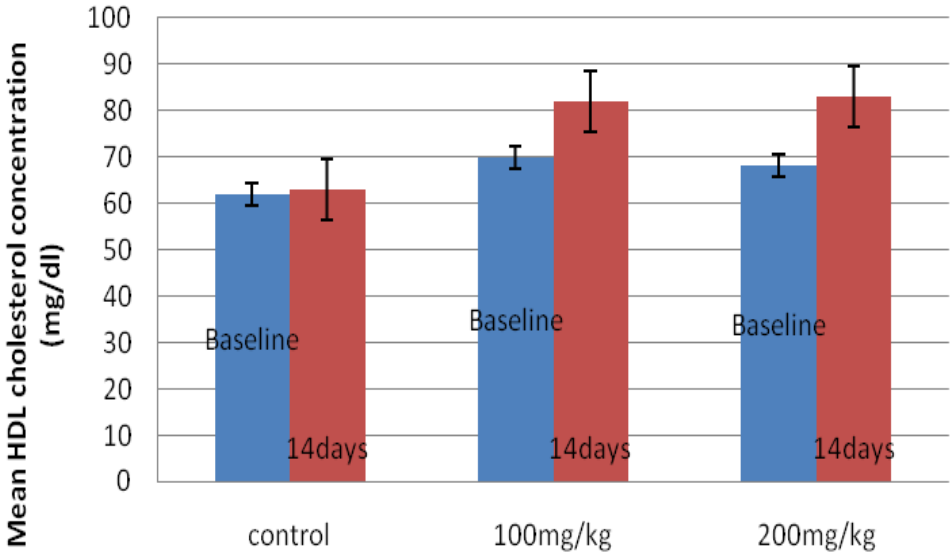

Figure 3. Effect of *Buccholzia coriacea* extract on the HDL cholesterol concentration of rats.

physiologically active constituents in the extract. There was no significant changes ($p>0.05$) in serum concentration of total cholesterol and triacylglycerol. HDL cholesterol has a protective effect against cardiovascular disease as it removes excess cholesterol from circulation and carries it back to the liver where it is degraded or converted into bile acids (Ahmad et al., 1992). The lipid raising effect of some traditional medicinal plants have been reported (Sundram et al., 1999).

The hypocholesterolemic activity of the extract after administration may be due to a number of mechanisms including the inhibtion of rate limiting of enzyme of cholesterol biosynthesis, HMG-CoA reductase, conversion of cholesterol into bile acids and inhibtion of cholesterol absorption from the intestine due to formation of complexes with compounds such as glycosides and saponins (Gaamoussi et al., 2010).

Conclusion

In conclusion, the results obtained from this study showed that oral administration of ethanol extract of *B. coriacea* seeds resulted in a significant improvement on

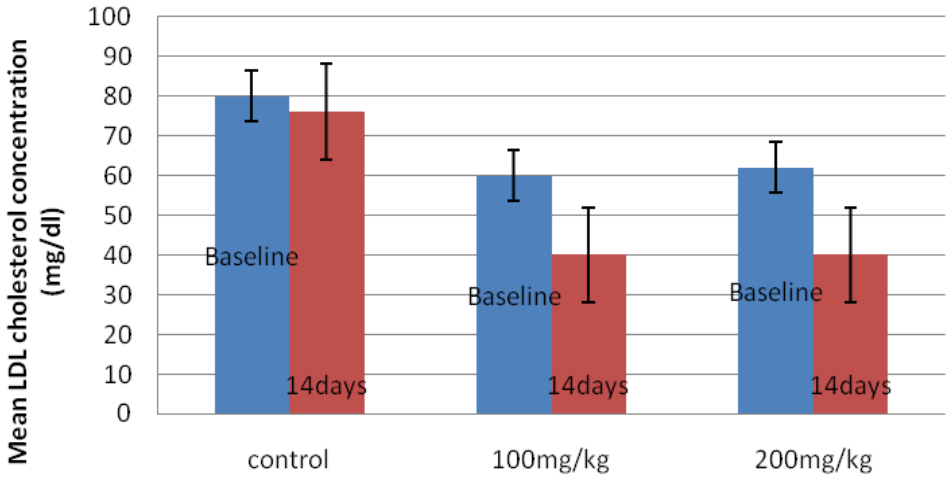

Figure 4. Effect of *Buccholzia coriacea* extract on the LDL cholesterol concentration of rats.

the levels of serum lipid profile by a significant increase in HDL concentration, reducing LDL-cholesterol concentration without any practical effect on triacylglycerol and total cholesterol. This may suggest that the plant extract possess hypolipidemic activity, and may be useful in the management of cardiovascular diseases and thus suggest that further research on the extract should be carried out to elucidate the actual mechanism underlying this effect.

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