

Full Length Research Paper

Hypolipemic effects of methanolic extract of *persea americana* seeds in hypercholestrolemic rats

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In this study, our objective was to investigate the possible hypolipemic effect of *Persea americana* (PA) on hypercholestrolemic rats. Acute administration of cholesterol resulted in the elevation of total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDLC), very low density lipoprotein cholesterol (VLDLC) and reduction in high density lipoprotein cholesterol (HDLC). However, treatment with various doses of the methanolic extract of the seeds of *Persea americana* caused a significant reduction in the levels of TC, TG, LDLC and VLDLC while the levels of HDLC increased significantly. These effects were dose dependent as marked changes were observed at the highest concentration (300mg/kg) of the methanolic extract of *Persea americana* seeds. It was concluded that *Persea americana* seeds showed an hypolipemic effect and may serve as possible alternative treatment for hyperlipemia and hypertension.

Key words: Hypercholestrolemic, hypolipidemia, methanolic, *persea americana*, doses

INTRODUCTION

Cardiovascular diseases are a growingly health problem all over the world (Crews, 2007). Several factors such as high caloric diet intake, age, lack of exercise, smoking, alcohol consumption and genetic predisposition have been linked with cardiovascular diseases (Garcia-Garcia, et al, 2006, Comuzzie, et.al., 1999).

Hyperlipidemia is known to be a risk factor for cardiovascular diseases which is one of the leading cause of mortality and morbidity in human (Krieger, 1998). The modification of lipid concentration has been found to be a useful approach to decrease cardiovascular mortality through prevention of development of atherosclerotic diseases (Frisinghelli and Mafrici, 2007, Singh, et.al., 2007 and Laclaustra, et al, 2007).

There are several medications that may help to lower plasma lipid. Medications can reduce LDLC by 20-40% and they can also modestly increase HDLC (Miller, 2001). Available drugs include niacin, fibrates and 5-hydroxy-3-methylglutaryl-CoA reductase inhibitors (HMG-CoA reductase) among others. However, these synthetic medications are not without their adverse effects. In view

of this, the quest for natural products with lipid lowering potential and with minimal or no side effects is warranted.

The use of medicinal plants in medicine most importantly, in the treatment of hypertension and related cardiovascular diseases is increasing because of relative cheapness, availability, time-trusted efficacy and absence of adverse effects (Fogari and Zoppi, 2004).

Persea americana also known as the avocados is a commercially valuable crop whose trees and fruits are cultivated in tropical climates throughout the world. Reports have shown the fruits and leaves of *Persea americana* to be very useful in the treatment and management of various diseases. For instance, The aqueous leaf extracts of *Persea americana* are known for their analgesic and anti-inflammatory (Adeyemi, et al., 2002), anticonvulsant (Oyewole and Amabeoku, 2006), hypoglycaemic and hypocholesterolemic (Brai, et.al., 2007), wound healing (Nayank, et. al., 2008), cutting cancer risk (Lu et.al., 2005). The leaf extract has been used as antihypertensive and diuretic in animal studies (De ARR, et.al., 1986). However, there is little information on the folkloric use of the seeds of *Persea americana* in the treatment of hypertension. This present study was therefore designed to evaluate the effects of the methanolic seed extract of *Persea*

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Table 1. Effects of *Persea americana* on lipid profiles of hypercholesterolemic rats.

Groups	TC (mmol/l)	HDLC (mmol/l)	LDLCL (mmol/l)	VLDLC (mmol/l)	TG (mmol/l)
Group 1,(Control) 5ml Distilled water	3.12 ± 0.83 ^a	2.50 ± 0.93	0.36 ± 0.12	0.26 ± 0.32 ^a	1.32 ± 0.58
Group 2 (hypercholesterolemic control), 5ml distilled water	7.52 ± 1.11 ^b	0.87 ± 0.13	5.79 ± 2.10 ^b	0.86 ± 0.28 ^b	4.32 ± 1.56
Group 3, 50mg PA/kg rat body weight	6.40 ± 1.21 ^b	1.11 ± 0.48 ^b	4.51 ± 1.28	0.78 ± 0.17	3.89 ± 1.34
Group 4, 100mg PA/kg rat body weight	5.91 ± 1.32 ^b	1.58 ± 0.31 ^b	2.20 ± 1.13	0.62 ± 0.13	3.01 ± 1-15
Group 5, 200mg PA/kg rat body weight	4.00 ± 1.03 ^b	1.70 ± 0.92 ^b	1.81 ± 0.53	0.49 ± 0.02	2.46 ± 1.12
Group 6, 300mg PA/kg rat body weight	8.32 ± 1.89 ^b	0.79 ± 0.01 ^b	6.44 ± 1.31 ^b	1.09 ± 0.02	5.44 ± 2.00 ^b

Values are Mean ± SD.

americana on plasma lipids of hypercholesterolemic rats as a possible treatment for hyperlipidemia and hypertension.

MATERIALS AND METHODS

Preparation of plant extract

Fresh seeds of *Persea Americana* were obtained from a tree in Ado-Ekiti, Ekiti State, Nigeria. The seeds were identified and authenticated at the herbarium of the Department of Plant Science, University of Ado-Ekiti, Nigeria. The seeds were washed, chopped into small pieces and sundried for two weeks. The small pieces were then powdered by mill. 100g of the powdered sample were sloped into a beaker and then extracted with 75% methanol overnight in a soxhlet extractor. The methanolic extract was concentrated and allowed to evaporate to dryness at 50°C using a rotary evaporator. The extract was dissolved in water at a concentration of 4g/100ml and aliquots of different concentrations were administered to the animals.

Animals

Thirty five matured male albino rats (150-180g) were used for the experiment. The animals were kept at Obafemi Awolowo University animal room for six weeks to acclimatized. During this period, the animals have free access to food, water, natural lighting conditions and were handled according to standard protocols for the use of laboratory animals (NIH, 2002). In this study, animals were assigned to six groups with five (5) animals in each group. Induction of hypercholesterolemia was done by the oral administration of 30mg/0.3ml of cholesterol to each animal (Adaramoye, et al, 2008). Group 1 served as normal control and was administered with distilled water while Group 2 was untreated hypercholesterolemic animals given distilled water. Groups 3-6 were treated with different doses (50, 100, 200 and 300mg/kg rat body weight respectively) of methanolic extract of the seeds of *Persea americana* in addition to oral administration of cholesterol.

Methanolic extract of the seed of *Persea americana* and cholesterol were administered to the rats by gastric intubation daily for ten consecutive days.

Sample Collection

After the last dose of the extracts, the animals were anesthetized and the blood was collected into EDTA tubes. Whole blood was

separated with high speed centrifuge at 4,000rpm for 5 minutes at 4°C and plasma was separated by Pasteur pipette for analysis of lipids.

Sample analysis

Determinations of TC and HDLC were done by CHOD-PAP method (Trinder, 1988). Estimations of LDLC and VLDLC were calculated by Frederickson-Friedewald's formular (Friedewald, 1972) while the determination of TG was carried out using the GPO-PAP method (Trinder, 1988)

Statistical analysis

Data obtained were subjected to one way ANOVA to see if there were any statistically significant differences between the groups. Values of P<0.05 were taken to be significant.

RESULTS

The results obtained from this study shows that there were significant differences in blood lipids after the administration of the methanolic extract of the seeds of *Persea americana*. Plasma levels of TC, TG, VLDLC and LDLC were significantly (P<0.05) reduced in treated groups with different concentrations of the extract of *Persea americana* while HDLC was significantly increased.

DISCUSSION

Cholesterol is a lipid, waxy steroid found in the cell membrane. It can dissolve and travel in the water-based blood stream at exceedingly small concentrations. Since cholesterol is insoluble in blood, it is transported in the circulatory system within lipoproteins. Abnormal high dietary cholesterol which leads to hypercholesterolemia is strongly associated with cardiovascular diseases because it promotes atherosclerosis (Durrington, 2003).

In our study, acute administration of cholesterol produced a marked elevation of the plasma levels of TC, TG, LDLC and VLDLC and significant reduction in

plasma HDLC (Table 1). Similar observations have been reported (Adaramoye, et. al., 2005 and Yokozawa, et. al., 2006). Treatment with *Persea americana* at a dose of 50, 100, 200 and 300mg/kg significantly reduced the elevated levels of TG. Suppression of TG levels suggests that the bile acid synthesis was reversed. By this TG reduction by the extract, VLDLC level also decreases, indicating that increase in intracellular synthesis of TG leads to increase in VLDLC synthesis. Therefore, since TG level was significantly reduced by this extract it is pertinent that VLDLC synthesis will be disturbed. Similar findings have been reported (Shirdel, et.,al., 2009). Similarly, VLDLC is indirectly involved in LDLC generation. So as plasma VLDLC increases, plasma LDLC also increases, meaning that the significant reduction in VLDLC by the extract will also reduce plasma LDLC concentration.

There is an inverse association between plasma TG concentration and HDLC levels and therefore, since there is reduction in the TG concentration by the methanolic extract of the seeds of *Persea americana*, one should expect an increase in the plasma concentration of HDLC.

These results show that methanolic extract of *Persea Americana* seed could be used as an effective supplement in hyperlipidemic patients.

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