

Effect of the Aqueous Extract of the Leaves and Seeds of Avocado Pear (*Persea Americana*) On Some Marker Enzymes and Cholesterol in the Albino Rat Tissues

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Abstract: The effects of various doses of aqueous extract of the leaves and seeds of *Persea Americana*, a widely used medicinal plant, on the enzyme activities of some rat tissues were studied. The effect of these extracts on cholesterol as a metabolite was also investigated. The enzymes assayed were Alkaline Phosphatase (ALP), acid phosphate (ACP), Alanine Aminotransaminase (ALT), and Aminoaspartate Transaminase (AST). The results obtained showed that there was a significant decrease ($P < 0.05$), in the activities of all enzymes studied in the liver of the rat. There was a concomitant increase in the activities of these enzymes in the plasma possibly due to leakages into the blood. This result indicates a probable damage to the hepatic cells which may be as a result of prolonged usage of the aqueous extract of the leaves and seeds of *Persea Americana*. Also, there was a significant decrease ($P < 0.05$) in the cholesterol level in the plasma and liver of rats. The result obtained indicates *Persea Americana* to have hypocholesteric effect, thereby suggesting it may help in the treatment of hypertension and thus reducing the risk of cardiovascular diseases.

Keywords: Medicinal plant, *Persea Americana*, Enzymes and Cholesterol

I. Introduction

Persea Americana (avocado pear) is widely found in America, Africa and the tropics. The leaf is simple, finely toothed, glossy and green in colour. The fruit has a bell shape with colour mostly green or brown. The flesh of the fruit is white and juicy with a hard seed inside. The plant has several species and its tree can grow up to 20m high. Apart from the nutritional value of *Persea Americana*, extracts from the leaf and seed of the plant have been found to be of good medicinal value (Ojewole et al, 2007, Owolabi et al, 2005). People in southern parts of Nigeria for instance, boil the leaf and grind the seed of the plant for consumption. It has been discovered that extracts of the leaf and seed of *Persea Americana* reduce hypertension, fever, heart diseases, obesity, cancer risks and helps in wound healing (Anderson, 1990, Lu et al, 2010, and Nayak et al, 2008). Reduction in Cholesterol levels is known as hypocholesterolemia effect (Dashty et al, 2014), and this has been known to lower the risk of heart diseases.

All over the world, focus on plant research has increased in recent times and results have shown an immense potential increase in the use of plants in various traditional systems (Asaolu et al). However there remains considerable concern over the toxicity effect of some of these medicinal plants, *Persea Americana* inclusive. This study therefore investigated the effect of the aqueous extracts of the leaves and seeds of *Persea Americana* on some rat tissues.

II. Materials And Methods

Plant materials

The leaves and fruits of *Persea Americana* were collected fresh from a farm in Akure, Ondo State, Nigeria, and duly identified in the Department of Biology, Federal University of Technology, Akure, Nigeria. The leaves were air dried, while seeds were removed from the fruit, cut into small pieces and air dried. The samples were subsequently ground to powdered form.

Extraction: The ground leaves (500g) and the ground seeds (500g) were soaked separately in 100ml of distilled water for 3 days.

Study Design and Administration of Extract

Wister male albino rats weighing between 100-150g were used for the study. The rats were allowed to acclimatize for 2 weeks before the commencement of the study. Following acclimatization, the rats were randomly divided into a control group and 10 experimental groups with each group consisting of 6 rats. The extracts were administered orally at a daily dose of 2ml each to the different groups of the experimental rats

while the control rats were fed with the equivalent dose of distilled water. It should be noted that each group received the dose of the extract for different durations (1,2 3,4 and 5 days). Groups designated 1, 2, 3, 4 and 5 were fed with aqueous leaf extract while groups 6, 7, 8, 9 and 10 were fed with aqueous seed extract. Group 11 served as the control group. Rats were sacrificed 24hrs after the 1st, 2nd, 3rd, 4th and 5th doses of the extracts were administered. The rats were sacrificed, by cervical dislocation, and then dissected. Blood was collected from the heart using a soil syringe and needle into a bottle containing anticoagulant for the collection of plasma after centrifugation. The liver was washed clean of blood, dried with clean tissue paper, weighed, cut finely with clean scalped blade and homogenized in ice cold 0.25M sucrose solution using pestle and mortal. The homogenate of the liver was then stored frozen until required for assay.

Enzymes Assay: Alkaline phosphates (ALP), Acid phosphates (ACP) activities were determined using the method described by Kings 1960, Alanine aminotransaminases (ALT) activities were determined in the liver homogenates and plasma using the conventional method(Bowers and McComb,1966).Total cholesterol was measured in all the samples collected by the cholesterol CHOD-PAP method (Trindall, 1988)

Statistical Analysis: Data were presented as the mean of three determinants and mean standard deviation (LSD) while differences between control and experimental groups were evaluated by students t-test(P<0.05)

III. Results And Discussion

The tables below show different results obtained in this experiment;

Table 1: Enzyme Activities In The Liver Of Rats Following Administration Of Aqueous Leaf Extract Of Persea Americana

TEST RATS	DAY	GROUP	AST(u/g)	ALT(u/g)	ACP(u/g)	ALP(u/g)
	1	G1	0.87±0.09	1.0±0.56	1.78±0.87	1.06±0.24
	3	G2	0.82±0.08	1.01±0.40	1.60±0.11	1.04±0.53
	5	G3	0.71±0.04	0.97±0.14	1.56±1.52	1.02±0.36
	7	G4	0.68±0.03	0.97±0.15	1.53±2.22	1.01±0.34
	9	G5	0.61±0.03	0.96±0.14	1.51±1.89	0.89±0.35
CONTROL RATS	1	C1	0.89±0.91	1.04±0.56	2.04±0.71	2.20±0.36
	3	C2	0.90±0.90	1.02±0.35	2.07±0.87	2.21±0.31
	5	C3	0.89±0.90	1.02±0.49	2.05±0.70	2.20±0.40
	7	C4	0.88±0.92	1.03±0.30	2.04±0.72	2.19±0.39
	9	C5	0.89±0.91	1.02±0.50	2.04±0.70	2.20±0.41

KEYS: C = Control groups, G = Test Groups, AST = Aspartate aminotransaminase, ALT = Alanine aminotransaminase, ACP = Acid phosphatase, ALP = Alkaline phosphatase.

Table 2: Enzyme Activiteis In The Plasma Of Rats Following Administration Of Aqueous Extract From Leaf Of Persea Americana

TEST RATS	DAY	GROUP	AST(u/g)	ALT(u/g)	ACP(u/g)	ALP(u/g)
	1	G1	0.38±0.78	0.32±0.08	3.12±0.02	2.01±0.38
	3	G2	0.40±0.04	0.33±0.05	3.12±0.03	2.03±0.40
	5	G3	0.43±0.03	0.38±0.04	3.13±0.02	2.07±0.04
	7	G4	0.47±0.02	0.42±0.03	3.12±0.03	2.09±0.05
	9	G5	0.59±0.03	0.46±0.06	3.13±0.02	2.09±0.04
CONTROL RATS	1	C1	0.40±0.04	0.33±0.17	3.11±0.56	2.04±0.43
	3	C2	0.41±0.03	0.31±0.18	3.12±0.47	2.04±0.44
	5	C3	0.40±0.04	0.33±0.16	3.12±0.46	2.03±0.42
	7	C4	0.39±0.05	0.33±0.17	3.12±0.47	2.04±0.41
	9	C5	0.40±0.03	0.32±0.35	3.13±0.35	2.04±0.90

Keys: Same as in Table 1.

Table 3: Enzyme Activiteis In The Liver Of Rats Following Administration Of Aqueous Seed Extract Of Persea Americana/Lc

TEST RATS	DAY	GROUP	AST(u/g)	ALT(u/g)	ACP(u/g)	ALP(u/g)
	1	G1	0.78±0.09	0.98±0.16	19.98±5.20	2.01±0.31
	3	G2	0.70±0.11	0.91±0.22	16.01±7.71	1.99±0.51
	5	G3	0.64±0.08	0.83±0.76	11.99±4.30	1.67±0.49
	7	G4	0.59±0.18	0.80±0.48	10.01±2.66	1.50±0.53
	9	G5	0.49±0.12	0.9±0.36	6.11±4.78	1.44±0.34
CONTROL RATS	1	C1	0.89±0.91	1.04±0.56	2.04±0.71	2.20±0.36
	3	C2	0.90±0.90	1.02±0.35	2.07±0.87	2.21±0.31
	5	C3	0.89±0.90	1.02±0.49	2.05±0.70	2.20±0.40
	7	C4	0.88±0.92	1.03±0.30	2.04±0.72	2.19±0.39
	9	C5	0.89±0.91	1.02±0.50	2.04±0.70	2.20±0.41

Keys: Same as in Table 1.

Table 4: Enzyme Activities In The Plasma Of Rats Following Administration Of Aqueous Seed Extract Of Persea Americana/Lc

TEST RATS	DAY	GROUP	AST(u/g)	ALT(u/g)	ACP(u/g)	ALP(u/g)
	1	G1	0.09±0.03	0.18±0.34	1.30±0.05	1.91±0.41
	3	G2	0.20±0.11	0.15±0.46	1.91±0.02	1.21±0.50
	5	G3	0.23±0.43	0.17±0.52	2.10±0.10	1.49±0.45
	7	G4	0.29±0.56	0.27±0.47	2.79±0.07	1.64±0.35
	9	G5	0.38±0.04	0.29±0.60	3.03±0.02	1.99±0.04

Keys: Same as in Table 1.

Table 5: Cholesterol Levels In The Liver And Plasma Of Rats Following Administration Of Aqueous Leaf Extract Of Persea Americana

TEST RATS	DAY	GROUP	LIVER(g/g)	PLASMA(g/L)
	1	G1	0.12±0.06	0.98±0.16
	3	G2	0.11±0.04	0.91±0.22
	5	G3	0.10±0.04	0.83±0.76
	7	G4	0.10±0.02	0.80±0.48
	9	G5	0.07±0.02	0.9±0.36
CONTROLRATS	1	C1	0.05±0.04	0.31±0.04
	3	C2	0.06±0.02	0.31±0.04
	5	C3	0.06±0.02	0.30±0.09
	7	C4	0.07±0.03	0.31±0.04
	9	C5	0.07±0.02	0.12±0.08

Keys: Same as in Table 1.

Table 6: Cholesterol Levels In The Liver And Plasma Of Rats, Following Administration Of Aqueous Seeds Extract Of Persea Americana

TEST RATS	DAY	GROUP	LIVER(g/g)	PLASMA(g/L)
	1	G1	0.02±0.01	0.27±0.11
	3	G2	0.02±0.01	0.22±0.02
	5	G3	0.02±0.01	0.17±0.02
	7	G4	0.01±0.01	0.11±0.02
	9	G5	0.01±0.01	0.09±0.02
CONTROLRATS	1	C1	0.018=0.01	0.26=0.15
	3	C2	0.018=0.01	0.22=0.02
	5	C3	0.012=0.01	0.17=0.02
	5	C4	0.012=0.01	0.15=0.02
	7	C5	0.01=0.01	0.11=0.02

Keys: Same as in Table 1.

The results obtained from this study reveal that the activities of all the enzymes studied decreased significantly ($P<0.05$) in the liver of the experimental rats when compared with the control (Tables 1 and 3). However the activities of these enzymes were raised in the blood (Tables 2 and 4). The observed decrease in the enzymes activities in the liver could be due to an inflammation of the liver cells (hepatitis). Since the liver is the major site for the synthesis of these enzymes, which leads to the leakage of these enzymes through altered membranes of the cell into the extra cellular compartment, thus the increase in the activities of all the enzymes studied in the plasma and liver respectively indicated that prolonged consumption of the aqueous extract of the seed and leaf of Persea Americana could be dangerous. A similar observation was reported on the toxicity of Persea Americana and its extracts (Trindall, 1988 and Friday et al, 2013). Also it has been reported that the administration of the liquid extract continuously could probably cause a liver damage, increase in plasma enzymes; AST and ALT can be an indication of this fact (Friday et al).

Also the results reported in Tables 5 and 6 show that the seed and leaf extracts of Persea Americana brought about significant reduction in the plasma and liver cholesterol levels. A reduction in the level of cholesterol lowers the blood pressure and prevents cardiovascular disease (Grant, 1991). A report by Anderson reveals that Persea Americana extracts would probably reduce hypertension, cardiovascular diseases, obesity and heart diseases by decreasing Cholesterol levels (Brent). However it is reported also that the decrease in plasma Cholesterol following administration of this extract can also affect metabolism of bile salts (Sadava et al, 2010).

IV. Conclusion

This present study indicates that prolonged administration of aqueous extracts of the seed and leaf of Persea Americana might cause inflammation or damage of the liver cells. It also suggests that the extracts of the leaf and seed of Persea Americana would probably lower cholesterol and therefore may be useful in the treatment of hypertension and other cardiovascular diseases.

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