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EFFECTS OF AQUEOUS LEAF EXTRACT OF *FUNTUMIA ELASTICA* ON BLOOD AND ORGANS OF AN EXPERIMENTAL RAT

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ABSTRACT: *Funtumia elastica has been used for centuries in traditional medicine in many parts of the world. To validate its use in traditional medicine, the present study was carried out to determine the effect of Funtumia elastica on haematological and biochemical parameters of rat. The animals were divided into 4 groups of 3 rats each. Group A, B and C were orally administered with aqueous extract of Funtumia elastica at doses 250, 500 and 750mg/kg/bw, group D served as control. The extracts were administered for 7 days. Haematological assay was carried out using auto reader PC 210 Erma (Japan) and biochemical parameter assay was carried out using RANDOX kit. The organs were preserved in formalin solution, stained with haematoxylin and eosin and viewed under microscope. The animals showed no symptom of toxicity. The results showed the effects of the extraction haematological and biochemical parameters, but all values were within the normal range. Although statistically there was a significant ($P < 0.05$) increase in AST level and decrease in ALT and ALP levels compared to control, there was slight decrease in WBC level and an increase in RBC, Hb and Hct level. Therefore, use of the extracts at these doses though not toxic to the organs but could alter haematological and biochemical parameters.*

KEYWORDS: Funtumia Elastica, Haematological, Biochemical Parameters, Histopathology, Toxic, Medicinal

INTRODUCTION

Funtumia elastica (Silk rubber) is a medium-sized African rubber tree with glossy leaves, milky sap, and long woody seedpods. "The bark is portion of the plant known for medicinal effect". Scientists studied *Funtumia* extensively in the 1960s, but only recently that its medicinal properties attracted the interest of scientists. "*Funtumia* has important antioxidant, antifungal, anti-inflammatory, and antibiotic properties (Bogne K. P., et. al., 2007). The plant's yellow-white flowers are fragrant and grow in dense *cymes*, resulting in long, spindly fruits of a grey-brown shade". "When matured, this 30 cm long fruit opens up to release a number of hairy, wind-dispersed seeds". "The study of medicinal plants is because of wide use of plants in folk medicines, good safety profile of plants and their ready availability (WHO 1978). It is used in tropical Africa to treat asthma, allergies, and other respiratory issues, as well as malaria. It has no known toxicity or side effect. Natural compounds found in *Funtumia* include anthocyanin which have beneficial effects on the heart, brain (enhancing learning and memory) and eyes (Barros M. H., et. al., 2006); flavonoids which are natural antihistamines and possess

strong anti – allergic properties (Kawai, M., et. al., 2007); steroid, alkaloids, plants steroids and brass in steroids which have immune- modulating effects as well as anti-inflammatory and anti – cancer properties "(Bouic, P. J. D., Lamprecht, J. H. 1999). "The concept of growing crops for health rather than for food or fiber is slowly changing plant biotechnology and medicine". "Rediscovery of the connection between plants and health is responsible for launching a new generation of botanical therapeutics that include plant derived pharmaceuticals, multi-component botanical drugs, dietary supplements, functional foods and plant produced recombinant proteins" (Okwu, D. E. 2005).

"Despite the wide use of this plant in treatment of various disease conditions, including asthma, malaria, allergies and various respiratory diseases, literature on the plant is scarce, and where available, it is on phytochemical screen, anti-inflammatory, anti-bacterial/fungal screen. Nonetheless, investigation on the toxicity and safe use of the herbs remains paramount. This study therefore, is aimed at investigating the effect of aqueous extract of *Funtumia elastica* on haematological and biochemical parameters, also the toxicological effect on essential organs of an experimental rat".

MATERIALS AND METHOD

Plant Material Collection and Extraction.

The fresh mature leaves of *Funtumia elastica* were gotten from bush along Nigerian Institute for Oil Palm Research road near Benin City and authenticated at Herbarium section, Department of Plant Biology and Biotechnology, University of Benin.

Albino rat weighing about 93.53-93.74g was used for the study. They were obtained from animal house of the Faculty of Biological Science University of Ibadan Oyo state. The rats were maintained ad libitum on water and growers mesh bought from 3rd east circular road. The animals were allowed to acclimatize for one week. There was daily changing of feed, water and daily cleaning of the cage.

Experimental Design

The rats were divided into four groups (A, B, C and D) each group containing 3 rats. The groups A, B, and C were administered orally with aqueous extract of *Funtumia elastica* at doses 250, 500 and 750mg/kg/bw respectively and the D group without plant extract served as the control. The extracts were administered for 7days after which the animals were sacrificed by placing in chloroform until they were unconscious. Blood was collected from the heart by cardiac puncture and was placed into two different tubes (Ethylene Diamine TetraAceticacid (EDTA) tube and lithium heparin tube) for haematological and biochemical test. Different organs were dissected out and placed in formalin for histological studies.

Haematological Assay

The haematological assay were evaluated with an auto reader PC 210N Erma (Japan). The blood in the EDTA container was used for full blood count which include white blood cell count (WBC), Red blood cell count (RBC), Hematocrit count (HCT), hemoglobin (HGB) and WBC differentials.

Preparation of Serum

Blood was obtained from the rats by cardiac puncture technique into centrifuge tubes. Serum was prepared by centrifuging for 10mins at 3000 rev/hr on a bench centrifuge. The clear supernatant was used for biochemical test carried out.

Biochemical

Serum alanine transaminase (ALT), aspartate transaminase (AST) and alanine phosphatase (ALP) were estimated calorimetrically using randox reagent enzyme kit based on the methods of [7] respectively. And the absorbance was read using a uv/vis spectrophotometer, Genesys 10S.

Histopathlogical Studies

Kidney and liver were embedded in formalin, sectioned at 5μ and stained with haematoxylin and eosin. Detailed microscopic examination of the above organ section was carried out for both control and test group.

Statistical Analysis

Results are expressed as the Mean ± SD. Difference between means was assessed by a two-tailed student T-test, $P \leq 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Haematological Results

The results of haematological analysis is presented in table 1

Table 1: Effect of aqueous extract of *Funtumia elastica* haematological parameter.

	Funtumia elastic			
Parameter	Control	25mg/kg	50mg/kg	75mg/kg
WBC (10^3 /UI)	12.00 ± 2.26	11.13± 4.17	9.90± 3.69	13.30± 1.21
LY (10^3 /UI)	7.30± 2.08	6.47± 0.90	6.70± 2.12	7.43± 1.25
MO (10^3 /UI)	1.40± 0.46	2.56± 1.96	1.20± 0.87	1.50± 0.14
GR (10^3 U/I)	3.20± 0.35	3.70± 4.18	1.30± 0.92	4.40± 2.40
RBC (10^6 /UI)	6.21± 0.61	7.02± 0.34	6.72± 0.45	6.82± 0.16
Hgb (g/dl)	13.80± 1.74	15.30± 1.33	15.00± 0.14	14.50± 0.59
HCT (%)	39.20± 3.32	44.20± 3.07	41.20± 0.14	41.20± 0.36
MCV (FI)	63.20± 2.37	62.90± 1.67	61.45± 4.31	60.40± 1.00
MCH(pg)	22.10± 0.75	21.70± 0.96	22.30± 1.27	21.30± 0.78
MCHC (g/dl)	35.10± 1.55	34.60± 0.72	36.35± 0.49	35.23± 1.61
PLT (10^3 /UI)	640.0± 71.01	807.0±98.22	824.0± 118.73	833.0± 43.00

Values are expressed as mean ± SD.

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Biochemical Result

The results of the biochemical assay is presented in table 2

Table 2: Effect of distilled water extract of *funtumia elastica* on hepatic markers

Markers	Control	25mg/kg	50mg/kg	75mg/kg
AST (U/I)	7.0 ±2.6	27.0± 28.30	14.0± 3.70	52.0± 7.20
ALT (U/I)	8.0± 6.93	4.0± 4.00	4.0± 2.00	8.0± 7.21a
ALP (U/I)	176.64± 90.49	84.18± 1.98	154.56± 66.30	71.76± 3.89

Values are expressed as mean ± SD.

Histological Results

Digital photographs of histological results.

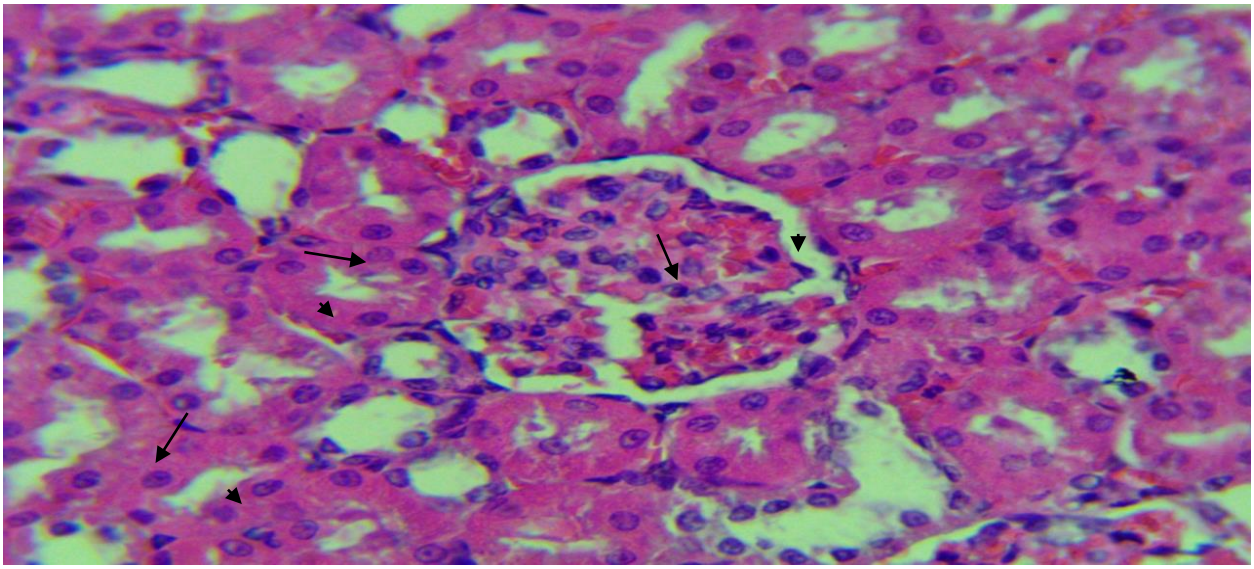

Fig 1: Control Kidney showing centrally located glomerulus (long arrow) with the bowmans space (arrow head) and tubules (long arrow and arrow head) that are lined by a single layer of cuboidal epithelium. Haematoxylin and eosin. X 400 magnification

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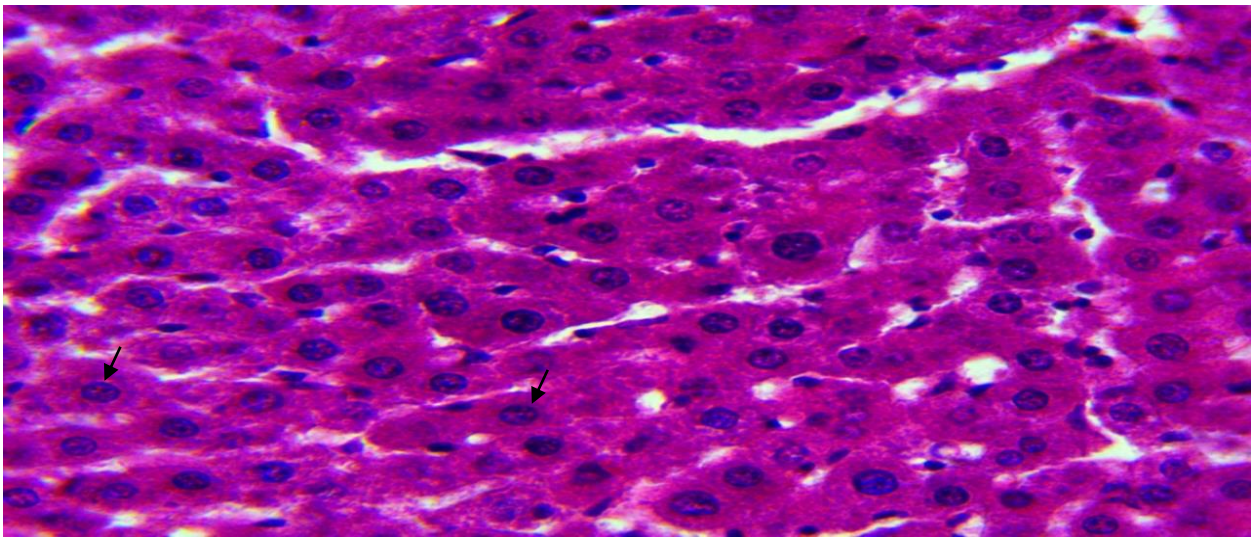

Fig 2: Control liver showing hepatocytes with round to oval nuclei (arrow) and abundant eosinophilic cytoplasm. Haematoxylin and eosin. X 400 magnification

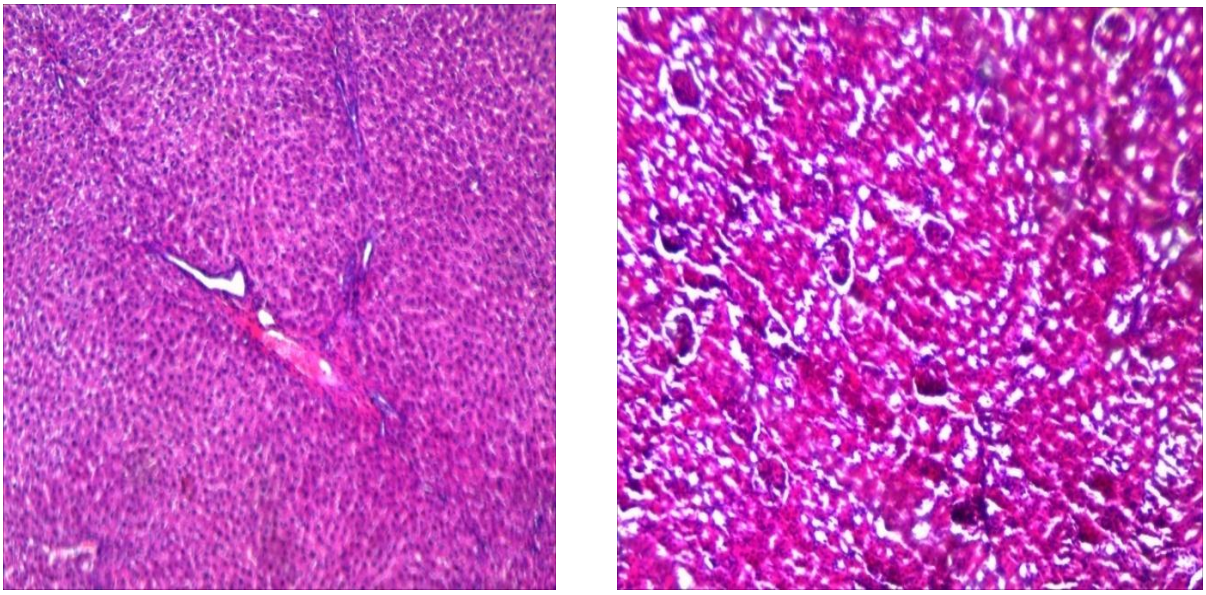

Fig 3: Structure of liver (left) and kidney (right) of rat fed with 25mg/kg of *Funtumia elastica* extract.

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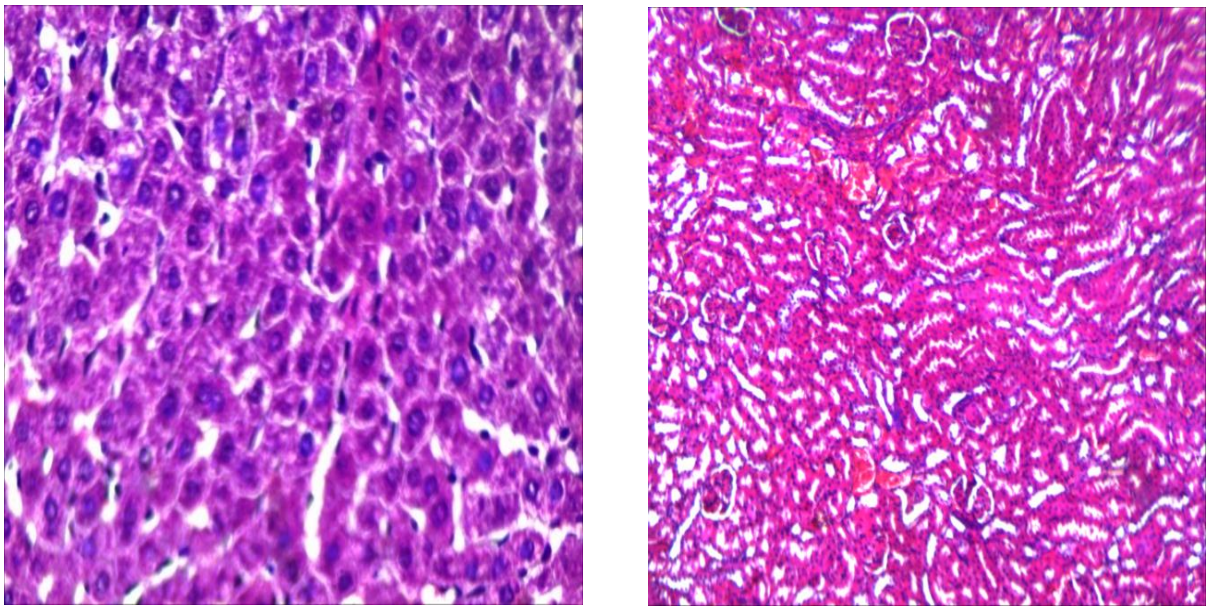

Fig 4: Structure of liver (left) and kidney (right) of rat fed with 50mg/kg of *Funtumia elastica* extract.

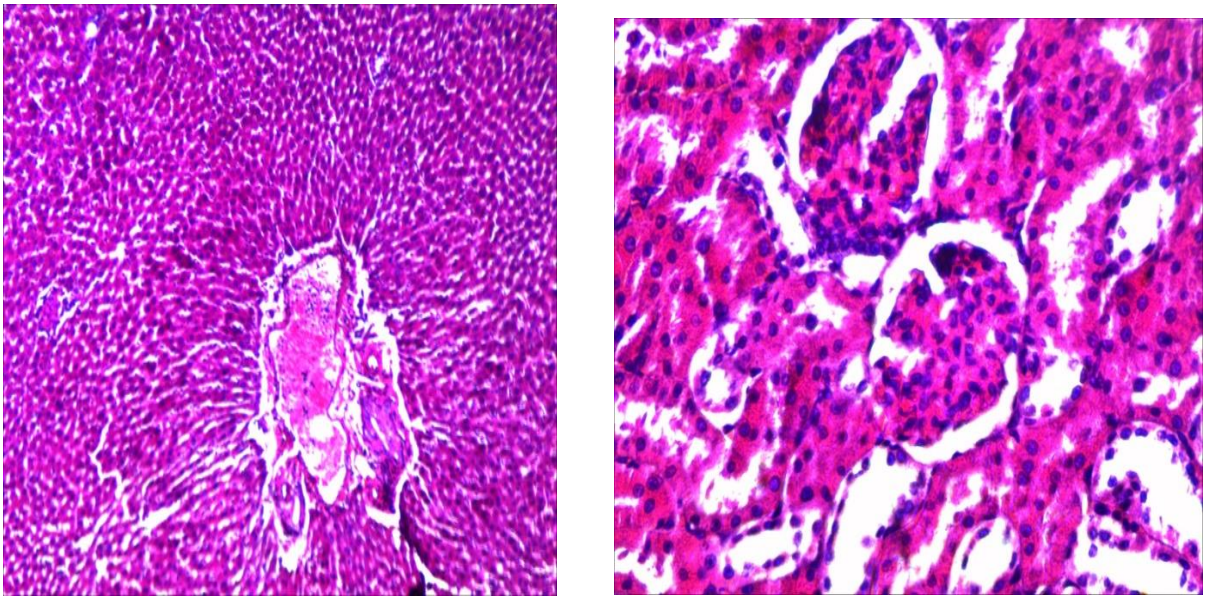

Fig 5: Structure of liver (left) and kidney (right) of rat fed with 75mg/kg of *Funtumia elastica* extract.

DISCUSSION

This study was carried out to investigate the effect of aqueous extract of *Funtumia elastica* on haematological and biochemical parameters of experimental rat. These plants have been used traditionally to treat many diseases.

Blood is a good indicator to determine the health of an organism. It also acts as pathological reflector of the whole body hence haematological parameters are important in diagnosing the functional status of exposed animal to toxicants (Joshi, P., K., et. al., 2002). The hematopoietic system is one of the most sensitive targets of toxic compounds and is an important index of physiological and pathological status in man and animals (Adeneye, A. A., et. al., 2006).

From this study, the hematological parameters were all within the normal range. The results also showed that there was a decrease in white blood cell (WBC) in group of rats fed with 200 and 500mg/kg concentration and slightly increase in groups fed with 750mg/kg concentration, compared to control. There was an increase in monocyte, granulocyte, red blood cell, hemoglobin, hematocrit and platelet levels. The oxygen-carrying capacity of the blood and amount of oxygen delivered to the tissues will be increased following the extract administration since RBC and Hgb are very important in transferring respiratory gases. Haematological functions is always an indication of state of health of individuals. For example, several studies reported a positive association between hypertension and elevated white blood cells (WBC) count among the number of population (Shankar, A., et. al., 2004, Nakanishi, N., et. al., 2002, Gillum, R. F., Mussolino M. E. 1994).

There are many enzymes found in the serum that did not initially originate from the serum. During tissue damage, some of these enzymes find their way into the serum, probably by leakage. Serum enzyme measurements are therefore also a valuable tool in clinical diagnosis, providing information on the effect and nature of pathological damage to any tissue. The increase in serum alkaline phosphatase activity may indicate hepatic damage probably by the altered cell membrane permeability leading to the leakage of the enzymes from the tissues to the serum (Appidi J. R., et. al., 2009, Akanji, M. A., Yakubu, M. T. 2000). The above results (table 1 and 2) indicate that the ALP level was reduced compared to the control group.

The tissue activities of the transaminase (AST and ALT) enzyme are markers for the functions and integrity of the heart and liver (Adeyemi O. T., Muhammed, N. O. 2010). They rearrange the building blocks of proteins. It is released from damaged liver cells (Nelson, D. I., Coxx, M. M. 2003). Elevation of these enzymes in the serum have been reported to indicate cellular damage, tissue necrosis, as well as a calculated risk for cardiovascular diseases, with higher risk of cardiovascular disease and elevated myocardial infarction being attributed to elevation of ALT and AST respectively (Ioannou G. N., et. al., 2006). Although AST activities were elevated in rats fed with *Funtumia elastica* (table 1) this elevation was not confirmed by the ALT level which was lower compared to the control group. Obtained values were within the acceptable range, thus implying that the earlier observed elevations in the AST of rats fed on the extracts was insignificant. Result therefore suggests that the extracts protected and prevented damage to the plasma membranes of not only the liver and heart, but also the brain, kidney, stomach, small intestine and spleen in the rats.

The histology result also showed that the distilled water extract of *Funtumia elastica did* not have any effect on the liver and kidney at all doses. The histopathological result of the liver did

not show any fatty change or hepatocytes necrosis just as the control. This explains the normal level of the ALT, ALP and AST. The kidney did not show any sign of glumeronephritis (inflammation and damage of filtering component of the kidney) also as the control. The physiology of the organs was normal under microscope.

CONCLUSION

The administration of aqueous extract of *Funtumia elastica* to experimental rat showed changes in haematological and biochemical parameters.

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