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The Effects of Ethanol Leaf-Extract of *Albizia ferruginea* on some Liver and Histopathological Parameters in Wistar Albino Rats

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ABSTRACT

The effects of ethanol leaf-extract of *Albizia ferruginea* on some liver and histopathological parameters were investigated using albino rats. Twenty four albino rats were randomly placed into four experimental groups (A, B, C and D) after seven days of acclimatization with six rats in each group. Animals in groups A, B, C and D were administered the ethanol leaf-extract of *Albizia ferruginea* at the doses of 0, 200, 400 and 600 mg/kg body weight respectively for fourteen days through oral intubation. The biochemical indices and histopathology were done using standard methods. The results showed that activities of aspartate aminotransferase (AST), alkaline phosphatase (ALP), alanine aminotransferase (ALT) and the concentrations of total bilirubin and conjugated bilirubin significantly ($p<0.05$) increased dose-dependently. Total protein (TP) and albumin levels were significantly ($p<0.05$) decreased dose-dependently. There were severe damages of the liver of the test animals at groups C and D. The extract of *Albizia ferruginea* could be toxic if taken in excess and can cause liver damage.

Key words: *Albizia ferruginea*, leaf-extract, biochemical indices, histopathological parameters, albino rats.

INTRODUCTION

The growing popularity of traditional medicine, particularly herbal medicine, is based on their observed effectiveness in the treatment and prevention of diseases. Traditional medicines are believed to be 'natural' and therefore safe; on the other hand, some modern medicines have unfavourable side effects [1]. However, this belief has led to indiscriminate use over a long period of time without appropriate dosage monitoring and undermining danger associated with the potential toxicity of medicinal plant therapy [1]. World Health Organization has found that about 80% of the developing countries' populations are handicapped to affording pharmaceutical drugs; rely on traditional medicines, mainly from plants, to sustain their primary health care needs [2]. Pharmaceuticals are prohibitively expensive for most of the world's population [3].

Albizia ferruginea is a perennial tree with about 45m high and 3m girth. The leaves are bipinnate with pinnae exceeding sometimes seven pairs. It is a species of plant in the Fabaceae family, found in Angola, Benin, Cameroon, Republic of Congo, Nigeria, Senegal, Togo, Uganda among others [4]. This species threatened by deforestation is widespread in west and central Africa [5]. It is called ''Uge-ehu'' in Abakaliki dialect of Ebonyi State, Nigeria [4]. The genus *Albizia* comprises approximately 150 species, mostly trees and shrubs native to tropical and subtropical regions of Asia and Africa. Stamens elongate and are usually white. Corolla is funnel-shaped, connate beyond the middle. Its fruit is broadly linear

indehiscent or 2-valved, valves not twisted [6].

Liver, as a large and complex organ of the human body, is known for its central role in carbohydrate, protein and fat metabolism. It is the site where waste products of metabolism are detoxified [7]. Liver has to perform different kinds of biochemical functions, so no single biochemical test can detect the global functions of liver. All laboratories usually employ a battery of tests for initial detection and management of liver diseases and these tests are frequently termed "Liver function tests" [8].

While the health benefits of most herbs have been strongly demonstrated, their safety is poorly documented, and the awareness of consumers and health professionals towards herbal preparations as potential sources of health damage is low. More worrisome are recent reports about adverse effects, following the intake of some herbal preparations/extracts resulting in acute and chronic liver injury [9]. Controversies exist regarding the health benefit and toxic effect of *Albizia ferruginea* extracts. Very little is known about its potential toxic effects on body organs. Since most medicinal plants exert their effects on targeted sites like liver and other vital organs, it is important to examine their toxicity; hence the need to investigate the effects of ethanol leaf-extract of *Albizia ferruginea* on some liver markers and histopathology of albino rats.

Figure 1: *Albizia ferruginea* (Ukpabi and Offor, 2018).

MATERIALS AND METHODS

Materials

The fresh leaves of *Albizia ferruginea* were gotten from Umuezeoka, Ezza North L.G.A. of Ebonyi State in the month of February while the adult albino rats were gotten from the animal house of Department of Veterinary Medicine University of Nigeria, Nsukka.

Methods

Extraction of Plant Material

The leaves of the plant were rinsed in water, dried and pulverized. Exactly 300g of the powdered sample was soaked in 1200l of ethanol and allowed to stand for 48 hours. It was then

filtered using a muslin cloth and concentrated by evaporation to dryness using rotary evaporator.

Administration of the Extract

The experimental animals were placed into four groups (A, B, C and D) of six albino rats in each. The animals in group A was the normal control given 0.1ml of normal saline, while those in groups B, C and D were given the ethanol leaf-extract at different doses of 200, 400, and 600 mg/kg body weight respectively. This administration was done through oral intubation for 14 days as feed and water were taken *ad libitum*.

Collection of Biological Samples

The blood samples were collected through the femoral vein and the liver organ was carefully removed.

Determination of Biochemical and Histopathological Parameters

The activities of AST and ALT were determined according to the methods of [10]. ALP activity was estimated according to the method of [11]. Albumin and total protein concentrations were assayed according to the methods described by [12] and [13] respectively, while total and conjugated bilirubin concentrations were determined according to the methods of [14]. The histopathology was done according to the modified method of [1].

Data Analysis

Data were treated by analysis of variance (ANOVA) and the level of significance was set at $P<0.05$.

RESULTS

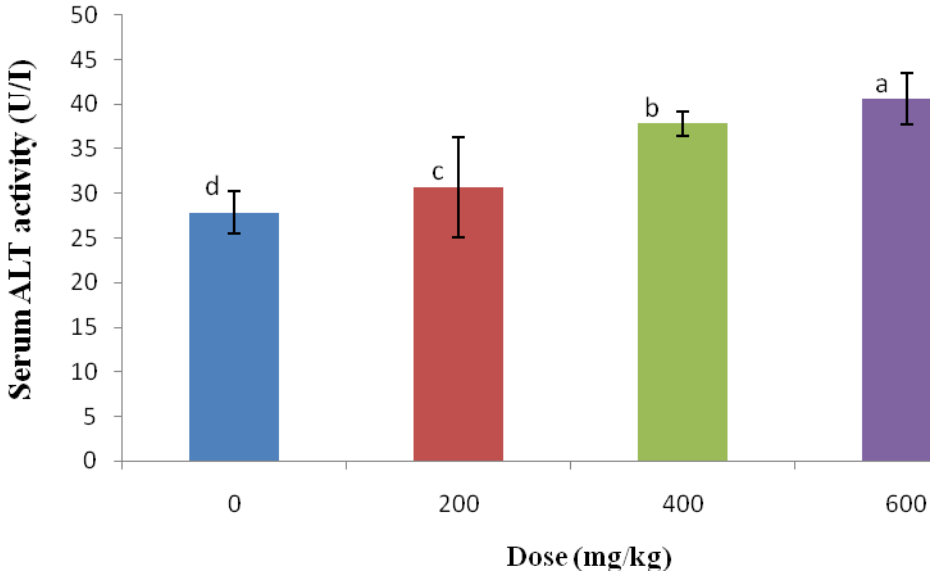

Figure 2: Serum ALT activities of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at $p<0.05$.

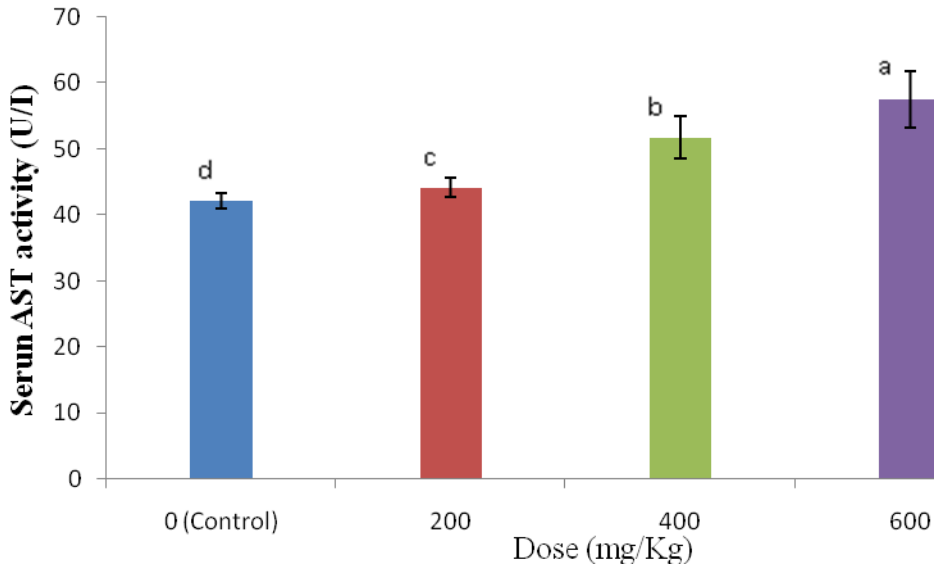

Figure 3: Serum AST activities of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at p<0.05.

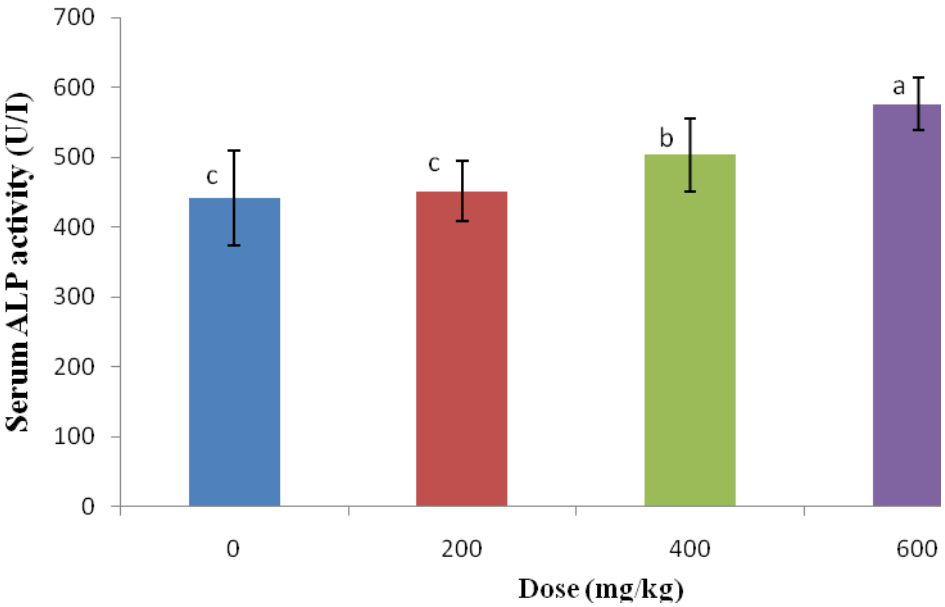

Figure 4: Serum ALP activities of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at p<0.05.

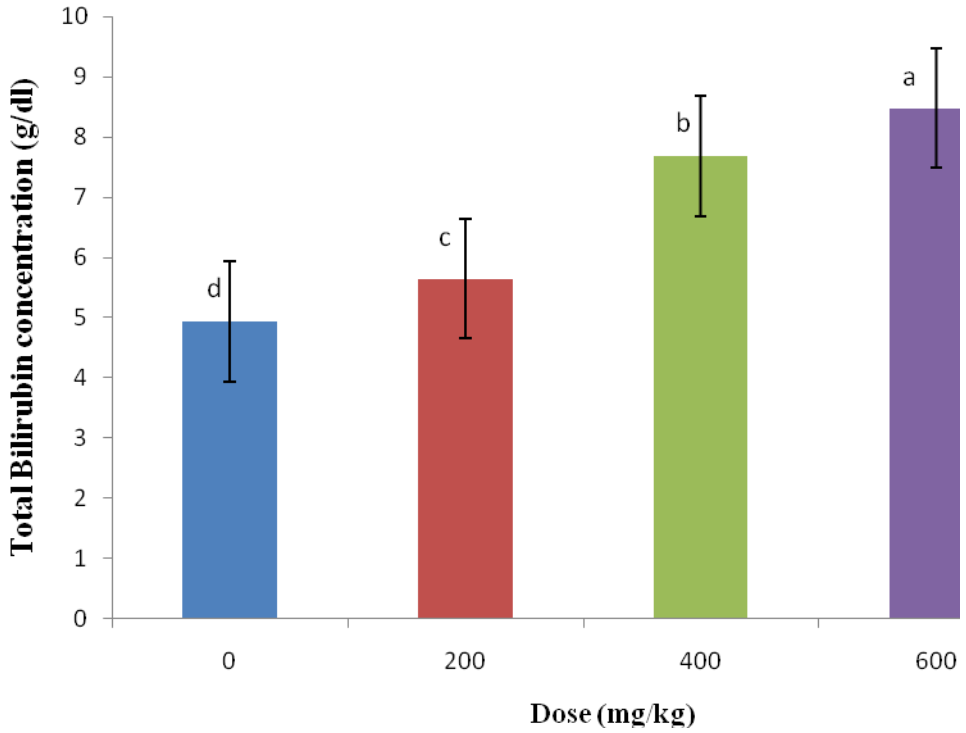

Figure 5: Serum total bilirubin concentrations of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at $p<0.05$.

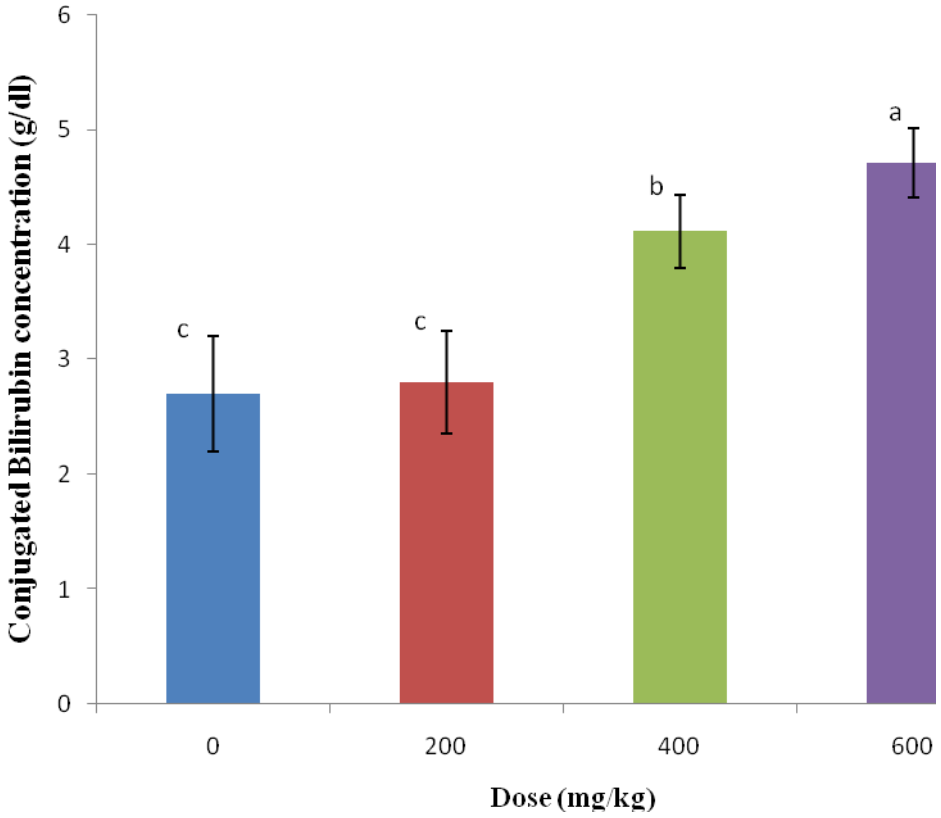

Figure 6: Serum conjugated bilirubin concentrations of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at p<0.05.

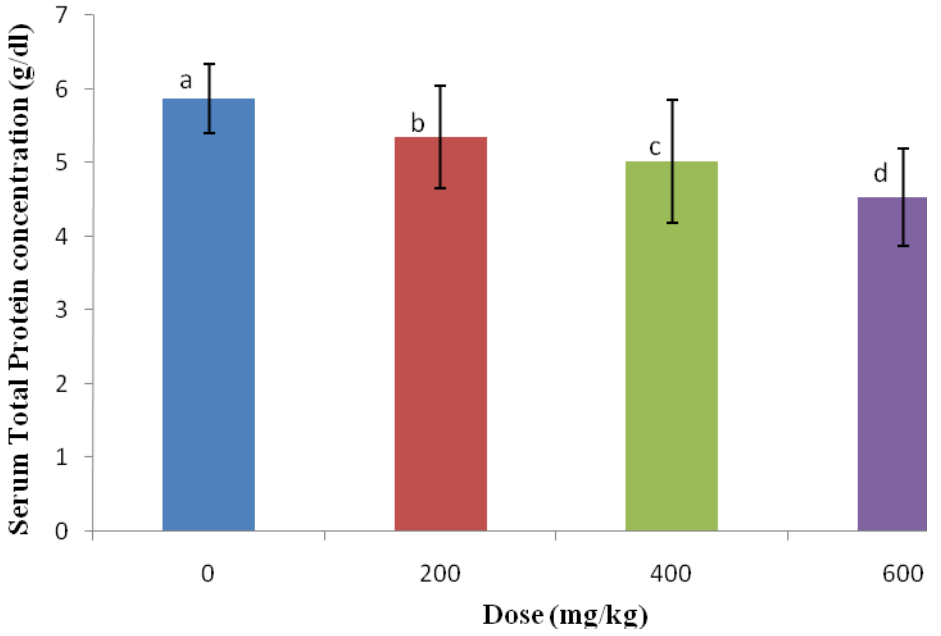

Figure 7: Serum total protein concentrations of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at p<0.05.

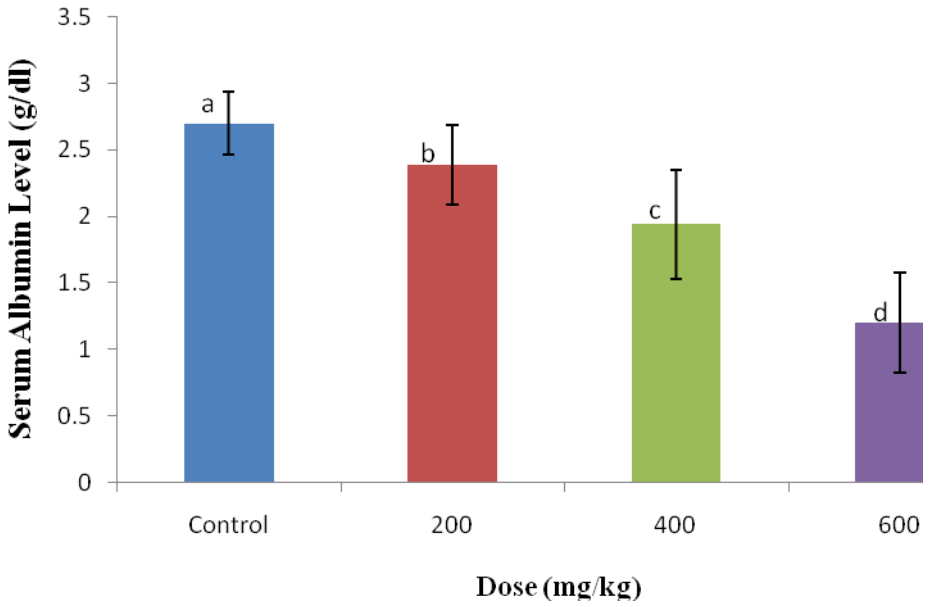

Figure 8: Serum albumin levels of albino rats administered ethanol leaf-extract of *Albizia ferruginea*. Data are shown as mean ± standard deviation (n=6). Mean values with different alphabets show significant difference at $p<0.05$.

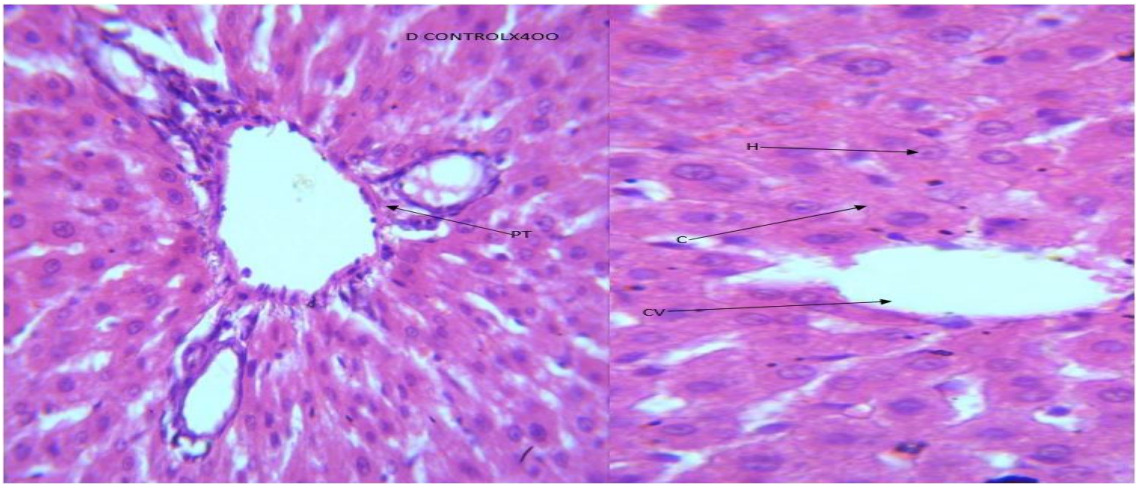

Plate 1: Photomicrograph of rat liver that did not receive the ethanol leaf-extract (x400) (H/E)

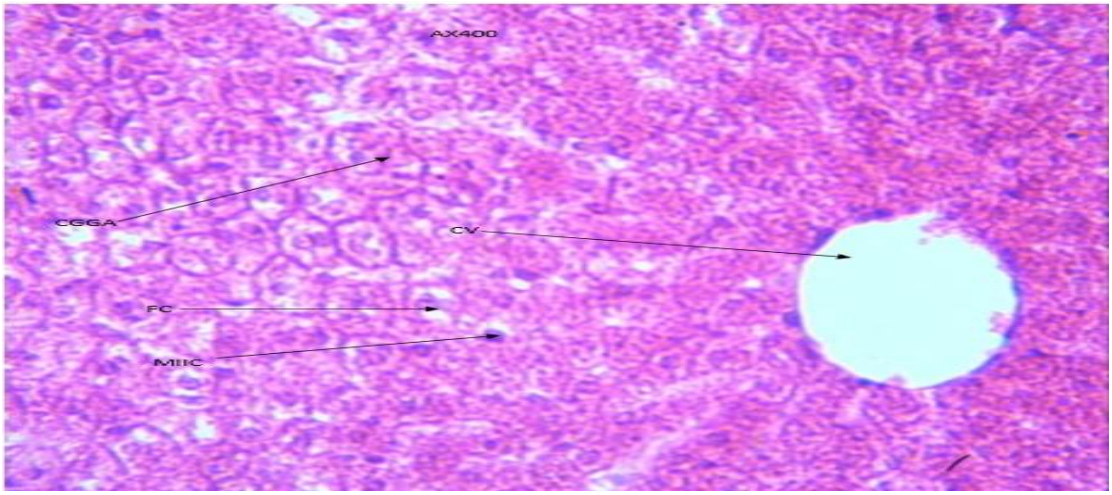

Plate 2: Photomicrograph of rat liver administered 200mg/kg of ethanol leaf-extract (x400) (H/E)

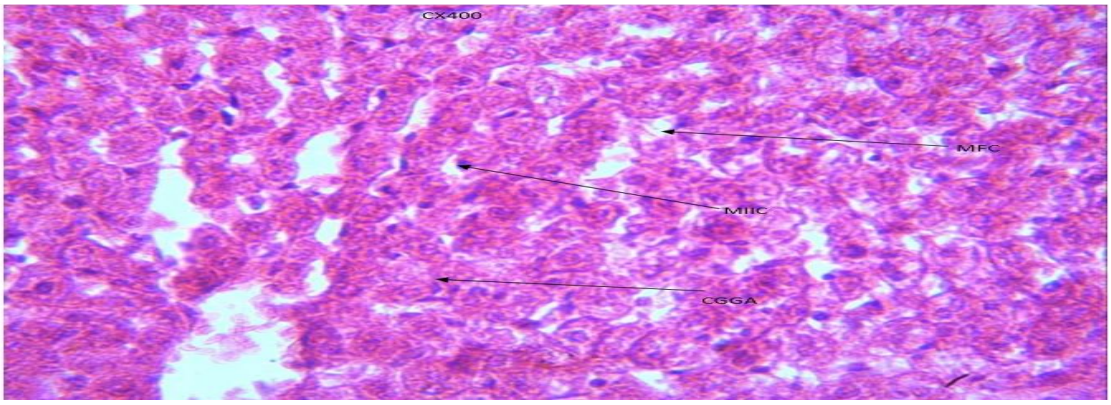

Plate 3: Photomicrograph of rat liver administered 400mg/kg of ethanol leaf-extract (x400) (H/E)

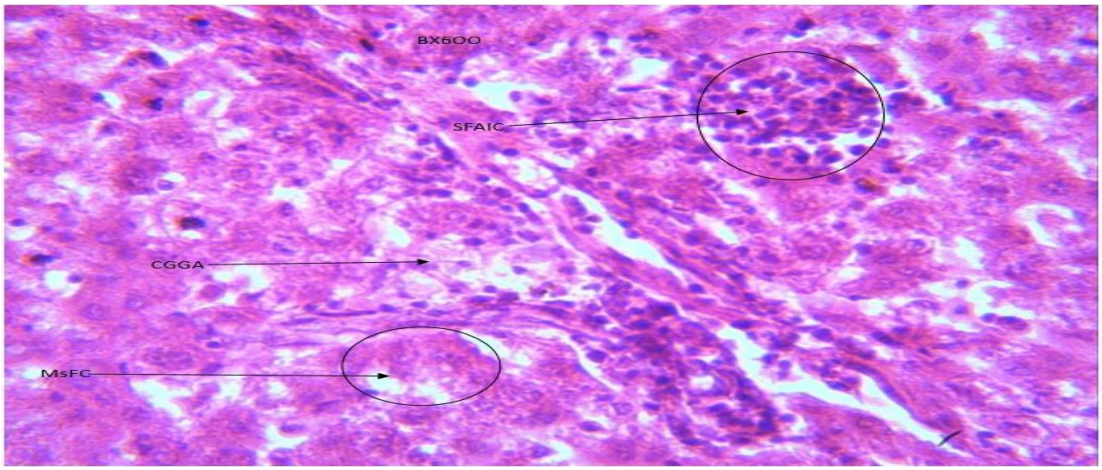

Plate 4: Photomicrograph of rat liver administered 600mg/kg of ethanol leaf-extract (x400) (H/E)

DISCUSSION AND CONCLUSION

The ethanol-leaf extract of *Albizia ferruginea* showed a significant ($p<0.05$) and dose-dependent increase in the activities of alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), concentrations of total bilirubin (TB) and conjugated bilirubin (CB) as shown in figures 2, 3, 4, 5 and 6 respectively. [15] reported that cisplatin significantly elevated aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activity. [16] reported that *Azadirachta indica* extract caused a significant dose-dependent increase in AST, ALT and ALP activities at the doses of 200, 400 and 600 mg/kg while *Vernonia amygdalina* significantly increased the activities of AST, ALT and ALP at 400 and 600 mg/kg body weights. [1] reported that ALP, ALT and AST activities were significantly increased in the female rats administered 250 mg/kg body weight of seed-extract of *Albizzia gummifera*. [17] reported that the serum activities of AST, ALT, and ALP in aqueous and phenolic extracts groups increased significantly. [18] reported that the extract of *Eleophorbia drupifera* decreased AST activity in treated groups compared to the control. [19] reported that the oral pre-treatment and co-administration of aqueous extract of *Moringa oleifera* leaves significantly ($p \leq 0.05$) reduced serum ALT, AST and ALP activities.

There were significant ($p<0.05$) and dose-dependent reductions in the concentrations of total protein (TP) and albumin (ALB) as shown in figures 6 and 7 respectively. [20] reported that total protein and albumin levels significantly increased ($P<0.05$) in *Plasmodium berghei* infected mice treated with ethanol leaf-extract of *Alstonia boonie*. [21] reported a significant increase ($p<0.05$) in total protein and globulin activities in all groups treated with the various fractions *of Vernonia amygdalina* compared to the paracetamol group and no significant decrease in albumin levels. [22] reported that the aqueous leaf-extract of *Maeasobotry abarteri* showed a significant ($p\leq0.05$) decrease in serum total protein and albumin concentrations in the acetaminophen treated groups compared to control. The variations in the results above may be explained by several factors such as climate [23], geography of development of the plant and methods used in analysis [24].The level of metabolites in vegetables depends on a number of factors including genetic properties of the crop species, climatic conditions, soil characteristics and the degree of maturity of the plant at the moment of harvesting [25].

The overall features of the liver in control group were normal; the group that received 200 mg/kg of the extract showed moderated damage on the liver features and a moderate severe damage on the liver of the rats that received 400 mg/kg and there was a severe liver damage of the features of the group that received 600 mg/kg of the extract as shown in plates 1, 2, 3 and 4. [1] reported that the administration of ethanol extract of *Albizia gummifera* seeds to rats showed that there were inflammations, congestions and focal hepatocellular necrosis of the liver tissue. The liver biopsy of rats treated with aqueous and phenolic extracts showed severe degeneration of the hepatocytes, while the group treated with solution of phenol showed little or no significant liver damage and may contribute significantly to liver damage at higher dose [17].

In conclusion, the results of this study show that the ethanol leaf-extract of *Albizia ferruginea* is not safe to the liver as it could likely affect the proper functioning of the liver at the stipulated doses.

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