

## Effect of methanol stem bark extract of *Ochna schweinfurthiana* (Ezeata) on liver enzymes in Wistar rats

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### Abstract

The effects of methanol stem bark extract of *Ochna schweinfurthiana* were studied using Wistar rats. Twenty (20) experimental animals (Wistar rats) were randomly grouped into four groups of 5 rats each. They were allowed to acclimatize for 2 weeks. Rats in group A served as the control and were fed with rat feed and water only, rats in groups B to D were fed with normal rat feed, water and were fed with different doses of *Ochna schweinfurthiana* extracts at 200, 400 and 800mg/kg respectively for 4 weeks. The Animals were sacrificed under anesthesia after the experiment and liver was harvested and the weights were taken. Blood samples were collected for liver enzymes estimation: aspartate transaminase (AST), alkaline phosphate (ALP) and alanine transaminase (ALT) were checked. The extract proved to be hepato-protective as there were significant decrease in the liver function enzymes (AST, ALT, and ALP)  $P < 0.05$ . This may indicate some hepato-protective effect of *Ochna schweinfurthiana*.

**Keywords:** AST; ALP; ALT; *Ochna schweinfurthiana*; Wistar rats

### 1 Introduction

The liver is concerned with many roles which include but not limited to metabolic function where all the food, drugs/ substances entering the gastrointestinal tract are taken for breakdown and detoxification <sup>1</sup>. Liver function is evaluated based on level of the liver enzymes. The liver function tests used to evaluate patients with known or suspected liver disease include: Alanine aminotransferase (ALT), alkaline phosphatase (ALP), aspartate aminotransferase (AST), bilirubin and albumin<sup>2</sup>. liver function test may be ordered for nonspecific symptoms or to confirm pre-clinical suspicion of specific liver and non-liver disease.<sup>2</sup> Recent studies have shown that the common liver enzymes, gamma-glutamyltransferase (GGT) and alanine aminotransferase (ALT), can be used as disease biomarkers which reflect liver function and also associated extra hepatic conditions<sup>3</sup>.

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Liver injury can occur as a result of ingestion of some drugs, chemicals, and herbs. Mechanism of drug-induced hepatic injury include: direct hepatic injury, immune reconstitution, hypersensitivity reaction, and mitochondrial injury<sup>4, 5, 6, 7</sup>.

AST is sensitive indicator of hepatocellular insult but it is not specific as it can also be found in cardiac and skeletal muscles, kidney and red blood cells. In the cytoplasm of the hepatocyte, AST is more abundant than ALT but it is more rapidly cleared with half-life of about 16 to 18 hours than ALT with half- life of 42 to 48 hours. As a result, the upper limit for AST (55 u/l) is higher than that of ALT (45 U/L)<sup>2</sup>.

ALP is found in the liver, bone, kidney, intestine and placenta. In liver injury, ALP is often normal or minimally increased<sup>3</sup>. This is used to differentiate liver parenchymal disease from biliary dysfunction.

*Ochna schweinfurthiana* (Os) belongs to the family of Ochnaceae which is a small tree that was named after Dr. Georg August Schweinfuth, a German taxonomist<sup>8</sup>. It is commonly called 'ezeata' in igbo<sup>8</sup>. brick- red Ochna in English, hieke in Yoruba<sup>9, 10</sup>. This plant for centuries has been used for medicinal, agricultural, religious, social purposes and has been shown by studies to have antimalaria, antihelminthic effects,<sup>11, 12</sup> and used in the treatment of stomach ache, toothache, multiple sclerosis.<sup>10</sup> The most recent study about this plant was done on the reproductive effect in male Wistar rats by<sup>8</sup>.

Due to the use of *Ochna schweinfurthiana* (Os) in ethnomedicine in the treatment of some illnesses, the need to ascertain the effect on the liver prompted this research

This study, therefore, was designed to investigate the effect of the use of *Ochna schweinfurthiana* on the liver enzymes (AST, ALT, ALP) as many herbal drugs have been known to have toxic effect on the liver even at normal dose, or sometimes because of inappropriate dosing.

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## 2 Materials and method

Fresh stem bark of *Ochna schweinfurthiana* was collected from Obukpa, Nsukka Local Government Area, Enugu State, Nigeria. It was authenticated by Mr. Ossai Ikenna Isaac the taxonomist at the Department of Botany, University of Nigeria Nsukka, Nigeria. The voucher was deposited at the herbarium of the department of Botany, University of Nigeria, Nsukka, Nigeria with a voucher number (UNH/04/0232). The stem bark was air dried under room temperature for 14 days.

### 2.1 Preparation of the extract

The methanol extract was done by measuring 500 g of the ground *Ochna Schweinfurthiana* bark powder using a sensitive weighing balance (Bioevopeak, BA-T series). The measured powdered sample was transferred into a 1000ml conical flask and 1000ml of 70 % methanol was added to it and allowed to sit for 36 hours. The mixture was filtered using Whatman filter paper number 4 and the filtrate was placed in a water bath at 100 centigrade for concentration, which was done until methanol was totally eliminated from the extract and paste was formed. The extract was stored in refrigerator between 0- 4 degree centigrade for further use.

### 2.2 Experimental design

The 20 Wistar rats were weighed on purchase from a local farm. They weighed between 90 g – 110 g. The animals were randomly grouped into 4 different groups of 5 rats per group. Group A served as the control group and were fed with rat chow and water, rats in groups B to D were fed with rat chow, water and different doses of the methanol extract of fresh stem bark of *Ochna schweinfurthiana* (200, 400, and 800 mg/kg respectively for 4 weeks).

### 2.3 Sample collection

The animals received the extracts for 4 completed weeks and were scarified under anesthesia and blood samples collected by ocular puncture and spanned in a centrifuge at 4000 RPM for 15 minutes and the serum was collected and sent to the lab for liver function test. The liver function test was conducted using the method of<sup>13</sup>.

### 2.4 Statistical analysis

The data from this study were analyzed using statistical package for social sciences (SPSS-24). Results were presented as mean ± standard error of mean (SEM). P < 0.05 was considered significant.

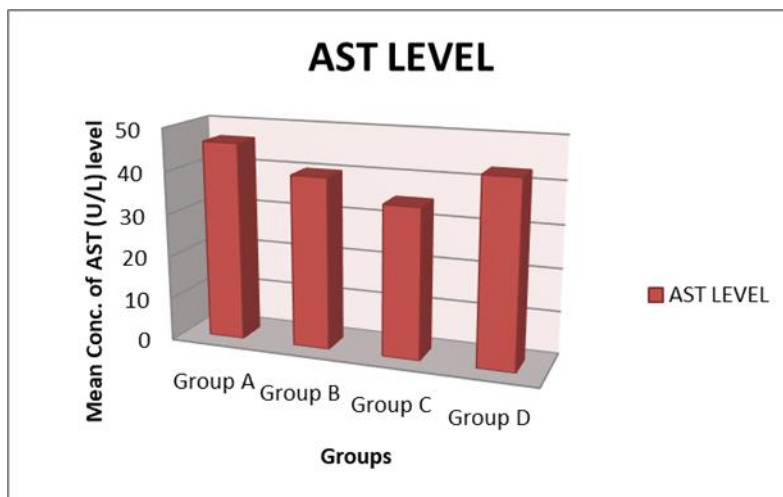
### 3 Results

Table 1. shows the weight of liver. There was statistical difference between the weight of liver of the control group and the rest of the groups (group B to D) as  $P < 0.05$ .

**Table 1** Effect of *Ochna schweinfurthiana*. on liver and Body weight (grams)

Group(s)	Liver(g)**	Body weight (g)
A	7.63	151
	7.47	150
	7.50	149
	7.60	151
	7.53	150
B	5.81	143
	6.43	153
	5.80	141
	6.42	140
	6.12	150
C	6.47	141
	6.36	147
	3.02	70
	6.45	145
	6.02	147
D	5.47	121
	5.19	124
	4.29	103
	5.30	120
	4.91	112

\*Statistically significant Liver function test



**Figure 1** Mean concentration of AST

There was significant decrease in the AST level of Group B and Group C when compared with the control group.

**Table 2** Effect of *Ochna schweinfurthiana*. on AST level

Group	AST (U/L)	Mean
Control (Group A)	48	46.40
	45	
	44	
	47	
	48	
Low dose (Group B)*	39	40.00
	42	
	40	
	38	
	41	
Mediumdose (Group C)**	34	35.80
	36	
	37	
	35	
	37	
High dose (Group D)	37	43.00
	37	
	48	
	46	
	47	

\*Statistically significant

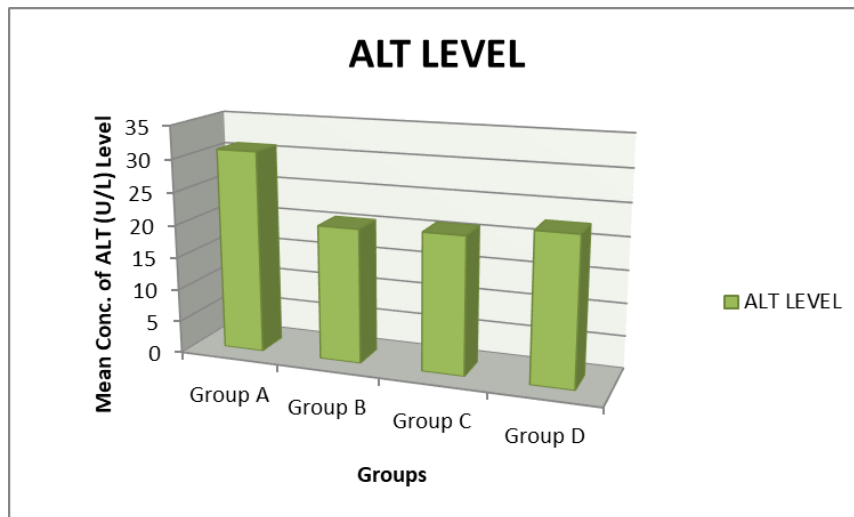
There was a significant decrease in the level of ALT in Group B, Group C and Group D respectively (p <0.05).

**Table 3** Effect of *Ochna schweinfurthiana*. on ALT level

Group	ALT (U/L)	Mean
Control (Group A)	32	31.00
	30	
	31	
	32	
	30	
Low dose (Group B)***	20	20.60
	21	
	20	
	21	

	21	
Mediumdose (Group C)**	21	21.00
	21	
	21	
	20	
	22	
High dose (Group D)**	23	22.60
	22	
	23	
	23	
	22	

\*Statistically significant



**Figure 2** Mean concentration of ALT

There was significant difference between the control group and Group B, Group C, and Group D rats as  $p < 0.05$ .

**Table 4** Effect of *Ochna schweinfurthiana*. on ALP level

Group	ALP (U/L)	Mean
Control (Group A)	130	131.70
	130	
	133	
	135	
	130	
Low dose (Group B)**	122	122.50
	123	
	122	
	123	

	122	
Mediumdose (Group C)**	120	122.90
	123	
	124	
	121	
	124	
High dose (Group D)*	125	124.40
	124	
	124	
	125	
	123	

\*Statistically significant

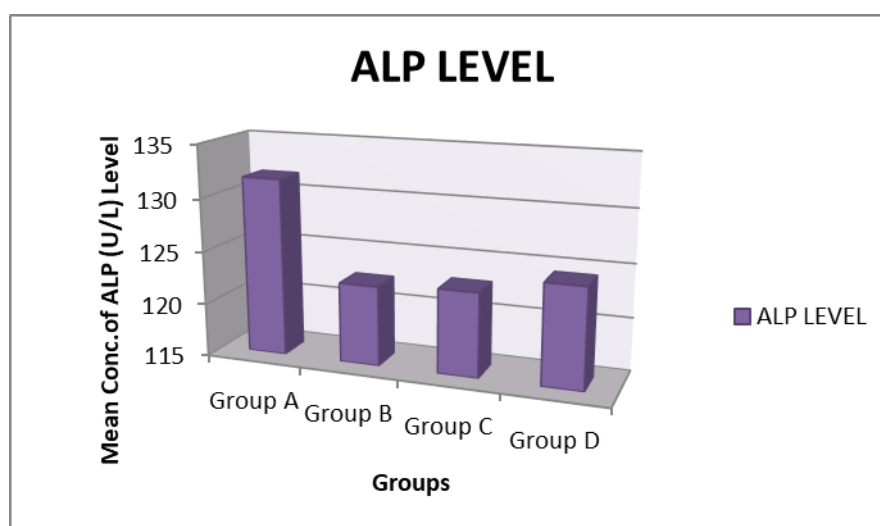


Figure 3 Mean concentration of ALP

There was significant difference between the control group and Groups B, C, and D rats as  $p < 0.05$ .

#### 4 Discussion

Results obtained from the study revealed that there was significant decrease in the level of Liver enzymes and also the organ weights of the liver were significantly reduced in the groups fed with the extract of stem bark of *Ochna schweinfurthiana*. It has been revealed in the study done on *Ochna schweinfurthiana*, by<sup>14</sup> that fractionated stem bark of *Ochna schweinfurthiana* contains phytoestrogen. The liver enzyme activity was shown to be significantly decreased in Group B, C and D respectively at  $p < 0.05$ . AST being an important biomarker enzyme used to determine the health of liver, its decrease may be as a result of protective effect of *Ochna S*. Because AST is not particularly specific to the liver, and ALT and ALP were also done. There was a slight decrease beyond the normal range of each of the liver enzymes and this may indicate some hepatoprotective effect of *Ochna schweinfurthiana*. AST can be used to estimate the extent of organ damage (liver, brain, heart, and kidney) by a substance; hence it is not specific to the liver. Other liver enzymes (ALT and ALP) were also estimated to complement and assess the extent of the damage and or protective effect the extract might have on the liver. Nonetheless, there was significant decrease in the levels of both ALT and ALP when compared with the control group and this might imply that the extract of *Ochna schweinfurthiana* has some hepatoprotective effect. However, a recent study by<sup>8</sup>, revealed that it had adverse effects on male reproductive hormones, testicular activity, and semen analysis.

Phytochemical analysis done on the extract revealed the presence of flavonoids, steroid, terpenes, and saponin. Its physiological actions may be due to these phytochemical constituents<sup>15,16</sup>.

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## 5 Conclusion

*Ochna Schweinfurthiana* is an important medicinal plant in Africa. It is used in ethnomedicine in the treatment of several illnesses. Based on this study the use of *Ochna schweinfurthiana* at current doses is safe for the liver. It significantly decreased liver enzymes, suggesting it may be hepato-protective. It is recommended that further research should be carried out to ascertain the mechanism of action of this medicinal plant.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of ethical approval*

Ethical approval was obtained from the Ethical Committee of the Faculty of Basic Medical Sciences, Chukwuemeka Odumegwu Ojukwu University, Uli campus, Anambra State. Nigeria.

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### Author's short biography



**Dr Cornelius. M. Nwozor** was the former head of department ( HOD) of Physiology. He was recently promoted to the rank of Associate Professor of Human Physiology. Currently he is the Associate Dean, Faculty of Basic Medical Sciences