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Effect Of Aqueous and Ethanol Leaf Extracts Of *Musa Paradisiaca* on Serum Protein, Liver And Kidney Function In Albino Wistar Rats

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Abstract : *The effect of aqueous and ethanol leaf extracts of Musa paradisiaca on serum proteins, liver and kidney function in albino rats was evaluated. Thirty-five (35) albino Wistar rats weighing between 120 -150g were divided into five (5) groups with seven rats in each group. Group A served as control while Groups B and C received 250mg/kg and 1000 mg/kg of the aqueous extract daily for 28 days. Groups D and E received 250 mg/kg and 1000 mg/kg of the ethanol extract daily for 28 days. Blood samples were obtained through cardiac puncture and centrifuged to obtain serum which was used for biochemical assays. Serum liver enzymes (ALT, AST and ALP) activities, protein, bilirubin, urea, creatinine and electrolytes concentration were assayed. The result showed that urea and creatinine levels were significantly ($p<0.05$) decreased in the test groups except in group B which urea and Cl^- were significantly ($p<0.05$) increased. The electrolytes concentrations were non-significantly ($p<0.05$) decreased except K^+ which was non-significantly ($p<0.05$) increased in group B. ALT and AST activities were decrease in all groups except in group B where significant ($p<0.05$) increase was observed. The low dose of aqueous extract of Musa paradisiaca leaf had toxic effect on serum proteins, liver and kidney, while the high dose of aqueous, low and high doses of ethanol leaf extract showed positive effect on the serum proteins and indices of liver and kidney function.*

Keywords - *Musa Paradisiaca leaf, liver enzymes, serum proteins, electrolytes urea, creatinine*

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I. Introduction

Musa paradisiaca, commonly known as plantain belongs to the family Musacease and plays a leading role in nutritional need of millions of people in the developing countries. It is a high status as well as one of the most expensive energy rich foods than other food stuffs (Burgess, 1962) [1]. The leaves are used as wrappers for cooking a number of traditional foods and are also fed to domestic animals. The foliage is also used for packing and as cigarette papers (Grantham and Paul, 1999) [2].

Analysis of plantain revealed a proximate composition of 15% moisture, 9% ash, 19% crude protein, 27% crude fiber and 39% carbohydrate. The plant has also been reported to contain some mineral elements including zinc, calcium, iron, potassium, phosphorus, magnesium, sodium and copper. The phytochemical compositions of the plant include tannin, phytate and hydrocyanic acid, glycoside, apigenin, baicabin, benzoic acid, beta carotene, lutelin, scutellarin, plantagoside and nepetin (El-Niggar and Beal, 1980; Bowers and Stamp, 1992) [3][4]. Antioxidant composition of the plant include: thiamine, riboflavin, nicotinic acid, panthothenic acid and folic acid (Bogert and Nicholas, 1982; Southgate and Paul, 1987; Brody, 1994) [5],[6],[7]. The leaf of the plant has been shown to have a wide range of medicinal benefits.

The plantain fruit have been reported to have no deleterious effect on serum hepatic enzymes in albino Wistar rats (Zilva *et al*., 1992) [8]. The anti-inflammatory property of plantain leaf extract in experimental acetaminophen-induced liver injury has been documented (Hussan *et al*., 2015) [9]. The syrup of plantain leaves extract has been reported to be safe with no sign of toxicity after 14 days of oral administration (Mansoor *et al*., 2017) [10].

Medicinally, plantain leaf is used as an antibacterial, antidote, astringent (Yakubu *et al*., 2007; Ojewole and Adewumi, 2003) [11][12], anti-inflammatory, antidiarrheal (Pannangpetch, 2001) [13], antihelminthic (Gustine, 2001) [14], antihypertensive, antiseptic and cardiac demulcent agents. It is an alternative medicine for asthma, hypertension (Osim *et al*., 1999) [15], rheumatism and blood sugar control (Narayanan *et al*., 2003; Dharma, 1987) [16][17], management of gastric ulcer and relief of colitis (Oke *et al*., 1998; Vijayakumar *et al*., 2009) [18][19]. *Musa paradisiaca* leaf has myriad of the traditional medicinal application.

However, due to limited scientific information on the toxicity of the leaves of *Musa paradisiaca* the present study evaluates the toxicity of aqueous and ethanol leaves extract of *Musa paradisiaca* on serum proteins, kidney and liver of albino Wistar rats after 28 days of oral administration.

II. Methodology

2.1 Plant material and Preparation

Fresh mature leaves of *Musa paradisiaca* were collected from Uyo metropolis, Akwa Ibom State. The plant was identified and authenticated in the Department of Botany and Ecological Studies, University of Uyo, Uyo, Nigeria. The *Musa paradisiaca* leaves were chopped, homogenized and divided into two. One part was macerated in 90% ethanol v/v for 24 hours while the other part was macerated in distilled water for 24 hours. The filtrates were obtained and concentrated in a water bath at 45^0C to obtain the crude extracts.

2.2 Experimental Animals and Design

` Thirty-five adult albino rats weighing between 120 - 150g were obtained from the Animal Breeding Unit of the Department of Pharmacology and Toxicology, University of Uyo. The rats were housed in standard laboratory conditions in the Animal House of Faculty of Basic Medical Sciences, University of Uyo. The rats were fed with standard rat feeds and clean drinking water *ad libitum*. They were selected into five (5) groups with seven rats in each group.

Rats in Group A served as the control group and received only distilled water. Groups B and C received 250 mg/kg b.w and 1000 mg/kg b.w respectively of the aqueous extract of the leaves while Groups D and E received 250 mg/kg b.w and 1000 mg/kg b.w of the ethanol extract of the leaves of *M. paradisiaca* respectively. The extracts were administered orally for 28 days.

2.3 Collection of blood samples

After the administration of the last dosage of the extract, the animals were fasted overnight and then euthanized under chloroform anaesthesia. Blood samples were obtained through cardiac puncture into plain bottles, spun in centrifuge at 3000 rpm for 15 minutes to obtain the serum. The serum was used to assay for biochemical parameters.

2.4 Biochemical Assays

The serum levels of biochemical parameters were assayed using commercially available diagnostic assay kits (Randox Laboratories, United Kingdom). Serum levels of AST and ALT were estimated using the method described by Reitman and Frankel (1957) [20]. Serum ALP concentration was determined using α-Naphthylphosphate method (Sood, 2006) [21]. The procedure described by Jendrassik and Goff, (1938) [22], was employed to assay for total and conjugated bilirubin while serum total protein, albumin and globulin was based on the methods of Bowers and Stamp, (1992) [23]. The method described by Baker, (2001) [24] was utilized to assay for serum creatinine levels. Electrolytes concentrations were estimated using colorimetric method.

2.5 Statistical Analysis

All results were expressed as Mean ± Standard Error while the level of significance was placed at $P<0.05$. One-way ANOVA and least significance difference (LSD) post hoc multiple comparisons were performed using SPSS version 20.0 (IBM Statistics, UK).

III. Results

The effect of ethanol and aqueous extracts of *Musa paradisiaca* leaf on biochemical parameters in albino Wistar rats are presented in Tables 1, 2 and 3.

Table 1.0: Effects of the Extracts of *Musa paradisiaca* Leaf on Serum Enzyme Activity in Albino Wistar Rats

Parameters	Group A (Control)	Group B (AE-250mg/kg)	Group C (AE-1000mg/kg)	Group D (EE-250mg/kg)	Group E (EE-1000mg/kg)
AST (IU/L)	36.0 ± 0.02	75.6 ± 0.01*	13.0 ± 0.01	31.0 ± 0.02	27.0 ± 0.01
ALT (IU/L)	11.2 ± 0.01	50.0 ± 0.04*	4.8 ± 0.02	9.6 ± 0.01	9.6 ± 0.02
ALP (IU/L)	281.0 ± 0.03	81.0 ± 0.02	148.0 ± 0.04	150.0 ± 0.01	128.0 ± 0.01

Values are expressed as Mean ± SEM, n=5, *P<0.05: AE=Aqueous Extract; EE= Ethanol Extract

Table 2.0: Effects of the Extracts of *Musa paradisiaca* Leaf on Serum Creatinine, Urea and Electrolytes in Albino Wistar Rats

Parameters	Group A (Control)	Group B (AE-250mg/kg)	Group C (AE-1000mg/kg)	Group D (EE-250mg/kg)	Group E (EE-1000mg/kg)
Creatinine (µmol/L)	1056.0±0.02	1360.0 ± 0.03	210.0 ± 0.01	750.0 ± 0.01	809.0 ± 0.01
Urea (µmol/L)	34.9 ± 0.04	58.1 ± 0.01*	13.3 ± 0.02	19.9 ± 0.01	24.9 ± 0.01
Cl^- (Mmol/L)	94.0 ± 0.02	100.0 ± 0.02*	94.0 ± 0.02	91.0 ± 0.02	91.0 ± 0.01
K^+ (mmol/L)	6.1 ± 0.01	7.2 ± 0.02	4.8 ± 0.02	5.8 ± 0.02	5.9 ± 0.01
Na^+ (mmol/L)	203.0 ± 0.01	182.0 ± 0.01	170.0 ± 0.01	250.0 ± 0.01	171.0 ± 0.01

Values are expressed as Mean ± SEM, n=5, *P<0.05: AE=Aqueous Extract; EE= Ethanol Extract

Table 5.0: Effects of the Extracts of *Musa paradisiaca* Leaf on Serum Bilirubin and Protein concentration in Albino Wistar Rats

Parameters	Group A (Control)	Group B (AE-250mg/kg)	Group C (AE-1000mg/kg)	Group D (EE-250mg/kg)	Group E (EE-1000mg/kg)
Conj. Bilirubin (µmol/L)	4.9 ± 0.03	7.4 ± 0.01*	2.5 ± 0.02	4.9 ± 0.01	2.5 ± 0.01
Total Protein (g/L)	77.0 ± 0.01	94.0 ± 0.01*	70.0 ± 0.00	70.0 ± 0.01	67.0 ± 0.01
Albumin (g/L)	42.0 ± 0.01	47.0 ± 0.01*	38.0 ± 0.01	42.0 ± 0.01	36.0 ± 0.01
Globulin (g/L)	35.0 ± 0.01	47.0 ± 0.01*	32.0 ± 0.01	28.0 ± 0.01	31.0 ± 0.01

Values are expressed as Mean ± SEM, n=5, *P<0.05; AE=Aqueous Extract; EE= Ethanol Extract

IV. Discussion

Serum activities of the liver enzymes have been used as a good indicator of not only the functionality and cellular integrity of the liver (Lavanaya *et al.,* 2011) [25] but as well, to assess the functional health status and the internal environment of the organism (Rehman *et al*., 2006) [26]. Normally, an elevation in serum enzyme activities may indicate an inflammation or damage to the hepatocytes (Sood, 2006) [21]. Inflamed or injured liver cells release higher than normal amounts of certain chemicals, including liver enzymes into the blood stream thereby resulting in elevated concentration of the liver enzymes in the blood. The low dose of the aqueous extract caused a significant increase in the serum levels of liver enzymes and is an indication that it had a negative impact on the hepatocytes. The aqueous extract at high dose and ethanol extract at both doses appeared not to cause any damage to the liver cells thus, not inducing any form of liver damage nor dysfunction (Crook, 2006) [27]. Plant extracts have been observed to either exert hepato-protective or hepatotoxic effect.

An elevation in the serum levels of electrolytes, urea and creatinine in clinical analyses presupposes renal dysfunction. Urea and creatinine are major catabolic products of protein metabolism usually excreted by the kidneys (Mehrdad *et al*., 2011) [28]. The absent of significant difference in the serum creatinine and electrolytes concentrations indicate that the extract had no negative effect on the kidneys. This implies that the leaf extract did not impair the functioning renal tubular mass as well as its regulatory functions.

Hyperbilirubinaemia may be due to the obstruction of biliary tract resulting in the regurgitation of bilirubin into the blood. This can manifest in conditions such as infectious hepatitis, gall stone or cancer of the head of pancreas (Robbert, 2000) [29]. The elevated concentration of bilirubin in the group administered with low dose of the aqueous extract suggests that it might have caused haemolysis in the rats. High dose of aqueous extract as well as both doses of ethanol extract did not exert this effect. The observed effect of the low dose of aqueous extract may be attributed to phytochemicals such as glycoside, aucubin, catalpol present in the leaves.

V. Conclusions

The aqueous and ethanol extracts of *Musa paradisiaca* leaves have been shown to have varying effects on biochemical parameters in albino Wistar rats. High dose of aqueous extract and the ethanol extract had no deleterious effect on the liver while low dose of aqueous extract showed increase activities of serum liver enzymes. Similarly, indices of kidney function were adversely affected by low dose of aqueous extract of *Musa paradisiaca* contrary to the ethanol extracts.

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