Histological Effects of Ethanolic Leaf Extract of Musa paradisiaca on the Organs of Albino Rat

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Abstract- ***The leaves of Musa paradisiaca commonly known as plantain are used for a number of purposes including wrappers for certain indigenous foods, animal feed and treatment of certain heath conditions due to their medicinal properties including antibacterial, antidote, astringent, anti-inflammatory, antidiarrheal, anthelminthic, antihypertensive, antiseptic, and cardiac demulcent. Despite the usefulness of Musa paradisiaca leaves especially for medicinal purposes, several studies have linked the ingestion of herbal remedies to deterioration of certain key organs such as kidney, liver, heart and the spleen. The current study therefore was designed to investigate the effect of the ethanolic leaf extract of Musa paradisiaca on the histology of the liver, kidney, heart and spleen of female Wistar albino rats. Ten (10) rats weighing 150-250 g were divided into two groups (Group A and Group B). Group A was administered distilled water only, while group B was administered the ethanolic leaf extract of Musa paradisiaca in appropriate concentrations depending on the animal weight for a period of 21 days. Photomicrograph results obtained from the histological study showed normal heart and spleen histology of the treated group administered ethanolic leaf extract of Musa paradisiaca. However, there were observed signs of necrosis in the liver and mild interstitial congestion in the kidney of the treated group administered ethanolic leaf extract of Musa paradisiaca. Result from the study points to the fact that the leaves of Musa paradisiaca may pose a threat on the kidney and liver.***

Indexed Terms- ***Extract, Histology, Organs, Photomicrograph, Musa-paradisiaca***

I. INTRODUCTION

Apart from their use as dietary supplements, natural plant-derived products find application in pharmaceuticals and various healthcare products (Ugbogu et al., 2020). Herbs, herbal materials, herbal preparations, and finished herbal products that comprise plant parts and other plant materials or combinations as active components are referred to as herbal medicine by the World Health Organization (WHO) (Victor et al., 2023). Research findings indicate that over 60% of individuals use herbal remedies without consulting a physician, as a result of their strong convictions on their efficacy and safety (Amorha et al., 2018). While many use these treatments in the hopes of experiencing positive outcomes, there is a chance that they may have negative consequences body organs and consequently functions thereby necessitating the need for further research (Victor et al., 2023).

Musa paradisiaca commonly known as plantain is an herbaceous, perennial, monocotyledonous plant in the Musacaceae family belonging to the genus Musa together with Musa sapientum commonly referred to as bananas (Ajijolakewu et al., 2021). Different parts of Musa paradisiaca such as the pulp, peel, shoot, root, fruit, seed, inflorescence, and flower have been found to be useful for either nutritional or medicinal purposes (Agama-Acevedo et al., 2016). While the leaves of Musa paradisiaca are used as wrappers for cooking a number of traditional foods and as feed for domestic animals, they also have a number of traditional medicinal application including antibacterial, antidote, astringent, anti-inflammatory, antidiarrheal, anthelminthic, antihypertensive, antiseptic, cardiac demulcent agents and also serve as an alternative medicine for asthma, hypertension,

rheumatism and blood sugar control, management of gastric ulcer and relief of colitis (Etim et al., 2018).

A number of studies have reported renal tubular lesions including inflammatory cell infiltration, degeneration, and necrosis of renal tubular epithelial cells caused due to ingestion of herbal medicinal remedies (Luo et al., 2018). More specifically, a study involving the exposure of rats to plant extracts revealed histopathological changes in the kidney showing acute tubular necrosis with diffused interstitial and glomerular hemorrhage, hence suggesting irreversible cellular injury affecting the epithelial parenchyma and endothelial cells (Lloyd et al., 2013). In line with this finding, a study by Victor et al. (2023) on the effect of premature Musa paradisiaca pulp extract on the histology of the liver and kidneys of female Wistar rats, reported induced nephrotoxic and hepatotoxic changes in rats treated with the extract. From the foregoing therefore, while the leaf of Musa paradisiaca may be a useful herbal remedy in treating a number of health conditions, it may also be associated with toxic effects on key organs such as the liver and kidney (Prabha et al., 2011; Victor et al., 2023). The current study therefore was designed to check the effect of ethanolic leaf extract of Musa paradisiaca on important organs including the spleen, liver, kidney and heart.

II. MATERIALS AND METHODS

2.1 Plant material

Fresh Musa paradisiaca leaves were collected using a cutlass at a plantation located at Ukpenu, Ekpoma Edo State Nigeria and taken to the Ambrose Alli University Herbarium for identification.

2.2 Experimental animals

Ten (10) female Wistar albino rats weighing between 0.15-0.25kg (150-250 g body weight) were obtained from college of Medicine animal house, Ambrose Alli University Ekpoma, Edo State Nigeria. The animals were housed in daily cleaned and weekly disinfected standard iron cages at room temperature and average humidity.

2.3 Preparation of Extract

The leaves of Musa paradisiaca separated from the stalk were sliced into smaller pieces with a kitchen knife and air dried under shade for 12 days, after which it was ground using a blender to obtain a homogenous powder weighing 20g. Extraction was done by dissolving 20g of the weighed powder in 200ml ethanol in a volumetric flask. After 48 hours of thorough maceration, the mixture was filtered into a beaker using Whatman filter paper. The obtained filtrate was concentrated under mild temperature using a water bath. The concentrated sample was then dissolved using 100ml of distilled water to make the stock ethanolic extract.

2.4 Experimental design

The ten (10) Wistar female albino rats were divided into two (2) groups of five rats depending on their weight with group A as the control group while Group B was the treatment Group. The rats were allowed five (5) days to acclimatize to the environment before the commencement of the experiment. The rats were fed with growers mash feed and given adequate water throughout the period of the research.

2.5 Administration of Musa paradisiaca extract

34.5ml of the stock ethanolic extract of Musa paradisiaca was taken and diluted in 200ml distilled water. 3ml of distilled water was administered to the control group (Group A) while the treatment group (Group B) was given 3ml of the diluted ethanolic extract. The administration for both groups was through the viscera and was done through 21 days.

2.6 Animal sacrifice

After the 21st day, the body weight of the rats was obtained using a digital weighing balance; the rats were thereafter anaesthetized using chloroform and humanely sacrificed. The animals were then dissected to harvest the liver, heart, kidney and spleen which were transferred into standard bottles containing formalin buffer.

2.7 Histological study

The tissues were each trimmed to about 3mm thickness to enable good fixation in 10% formalin. Dehydration, clearing and embedding were done in ethanol, xylene and paraffin respectively. After preparation and staining with hematoxylin and eosin (H&E), a photomicrograph of the slides was taken using photographic microscope.

III. RESULTS

3.1 Histology of liver of control and treated group with Musa paradisiaca leaf extract

The histological result of the effect of ethanolic leaf extract of Musa paradisiaca on the liver of an adult female albino rat showed that the control group (Figure 1) has normal histology at x400 with the basophilic hepatocytes (H), the Sinusoids (S) and the Central veins clearly observable. The liver section of the treated group (Figure 2) however shows signs of necrosis with the tissue Sinusoids (S) and hepatocyte (H) at x400 in comparison with the control group.

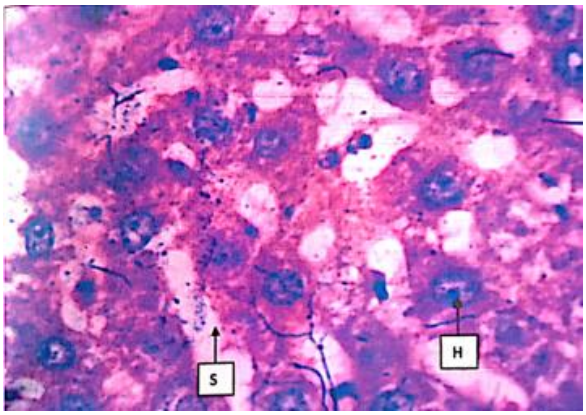

Figure 1: photomicrograph of rat liver section of control group administered distilled water (H&E, x400)

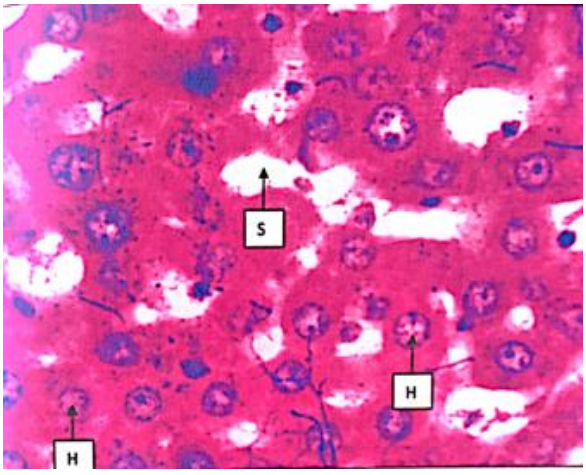

Figure 2: photomicrograph of rat liver section of treated group administered Musa paradisiaca ethanolic leaf extract (H&E, x400)

3.2 Histology of the Kidney of control and treated group with Musa paradisiaca leaf extract

The kidney section of the control group (Figure 3) shows normal histology at x100 with the renal Corpuscle (C) and the intersection (i) at 1x100 clearly observable. The kidney section of the treated group (Figure 4) shows the renal corpuscle, kidney tubules (T) and mild interstitial congestion when compared to that of the control group.

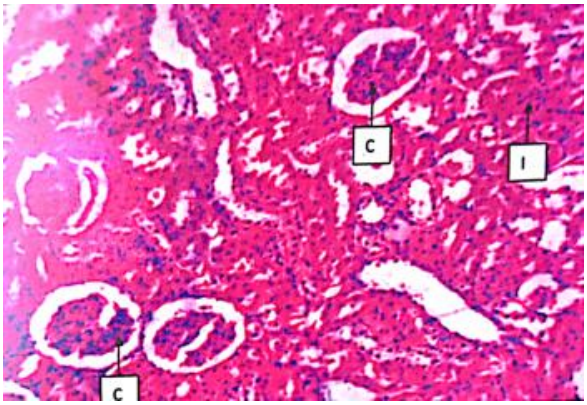

Figure 3: photomicrograph of Kidney section of control group administered distilled water (H&E, x100)

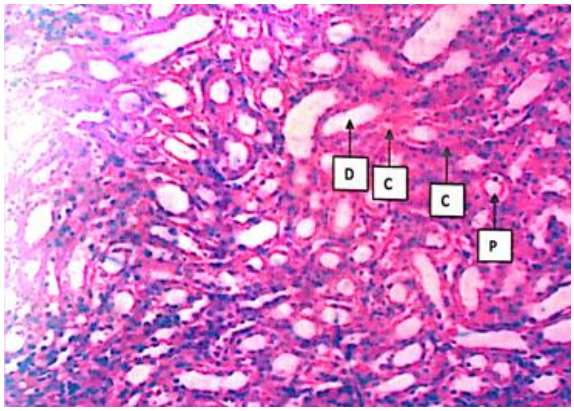

Figure 4: photomicrograph of Kidney section of treated group administered Musa paradisiaca ethanolic leaf extract (H&E x400)

3.3 Histology of the heart of control and treated group with Musa paradisiaca leaf extract

The heart section of the control group (Figure 5) composed mainly of myocardial fiber (A) and interstitial space (B) shows normal histology at x400. The treated group (Figure 6) section of the heart shows normal histology of myocardial fiber (A) and interstitial space (B) when compared to the control group.

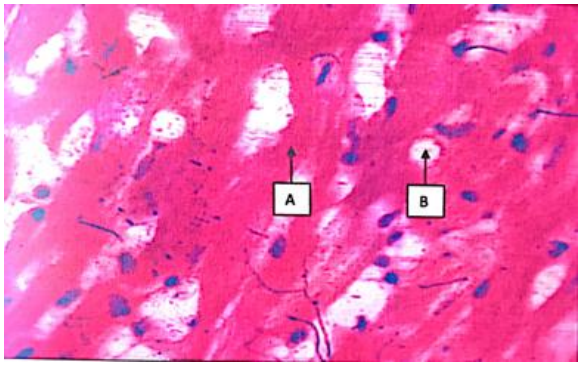

Figure 5: photomicrograph of heart section of control group administered distilled water (H&E x400)

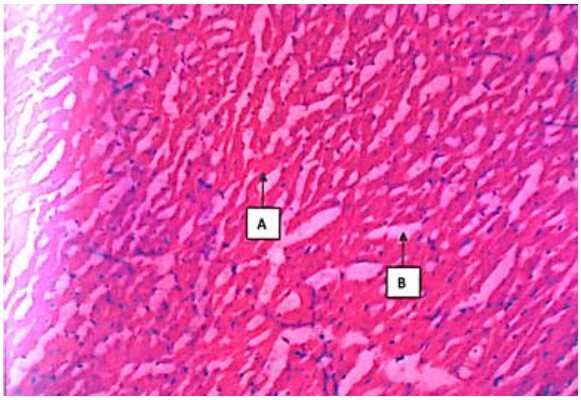

Figure 6: photomicrograph of heart section of treated group administered Musa paradisiaca ethanolic leaf extract (H&E x400)

3.4 Histology of the spleen of control and treated group with Musa paradisiaca leaf extract

The splenic tissue section of the control group (Figure 7) composed mainly of peri-arterial lymphoid sheath with germinal center (G) shows normal histology at x100. The splenic section of the treated group (Figure 8) also shows normal histology when compared to the control as the peri-arterial lymphoid sheaths with germinal center (G) are clearly observable.

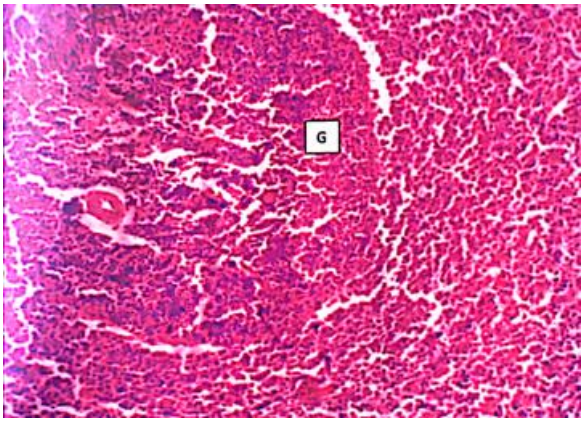

Figure 7: photomicrograph of spleen section of control group administered distilled water (H&E x100)

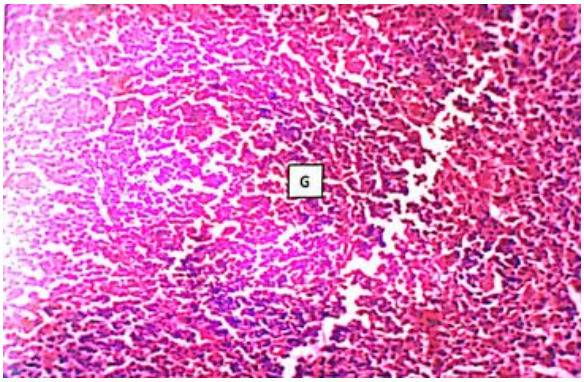

Figure 8: photomicrograph of spleen section of treated group administered Musa paradisiaca ethanolic leaf extract (H&E x100)

IV. DISCUSSION

Various parts of *M. paradisiaca* are used in traditional medicine in the management or treatment of a number of health conditions including diabetes, diarrhea, burns, hypertension, marasmus, bites, hemorrhage and ulcers (Ugbogu et al., 2018). According to Asuquo & Udobi (2016) the leaf juice of Musa paradisiaca is used in the treatment of fresh wounds, cuts and insect bites. Despite the usefulness of different parts of Musa paradisiaca, a number of studies have established potential toxicities associated with some plants and vegetables including hepatotoxicity, nephrotoxicity, and cancer (Nalimu et al., 2021). This hence necessitated the study on the effect of the ethanolic leaf extract of Musa paradisiaca on relevant oragans in female wistar albino rats.

The liver and kidney are the main organs of biotransformation in the body, hence the pathological changes observed in the liver and kidney (Figure 2 and Figure 4) of the treated experimental group may not be surprising. This pathological change may be as a result of exposure to some harmful phytochemical or substance present in the extract (Yang et al., 2018). This result is in line with the study conducted by Victor et al. (2023) in which the ethanolic extract of premature Musa Paradisiaca pulp showed nephrotoxic and hepatotoxic effect. In an earlier study by Ogunk-Nnoka et al. (2012), the histological effect of ethanolic leaf extract of sorghum bicolour on the liver and kidney of rats showed presence of lesions in these tissues suggesting toxicity of the extract. These changes can be attributed to presence of liver injuries leading to distinct morphological abnormalities such as loss of sinusoidal fenestrations (Greuter et al., 2016).

The absence of lesion or cyto-architectural distortion observed in the heart and spleen sections of the treated group may be attributed to the short duration of the experiment. It is possible that the tissue sections may possess histological lesions from 28days and above. The absence of lesions observed in these two tissues (heart and spleen) is consistent with the study on the effect of ethanolic leaf extract of moringa leaf on rat organs in which the kidney, liver, heart and spleen possessed normal histology (Owolabi & Ogonnaike, 2014).

CONCLUSION

In conclusion, though the leaves of Musa paradisiaca have a number of uses both nutrient and medicinal wise the study provides evidence that its use may likely cause liver and kidney damage.

COMPETING INTERESTS

The author has declared that no competing interests exist.

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