https://dx.doi.org/10.4314/dujopas.v10i4a.17
ISSN (Print): 2476-8316
ISSN (Online): 2635-3490
Dutse Journal of Pure and Applied Sciences (DUJOPAS), *Vol. 10 No. 4a December 2024*

Effects of Aqueous Extract of Banana *(Musa Spp)* Blossom and Silymarin Ameliorates on Lead Acetate Induced Hepatorenal Toxicity in Albino Wistar Rats

Ayuba, Y.,[1*] Buba M. A.[2] Ishyaku, I.,[2] Musa, A.,[1] Ikipwen, T. N[1]., Buba, M.,[1] Saleh, M. S[3] Joseph, E.[4] Rabiu, M. S.[5] Adamu, S.[6] and Makena W.[1]

[1]Department of Human Anatomy,
Faculty of Basic Medical Sciences,
College of Medical Sciences
University of Maiduguri,
Maiduguri, Borno State,
Nigeria.

[2]Department of Human Anatomy,
Faculty of Basic Medical Sciences,
Yusuf Maitama University Kano,
Kano State
Nigeria.

[3]Department of Anatomy,
Faculty of Basic Medical Sciences
Bayero University
Kano

[4]Khaldia Dispensary
Ministry of Health Taif,
Saudi Arabia.

[5]Farsha General Hospital
Aseer Region Serrate Abida Governorate
Kingdom of Saudi.

[6]Emergency Department,
Turba General Hospital, Tafi,
Kingdom of Saudi Arabia.

Email: yohanaayuba15@gmail.com

Abstract

This study was on the effect of banana blossom (Musa acuminate) against lead acetate induced hepatorenal toxicity in albino Wistar rats. Thirty albino Wistar rats were divided into 6 groups of 5 rats each. Group A served as the control group. Group B received 150mg/kg of lead acetate solution. Group C received 150mg/kg of lead acetate and 200mg/kg banana blossom aqueous extract. Group D received 150mg/kg of lead acetate and 400mg/kg banana blossom. Group E received 150mg/kg of lead

Author for Correspondence

acetate plus 100mg/kg Silymarin. Group F received banana blossom only. Lead acetate administration was for 14 days followed by banana blossom and silymarin treatment for 21 days. Animals were sacrificed by injecting them with ketamine and their blood samples collected by cardiac puncture in plain EDTA bottles. Kidney and liver were harvested and fixed in neutral buffered formalin and processed for Hematoxylin and eosin. The results of this study showed that banana blossom was able to significantly ($p<0.05$) increased body weight while kidney and liver to body weight relative ratio were not affected. Lead acetate significantly increased aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activity while banana blossom and silymarin was seen to significantly reduced the increased caused by lead acetate. Changes observed in Kidney function parameter were not statistically significant at $p<0.05$. Histological observation showed that lead acetate was able to cause severe widespread degeneration and disruptions of the kidney glomerulus and glomerular tubules. It also caused disruption of the hepatocytes and sinusoids while banana blossom and silymarin was able to ameliorate the effect of lead acetate. Banana blossom may have protected the kidney and liver to some degree from acute and chronic degeneration caused by lead acetate. Banana blossom can serve as alternate antioxidant against free radicals with relatively no morphological hazard to the kidney and liver at doses used in this study.

Key words: Albino rats; Banana bossom; Hepatorenal; Histology; Lead acetate; Orogastric; Silymarin and Toxicity.

INTRODUCTION

Lead is a soft white crystalline heavy metal which is soluble in water with a sweetish taste found in the earth crust. It has a melting point of 280^{o}C found in the earth crust since 5000BC ((Greenwood and Earnshaw, 1997). Lead acetate is a lead compound that when dissolved in water it forms the trihydrate, Pb(CH3COO)2.3H2O, a colorless or white monoclinic crystalline substance that is commonly known as sugar of lead. The commercial form of lead acetate, lead acetate trihydrate, is used as a mordant in textile printing and dyeing, as a lead coating for metals, as a drier in paints, varnishes, and pigment inks, and as a colorant in hair, dyes leaded fuel, paints, in some cosmetic product, car batteries, coating of cans, waterproofing, insecticides, gold cyanidation process, cables and pipes among others (Greenwood and Earnshaw, 1997). In general sources of lead include; mining, agriculture, coal production and burning (Greenwood and Earnshaw, 1997; Ab Latif *et al.*, 2015; Kim *et al.*, 2020).

Lead is one out of four heavy metals that have the most damaging effects on human health. It enters the human body through uptake of food (65%), water (20%) and air (15%) (Lenntech, 2022).

Foods such as fruits, vegetables, meats, grains, seafoods, soft drinks and wine may contain significant amounts of lead (Kim *et al.*, 2020). Cigarette smoke also contains small amount s of lead. Lead can enter (drinking) water (Aliyu *et al.,* 2020), through corrosion of pipes. This is more likely to happen when the water is slightly acidic. That is why public water treatment systems are now required to carry out pH-adjustments in water that will serve drinking purposes (Aliyu *et al.*, 2020). For as far as we know, lead fulfils no essential function in the human body, it can merely do harm after uptake from food, air or water (Lenntech, 2022).

Banana Blossom

Banana (*Musa spp.*), belongs to the family Musaceae, are the perennial monocotyledons commonly grown in the tropics situated at latitude 20° above and below the equator, where there is a wide seasonal variation in rainfall and temperature (Pua, 2007).

Banana blossom is the edible flower of a species of tropical and subtropical banana known scientifically as *Musa acuminata* (Timsina and Kilingar 2014). It originated in Malaysia, and spread to India and Myanmar. Banana flower is often cooked like a vegetable. For example, in Sri Lanka, it's enjoyed in dishes like vazhaipoo (stir-fry) and keselmuwa (curry) (Morilla, 2014).

Banana flower can also be steeped as a tea and taken as a nutritional supplement. Its taste is pleasant, slightly sweet but the sap between the petals should be removed before cooking because it has a bitter taste (Sheng, 2010). It is soaked in lemon water to reduce its bitterness. Like the fruit, the flower's leaves are perishable and will turn brown or black when exposed to air. Therefore, the outer layers of the peels should not be removed until when it is ready for use (Tin *et al*., 2016). As the banana bunch grows, some farmers may cut off these purple-colored blossoms to decrease the weight on the banana branches and ensure the nutrients go to the banana fruits (Novella *et al*., 2023).

Banana blossom is incredibly nutrient-dense, providing fibre, antioxidants and high amounts of numerous minerals. It may have offer digestive, blood sugar, cholesterol, bone health, and prostate health benefits ((Timsina and Kilingar 2014).

Previous research suggested that the antioxidants in banana blossoms may have properties that help to prevent certain types of cancer and diabetes. The study also noted that the antioxidants found in banana blossoms, quercetin and catechin, may interfere with an enzyme that assists with carbohydrate absorption, thereby decreasing blood sugar levels after eating. However, with very few research studies of banana blossoms involving human participants, evidence of the potential health benefits of the flower is limited (Novella *et al*., 2023). Banana blossoms are particularly high in insoluble fibre, an indigestible fiber that bulks up stools to ensure that waste moves through the colon (Novella *et al*., 2023).

Figure 1: Banana Fruits Cluster and Blossom. Source: (Simone *et al*., 2022).

Lead has been used by humans for many centuries. This easily worked and corrosion-resistant metal has been used for pipes, pewter and paint since Roman times. It has also been used in lead glazes for pottery and in this century, insecticides, hair dyes and as an anti-knocking additive for petrol. All these uses have now been banned, replaced or discouraged as lead is known to be detrimental to health. Lead poisoning also can induce brain, blood, spleen, pancreatic and even hepatorenal dysfunctions. Banana blossoms have many nutritional and medicinal properties as well as function in organs and system of humans. Banana flower/blossoms has been used in traditional medicine across the Americas, Asia, Oceania, India, and Africa to treat various ailments (Devje *et al*., 2022). Therefore, this study was carried out to ascertain the medicinal benefit of banana blossoms and its ameliorative effect on lead acetate toxicity against the liver and kidney in Albino Wistar rats.

MATERIALS AND METHOD

Study area
This study was conducted in the Animal House Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Medical Sciences University of Maiduguri, Borno State Nigeria.

Collection of samples
Banana blossom was collected in Maiduguri, Borno State, Nigeria, during the dry season (April, 2023), from a backyard garden. Mr. Philip Edward, a plant taxonomist with the Department of Biological Sciences in the Faculty of Science at Maiduguri University in Nigeria, verified the plant's authenticity. A voucher specimen number (UMM/FPH/MUS/001) was placed at the University Of Maiduguri Herbarium Department Of Pharmaceutical Sciences. Banana blossom was divided into pieces and allowed to air dry for seven days.

The animals were subsequently sacrificed on the 36th day by given the animals a single dose of 150mg/kg ketamine injection. The liver and both kidneys were removed by performing an anterior-median incision on the abdominal wall and the extra fats and fascia were cleared, pieces of the liver and the kidney was cut and fixed in neutral buffered formalin (NBF).
Blood samples were collected into sterilized EDTA bottles by cardiac puncture using a syringe and needle which were used for liver and kidney function test.

Plant Extraction
The dried banana blossom was crushed with a mortar and pestle after drying. According to Trease and Evans (2002), Three hundred and sixty grams of the dried powder were subjected to soxhlet extraction using distilled water. The extraction was done in Human Anatomy Laboratory.

Experimental Animals
Albino Wistar Rats were used in the experiment, where they were kept in the animal house of the Department of Biochemistry at the University of Maiduguri after being received from the Department of Animal Sience's animal house at Bayero University Kano. They were kept in plastic cages covered with wire-mesh. Water was available at all times, and the animals were given pelletized animal feed (Growers mesh vital feed, Jos). The rats were given two weeks to adjust to the current climatic conditions. For the investigation, 30 mature male Wistar albino rats weighing 90–180g were used.

Experimental Design
A total of 30 Wistar albino rats were used for the study. After acclimatization of the animals for 14 days, the rats were divided into 6 groups of 5 rats each.
The rats were grouped as follows:

Group A: was the control group in which the rats received only the vehicle (distilled water) in equivalent dose volume.

Group B: contained 5 rats which served as the lead acetate non- treated group; they received 150mg/kg of lead acetate solution for 14 days.

Group C: composed of 5 rats which received 150mg/kg of lead acetate solution for 14 days followed by 200mg/kg banana blossom aqueous extract for 21 days.

Group D: received 150mg/kg of lead acetate solution for 14 days followed by 400mg/kg banana blossom aqueous extract for 21 days.

Group E: received 150mg/kg of lead acetate solution for 14 days followed by 100mg/kg for the standard drug silymarin for 21 days.

Group F: consists of 5 rats they received banana blossom only for 21 days. All treatments commenced on the 15th day of lead acetate solution and lasted for 21 days.

Determination of Body and Organ Weights

A digital weighing balance was used to weigh thirty adult male rats one after another, after they had been tagged with permanent markers of various colors. The animals were divided into six groups (A, B, C, D, E, and F), each with five rats and their weights were recorded each week during the experiment.

After removing extra fat and fascia, the organs were weighed on a sensitive computerized electronic weighing balance to determine their weights. Organ to body relative weight ratio was obtained by dividing the organ weight by the body weight of the rat under investigation and multiplying the results by 100 as shown below;

$$\frac{\text{Mean organ weight}}{\text{Mean body weight of rat under investigation}} \times 100\%$$

Biochemical Analyses

Biochemical parameters were measured from the rats by separating the serum from the blood by centrifugation at 4000rpm for 10min 4^0C and analyzed immediately in the laboratory of the Department of Biochemistry University of Maiduguri using atomic absorption spectrophotometer.

Liver functions (Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) enzymes activities) was estimated by Sherwin, (1984) and kidney function as uric acid, urea and creatinine were determined according to Haisman and Muller (1977), Henry et *al*. (1974) and Larse, (1972).

Assessment of Effects of Banana Blossom and Silymarin on the Histology of Liver and Kidney

The cut and fixed tissues were dehydrated in series of alcohol concentrations of 30%, 50%, 80%, 95%, and 100% respectively. The tissues were imbedded in paraffin wax after being cleared in xylene. Hematoxylin and eosin were used to stain the tissues, which were divided into sections between 5 and 7 microns. The tissues were photographed using the arm scope at magnifications of x100, x200, and x400 (Das *et al*., 2012).

Statistical Analysis

One-way analysis of variance (ANOVA) was used to determine the differences in the measured parameters across the study groups. Statistical package for social sciences (SPSS) version 21 was used to analyze the data obtained from this study. A Bonferoni post-hoc test was carried out to identify the comparative group responsible for the significant difference identify in the ANOVA test to identify differences between and within groups. Values of $p<0.05$ were regarded as statistically significant.

RESULTS

Effect of Banana Blossom on Lead Acetate Induced Toxicity on Body Weight and Organ to Body Relative Weight Ratio

The Tables presents the results obtained from the experiment and provides valuable insights into the impact of these treatments. The groups consisted of a control group and several groups treated with different combinations of lead acetate, banana blossom, and silymarin. The control group, which did not receive any treatment, had an initial body weight of 180.20g. After the study period, their body weight increased to 199.40g, with a weight deference of 19.20g which indicated natural growth. On the other hand, the group treated with lead acetate solution alone showed a smaller increase in body weight, with a mean difference of 6.80g. In the other treatment groups, various combinations of lead acetate, banana blossom, and silymarin were administered. Interestingly, the group treated with lead acetate at a dose of 150mg/kg in combination with banana blossom at a dose of 200mg/kg exhibited a higher increase in body weight, with a mean difference of 10.00g. Similarly, the group treated with lead acetate at a dose of 150mg/kg in combination with silymarin at a dose of 400mg/kg showed a slight increase in body weight, with a mean difference of 4.9g. These findings suggest that the combination of lead acetate with certain substances may have a synergistic effect on weight gain as shown in Table 1.

Table 1. Effect of Banana Blossom on Lead Acetate Induced Toxicity on Body Relative Weight Ratio

Group (N-5)	MIBWT (g)	MFBWT (g)	MBWTD (g)	MLWT	LBWTR	MKBWT	KBWTR
Control (0.00)	180.20 ± 4.50	199.40 ± 4.40	19.20	5.02 ± 0.14	2.51	1.13 ± 0.04	0.01
LA 150mg/kg	173.40 ± 12.15	180.20 ± 13.73	6.80	3.85 ± 0.42	2.14	1.22 ± 0.09	0.01
LA 150mg/kg/ BB 200mg/kg	177.40 ± 9.81	187.40 ± 12.43	10.00	4.93 ± 0.27	2.63	1.35 ± 0.05	0.01
LA 150mg/kg/ BB 400mg/kg	153.40 ± 13.48	174.20 ± 13. 20	20.80	4.36 ± 0.20	2.50	1.22 ± 0.04	0.01
LA 150mg/kg/ SLR 400mg/kg	177.60 ± 11.09	182.50 ± 12.16	4.90	3.61 ± 0.18	1.98	1.14 ± 0.07	0.01
BB 400mg/kg	96.00 ± 4.87	151.20 ± 5.51*	55.200.	3.39 ± 0.12	2.24	0.91 ± 0.07	0.01

Values are Presented as Mean ± SEM. LA= Lead acetate, BB = Banana Blossom, SLR= Silymarin, MIBWT= Mean Initial Body Weight, MFBWT = Mean Final Body Weight, MBWTD = Mean Body Weight Difference, MOWT= Mean Organ Weight Difference, OBWTR= Organ to Body Weight Ratio, MLWT=Mean liver weight, MKWT=Mean Kidney Weight LBWTR=Liver to Body Weight Ratio, KBWTR=Kidney to Body Weight Ratio. Statistical values of $p \geq 0.05$ is Considered Significant, * = Level of Significant.

Effect of Banana Blossom and Silymarin on Lead Acetate Induced Toxicity on Kidney Function Test

The result of the kidney function test showed that for Urea (UR) the values of the control group was 70.10mg/dl, Group B which was treated with lead acetate 150mg/kg, showed that UR level was 80.53mg/dl, Group C which was treated with lead acetate 150mg/kg and banana blossom 200mg/kg (low dose) showed that UR level was 70.54mg/dl, Group D which was treated with lead acetate 150mg/kg and banana blossom 400mg/kg (high dose), showed that the UR level was 60.16mmol/dl, Group E which was treated with lead acetate 150mg/kg and silymarin 400mg/kg showed that the level of UR was 60.78mg/dl, Group F which was treated with banana blossom 400mg/kg showed that the UR level was 80.17mg/dl. (Therefore, Group B, C and D showed decrease in UR level which was not statistically significant) at $p>0.05$ as shown in table 2.

While the results for Albumin (ALB) showed that the value of the control group was 25.0g/dl, Group B which was treated with lead acetate 150mg/kg, showed that ALB level was 15.3g/dl, Group C which was treated with lead acetate 150mg/kg and banana blossom 200mg/kg (low dose) showed that ALB level was 19.0g/dl, Group D which was treated with lead acetate 150mg/kg and banana blossom 400mg/kg (high dose), showed that the ALB level was 27.6g/dl, Group E which was treated with lead acetate 150mg/kg and silymarin 400mg/kg showed that the level of ALB was 29.8g/dl, Group F which was treated with banana blossom 400mg/kg showed that the ALB level was 15.7g/dl. The changes observed where not statistically significant as showed in table 4.1. The result of the kidney function test showed that for Createnine (CRT) the values of the control group was 8.52mg/dl, Group B which was treated with lead acetate 150mg/kg, showed that CRT level was 9.52mg/dl, Group C which was treated with lead acetate 150mg/kg and banana blossom 200mg/kg (low dose) showed that CRT level was 9.77mg/dl , Group D which was treated with lead acetate 150mg/kg and banana blossom 400mg/kg (high dose), showed that the CRT level was 11.11mg/dl, Group E which was treated with lead acetate 150mg/kg and silymarin 400mg/kg showed that the level of CRT was 14.70mg/dl, Group F which was treated with banana blossom 400mg/kg showed that the CRT level was 13.15mg/dl. (Therefore, Group B, C, D and E shows decrease in CRT level which was not statistically significant) at $p>0.05$ as shown in Table 2.

Table 2: Effect of Banana Blossom and Silymarin on Lead Acetate Induced Toxicity on Kidney Function Test

Group **(N=5)**	UR (mg/dl)	ALB (g/dl)	CRT (mg/dl)
Control (0.00)	70.10 ± 5.11	25.0 ± 0.17	8.52 ± 0.44
LA 150mg/kg	80.53 ± 0.33	15.3 ± 0.14	9.52 ± 1.04
LA 150mg/kg/ BB 200mg/kg	70.54 ± 2.00	19.0 ± 0.39	9.77 ± 0.26
LA 150mg/kg/ BB 400mg/kg	60.16 ± 6.62	27.6 ± 0.38	11.11 ± 0.75
LA 150mg/kg/ SLR 400mg/kg	60.57 ± 8.87	29.8 ± 0.48	14.70 ± 1.35
BB 400mg/kg	80.17 ± 6.08	15.7 ± 0.24	13.15 ± 0.98

Values are Presented as Mean ± SEM. LA= Lead acetate, BB = Banana Blossom, SLR= Silymarin, UR = Urea, ALB = Albumin and CRT = Creatinine, Statistical Values of $p \geq 0.05$ is Considered Significant, * = Level of Significant.

The Effects of Banana Blossom and Silymarin on Liver Function in Lead Acetate Induced Toxicity in Albino Wistar Rats.

Enzyme activity of AST and ALT significantly increased in groups treated with lead acetate at p>0.005, While the group treated with banana blossom and silymarin significantly reduced the increased in the enzyme activity caused by lead acetate. The group banana blossom only showed values which are similar to the control group as shown in Table 3.

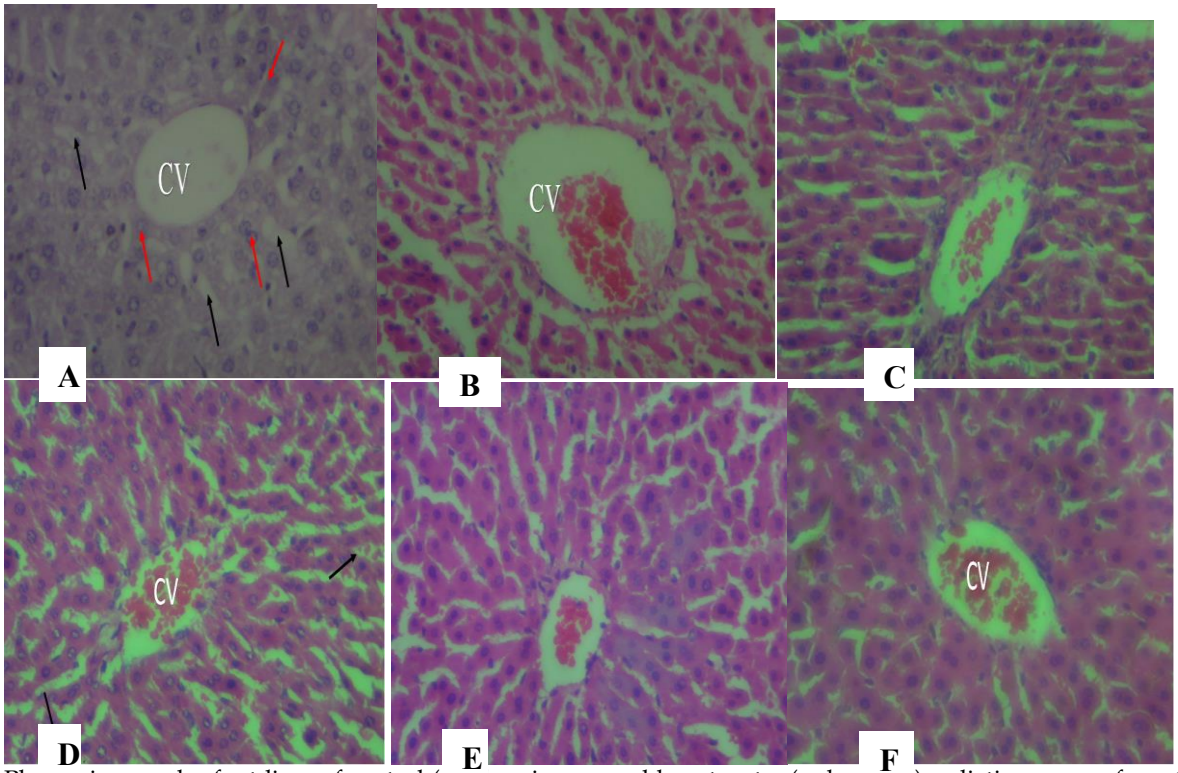
Table 3: The Effects of Banana Blossom and Silymarin on Liver Function in Lead Acetate Induced Toxicity in Albino Wistar Rats.

Group (N-5)	AST(u/l)	ALT(u/l)
Control (0.00)	66.80 ± 0.49^{a}	28.6 ± 2.54^{a}
LA 150mg/kg	106.4 ± 1.57^{b}	63.4 ± 2.18^{b}
LA 150mg/kg/ BB 200mg/kg	91.8 ± 1.53^{c}	47.2 ± 1.00^{c}
LA 150mg/kg/ BB 400mg/kg	82.6 ± 1.08^{c}	41.9 ± 2.18^{bc}
LA 150mg/kg/ SLR 400mg/kg	73.6 ± 0.93^{c}	29.8 ± 2.20c
BB 400mg/kg	59.8 ± 3.25^{a}	26.8 ± 2.20^{a}

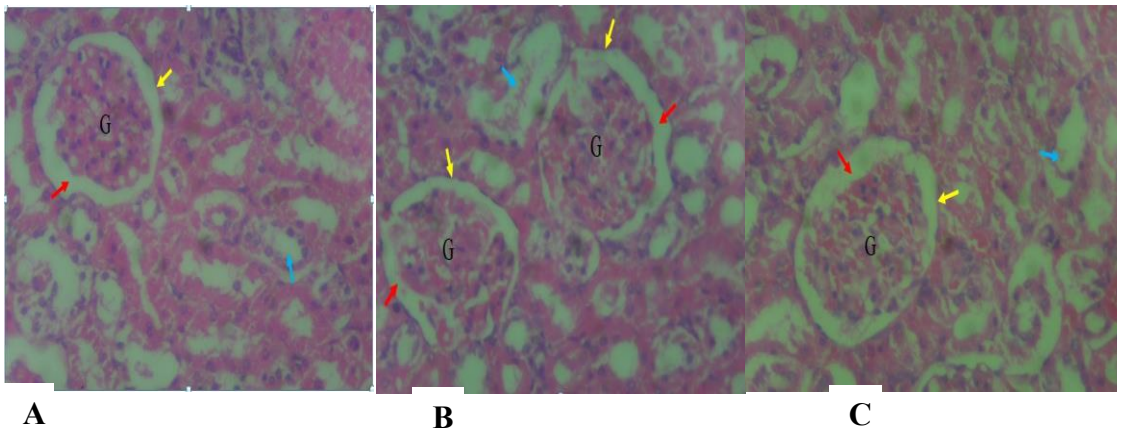
Values are Presented as Mean ± SEM. LA= Lead acetate, BB = Banana Blossom, SLR= Silymarin, MIBWT= Mean Initial Body Weight, MFBWT = Mean Final Body Weight, MBWTD = Mean Body Weight Difference, MOWT= Mean Organ Weight Difference, OBWTR= Organ to Body Weight Ratio, a, b and c = means values with same superscript are not differently statistically significant while those with different superscript are significantly differently significant at p≥0.05.

Effects of Banana Blossom and Silymarin on the Histology of the Liver in Lead Acetate Induced Toxicity in Albino Wistar Rats

Composite Photomicrograph of Rat Liver of Control (Group A) Showing Normal Hepatocytes (Red Arrows) Radiating way from the Central Vein (CV) with Clear Sinusoids (Black Arrows), Group B showing Photomicrograph Liver of Rat Treated with 150mg/kg lead Acetate only shows Severe Wide Spread Disruptions of Hepatocytes Around the Central Vein (CV), while Photomicrograph Rat Liver Treated with Lead Acetate 150mg/kg and Banana Blossom 200mg/kg (Group C) Showing Cremations of Hepatocytes (Red Arrows) Radiating Away From the Central Vein (CV) with Clear Sinusoids (Black Arrows), while Photomicrograph Rat Liver Treated with Lead Acetate 150mg/kg and Banana Blossom 400mg/kg (Group D) Showing Hepatocytes Necrosis and the Central Vein with Congestion (CV), Sinusoidal Haemorrhages (Black Arrows), Photomicrograph rat Liver treated with lead acetate 150mg/kg and silymarin 100mg/kg (group E) showing normal hepatocytes (Red arrows) radiating away from the central vein with clear sinusoids (black arrows), finally Photomicrograph Rat Liver Treated with 400mg/kg of Banana Blossom (Group F) Showing Normal Hepatocytes Radiating Away from the Central Vein (CV) same with the control group.



Photomicrograph of rat liver of control (A) showing normal hepatocytes (red arrows) radiating away from the central vein (CV) with clear sinusoids (black arrows), group (B) rat treated with150 mgkg^{-1}lead acetate only showing severe wide spread disruptions of hepatocytes around the central vein (CV), group (C) treated with lead acetate + banana blossom showing cremations of hepatocytes (red arrows) radiating away from the central vein (CV) with clear sinusoids (black arrows), group (D) treated with lead acetate and banana blossom showing hepatocytes necrosis and the central vein with congestion (CV), sinusoidal haemorrhages (black arrows), group (E) treated with lead acetate and silymarin showing normal hepatocytes (red arrows) radiating away from the central vein (CV) with clear sinusoids (black arrows), group (F) treated with 400mgkg-1of banana blossom showing normal hepatocytes radiating away from the central vein (CV). H&E x200.



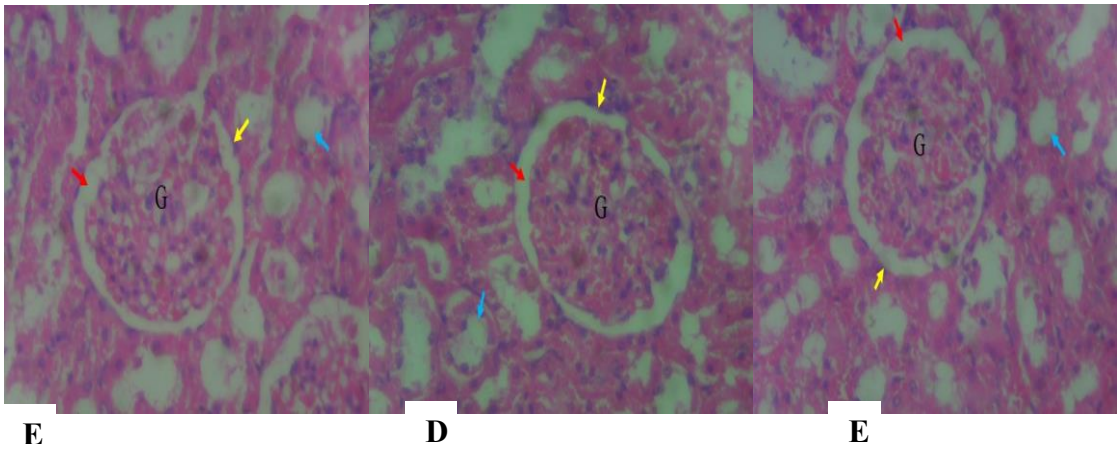


Figure 3: Composite photomicrograph of Rat's kidney control group A showing normal glomerulus (G), normal Bowman's capsule (red arrow), Parietal layer (yellow arrow) and renal convoluted tubule (blue arrow). Group B treated with 150mg/kg of lead acetate showing degeneration of glomerulus (G), Bowman's capsule (red arrow), Parietal layer (yellow arrow) and renal convoluted tubule (blue arrow). Group C and D treated with 150mg/kg of lead acetate solution and 200mg/kg and 500mg/kg banana blossom aqueous extract showing mild degeneration of glomerulus (G), Bowman's capsule (red arrow), Parietal layer (yellow arrow) and Renal convoluted tubule (blue arrow) . Group E treated with 150mg/kg of lead acetate solution and 100mg/kg Standard drug Silymarin showed glomerulus (G), Bowman's capsule (red arrow), Parietal layer (yellow arrow) and renal convoluted tubule (blue arrow) similar to the group A control. Group F treated with 400mg/kg banana blossom aqueous extract showed features similar to that of the control group A. H&E x200.

Discussion

Banana blossoms (*Musa acuminata*) are often discarded after unplugging the Banana fruit clusters. This is a sign that many people do not know that *Banana Blossom* has medicinal values. Banana Blossom is relatively cheap, available and common; it has high content of phenols and demonstrates good antioxidant effect. A study by Sharmila *et al.* (2013), affirms the nutritional and antioxidant activity of banana blossom and considered it as a potential antioxidant medicine due to its health benefits when consumed (Sharmila and Ezeani, 2013). This present study showed the potential effects of banana blossom on lead-acetate induced toxicity on the liver and kidneys of the albino Wistar rats. There was a significant decrease in body weight in the rats administered 150mg/kg lead acetate for two weeks. This could be due to loss of appetite or direct effects of lead acetate on the body tissues. This result conformed to the studies conducted by Nabill *et al*. (2012) and Amany *et al*. (2015), who observed significant decrease in body weight of rats after administration of lead acetate. Histologically, there was deterioration in the glomerulus, Bowman's space and even in the renal tubules. These changes confirm to the claim made by Rastogi (2008). This result is in line with a study which evaluates the effect of lead acetate toxicity on experimental male albino rat by Samuel *et al*. (2019) which also found significant reduction in body weight.

The study also observed significant increase in the body weight of the groups that received banana blossoms. This may be due to its cellulose constituents. The result obtained was in line with the study carried out on the beneficial effects of banana which showed significant higher percentage weight gain and percentage length gain in prawn fed with banana blossom (Mapanao *et at*. 2022).

The result of the kidney function test showed that the group treated with lead showed an increase in urea and creatinine level followed by a decrease in the groups treated with banana blossom but the changes were not statistically significant. This may be due to body immune response in reversing the effect of lead acetate and also probably due to the dosage used in this study. Saro cultivar aqueous extracts showed an increased in kidney biomarkers. In the

management and/or treatment of hypertension and other cardiovascular diseases, acuminata, particularly Saro cultivar, as a medication can trigger potential renal problems (Chidi *et al*., 2017). The study also agreed with those of Fankun *et al*. (2019) and Sefa *et al.* (2021), who exposure rats to heavy metals such as lead (Pb), cadmium (Cd) and mercury and observed histopathological changes in the brain, liver, kidney and testicle. The findings of Ereny and Hala (2021), showed that rats treated with the aqueous extracts of *Musa acuminata's* three cultivars pose no liver danger but rise in kidney biomarkers.

The results for Albumin (ALB) for the group treated with lead acetate only, showed a decreased in albumin level while the treated groups showed and increased when compared to the lead treated group. The group which received banana blossom only showed values similar to control. All the changes observed were not statistically significant at $p>0.05$ as showed in Table 3.

Histological sections of the liver tissue of the control group showed normal architecture of normal hepatocytes radiating away from the central vein with clear sinusoids while the photomicrograph liver of rat treated with 150mgkg-lead acetate only showed severe wide spread disruptions of hepatocytes around the Central Vein. Sever disruption of the liver cells which may lead to cirrhosis was also observed. The group treated with lead acetate followed by banana blossom shows cremations of hepatocytes which are radiating from the central vein with clear sinusoids. It also showed hepatocytes necrosis and congested central vein and sinusoidal hemorrhages. The group treated with lead acetate and then silymarin show hepatocytes that are similar to normal. The group which receives banana blossom only showed hepatocytes radiating away from central vein similar to the control group. Administration of banana blossom seemed to have moderately mitigated the destructive effects caused by lead acetate on the histology of the liver. Lead can generate free radicals in the body because it is unstable and causes dysfunctions especially in organs where it accumulates more. Previously study by Kren *et al*. (2008), published that heavy metals affects many body organs and silymarin is a good antioxidant that inhibits the activity of free radicals as supported by the study carried out by Eminzade *et al.* (2008) which showed that silymarin protect the liver against liver toxicity. Ereny and Hala (2021) observed focal hepatic necrosis completely replaced by leucocytic cells infiltration while the liver of the rats that received banana peels showed no histopathological changes. Rui *et al*. (2016) reported no histopathological changes in liver for rats that received banana peels. The ameliorative response of Banana blossom could be due to its positively charge property which helps rid negatively charged free radicals cause by lead acetate. This conforms to the findings of Flora (2007) that banana plant is positively charge which is the basic quality of antioxidant to merge with the negative charge of free radicals making them harmless and preventing dysfunctions. The findings of this study observed that rat's kidney of control group showed normal glomerulus, normal Bowman's capsule, Parietal layer and renal convoluted tubule. The group treated with lead acetate only showed moderate to severe degeneration of glomerulus, Bowman's capsule, parietal layer and renal convoluted tubule. The group treated with lead acetate and banana blossom aqueous extract showed mild degeneration of glomerulus, Bowman's capsule, parietal layer and renal convoluted tubule. While the treated lead acetate solution and the standard drug Silymarin and the group that received banana blossom only showed glomerulus, Bowman's capsule, parietal layer and renal convoluted tubule similar to the group A control.

Conclusion

This study concludes that banana blossom was able to significantly increase body weight in the group treated with banana blossom only while liver to body relative ration was not

affected. Histological observation showed that lead acetate was able to cause severe widespread disruptions of hepatocytes and sinusoids while banana blossom and silymarin was able to ameliorate the effect of lead acetate. Banana blossom may have protected the liver and kidney to some degree from acute and chronic degeneration caused by lead acetate. Banana blossom can serve as alternate antioxidant against free radicals with relatively no morphological hazard to the liver and kidney at doses used in this study.

Recommendation

There is need for further studies on higher doses above the doses used in this study to ascertain its safety. Other organs, ultrastructure and immunohistochemical studies should be explored.

References

Ablatif, W., Anjum, A. and Jawed, A. U. (2015). Lead toxicity: a review. *Interdiscip Toxicol*. **8**(2): 55–64.

Aliyu, H. S., Musa, A. and Cyril, O. (2020). Trace and heavy metals status in selected staple foods and associated health risk in artisanal and small scale gold mining vicinity in Kuchiko-Hausa, Gurara LGA, Niger state, Nigeria. *ATBU Journal of Science, Technology and Education* **8**(4): 231-241.

Amany, R., Ragab, E. E.Nabila, M. A. and Elham, A. E. (2015). The effect of lead toxicity on male albino rats reproduction with ameliorate by vitamin E and pumpkin seed oil. *Benha Veterinary Medical Journal* **28**((1); 43-52.

Chidi. E., Stanley, I., Okoduwa, I. and Oche, O. A. (2017). Effects of Aqueous Extract of Three Cultivars of Banana (Musa acuminata) Fruit Peel on Kidney and Liver Function Indices in Wistar Ratsjournal/medicines **10**(3): 3380-91.

Das, S., Dey, K. K., Dey, G., Pal., Majumder, A. and Maitichoudhury, S. (2012). Antineoplastic and Apoptotic Potential of Traditional Medicines Thymoquinone and Diasgenin in Squamous Cell Carcinoma. PLoS ONE **7**(10): E46641.

Eminzade, S., Ustaz, F. and Ezzertrrtin, F. V. (2008) Sylimarin protects liver against toxic effects. Anti-tuberculosis drugs in experimental animals **7**(12); 112.

Ereny, W. N. and Hala, R. A. (2021). Effect of mango and banana peels induced on toxicity by lead acetate in rats. *Home Econ. J.* **37**(1); 1-20.

Evans, O and Oskar, O. (2013). Methodology and application of one-way ANOVA. *Ame. J. Mech. Eng*. **1**(7); 256- 261.

Fankun, Z., Guangming, Y., Yanyan, G., Dong, L., Jie, X., Lu, O., Ying, F., Han, Y., Zhipeng, Z., Kai, W., Lijian, S., Chang, F and Guangqin, F. (2019): Toxicity assessment due to prenatal and lactational exposure to lead, cadmium and mercury mixtures. Epub. **133**(10):105-120.

Flora, S. J. Flora, G. Saxene, G. and Mishra, M. (2007). Arsenic and lead induced free radicals generation and their reversibility following chelation. *Cell Mol Bio*. 53:26-47.

Greenwood, N. N. and Earnshaw, A. (1977). Chemistry of element 2nd Edition, Butherworth-Heinemann, Oxford.

Haisman, P. and Muller, B. (1977). Quantitative enzymatic colorimetric determination of uric acid in serum. Clin Chem. **12**(2); 216-227.

Kim, H. J. S., Mahboob, P., Viayaraghavan, K. A., Al-Ghanim, F., Al-Misned, Y. O. K. and Ahmed, Z. (2020). Determination of toxic effects of lead acetate on different sizes of zebrafish (Danio rerio) in soft and hard water. *Journal of King Saud University-Science* **32**(2): 1390-1394.

Kren, E., Barve, A., Khan, R., Marsano, L., Ravindra, K. V. and McClain, C. (2008). Treatment

of alcoholic liver disease. *Ann Hepatol.* **7** (1):5-15.
Larsen, K. (1972). Creatinine colormitric method. *J. of Clin. Chem.* 41:209.
Lenntech (2022). Chemical properties of lead - Health effects of lead. Environmental effects of lead. Lenntech USA LLC (Americas) 5975.
Morilla, L. J., Samaya, N. H., Rivero, H. I., Reina, M. and Madamba, S. B. (2014). Medicinal Plants of Subaneus in Dumingag, Zamboanga Del Sur, Philippines [Paper Presentation]. International Conference on Food, Biological and Medical Sciences, Bankok, Thailand.
Nabill, M. I., Esam, A. E., Hossam, S. E. and Yasmin, E. A. (2012). Effect of lead acetate toxicity on experimental male rat. *Asian Pac J. Trop. Biomed*. **2**(1); 41-46.
Novella, L. R. D. (2023) Eating well's Editorial Guidelines.
Pua, E. (2007). Banana. Biotechnology in Agriculture and Forestry, 60.
Rastogi, S. K. (2008). Renal effects of environmental and occupational lead exposure. *Indian J. Occup Environ Med*. **12**(3); 103-6.
Mapanao, R., Rangabpai, T., Lee, Y. R., Kou, H. W. and Cheng, W. (2022). The effect of banana blossom on growth performance, immune response, disease resistance and anti- hypothalamal stress of macrobbrachium rosenbergii. *Fish Shell Immunol*. 124; 82-91.
Sefa, K., Fulya, B., Serkan, Y., Cihan, G., Fatih, M., Aydin, S., Adnan, A., Cuneyt, C. and Muhammet, B. (2021). Protective Effects of Chrysin against Oxidative Stress and Inflammation Induced by Lead Acetate in Rat Kidneys: a Biochemical and Histopathological Approach. Epub. **199**(4); 15011514.
Sharma, L. (2023). A Review on the Recent Developments on New Formulations to Prepare Nutrient Dense Noodles. BioGecko.
Sharmila E. S. and Ezeani, I. (2013). The Use of Banana Flavour Essence, Formalin and Ordinary Water in Pitfall. Traps in The Study of The Diel Activities of Insects From a Fallow Plot in Awka, Nigeria. *Animal Research International* 4(1).
Sheng, Z. W., Ma, W. H., Jin, Z. Q., Bi, Y., Sun, Z. G., Dou, H. T., Li, J.Y. and Han, L. N. (2010). Investigation of dietary fiber, protein, vitamin E and other nutritional compounds of banana flower of two cultivars grown in China **9**(25); 3888-3895.
Sherwin, J. (1984). Liver function. In: Kaplan LA, pesce AJ eds, clinical chemistry, theory, analyses, and correlation **33**(3): 420-438.
Simone, B., Kamala, H., Tim, W., Donald, T.., Katie, L. and Noah, L. (2022). Banana flower stock pictures, royalty- free photos and images (www.gettyimages.com).
Samuel, J. O., Herbert, O. M. And Orish, E. O. (2019). Improvement of Lead Acetate-Induced Testicular Injury and Sperm Quality Deterioration by Solanum Anomalum Thonn. Ex. Schumach Fruit Extract in Albino Rats. *Journal of Family Reproductive Health* **13**(2): 98-108.
Trease, G. and Evans, E. (2002). Phytochemicals. In: pharmacognosy,15th Edition, Saunders publishers, London; 42-393.
Timsina, B., and Kilingar, N, V. (2014). Anti-cancer potential of banana flower extract: An in vitro study. *A Journal of the Bangladesh Pharmacological Society* (BDPS) 9,628.
Tin, H. S., Padam, B. S., Kamada, T., Vairappan, C. S., Abdullah, M. I. and Chye, F.Y. (2016). Isolation and structure elucidation of triterpenes from inflorescence of banana (Musa balbisiana cv. Saba) *International Food Research Journal* **23**(2): 866-872.