



Toxicological Effect of *Euphorbia heterophylla* Linn

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Authors' contributions

This work was carried out in collaboration between both authors. Author JKK designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors AKO and JKK managed the analyses of the study. Author JKK managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JOCAMR/2020/v12i330207

Editor(s):

- (1) Dr. Loai Aljerf, Damascus University, Syria.
- (2) Dr. Francisco Cruz-Sosa, Metropolitan Autonomous University, México.
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Reviewers:

- (1) Aparna Darshan Palshetkar, S.N.D.T. Women's University, India.
 - (2) M. Vijayabaskaran, The Tamil Nadu Dr. M.G.R. Medical University, India.
- Complete Peer review History: <http://www.sdiarticle4.com/review-history/62949>

Original Research Article

**Received 25 October 2020
Accepted 29 December 2020
Published 18 January 2021**

ABSTRACT

Euphorbia heterophylla has been reported to possess enormous medicinal benefits hence there is a need for holistic research on its toxicological effects. Four different solvents (cold and hot water, chloroform and 80% methanol) were used to extract the aerial parts of *Euphorbia heterophylla* Linn. Experimental albino rats were obtained from Federal University of Technology Akure's Microbiology Department Animal House. Toxicological analysis of *Euphorbia heterophylla* extracts was carried out on the experimental albino rats. The animals were grouped into thirteen with three rats in a group different concentrations of the extracts were administered orally to different groups of the rats for a period of two weeks (14 days). Sterile distilled water was administered to the negative control group. During the 14 days of extracts administration, the animals were observed for clinical manifestations like salivation, nervousness, imitability, itching of the nose and diarrhoea. After the expiration of the two weeks, the animals were sacrificed and vital organs like heart, liver, kidney and intestine were harvested and examined for any degenerative changes and lesions. Blood samples were collected before and after the administration of the extracts to check for blood parameters (Packed Cell Volume (PCV), white blood cell count (total and differential), erythrocyte sedimentation rate (ESR) and haemoglobin (Hb) estimation. The toxicological results of the

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extracts showed various degrees of abnormalities detected in the histopathological sections of the intestine, kidney and the heart. It was found that all the extracts at different concentrations burnt the intestinal walls of all the animals tested. There were significant reductions in the total white blood cells (WBC) and neutrophil counts while there was a significant increase in the lymphocytes count after the administration of the extracts. The findings of this study revealed that *Euphorbia heterophylla* had toxicological effects on the albino rats organs but increases there lymphocytes count, boosting their immune system, however advance researches to eliminate the toxic phytochemicals from the extract is recommended.

Keywords: *Euphorbia heterophylla*; toxicological analysis; histopathological; immune system; phytochemicals.

1. INTRODUCTION

The use of herbal remedies against different ailments is an age long practice among local communities. In other words, the use of medicinal plants in curing illnesses is as old as man [1]. A larger percentage of the people's population, especially in developing world rely so much on the folk medicines for the treatment of common infections as well as chronic diseases. Extracts are made from different parts of plants and in some cases, the whole plant are usually ingested as decoctions and teas or used as spices in the preparation of local delicacies [2]. Some leafy vegetables are known for the medicinal properties they possess which make them to be reserved for the sick and convalescent [2]. For instance, *Vernonia amygdalina* (Bitter leaf) for instance, possesses phytochemicals such as alkaloid and vernomine which make it possible for the plant to be effective in reducing headache associated with hypotension [3]. The importance of *Ocimum* species as sources of alkaloids with medicinal properties used in the management of cold, chronic catarrh and persistent headache has also been reported by Sofowora [4]. The present study aims at investigating the antibacterial and antifungal effectiveness as well as the phytochemical properties of leaf extracts of *Euphorbia heterophylla* Linn.

Medicinal plants are plants that are used to cure both infectious and non-infectious diseases. Almost all our present medicines come from medicinal plants and are derived from research on medicinal plants [5]. The impact of natural products (phytochemicals) on human is increasingly recognized [6] and plants contain chemical substances that can be used for therapeutic purposes.

Quite a number of plants have been discovered to possess medicinal properties, among which

are *Cleome rutidosperma*, *Emilia coccinea*, *Euphorbia heterophylla*, *Physalis bransiliensis*, *Scaparia dulcis*, *Richardia bransiliensis* and *Sida acuta*. All these plants are used for curing one ailment or another including fever, diarrhoea, gonorrhoea, Cough, ulcer, diabetes, stomach ache, migraine, headache, skin diseases like ring worm, craw-craw etc. [7].

Euphorbia heterophylla is a fast growing weed that can form a dense canopy over leguminous crops making them difficult to harvest [8]. This plant belongs to the family Euphorbiaceae, and the genus *Euphorbia* is the largest genus in the family. The genus *Euphorbia* contains milky juice in special tissues in their bodies [9]. It is an erect fast growing annual herb that grows up to 90 cm high. It exudes white latex when cut and reproduces itself from seeds. The leaves are alternate, variable in shape, oblong -lanceolate to ovate, 6- 15 cm long and 4-7 cm wide, acute at the apex and wedge-shaped at the base [9]. The leaf blade is smooth with wavy or toothed margins. The fruit is a 3 chambered capsule that splits along the midrib when ripe. The seeds are dark brown to black in colour [10]. It is a common weed of cultivated fields in the forest and savannah zones throughout West Africa, [11]. It is a serious problem in cowpea and soybean cultivation because it competes with these crops for growth resources.

The antibacterial, antifungal, antiviral and cytotoxic activities of most members of this genus have been demonstrated by different authors [12,13]. Burkill [14] recorded that the latex of *E. lateriflora* is a drastic purge used in the treatment of Syphilis, head lice and ringworm on the scalp. At the same time Bentancur et al. [12] reported the antiviral and cytotoxic activities of 10 members of the genus *Euphorbia*.

Generally, most members of this genus are known to have purgative action. Among the

members are *E. balsamifera*, *E. hirta*, *E. hyssopifolia*, *E. lateriflora*, *E. mauritanica*, *E. helioscopia* and *E. platyphyllos* [15]. Al-Sultan and Hussein [9] reported that the poisonous white latex produced by most members of the genus *Euphorbia* contains euphorbic acid and that drying does not remove its toxicity. The latex of *E. helioscopia* contains a strong irritant capable of causing burning and swelling in animals that ingest it [16]. The toxicity of the plant, particularly the root and latex, is recognised in Fast Africa [16]. *Euphorbia heterophylla* is commonly called 'ewe eba' by the people of the South-Western part of Nigeria because they believe it has medicinal properties to treat typhoid fever [17].

Euphorbia heterophylla was chosen for this study due to the belief of the people in the Western part of Nigeria that it cures typhoid fever, hence the need to evaluate its effectiveness. The aim of this study was to evaluate *in-vivo* trial of the plant extracts for treatment of some diseases and the toxicological effects of the extracts using experimental animals.

2. MATERIALS AND METHODS

2.1 Collection of Plants, Organisms and Source Experimental Animals

The plant, *Euphorbia heterophylla*, used in this work was freshly harvested from Federal University of Technology, Akure community (Plate 1). Experimental albino rats were obtained from Federal University of Technology Akure's Microbiology Department Animal House.

2.2 Preparation of Crude Plant Extracts

Four different solvents were used to extract the plant material viz. chloroform, methanol (80%), hot water and cold water using the method described by [18]. The aerial parts of the plant (leaves, stem and fruits) were rinsed with distilled water, drained and air dried for two weeks. They were then milled into powdery form using a clean mechanical blender and stored in sterile air tight plastic container for one week. One litre of methanol (80%) was added to 500 g of the powdery form of the plant parts in a new plastic container. One litre of chloroform was also added to 500 g of the plant powder in a new screwed capped plastic container. The two containers were allowed to stay for 48 hours with occasional stirring. This was then filtered afterwards.

The method of Adedapo et al. [16] was employed for the hot and cold water extraction. Freshly

harvested aerial part (700 g) of *E. heterophylla* was macerated using mortar and pestle after it has been rinsed in sterile water. This was then boiled in two litres of distilled water for 30 minutes. It was allowed to cool down and later filtered into sterile flasks using sterile muslin cloth that has been double folded. The cold water extraction was done by weighing 700g of freshly harvested and macerated plant parts and soaked in two litres of sterile distilled water for 48 hours with constant stirring. This was later filtered into sterile flasks at the end of the 48 hours using sterile muslin cloth as described above.

All these were allowed to settle to get concentrated extracts. Since the organic solvents were volatile, the filtrates were exposed so that the solvents could evaporate while the supernatants of the hot and cold water extracts were decanted. All the prepared extracts were kept at 4°C in a refrigerator at least 24 hours before subsequent testing.

2.3 Reconstitution and Sterilization of Extracts

The methanolic and chloroform extracts were reconstituted using 0.01 % Tween 20 to aid solubility and maximal yield of the extracts final product for better effects as described by [19]. This was done by dissolving 11 g of the extract in 10 ml 0.01% Tween 20. The resultant solution was then filtered using sterile Millipore membrane filter (0.45µm). The cold and hot water extracts were reconstituted by dissolving 1 g of the extract in 10 ml sterile distilled water and later filtered using sterile Millipore membrane filter (0.45µm).

2.4 Toxicological Testing of the Extracts Using Experimental Animals (Albino Rats)

Toxicological analysis was carried out using the method described by Onwusonye et al. [20]. A total number of 39 albino rats were used to test whether any of the components was toxic to humans. Prior to the experiments, the animals were weighed and stabilized for a period of 8 days by giving them water and grower mash prepared by Guinea Feed Nigeria Limited, This was done to ascertain their state of health. The animals were grouped into thirteen with three rats in a group different concentrations of the extracts were administered orally to different groups of the rats for a period of two weeks (14 days). Clean water was administered to the control group. During the 14 days of extracts

administration, the animals were observed for clinical manifestations like salivation, nervousness, irritability, itching of the nose, diarrhoea etc. After the expiration of the two weeks, the animals were sacrificed and vital organs like heart, liver, kidney and intestine were examined for any degenerative changes and lesions (Plate 2). Blood samples were collected before and after the administration of the extracts to check for blood parameters like Packed Cell Volume (PCV), white blood cell count (total and differential), erythrocyte sedimentation rate (ESR) and haemoglobin (Hb) estimation.

2.5 Statistical Analysis of Data

Data obtained were subjected to statistical analysis of variance (ANOVA) and treatment means were separated using Duncan multiple range test. Paired 2-tailed t test was used to compare the haematological parameters before and after administration of the extracts.

3. RESULTS

3.1 Percentage Yield of Methanolic, Chloroform and Aqueous Extracts Obtained from Leaves of *Euphorbia heterophylla*

Four different solvents were used for the extraction of the aerial parts of *Euphorbia heterophylla*, they were cold water, hot water, chloroform and 80 % methanol. The extracts obtained from hot and cold water after concentration were in slurry form while that of the chloroform and methanol extracts were in semi-solid form retaining the plant oil. When one hundred and ten grams (110g) of the dry leaves of *Euphorbia heterophylla* were used, the percentage of extract recovered was highest using hot water as solvent while it was least for methanol as shown in Table 1.

3.2 Haematological Parameters of Experimental Rats

Table 2 shows the results of the haematological parameters after administration of extracts. Group D had the highest Packed Cell Volume (PCV) of 41%. Red Blood Cell (RBC) of 1138 cm^3 , Haemoglobin (Hb) of 13.67 cm^3 and White Blood Cell (WBC) counts of 255.67 cm^3 . However, the lowest value for these parameters was observed in Group I. The results of the effects of extracts on white blood cells differential are shown in Table 3. Generally, Group 1, the group that received 1000 mg/kg of methanol extract had the

least neutrophil (15%), basophil (0.676), eosinophil (1.676), monocyte (5.33%) and lymphocyte (44.336) counts. Significant difference was only observed in neutrophil counts as shown in Fig. 7. The results of the investigation of the haematological parameters of the rats before and after administration of extracts are shown in Figs 1-10. There were significant differences in the total WBC, lymphocytes, neutrophils at P 0.05 using 2-tailed t-test. However, there was no significant difference in the PCV, ESR, Hb and RBC of the rats.

3.3 Histopathological Investigations of Organs of Experimental Rats

Going through the histological sections of the intestines of the animals, it was discovered that there were various degrees of abnormalities detected in all the animals. The intestinal abnormalities range from balloon degeneration to necrosis of the glandular epithelial cells to haemorrhagic necrosis of glandular epithelial cells. This is shown in Plate 1. Even the lowest concentration of each of the four extracts showed toxicity in the intestinal mucosa of the animals as evident in the burning up of the intestinal walls. Also, the three different concentrations of the hot water extract show toxicity in the liver, heart and kidney. In addition, chloroform extract at 1000 and 1500 mg/kg was toxic to the liver, heart and the kidney of the animals. Cold water extract at 500 mg/kg caused oedema of cardiac myocytes in the heart and oedema of tubular epithelial cells in the kidney as shown in Plate 2-3. However, apart from the intestinal disorder that was developed with methanolic extracts, none of the different concentrations of the methanolic extract showed any toxicity in other organs.

4. DISCUSSION

The findings in this research work indicate that the percentage yields of the extracts using different solvents varied among the different extract used. These findings are in line with the work of [21] that worked on the antifungal activities of leaves of three species of *Pistacia* and reported that the percentage recovery was dependent on the solvents used. This result corroborates those obtained by [22] in which percentage yield of *Croton cajucara* varied with the different extraction solvents. It has been shown that polar solvents have the ability to extract organic and inorganic materials from natural sources [22;23]. Polar solvents have been proved by [24] to give a higher yield of

active components in plants than the non-polar solvents.

In this research, it was observed that the hot water extract gave the highest yield of 17.38% which could have been higher than that if not for the fact that some of the constituents had escaped with the steam. This was followed by cold water extract with 16.28%. This may be due to the high level of polarity of water which makes it easier to dissolve chemical components of the leaves that have been shown to be organic in nature and slightly polar. The variation between the hot and cold water extract yield might be due to the fact that the heat applied has helped to extract some oils from the plant which cold water is unable to dissolve.

It was discovered that none of the animals used for this research work passed abnormal or watery stool as people claim [25]. This might be due to the concentrations of the extract given or any other factor.

The animals were always excited during the day which is in conformity with the findings of [16]

and [9]. But the inability of the animal to salivate, show signs like dullness, itching of the nose, diarrhoea, etc. as claimed by the above named authors might be due to the higher concentration of the extracts administered by them. Adedapo m et al. [16] administered 1g/100g body mass, Al-Sultan and Hussein [9] administered as high as 2,362.5 mg/kg body weight while the highest concentration administered in this research work was 1500 mg/kg body weight.

The results of the haematological parameters showed significant differences in the total WBC, lymphocytes, and neutrophils at $P < 0.05$ and there was no significant difference in the PCV and RBC before and after administration of the extracts which is in line with the report of Al-Sultan and Hussein [9]. The histopathological results showed that all the extracts at different concentrations administered altered the intestinal mucosa of the animal. The abnormalities observed ranged from balloon degeneration of the intestinal mucosa to haemorrhagic necrosis of glandular epithelial cells.

Table 1. Percentage yield of extracts obtained from leaves of *Euphorbia heterophylla*

| Solvents | Input: dried material (g) | Output: extract (g) | % Recovery |
|------------|---------------------------|---------------------|------------|
| Chloroform | 110 | 15.83 | 14.39 |
| Cold water | 110 | 17.90 | 16.28 |
| Hot water | 110 | 19.11 | 17.38 |
| Methanol | 110 | 15.76 | 14.33 |

Table 2. Effect of administration of extracts on haematological parameters of albino rats

| Group | ESR (Mm/hr) | PCV (%) | RBC (cm ⁻³) | WBC (cm ⁻³) | Hb (cm ⁻³) |
|-------|-------------|--------------------------|-------------------------|----------------------------|--------------------------|
| A | 1.00±0.00 | 39.67±3.51 ^{ab} | 993.00± 322.38 | 247.00±29.55 ^a | 13.20±1.15 ^{ab} |
| B | 1.00±0.00 | 38.67±1.15 ^{ab} | 932.67±53.00 | 230.67±7.51 ^{ab} | 12.90±0.35 ^{ab} |
| C | 1.00±0.00 | 37.33±1.15 ^{ab} | 817.67±127.21 | 214.33±20.5 ^{ab} | 12.47±0.40 ^{ab} |
| D | 0.83±0.29 | 41.00±2.00 ^a | 1138.00±148.62 | 255.67±26.63 ^a | 13.67±0.65 ^a |
| E | 1.00±0.00 | 38.00±2.00 ^{ab} | 847.00±167.90 | 227.67±36.9 ^{ab} | 12.67±0.65 ^{ab} |
| F | 1.00±0.00 | 35.00±5.57 ^{ab} | 702.67±257.89 | 179.33±32.72 ^{ab} | 11.67±1.88 ^{ab} |
| G | 1.00±0.00 | 35.00±2.65 ^{ab} | 680.33±175.52 | 191.67±28.22 ^{ab} | 11.43±1.21 ^{ab} |
| H | 1.00±0.00 | 36.33±1.53 ^{ab} | 729.67±135.07 | 204.67±24.76 ^{ab} | 12.17±0.57 ^{ab} |
| I | 0.67±0.58 | 26.67±23.12 ^b | 669.67±580.28 | 150.33±130.79 ^b | 8.90±7.72 ^b |
| J | 1.00±0.00 | 36.33±1.53 ^{ab} | 730.00±117.36 | 203.67±23.76 ^{ab} | 12.17±0.57 ^{ab} |
| K | 1.00±0.00 | 37.67±3.51 ^{ab} | 808.00±222.03 | 204.33±26.50 ^{ab} | 12.60±1.21 ^{ab} |
| L | 1.00±0.00 | 36.67±1.15 ^{ab} | 737.00±114.35 | 198.67±24.01 ^{ab} | 12.27±0.46 ^{ab} |
| M | 1.00±0.00 | 35.67±3.51 ^{ab} | 723.67±241.99 | 210.00±25.53 ^{ab} | 11.90±1.15 ^{ab} |

Notes: Values are means of three replicates, ± Standard deviation

Values followed by similar alphabets along the same column are not significantly different at $P < 0.05$

Keys: A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

Table 3. Effect of administration of extract on white blood cell differential albino rats

| Groups | Neutrophils (%) | Lymphocytes (%) | Monocytes (%) | Eosinophils (%) | Basophils (%) |
|---------------|-------------------------|------------------------|----------------------|------------------------|----------------------|
| A | 25.67±3.21 ^a | 63.00±5.29 | 8.00±2.00 | 2.33:0.58 | 1.00±0.00 |
| B | 24.33±1.53 ^a | 65.33±0.58 | 7.33±1.53 | 2.33:0.58 | 0.67±0.58 |
| C | 26.67±2.52 ^a | 63.67±3.21 | 6.67±1.53 | 2.33:0.58 | 0.67±0.58 |
| D | 25.00±3.00 ^a | 65.33±2.52 | 6.67±2.08 | 2.33:0.58 | 0.67±0.58 |
| E | 25.00±2.00 ^a | 64.33±2.52 | 7.67±2.08 | 2.00±0.00 | 1.00±0.00 |
| F | 25.33±0.58 ^a | 63.67±1.53 | 7.33±1.15 | 2.67±0.58 | 1.00±0.00 |
| G | 26.00±2.65 ^a | 62.33±2.08 | 8.33±1.53 | 2.67±0.58 | 0.67±0.58 |
| H | 25.33±3.51 ^a | 65.00±4.36 | 6.67±2.08 | 2.00±0.00 | 1.00±0.00 |
| I | 15.00±3.00 ^b | 44.33±38.48 | 5.33±5.03 | 1.67±1.53 | 0.67±0.58 |
| J | 24.67±1.53 ^a | 65.00±2.65 | 7.33±1.53 | 2.00±0.00 | 0.67±0.58 |
| K | 24.00±2.65 ^a | 65.67±4.51 | 7.00±1.73 | 2.67±0.58 | 1.00±0.00 |
| L | 24.67±1.15 ^a | 64.67±2.08 | 7.33±1.53 | 2.33:0.58 | 1.00±0.00 |
| M | 25.33±1.53 ^a | 63.67±1.15 | 7.67±2.08 | 2.33:0.58 | 1.00±0.00 |

Notes: Values are means of three replicates, ± Standard deviation

Values followed by similar alphabets along the same column are not significantly different at P<0.05

Keys: A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

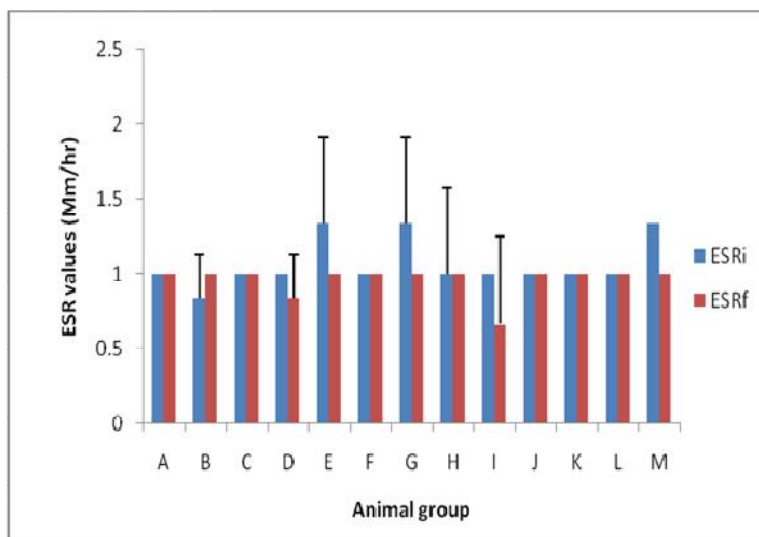


Fig. 1. Erythrocyte sedimentation rate of the animals before and after administration of extracts

Key: ESRi: Erythrocyte sedimentation rate before administration of extract; ESRf: Erythrocyte sedimentation rate after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

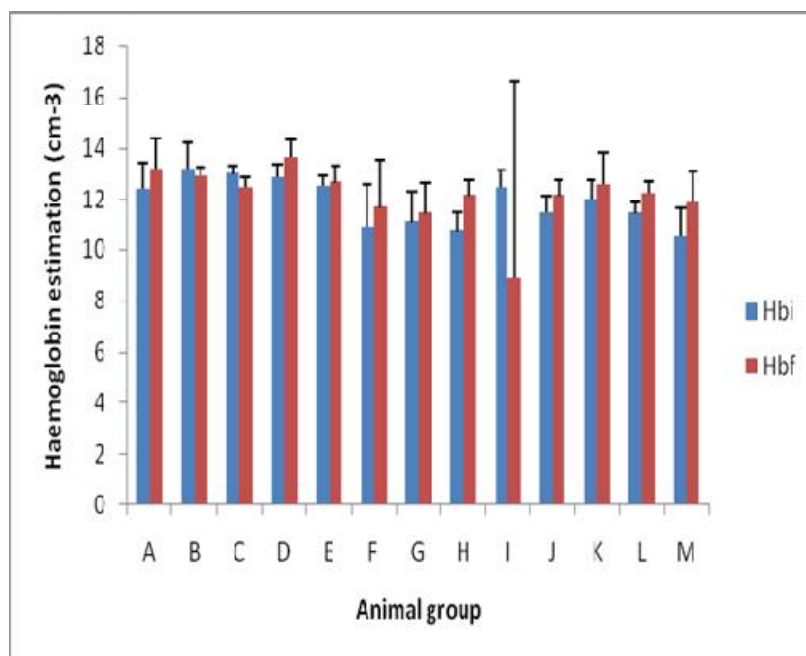


Fig. 2. Haemoglobin content of the animals before and after administration of extracts

Key; Hbi: Haemoglobin content before administration of extract; Hbf: Haemoglobin content after administration of extract; A: Ordinary water (control); B: Cold water extract (500mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

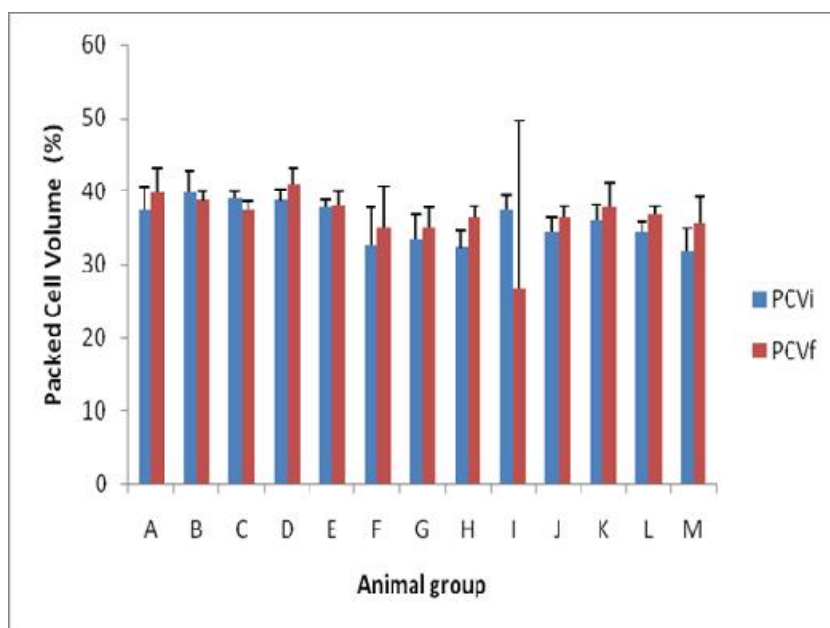


Fig. 3. Packed cell volume of the animals before and after administration of extracts

Key: PCVi: Packed cell volume before administration of extract; PCVf: Packed cell volume after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

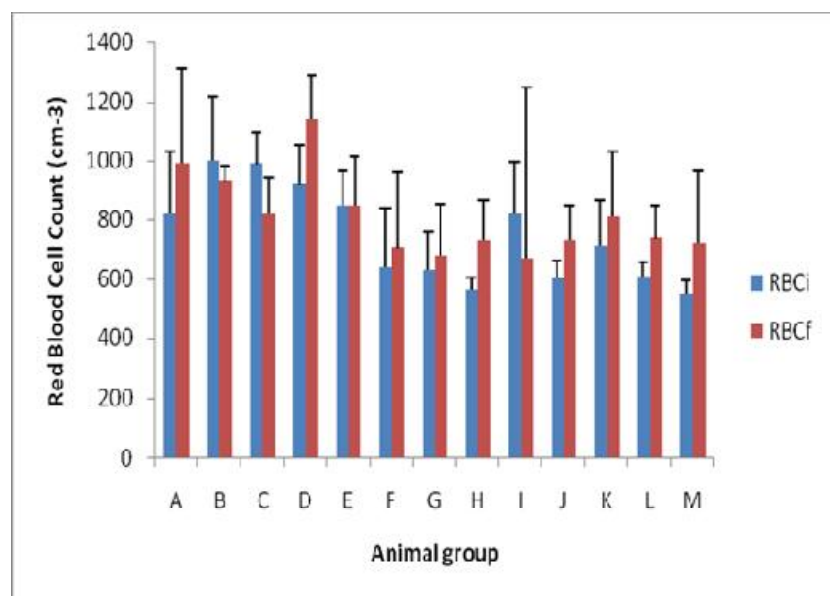


Fig. 4. Red blood cell count of the animals before and after administration of extracts

Key: RBCi: Red blood cell before administration of extract; RBCf: Red blood cell after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

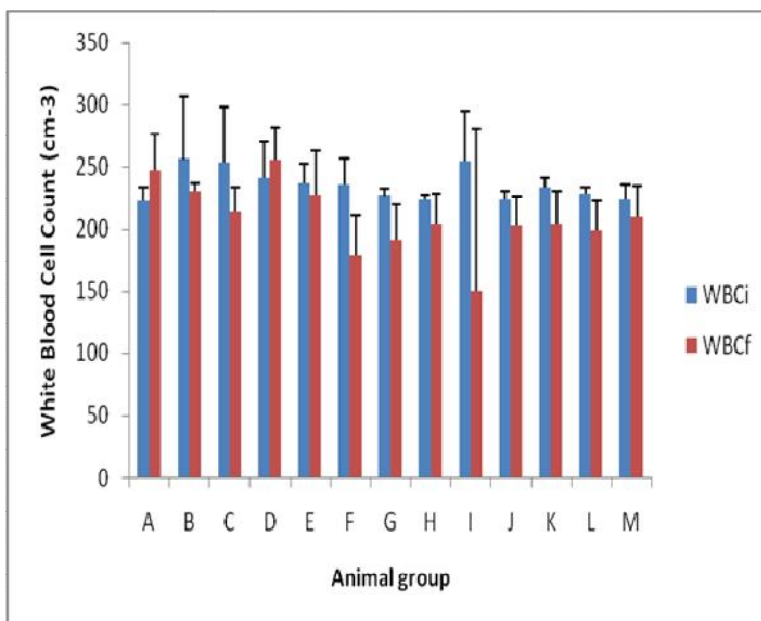


Fig. 5. White blood cell count of the animals before and after administration of extracts

Key: WBCi: White blood cell before administration of extract; WBCf: White blood cell after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

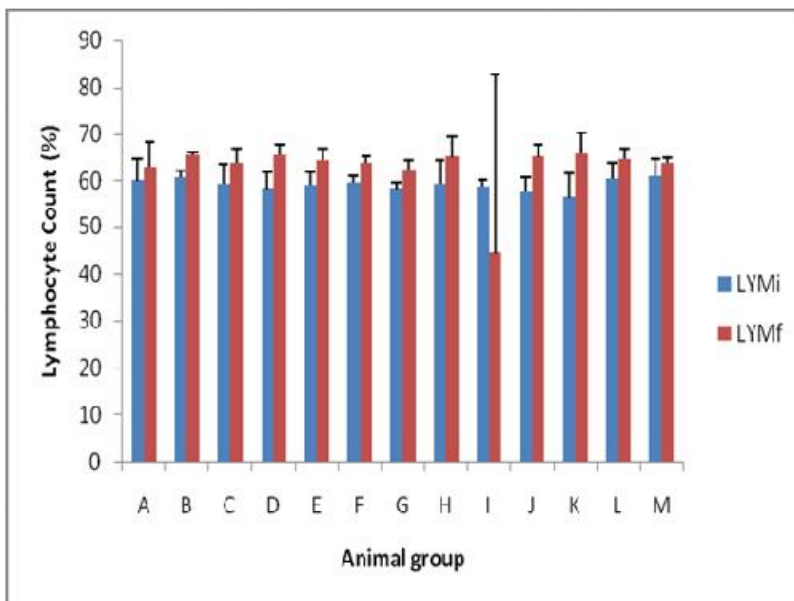


Fig. 6. Lymphocyte count of the animals before and after administration of extracts

Key: LYMi: Lymphocyte count before administration of extract; LYMf: Lymphocyte count after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

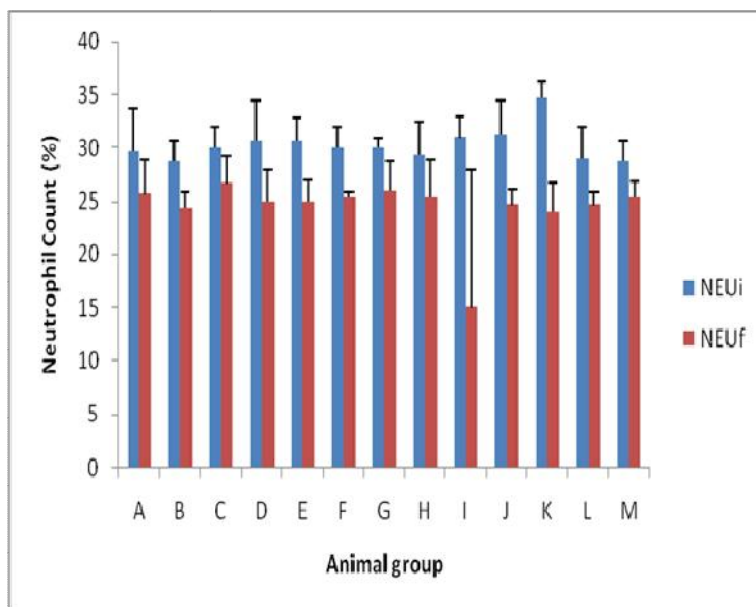


Fig. 7. Neutrophil count of the animals before and after administration of extracts

Key: NEUi: Neutrophil count before administration of extract; NEUF: Neutrophil count after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

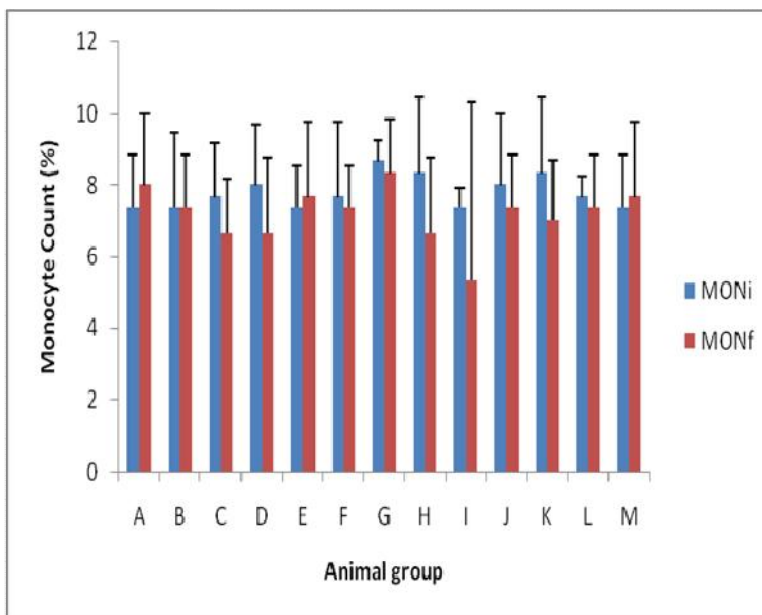


Fig. 8. Monocyte count of the animals before and after administration of extracts

Key: MONi: Monocyte count before administration of extract; MONf: Monocyte count after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

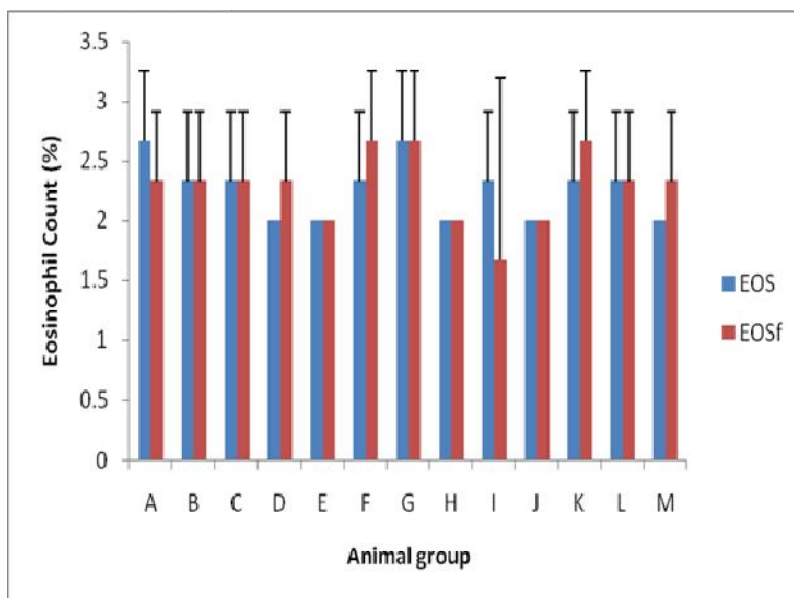


Fig. 9. Eosinophil count of the animals before and after administration of extracts

Key: EOSi: Eosinophil count before administration of extract; EOSf: Eosinophil count after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)

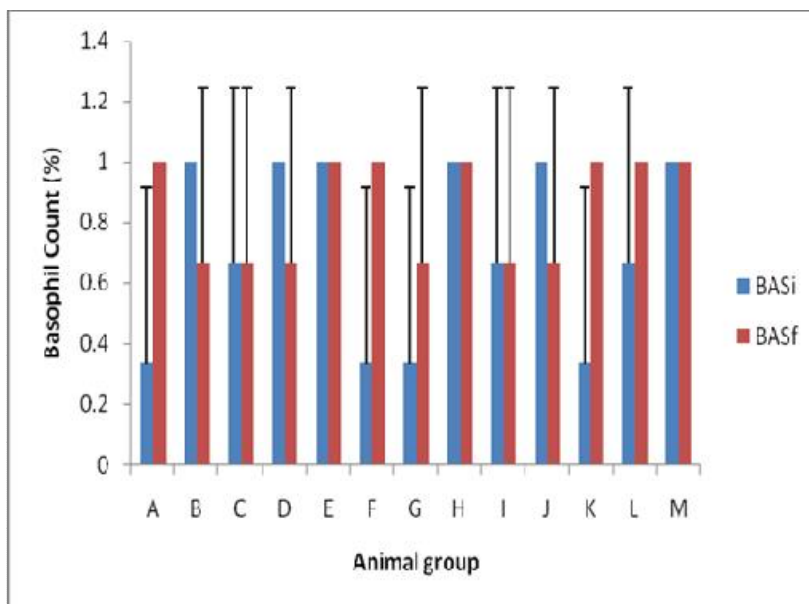
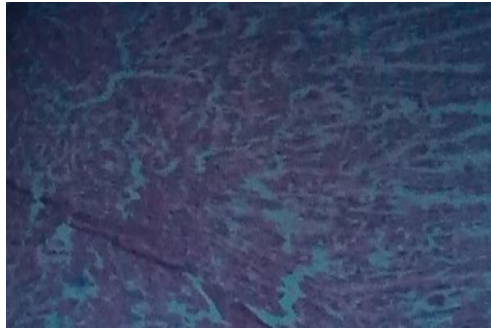
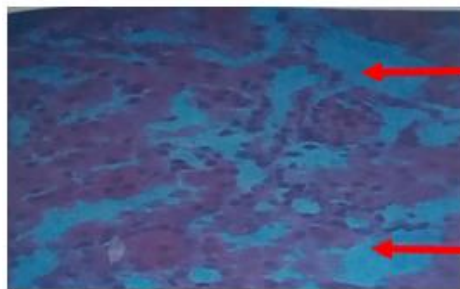


Fig. 10. Basophil count of the animals before and after administration of extracts

Key: BASi: Basophil count before administration of extract; BASf: Basophil count after administration of extract; A: Ordinary water (control); B: Cold water extract (500 mg/kg); C: Cold water extract (1000 mg/kg); D: Cold water extract (1500 mg/kg); E: Hot water extract (500 mg/kg); F: Hot water extract (1000 mg/kg); G: Hot water extract (1500 mg/kg); H: Methanol extract (500 mg/kg); I: Methanol extract (1000 mg/kg); J: Methanol extract (1500 mg/kg); K: Chloroform extract (500 mg/kg); L: Chloroform extract (1000 mg/kg); M: Chloroform extract (1500 mg/kg)



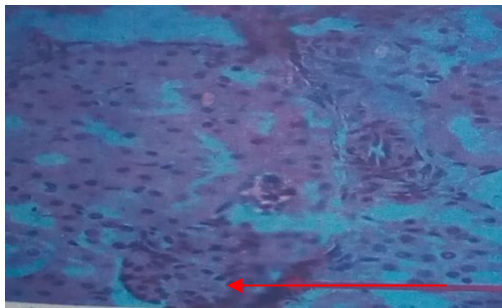
Intestine of untreated rat



Balloon degeneration of the epithelial cell

Balloon degeneration of the epithelial cell

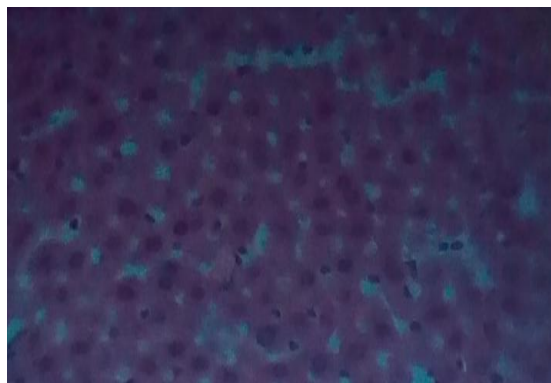
Intestine of rat treated with extract



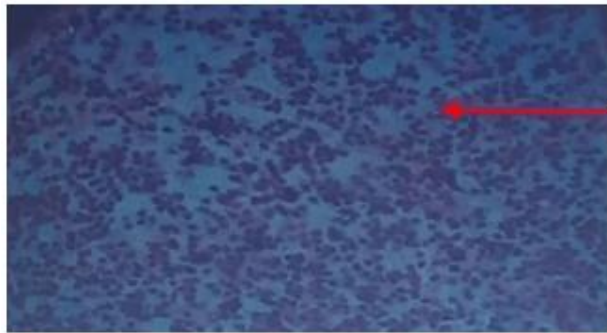
Haemorrhagic necrosis of glandular epithelial cells

Intestine of rat treated with extract

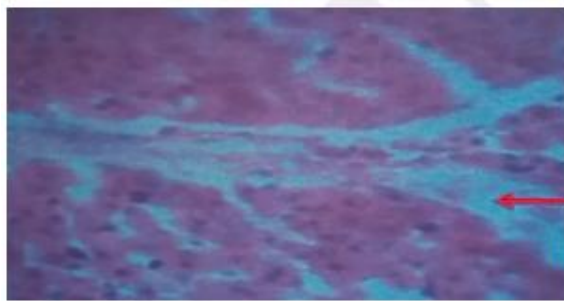
Plate 1. Histopathological sections of the intestine of experimental rats



Liver of untreated rat



Liver of rat treated with extract

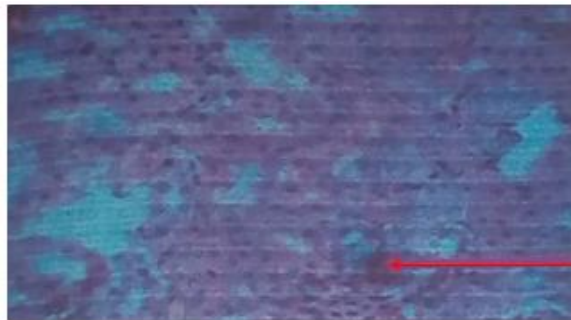


Liver of rat treated with extract

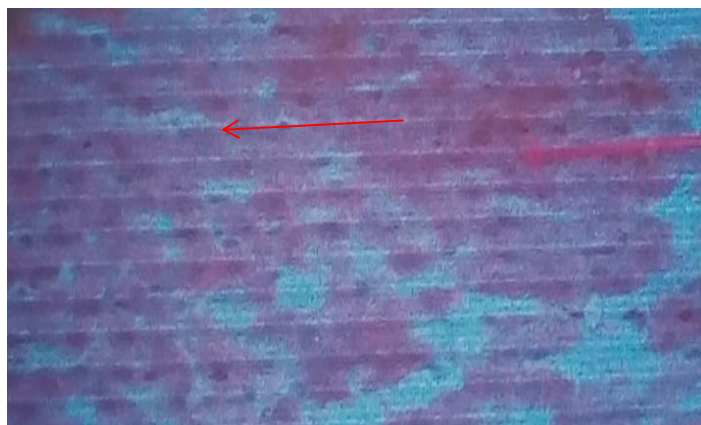
Plate 2. Effects of various treatments on histopathological section of the liver



Kidney of untreated rat



Kidney of rat treated with extract



Kidney rat treated with extract

Plate 3 Effects of various treatments on histopathological section of the kidney

Apart from the abnormalities observed in the intestinal wall, the cold water extract at 500 mg/kg and 1000 mg/kg body weight did not have any other side effect on the liver and the kidney of the animals. But at 1500mg/kg, the extract caused oedema of tubular epithelial cells in the kidney. Setting aside the disorderliness recorded in the intestinal wall, heart and kidney tissues. The hot water extract caused dilated hepatic venules in the liver tissues. Methanolic extract at 500 and 1000mg/kg did not affect other organs apart from the intestine, but caused the same abnormalities as reported in the hot water extract when administered at 1000 mg/kg. Chloroform extract at 1000 and 1500 mg/kg caused distortion in all other organs except at 1000mg/kg that showed no abnormality to the heart tissues. With the histological results observed, the plant material has greater damage to the body tissues and organs.

5. CONCLUSION AND RECOMMENDATION

The direct consumption of the plant material should be discouraged as the findings in this study revealed that the plant was toxic to different organs of the body but increases their lymphocytes count, boosting their immune system. Further research can be carried out to remove the toxic metabolites, isolates the bioactive chemical constituents and formulate it into antimicrobials for clinical trials.

CONSENT

It's not applicable.

ETHICAL APPROVAL

Animal Ethic committee approval has been taken to carry out this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ozioma EO, Okaka AN. Herbal medicines in african traditional medicine. In Herbal medicine, Chapter 10. IntechOpen Ed. 2019;191-214.
2. Mensah ML, Komlaga G, Forkuo AD, Firempong C, Anning AK, Dickson RA. "Toxicity and safety implications of herbal medicines used in Africa", Herbal Medicine. 2019;63.
3. Sofowora A. Medicinal plants and traditional medicine in Africa. 5th edition spectrum Bks Lid, Ibadan, Nigeria. 2006;289.
4. Debjoy B, Sinchan A, Arijit B, Anil B, Parthadeb G, Soumen S. Ocimum phytochemicals and their potential impact on human health, phytochemicals in human health, Venketeshwar Rao, Dennis Mans and Leticia Rao, IntechOpen; 2019. DOI: 10.5772/intechopen.88555.
5. Mintah SO, Asafo-Agyei T, Archer MA, Junior PA, Boamah D, Kumadoh D. Medicinal plants for treatment of prevalent diseases. In Pharmacognosy Medicinal Plants; Perveen, S. Al-Taweel. A. Eds.; IntechOpen: London, UK; 2019.

- Available: <https://www.intechopen.com/books/pharmacognosy-medicinal-plants/medicinal-plants-for-treatment-of-prevalent-diseases> (Accessed on 20 September 2020).
6. Altemimi A, Lakhssassi N, Baharlouei A, Watson D, Lightfoot D. Phytochemicals: Extraction, isolation, and identification of bioactive compounds from plant extracts. *Plants*. 2017;6(42):1-23.
 7. Kutama RM, Adbulkadi RS, Kwalli SA, Chiroma G. Phytochemical compositions in some Nigerian medicinal plants and their pharmacological properties: A review. *Journal of Anesthesiology*. 2018;6(1):15-25.
 8. Olaniyan AB. Maize: Panacea for hunger in Nigeria. *African Journal of Plant Science* 9. 2015;155–174.
 9. Al-Sultan SI, Hussein YA. Acute toxicity of *Euphorbia helioscopia* n Rats. *Pak. J. Nutri*. 2006;5(2):135-140.
 10. Omale James, Friday, Emmanuel. Phytochemical composition, bioactivity and wound healing potential of *Euphorbia heterophylla* (Euphorbiaceae) leaf extract. *International Journal of Pharmaceutical and Biological Research*. 2010;1.
 11. Takim FO, Olaoye AO, Adeyemo J. survey of *Passiflora foetida* L. and associated weed species on arable crops in Ballah, Southern Guinea Savanna Zone Of Nigeria, *Agrosearch*, 2012;12(2):117 – 12.
 12. Bentancur-Galvis LA, Morales GE, Forero JR. Cytotoxic and antiviral activities of colombian medicinal plant extracts of the *Euphorbia* genus. *Mem Inst. Oswaldo Cruz, Rio de Janeiro* 2002;97(4):54 –546.
 13. Egharevba RKA, Ikhatua MI. Ethnomedicinal uses of plants in the treatment of various skin diseases in Ovia North East, Edo State, Nigeria. *Nigerian Tribune*. 2008;1-4.
 14. Burkill HM. The useful plants of West Tropical Africa. *Roy. Bot. Gard. Ken*. 1994(2):12–150.
 15. Salehi B, Iriti M, Vitalini S, Antolak H, Pawlikowska E, Kręgiel D. Euphorbia-derived natural products with potential for use in health maintenance. *Biomolecules*. 2019;9:337.
 16. Adedapo AA, Abatan MO. Olorunsogo. Toxic effects of some plants in the genus *Euphorbia* on haematological and biochemical parameters of rats. *Vdet. Arhic* (2004)74: 53-64.
 17. Quiroz D. Do not fear the supernatural!: The relevance of ritual plant use for traditional culture, nature conservation, and human health in western Africa; 2015.
 18. Adenola OJ. Fourier transform infrared spectroscopy analysis of *Allium sativum* L. and *Nymphaea lotus* L. *Asian Journal of Applied Chemistry Research*. 2020;6(2):7-24.
 19. Onifade AK. Phytotherapy: A random walk through a random forest Inaugural lecture Series 57, delivered at The Federal University of Technology Akure. 2010;7.
 20. Onwusonye JC, Augustine Uwakwe A, Kingsley Patrick Iwuanyanwu. Acute and sub-acute toxicity studies of methanol leaf extracts of *Annona squamosa* linn. in mice. *Sky Journal of Biochemistry Research*. 2014;3(7):53-59.
 21. Kordali S, Cakir A, Drum ME. Antifungal activity of the leaves of 5 pistacies from Turkey. *Fitoterapia*. 2003;74:164-167.
 22. Campos AR, Rao VSN, Printed AC. Investigation in the antinociceptive activity of crude extracts from *Croton cajicara* leaves in mice. *Fitoterapia*. 2002;73(1)P:16-120.
 23. Tanker M, Tanker N. *Pharmacognosy*, Akara University Press. 1st edition. 1990;375.
 24. Islam A, Sayeed MS, Model T, Kham GR. Antimicrobial activity and cytotoxicity of *Zanthoxylum budrunga*. *Fitoterapia*. 2001;72:428-430.
 25. Oyedum UM. Antimicrobial and toxicological effects of leaf extracts of *Euphorbia heterophylla* on some enteric bacteria. *Global Journal of Pure and Applied Science*. 2017;23(1):59.

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