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Hematological Variation in Female Wistar Rats Treated with Aqueous Extract of *Xylopia aethiopica* Fruit

AZEKHUMEN, GN; EBOMOYI, MI

Department of Physiology, School of Basic Medical Sciences, College of Medical Sciences, University of Benin, Benin City, Nigeria.

**Corresponding Author Email: gloria.azekhumen@uniben.edu*
Co-Author Email: isoken.ebomoyi@uniben.edu

ABSTRACT: *Xylopia Aethiopica* which belongs to the family of Annonceae is a broad-spectrum medicinal plant that has received worldwide recognition. The aim of this study was to investigate the effect of consumption of aqueous extract of *Xylopia Aethiopica* on some hematological parameters in female wistar rats. Results obtained showed that there was no significant change (P> 0.05) in RBC, monocyte, hemoglobin, PCV, granulocyte and lymphocyte at 100mg/kg dose. There was also no significant change (P>0.05) in RBC, hemoglobin, PCV, lymphocyte, monocyte and granulocyte at 200mg/kg dose. Also, there was a significant decrease (p<0.05) in platelet at 100mg/kg dose and a significant increase (p<0.05) in platelet at 200mg/kg dose. In conclusion, the administration of aqueous extract Xylopia Aethiopica at high doses (200mg/kg) over a period of four weeks in female wistar rats significantly increase in platelet count. Thus, suggesting while the fruit may have been useful in traditional medicine to arrest bleeding.

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Xylopia originated from Greek word (xylon pikron) meaning bitter wood, the second part of the plants binomial name aethiopica refer to the Ethiopia origin (Ethiopia) of the tree Orwa *et al*., (2009). *Xylopia Aethiopica* is locally known as Hweentia or Kimba. The dried fruits of *Xylopia Aethiopica* (grains of selim) are used as a spice and as herbal medicine in treatment of conditions such as infertility, asthma, bronchitis, rheumatism, arthritis and as a postpartum tonic Burkill (1985). An infusion of the plants fruits has been useful in the treatment of dysenteric conditions or as a mouthwash to treat toothaches, it has also been used as medicine for biliousness and febrile pains. The dried fruit is lightly crushed before being added to West African soups (stews). The seeds of the fruit contain various compound such as bitter substances, alkaloids, glycosides, saponins, tannins, sterols, carbohydrates, proteins, free fatty acids, mucilages and acidic components, some of which could be linked to their known uses Woode *et al*., (2011). Hematology refer to the study of the numbers and morphology of the cellular elements of the blood with the red cell (erythrocytes) white cells (leucocytes), and the platelets (thrombocytes) and the use of the results in the diagnosis of many diseases as well as the investigation of the extent of damage of blood Togun *et al*., (2007). Hematological parameters are good indicators of the physiological status of animals Khan and Zafer, (2007) and are those parameters that are related to the blood and blood forming organs Waugh *et al*., (2001). According to the work done by Oso et al. (2019) rats treated with ethanolic extract of Xylopia aethiopica fruit showed significant increase in their hematocrit and other

related hematological parameters compared to control. Obembe et al. (2015) reported that rats treated with aqueous extract of Xylopia aethiopica fruit had no significant difference in their red blood cell count, packed cell volume, mean corpuscular hemoglobin and mean corpuscular volume compared to control while there was significant decrease in white blood cell count , hemoglobin count and mean corpuscular hemoglobin concentration compared to control in the low dose group. Onyebuagu et al. (2014) reported that rats treated with dietary Xylopia aethiopica fruit showed significant increases in hemoglobin concentration, packed cell volume , mean corpuscular volume and red blood cell count and significant decreases in erythrocytes sedimentary rate and total cholesterol in male rats compared to control. Despite the research work that has been done with Xylopia aethiopica fruit on hematological parameters there is limited literature on the effect of the fruit on hematological parameters in female rats.

MATERIALS AND METHOD

Materials: *Xylopia Aethiopica* fruit, distilled water, orogastric tube, 5ml syringe. Chloroform, cotton wool, heparinized tube and plastic cages.

Exract preparation: The dried fruits of *Xylopia Aethiopica* was bought from Uselu market, in Egor Local Government Area, Edo State, Nigeria, and was identified by a plant taxonomist, Dr. Akinbosu of the department of Pharmacognosy, University of Benin. The dried fruit was pulverized to powder level using the British military machine, the weight was measured to be 600gram. It was macerated inside a container containing 900ml of distilled water for twenty-four hours with constant shaking and stirring. The mixture was filtered to separate the residue from filtrate using filter paper placed over a funnel. The filtrate obtained in a conical flask weighed 700gram and was concentrated to paste level over a water bath at a temperature of 40^0c under reduced pressure to obtain a brownish paste. The brownish paste obtained weighed 9.8gram and was preserved in a sample bottle and kept in a refrigerator and was occasionally weighed and dissolved in distill water when needed for administration.

Experimental Animals: Twelve (12) female wistar rats from the animal house, department of Anatomy, University of Benin were used for this study. The animals were grouped into two groups; control and test group. The test group was further divided into two groups: group 1and group 2 and were given 100mg/kg and 200mg/kg of the aqueous extract of *Xylopia Aethiopica* fruit respectively according to the work of (Oso *et al*., 2009) n=4 each. All the animals were housed in big plastic cages with wired gauge covers and kept in the animal care unit, department of Anatomy, University of Benin. All the animals had unlimited access to water and feed before the commencement of the experiment and were allowed to acclimatized for one week after which their body weight was measured accordingly before the commencement of the treatments.

Administration of Extract: Administration of the fruit extract was done orally using an orogastric tube every 8am each day for 28 days. Animals in group 1 and group 2 treated groups receive extracts of *Xylopia Aethiopica* at a dose of 100mg/kg and 200mg/kg body weight respectively.

Collection of Blood Samples: At the end of the period of extract administration the animal was anaesthetized with chloroform. All blood samples were collected from the abdominal aorta of the rat using a 5ml syringe into a heparinized tube. Red blood cells (RBC) hemoglobin concentration (Hb) packed cell volume (PCV) mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC) and white blood cell (WBC) were determined using standard method.

Statistical Analysis: Computer software SPSS and excel analyzer were used for the analysis. All data were expressed as mean ±SEM. The one-way analysis of variance (ANOVA) was used to analyze the data. P values less than 0.05 were considered significant.

RESULTS AND DISCUSSION

The mean values of the effects of extract of *Xylopia Aethiopica* fruit on some hematological parameters in female wistar rats is presented in Table 1. The various hematological parameters investigated in this study are useful indices of evaluating the toxicity of the plant extract in animals (Yakubu *et al*., 2007). Assessment of hematological parameters can not only be used to determine the extent of deleterious effect of extracts on the blood of an animal, but can also be used to explain blood relating functions of plant extract (Yakubu and Afolayan, 2008). From the observed value of lymphocyte, it is clear that increase in the number of lymphocytes is a normal reaction of rats to foreign substances. The lymphocytosis observed in the present study could be as a result of saponin in the extract which have the ability to stimulate the cell immune system as well as to enhance antibody production (Oda *et al*., 2003), which protects rats against infection that might have been caused by chemical and secondary infections. In this study, it was observed that hemoglobin count for 100mg/kg dose decreased compared to the control. The decrease

in hemoglobin count as observed in this study is in agreement with the work of Obembe *et al*. (2015) who reported that the rat treated with extract of *Xylopia Aethiopica* had reduced hemoglobin count. The reduction in hemoglobin count could be as a result of tannin constituent of *Xylopia Aethiopica* fruit (John-Dewole *et al*., 2012). Tannins act as chelates, binding to minerals e.g Fe (iron) and inhibiting the body ability to absorb them, hence decreasing the rate at which heme which is a portion of hemoglobin is formed, thereby leading to decrease in hemoglobin concentration in the blood.

Table 1. Mean values of the effects of extract of *Xylopia Aethiopica* fruit on some hematological parameters in female wistar rats.

Hematological parameters	CONTROL	LOW DOSE (100mg/kg bodyweight)	P value	HIGH DOSE (200mg/kg body weight)	P Value
WBC (10^3/ul)	9.20±4.45	5.13±2.25	0.47	10.40±3.50	0.85
LY (10^3/ul)	5.40±2.80	3.47±0.80	0.54	8.57±3.18	0.50
MO (10^3/ul)	1.13±0.61	0.46±0.42	0.42	0.70±0.42	0.59
GR (10^3/ul)	2.63±1.27	1.23±1.03	0.44	1.20±0.76	0.39
LY (%)	66.40±12.0	78.60±13.10	0.53	83.80±9.49	0.32
MO (%)	9.33±3.99	5.77±3.87	0.56	5.70±3.39	0.53
GR (%)	24.20±8.23	15.60±9.22	0.53	10.50±6.13	0.25
RBC (10^6/ul)	6.56±0.69	5.96±0.99	0.65	6.78±0.61	0.83
HgB (g/dl)	13.00±1.56	10.90±2.07	0.46	13.80±1.53	0.73
HCT (%)	37.20±4.80	31.30±5.44	0.46	39.00±4.38	0.80
MCV (fl)	56.40±2.02	52.30±0.76	0.13	57.20±1.27	0.75
MCH (pg)	19.70±0.51	18.10±0.40	0.07	20.20±1.16	0.71
MCHC (g/dl)	35.00±0.38	34.60±0.66	0.63	35.40±2.23	0.87
RDW (%)	15.80±0.40	16.10±0.18	0.53	15.80±0.15	0.92
PLT (10^3/ul)	284.00±11.00	194.00±24.80*	0.042	727.00±34.00**	0.0093
PCT (%)	0.27±0.11	0.11±0.05	0.26	0.43±0.22	0.55
MPV (fl)	5.63±37.00	5.30±0.27	0.51	5.80±0.12	0.69
PDW (fl)	6.67±0.90	5.53±1.59	0.57	7.13±0.52	0.68

In this study, it was also observed that the hematocrit counts for 100mg/kg decrease compared to the control. The decrease in hematocrit count observed in this study is in contrast with the work of Oso *et al*. (2019) who reported that the rat treated with *Xylopia Aethiopica* fruit had increased hematocrit count. The reduction in hematocrit could be as a result of tannin constituent in *Xylopia Aethiopica* fruit increasing iron-binding capacity by tannin causes iron defiency in the circulation, thus decreasing transferrin and reducing bone marrow hemosiderin which results to reduced hematocrit. In this study, it was observed that the red blood cell count for 100mg/kg dose decreased compared to the control. The decrease in RBC count as observed in this study is in agreement with the work of Obembe *et al*. (2015) who reported that rat treated with extract of *Xylopia Aethiopica* had reduced RBC count. The reduction in RBC count could be as a result of saponin constituent of *Xylopia Aethiopica* fruit. Saponin has been shown to trigger hemolysis (Bissinger *et al*., 2014). In this study, it was observed that platelet count of the treated rat increased compared to the control. The increase in platelet count as observed in this study is in agreement with the work of (Johnkennedy *et al*., 2011) who reported that rat treated with extract of *Xylopia Aethiopica* fruit has increased platelet count. The platelet count increases observed in this study may be as a result of flavonoid constituent of *Xylopia Aethiopica* fruit. Flavonoid has been shown to act at the blood platelet level by stimulating platelet activity-related thrombosis (Harnafi and Amrani, 2007). *Xylopia Aethiopica* fruit has been reported to contain flavonoids as one of its active compounds (Akaname, 2008). Some studies suggested various mechanisms by which flavonoid exert its platelet property that is, by increasing intracellular ca^{2+} levels; alteration in the metabolism of Camp (Dutta-Roy *et al*., 1999). This study also investigated the effect of aqueous extract of *Xylopia Aethiopica* fruit in monocyte count. It was observed that the monocyte counts of the treated rat decreased compared to the control. The decrease in monocyte count observed in this study is in agreement with the work of Ogbuagu *et al*. (2022) who reported that the rat treated with extract of *Xylopia Aethiopica* had reduced monocyte count. The reduction in monocyte count observed in this study may be as a result of tannin constituent of *Xylopia Aethiopica* fruit. This study also investigated the effect of aqueous extract of *Xylopia Aethiopica* fruits on some hematological parameters using female wistar rats. There was no significant change in mean corpuscular volume (MCV), and mean corpuscular hemoglobin (MCH) among all the groups irrespective of the doses compared to the control, this is in contrast to the report of John Kennedy *et al*. (2011) where the authors reported a dose dependent increase in MCH, MCV etc. Mean corpuscuslar hemoglobin concentration (MCHC) was significantly lower (P>0.05) in the low dose treated group compare with control and 200mg/kg dose treated group. Evaluation of MCH and MCHC are influential in identifying the morphology

of RBC. Hence a decrease in MCHC clinically might confer conditions of hypochromic anemia.

Conclusion: In conclusion, the administration of aqueous extract Xylopia Aethiopica at high doses (200mg/kg) over a period of four weeks in female wistar rats significantly increase in platelet count. Thus, suggesting while the fruit may have been useful in traditional medicine to arrest bleeding.

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