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Original Research Article

The Effects of Aqueous Extract Of *Garcinia Kola* on Hematological Parameters and Lipid Profile in Female *Sprague-Dawley* Rats

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ABSRTACT

Hematological parameters are veritable indicators of state of diseases and wellbeing of individuals. This study evaluated the effects of *Garcinia kola* on hematological parameters and lipid profile in *sprague dawley* rats. Eighteen adult female rats were used. These were divided into 3 groups; group A served as control, group B received *Garcinia kola* extract 0.5mg/kg orally, while group C received *Garcinia kola* extract 1.0 mg/kg of *Garcinia kola*. All groups were treated for 2 weeks. Comparately, there was no significant difference in the perked cell volume (PCV), hemoglobin (Hgb), red blood cell (RBC), mean corpuscular hemoglobin concentration (MCHC), triglyceride (TAG), total cholesterol, low density lipoprotein (LDL) and high density lipoprotein (HDLP) in groups treated with *Garcinia kola* compared with control. However there were significant decrease in WBC and significant increase in platelets, MCV and MCH in the treated groups compred with control. Based on the outcome of this study, aqueous extract of *Garcinia kola* has the potential of inreasing MCV and MCH but decrease WBC at a higher dose. The extract however had no significant effect on the lipid metabolism in spraque dawley rats.

Keywords: *Garcinia kola*, hematological parameters, Lipid profile, *Sprague dawley* rats.

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Introduction

The number of leukocytes in the blood is often an indicator of disease, and thus the white blood cell count is an important subset of the complete blood count. The normal white cell count is usually between 4 × 109/L and 1.1 × 1010/L. White blood cells make up approximately 1% of the total blood volume in a healthy adult.[1] However, this 1% of the blood makes a large difference to health, because immunity depends on it. An increase in the number of leukocytes over the upper limits is called leukocytosis. It is normal when it is part of healthy immune responses, which happens frequently. It is occasionally abnormal, when it is neoplastic or autoimmune in origin. A decrease below the lower limit is called leukopenia. This indicates a weakened immune system. Many plants have medicinal uses and virtually, all parts of these plants were put to one use or the other. The flowers, stems, berries, back, leaves and seeds are usually employed to prevent, relieve and treat illnesses. While drugs listed as conventional medication were originally derived from plants. Many plants are benefical to man (medicinal), some others are poisonous, even among the useful ones are side effects in the form of toxicity to one organ, physiological process or the other.[2] Over 50% of all modern clinical drugs are of natural product origin and natural products play an important role in drug development industry.[3,4]

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Investigation into biological and chemical activities of plants during the past two centuries have yielded compounds for development of mordern systemic organic chemistry and the emergence of medicinal chemistry as a major route for the novel and more effective therapeutic agents.[5] Presently, many scientists and organizations are in search of traditional remedies as alternate medicine.[6] One of such plants that has been extensively studied and reported to have great potential is *Garcinia kola* and is of interest in this study.

*Garcinia kola (*bitter kola*)* is a species of flowering plant belonging to the Mangosteen genus Garcinia of the family Clusiaceae (also known as Guttiferae) and contains pharmacologically active ingredients. It is found in Benin, Cameroon, Gambia, Democratic Republic of the Congo, Ivory Coast, Guinea, Mali, Gabon, Ghana, Liberia, Nigeria, Senegal and Sierra Leone. Its natural habitat is subtropical or tropical moist lowland forests.

The seeds are used in Nigerian traditional medicine, for therapy of broad spectrum of ailments such as in dysentery and diarrhoea diseases.[7] According to a report from the Center For International Forestry Research, *Garcinia kola* trade is still important to the indigenous communities and villages in Nigeria. *Garcinia kola* is traditionally used by African folk healers who believe that it has purgative, antiparasitic, and antimicrobial properties.[8] The seeds are used for liver disorders, bronchitis, throat infections, colic, head or chest colds, and cough[7]. It is also used as a chewing stick.[8]

There are claims, that traditional medicine practitioners use *Garcinia kola* seeds for the treatment of hypertension. There are also reports that *Garcinial kola*, reduced *glutathione* concentration, and also inhibited prostaglandin synthesis.[9] *Garcinia kola* has a spamolytic effect on gastronintestinal smooth muscle.[10] It relaxes the smooth muscles of the uterus and gastrointestinal tract. It has been reported to stimulate Histamine dependent gastric acid secretion.[11] Recently, the antithrombotic activity of GK (*Garcinia kola*) has been reported and its antibacterial effect on respiratory tract pathogens has also been reported.[12,13] It was reported that aqueous extract of GK stabilized the membranes of HbAA, HbAS and HbSS human erythrocytes and reduced blood viscosity.[14] Also GK has been reported to reduce body

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weight, reproductive organ weight and inhibit spermatogenesis in male wistar rats.[15] Considering the medicinal potential of *Garcinia kola*, and the lack of sufficient information in the literature particularly on how it could impact on hematological and lipid profile; bearing in mind the abuse consumption of this plant because of its stimulant effect. This research was designed to investigate its effects on hematological parameters and lipid profile.

Materials and Methods

Plant Material
Garcinia kola were obtained locally at Ado-Ekiti Market in the month of February 2025 and certified at the herbarium in the Department of Botany, Ambrose Alli University.

Extraction of Garcinia kola
The *Garcinia kola* was rinsed with clean water to remove any sand, dirt and contaminant and cut into small pieces around 1 inch with stainless-steel knife. The pieces of the *Garcinia kola* was dried at 45ºC for 72 hours using a hot air convection oven (Model SM-9023), milled with Glen Creston Laboratory mill (Model HA7 1DA) and passed through a 40 mesh sieve. The powdered sample was soaked in distilled water (20% W/V) for 48 hours (2 days) with intermittent stirring/shaking. At the end of the extraction, the extract was filtered using muslin cloth to remove all unextractable matters, including cellular materials and other constituents that are insoluble in the extraction solvents. Afterward, the filtrate was concentrated on a water bath set at 45ºC.

Animal Selection
The animals were obtained from the animal house of the college of medicine, Ambrose Alli University. Ekpoma. A total of 18 adult female rats weighing between 150 to 200g were used. The rats were kept in cages in the animal house and were allowed acclimatization for 2 weeks before the commencement of the experiment. Room temperature was between 30-31% while room barometric pressure was 750-760mmHg. The rats were fed with mash bought from Animal Feeds and had free access to water. The rats were weighed for the period of the experiment. The 18 female rats were divided into 3 groups as follows:

1. Group A, control
2. Group B, given *G. kola* extract 0.5mg/kg orally for 2 weeks.[16]
3. Group C, given *G. kola* extract 1mg/kg orally for 2 weeks

Administration was done orally through the means of a metal cannula as described by Naiho and Ugwu with slight modification.[16] The animals were weighed weekly.

Sample Collection
The animals were sacrified by sedating with chloroform. Blood sample (5ml) was collected from all the rats through the retro-orbital venous plexus into heparinized tubes for determination of the haematological parameters and lipid profile. The blood was centrifuged afterward at 4,000 rpm for 10 minutes to obtain the plasma for the biochemical assays.

Determination of Hematological Parameters
From the blood samples, the Hematological Parameters were determined using the automated hematologic analyzer SYSMEX KX21, a product of SYSMEX Corporation, Japan employing the methods described by Dacie and Lewis.[18]

Biochemical assays
Plasma analysis for total cholesterol (TC), triglycerides (TAG), and high density lipoprotein cholesterol (HDL-C) were determined by enzymatic method coupled with spectrophotometry using assay kit (Randox Lab. Ltd., Co. Antrim, UK). Low density lipoprotein cholesterol (LDL-C) was estimated with the use of Friedewald's formula.[18]

Statistical Analysis
The Statistical Package for Social Sciences (SPSS version 20) was used for data analysis. The one-way analysis of variance (ANOVA) was employed for data analysis and where applicable LSD was determined and confidential interval of $p \leq 0.05$ considered statistically significant. Results were presented as mean ± Standard error of mean using suitable tables and charts.

Results and Discussion

Effect of Garcinia kola on Hematological Parameters
There was no significant difference ($p<0.05$) in PCV, Hgb, RBC and mean corpuscular hemoglobin concentration (MCHC) across the groups compared with control (Group A). In Group C there was significant dicrease ($p<0.05$) in WBC compared with Group A and B. There was a significant increase ($p<0.05$) in platelets count in Group C compared with Group B. There was a significant increase ($p<0.05$) in MCV and MCH in Group C, compared with Group A and B (Table 1). The result of this study showed that extract of *Garcinia kola* had no significant effect on the PCV, Hgb and RBC across the groups compared with control. This report is consistent with the findings of Tamuno-Emine *et al* and Esomonu *et al*., in which the mean Hb, percentage PCV and RBC count of rats fed G.kola seed extract were found to be non-significantly different ($p>0.05$) from control.[19,20] The result of this study also showed that extract of Garcinia kola significantly decreased the WBC count and this is an indication that the extract interfered with the leukopoietic system in the rats. This report is however not consistent with the findings of Tamuno-Emine *et al* and Frandson *et al*, in which the extract of *Garcinia kola* was reported to induce a remarkable increase ($p<0.05$) in WBC count of rats.[19,20] This contrasting report may be attributed to the difference in dose and duration of administration of the extract. The mean corpuscular hemoglobin concentration (MCHC) is a measure of the concentration of hemoglobin in a given volume of packed red blood cell. A low MCHC can be interpreted as identifying decreased production of hemoglobin.[22] The result of this study further showed that the extract of *Garcinia kola* had no significant effect on the MCHC but significantly increased the MCV and MCH ($p<0.05$) at a higher dose compared with control. Going by the finding of this study it is evidenced that the *Garcinia kola* has only a mild effect on the quality of red blood cells production in *Spraque Dawley* rats.

Table 1: Effect of *Garcinia kola* on Hematological Parameters

Parameter	Group A (Control)	Group B (0.5 mg/kg)	Group C (1 mg/kg)
PCV (%)	48.20 ± 1.99	44.80 ± 1.05	47.20 ± 1.87
Hgb (g/dL)	16.06 ± 0.66	14.92 ± 0.35	15.74 ± 0.63
RBC (10^6/µL)	4.84 ± 0.20	4.46 ± 0.08	4.58 ± 0.22
WBC (10^3/µL)	10.58 ± 0.56	10.32 ± 1.05	7.50 ± 0.56*+
Platelets (10^3/µL)	17.56 ± 0.64	15.74 ± 1.23	20.94 ± 1.17+
MCV (fL)	99.80 ± 0.45	99.12 ± 0.27	103.66± 0.96*+
MCH (pg)	33.26 ± 0.21	33.32 ± 0.06	34.46 ± 0.41*+
MCHC (%)	33.30 ± 0.03	33.34 ± 0.02	33.37 ± 0.23

Effect of Garcinia kola on Lipid Profile
There was no significant difference ($p<0.05$) in the values of T. cholesterol, TAG, LDL-cholesterol and HDL-cholesterol across the groups compared with control (Table 2). Several studies have shown that elevated serum cholesterol concentration may be a risk factor related to atherosclerosis, which causes thickening of the walls of blood vessels.[23] The result of this study showed that the extract of *Garcinia kola* had no significant effect on the lipid profile and this is an indication that the extract does not alter the plasma lipids nor interfere with its metabolism in the Sprague Dawley rats. This finding is however at variant with the report that *Garcinia kola* (root b ark, stem bark and seed) biflavonoid fractions can be used in the management of hyperlipidemia.[24,25] While another report expressed that G. kola seed

feeding significantly lowered (P<0.05) serum cholesterol concentration and that the test material may not likely contribute to any disease associated with hypercholesterolemia.[19] The difference in the report of this study may be associated with the difference in dose or experimental procedure.

Table 2: Effect of *Garcinia kiola* on Lipid Profile

Parameter	Group A (Control)	Group B (0.5 mg/kg)	Group C (1 mg/kg)
Total cholesterol (mg/dL)	186.00 ± 33.12	233.00 ± 18.78	210.00 ± 16.33
TAG (mg/dL)	128.00 ± 13.35	114.00 ± 13.10	145.00 ± 20.77
HDL-cholesterol (mg/dL)	50.00 ± 4.08	61.00 ± 9.17	57.60 ± 5.14
LDL-cholesterol (mg/dL)	86.00 ± 7.96	99.00 ± 10.04	89.60 ± 5.60

Values are means ± SEM.

Conclusion

Results of this study show that the aqueous extract of *Garcinia kola* has the potential of inreasing MCV and MCH but decrease WBC at a higher dose. Consequently, the impact of this on the body immune system is subject to further investigation. The extract however had no significant effect on the lipid metabolism in spraque dawley rats

Conflict of interest

The authors declare no conflict of interest

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them

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