

Effects of *Garcinia kola* Seed on Some Haematological and Serum Biochemical Parameters of Wistar Albino Rats

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The effect of graded doses of *Garcinia kola* seed (G. kola seed) on serum cholesterol concentration and some hematological and liver function indices of wistar albino rats was studied. Different groups of the animals were fed powdered G. kola seed (0 mg, 50 mg and 100 mg/100g body weight, respectively) once a day for 60 days. Results obtained showed that G.kola seed feeding produced in rats a significant decrease ($p < 0.05$) in serum total cholesterol concentration, and a significant increase ($p < 0.05$) in white blood cell (WBC) count. The other parameters studied, including haemoglobin (Hb) concentration, percentage packed cell volume (PCV), red blood cell (RBC) count and the biomarkers of liver function such as serum total bilirubin concentration, and activities of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) were all found to be unaffected by the kola seed feeding. These findings suggest that G.kola seed may have no possible adverse effect on the functions of the liver and may have a beneficial effect as evidenced by its ability to produce significant reduction in serum total cholesterol concentration and a significant increase in the WBC count.

Key words: *Garcinia kola* seed, Haematological parameters, Serum cholesterol, Liver function markers, Albino rats.

INTRODUCTION

Garcinia kola Heckel is a fruit-bearing plant that belongs to the family Guttiferae. Traditionally, it is claimed that every part of this herbal plant is of medicinal importance. *Garcinia kola* seed (hereafter referred to as G. Kola seed) is commonly called "bitter kola" in Nigeria because of its bitter taste. It is highly valued in African ethnomedicine because it is used not only as a cure for human ailments but also as a disease preventive. Studies have shown that G. kola seed possesses among others anti-inflammatory, antidiabetic, antioxidant and antihepatotoxic activities (Iwu *et al.*, 1990; Adegoke *et al.*, 1998; Adegboye *et al.*, 2008; Eminatedoki *et al.*, 2010; Udenze *et al.*, 2012). The seed has also been reported to be useful in the treatment of abdominal pain, cough, laryngitis, infectious diseases, erectile problems, and liver and lipid disorders (Adegoke *et al.*, 1998; Adaramoye *et al.*, 2006; Njume *et al.*, 2011).

Phytochemical studies have shown that G. kola seed contains a variety of phytochemicals including flavonoids, saponins, tannins and cardiac glycosides (Adegboye *et al.*, 2008). The flavonoid of G.kola seed (also known as kolaviron)

has been identified as the main bioactive constituent which is responsible for the numerous physiological and pharmacological effects of the kola seed. The numerous medicinal uses of G. kola seed and the scarcity of information on its possible toxicological potential informed studies involving the use of animal models. The present study was therefore undertaken to investigate the effects of G. kola seed on serum cholesterol concentration and some haematological and liver function indices of wistar albino rats.

MATERIALS AND METHODS

Animals: Fifteen albino rats of the wistar strain (50-100g) obtained from the Animal House of the Department of Biochemistry, University of Port Harcourt, Nigeria, were used in this study. The animals were kept in a well-ventilated room with specially designed laboratory cages and fed with a commercial rat diet (Topfeed Limited, Sapele, Nigeria) and clean drinking water *ad libitum*. **Plant Material:** Fresh G.kola seeds were purchased from a local market in Port Harcourt, Nigeria during

December, 2009. After removing the outer brown testa, the seeds were cut into small pieces, air-dried and then ground into fine powder using an electric blender with a mill (Kenwood, BL 430 series). Twenty-five grammes (25g) of the pulverized seeds were mixed with 100ml of distilled water at a weight/volume ratio of 1:4.

Study Design

The animals used were divided into three groups, each group consisting of five rats. Group I served as control and received orally 0.4ml/100g body weight of distilled water once a day for 60 days. Group II rats received orally 50mg/100g body weight of powdered G.kola seed at a constant volume of 0.2ml/100g body weight once a day for 60 days. Group III rats received orally 100mg/100g body weight of powdered G.kola seed at a constant volume of 0.4ml/100g body weight once a day for 60 days.

All the animals in groups I to III were allowed access to water and rat diet ad libitum throughout the duration of the experiment. At the end of the experimental period, the animals were fasted for 6 hours and then sacrificed under chloroform anaesthesia. Blood samples were collected and transferred into:

- i. Labelled tubes containing ethylene diamine tetra-acetic acid (EDTA) anticoagulant for determination of haemoglobin concentration, percentage packed cell volume, and red and white blood cell count based on the methods described by Ochei and Kolhatkar, 2007.
- ii. Labelled tubes without anticoagulant, and allowed to clot. Serum was obtained by centrifuging at 3,000 rpm for 10 minutes in a wispertuge centrifuge (model 1384). The serum thus obtained was used for determination of total cholesterol concentration (using assay kit from Randox Laboratories, UK), total bilirubin concentration (using the method described by Tietz, 1986 and WHO, 2010) and for the assay of the activities of alkaline phosphatase (using assay kit from Quimica Clinica, Spain) and alanine (ALT) and aspartate (AST) aminotransferases (Using an assay kits from Randox Laboratories, UK).

Statistical Analysis

All values were expressed as mean±standard error of mean (SEM). Statistical comparisons between group means were performed using analysis of variance (ANOVA), followed by Tukey HSD test. The group means were considered to be significantly different at $p < 0.05$.

RESULTS

The effects of G.kola seed on serum total cholesterol and bilirubin concentrations and serum activities of three hepatic

marker enzymes of wistar albino rats are shown in Table 1. Feeding the rats with G. kola seed for 60 days at 50mg/ 100g (Group II) and 100mg/100g (Group III) was found to produce a significant decrease ($p < 0.05$) in serum total cholesterol concentration (2.04 ± 0.12 mmol/L and 1.84 ± 0.14 mmol/L, respectively) when compared with control (2.56 ± 0.20 mmol/L). However the concentration of serum total bilirubin and activities of the three hepatic marker enzymes (AST, ALT and ALP) was found to be non-significantly affected ($p > 0.05$) following G. kola seed feeding for 60 days.

Table 2 shows the effects of G .kola seed on some haematological parameters, namely packed cell volume (PCV), haemoglobin (Hb), white blood cell (WBC) count and red blood cell (RBC) count of rats. In the animals fed G. kola seed for 60 days at 50mg/100g (Group II) and 100mg /100g (Group III), the WBC counts recorded ($5.70 \pm 0.10 \times 10^3/\text{mm}^3$ and $6.20 \pm 0.10 \times 10^3/\text{mm}^3$, respectively) were found to be significantly increased ($p < 0.05$) when compared with control ($4.90 \pm 0.020 \times 10^3/\text{mm}^3$). The other haematological parameters (PCV, Hb and RBC count) were, however, found to be non-significantly affected ($p > 0.05$) by the G. kola seed feeding.

DISCUSSION

G. kola seed has been reported to contain appreciable quantities of certain phytochemicals (e.g. oxalates and cardiac glycosides) which are well-known to be toxic to vital organs and tissues (Monago and Akhidue, 2002; EMEA, 2004). When a vital organ such as the liver is damaged by chemical agents, loss of organ function may be determined by certain biochemical markers such as serum total bilirubin concentration and the activities of serum alkaline phosphatase (ALP), alanine aminotransferase (ALT) and aspartate aminotransferase (AST). When liver cells are destroyed by a chemical agent, AST and ALT are often released into the blood stream in conformity with the extent of the damage (Lin and Wang, 1986). Elevated serum ALP activity and bilirubin concentration are indicative of bile ducts obstruction. Bilirubin may also be elevated when the secretory function of the liver is impaired.

In this study, rats fed G. kola seed was found to exhibit non-significant differences ($p > 0.05$) in serum total bilirubin concentration and activities of AST, ALT, and ALP as compared with control (Table 1). This observation is an indication that the test material had no possible adverse effect on the cellular integrity and secretory function of rat hepatic (liver) cells. 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 (Ekpo et al., 2007). The fact that G. kola seed feeding significantly lowered ($P < 0.05$) serum cholesterol concentration showed that the test material may not likely contribute to any disease associated with hypercholesterolemia.

Table 1: Effect of G.kola seed on the activities of some serum enzymes and serum total bilirubin and cholesterol concentration of rats

Rat Group	AST(U/L)	ALT(U/L)	ALP(U/L)	Bil(umol/L)	Chol(mmol/L)
I	22.00±2.40	13.80±1.90	31.30±2.20	7.00±0.40	2.56±0.20 ^a
II	24.50±2.20	14.20±2.10	33.00±2.60	7.50±0.40	2.04±0.12 ^b
III	30.50±2.80	18.50±1.80	33.50±3.00	7.70±0.30	1.84±0.14 ^c

All values are expressed as mean ±SEM for 5 rats.

Group means were compared for significant differences using ANOVA followed by Tukey HSD test.

Groups I,II and III rats received 0mg, 50mg and 100mg/100g powdered G. kola seed, respectively.

Means with different superscripts in the same column differed significantly (p<0.05)

AST=Aspartate aminotransferase.

ALT= Alanine aminotransferase.

ALP =Alkaline phosphatase

Bil =Total bilirubin.

Chol=Total cholesterol.

Table 2: Effect of G. kola seed on some haematological parameters of Wistar Albino rats

Rat Group	PCV (%)	Hb g/dL	WBC count (x1000/MM ³)	RBC Count (X106/ MM ³)
I	38.80± 1.50	14.10±0.40	4.90±0.20 ^a	5.20±0.20
II	37.70±1.10	14.00±0.30	5.70±0.10 ^b	4.80±0.20
III	36.50±1.80	13.40±0.30	6.20±0.10 ^c	4.60±0.10

All values are expressed as mean ± SEM for 5 rats. Group means were compared for significant differences using ANOVA followed by Tukey HSD test.

Groups I, II and III rats received 0mg, 50mg and 100mg /100g G. kola seed, respectively. Means with Different superscripts in the same column differed significantly (p<0.05).

PCV =Packed cell volume

Hb= Haemoglobin

WBC=White blood cell

RBC= Red blood cell

The population of defensive white blood cells (WBC) can be significantly increased by certain substances which have the ability to boost the immune system (Frandsen, 1981). G. kola seed appears to be one of such substances as it was found in this study to induce a remarkable increase (p<0.05) in WBC count of rats (Table 2).The other haematological parameters investigated, notably haemoglobin (Hb) concentration, percentage packed cell volume (PCV) and red blood cell (RBC)count, were, however, found to be non-significantly affected (p>0.05) by G. kola seed feeding. This result is in agreement with the report of Esomonu et al. (2005) 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. The fact that G. Kola seed exerted no influence on Hb concentration, percentage PCV and RBC count indicated that the test material did not adversely interfere with the functions of the haematopoietic system.

CONCLUSION

Feeding rats with G.kola seed caused a significant decrease in serum total cholesterol concentration, a significant increase in WBC count and a non-significant effect on Hb, PCV,RBC count and some biomarkers of liver function.The reduced serum cholesterol concentration induced by G.kola seed suggested that the kola seed may not contribute to any disease associated with hypercholesterolaemia. The raised WBC count induced by the kola seed suggested that the herb contains biologically active components that can boost the

immune system through increasing the population of defensive white blood cells. Thenon-significant effect of the kola seed on Hb,PCV, RBCcount and the biomarkers of liver function showed that the herb had no possible adverse effect on the functions of the liver and the hematopoietic system.

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