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Effect of *Garcinia* Kola Seed on Serum Enzyme, Urea, Creatinine and Electrolytes of Healthy Human Subjects

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Abstract: ***Serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), urea, creatinine, sodium (Na^*) and potassium (K^*) are key diagnostic markers of hepatic and renal function. In this study, the effect of Garcinia kola seed (G. kola seed) on the key diagnostic markers of hepatic and renal function in healthy human subjects was investigated. In the group of human subjects fed 20g G. kola seed plus 250ml water, none of the renal function markers (serum urea, creatinine, Na^* and K^*) was significantly affected ($P > 0.05$). However, two of the hepatic function markers (serum AST and ALP activities) were found to show a significant decrease ($p < 0.05$) following G. kola seed feeding. These findings suggest that G. kola seed may not be toxic to the kidney and may have a protective effect on liver function.***

Keywords: *Garcinia* kola seed, Enzymes, Urea, Creatinine, Electrolytes, Human subjects.

1. Introduction

*Garciniakola*Heckel otherwise called "bitter kola" is a fruit-bearing plant that belongs to the family *Guttiferae*. The plant is found mainly in the tropical rain forest region of Central and West Africa. The seeds of the plant are used as refreshment and as medicine for the treatment of abdominal pain, cough, liver disease, infections and erectile problems (Njume*et al.,* 2011). Traditionally, it is claimed that regular consumption of *Garciniakola* seed (hereafter referred to as *G. kola* seed) can lower blood glucose concentrations and can improve the complications of diabetes mellitus. 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 component has been shown to be responsible for most of the biological activities of *G. kola* seed including hepatoprotective, anti-inflammatory, antioxidant, anti-fertility and antimicrobial effects (Adaramoye and Adeyemi, 2006; Adegboye*et al.,* 2008; Eminedoki*et al.,* 2010).

Traditionally, *G. kola* is used by African medicine men as a purgative, for oral hygiene and as an antidote for ingested poison (Iwu, 1999). In view of the many uses of *G. kola*, especially in Nigeria, and the fact that traditional medicine practitioners prescribe and administer herbal preparations to patients without regard to the possible adverse effects associated with some herbs, this study was undertaken to assess the effect of *G. kola* seed on some markers of hepatic and renal functions in healthy human subjects.

2. Materials and Methods

Plant Material: Fresh *G. kola* seeds were purchased from a local market in Port Harcourt, Nigeria during December 2014. The outer testa of each seed was removed before it was ingested.

Study Participants: Twenty (20) healthy human subjects were recruited for the study. The study protocol was carefully explained to each participant and consent was given to participate in the study. The study participants consisted of 14 males and 6 females aged 25 to 48 years, with body mass index (BMI) ranging from 22.0 to 26.5kgm^{-2}. None of the participants ingested any medicine or alcoholic beverages before and during the duration of the study.

Study Design: The study participants were asked to fast overnight and were divided into 2 groups, each consisting of 10 persons. Group 1 participants were given to drink first thing in the morning for 10 days 250ml Eva premium table water (produced by Nigerian Bottling Company). Each participant was asked to eat 2 hours after the water. Group II participants were fed 2 seeds of *G. kola* plus 250ml Eva premium table water first thing in the morning for 10 days. On each day, the participants were asked to eat 2 hours after consuming the kola seeds and water.

Blood Test: Blood was collected before feeding on the 1st day and 2 hours after feeding with test materials on the 10th day. The blood samples thus collected were transferred into labeled tubes without anticoagulant. The blood was allowed to clot at room temperature for 30 minutes and then centrifuged at 1500 x g for 10 minutes. Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities were determined using kits of Randox Laboratories, UK, while the activity of serum alkaline phosphatase (ALP) was determined using kit from QuimicaClinica, Spain.

Serum urea and creatinine concentrations were determined using diacetylmonoxime method and Jaffe reaction, respectively as described by Ochei and Kolhatkar (2007). Serum sodium (Na^*) and potassium (K^*) concentrations were determined using Petracourt353 flame photometer.

Statistical Analysis: All values were expressed as mean ± standard error of mean (SEM) and statistically analysed using students T-distribution test. Differences were considered significant at $P < 0.05$.

3. Results

The effect of feeding human subjects with *G. kola* seed on the activities of some serum enzymes is shown in Table 1. Serum aspartate aminotransferase (AST) and alkaline phosphatase (ALP) activities were found to decrease significantly ($p < 0.05$) in the human subjects fed 20g *G. kola* seed and 250ml water each day for 10 days. In the subjects fed only water, serum activities of all three enzymes examined (AST, ALT and ALP) were found to show non significant changes ($p < 0.05$).

In table 2, serum concentrations of the renal function markers e.g. serum sodium (Na^*), potassium (K^*), urea and creatinine, measured on the 10^{th} day following G. kola seed feeding were found to change non significantly ($p > 0.05$) as compared to the values measured at the beginning of the study. Similarly, water alone produced a non significant change ($p > 0.05$) in serum concentrations of all the renal function markers.

Table 1: Activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) in serum of human subjects fed *G.* kola seed.

Group fed with	*Day*	*Serum activity (IU/L)*		
		AST	**ALT**	**ALP**
Water alone	0	9.13 ± 0.29	8.20 ± 0.30	25.67±0.36
	10	9.73 ± 0.32	8.07 ± 0.25	27.73±0.96
G.kola seed Plus water	0	9.00±1.44#	7.93±0.28	31.00±1.80*
	10	7.40±0.85#	8.00±0.26	27.00±1.30*

All values are expressed as mean ± SEM for 10 human subjects. Group means were compared for significant differences using student T-distribution test. * and # = statistically significant differences ($p < 0.05$).

Table 2: Concentrations of sodium (Na*), potassium (K*), urea and creatinine in serum of human subjects fed *G. kola* seed.

Group fed with	Day*	Serum concentrations (mmol/L)			
		Na^*	K^*	Urea	Creatinine
Water alone	0	140.20±0.52	4.18 ± 0.09	3.48± 0.15	90.00± 4.50
	10	141.00±0.61	4.25 ± 0.11	3.53± 0.12	92.00± 5.20
G. kola seed Plus water	0	141.00±1.46	4.11±0.07	3.30±0.16	89.00±3.70
	10	139.00±0.67	4.27±0.11	3.39±0.15	88.00±4.10

All values are expressed as mean ± SEM for 10 human subjects. Group means were compared for significant differences using student T-distribution test. * = No differences between day 0 and day 10 values ($p < 0.05$).

4. Discussion

The assessment of how medicinal herbs affect key diagnostic makers of renal and hepatic function in experimental animal models has been carried out by several workers. In one such assessment, Alli Smith and Adanlawo (2012) reported that animals fed saponin from the root of *G. kola* and a significant rise in serum AST and ALP activities and a non significant change in serum ALT activity. This report is found to be inconsistent with the results of this study in which human subjects fed 20g *G. kola* seed had a significant decrease in serum AST and ALP activities and a non significant change in serum ALT activity (Table 1). Serum AST and ALT are maker enzymes for hepatic function. Serum ALP activity could give indications of hepatic and bone malfunctions. An increase in serum activities of the marker enzymes could be due to cellular leakage and loss of functional integrity of liver cells (Moore *et al.* 1985). The fact that *G. kola* seed feeding resulted in a decrease in the activities of serum AST and ALP indicated that the kola seed may have a protective effect on the liver.

Serum urea, creatinine and electrolytes are makers of renal function. Okoko and Awhin (2007) reported that cisplatin administered to rats at 5mg/kg produced a marked increase in urine protein and serum urea and creatinine concentrations, indicating renal damage. This observation is in agreement with the report of elevated serum urea and creatinine concentrations and decreased serum albumin concentration in humans with renal failure (Bell *et al.* 1976; Burtis*et al.* 2012). In this study, it was observed that feeding human subjects with *G. kola* seed produced a non significant effect ($p < 0.05$) on the concentrations of serum urea, creatinine, sodium and potassium (Table 2). The non significant effect observed is an indication that *G. kola* seed may not be nephrotoxic (toxic to the kidney).

5. Conclusion

Feeding human subjects with *G. kola* seed produced a non significant effect on serum urea, creatinine and electrolytes, but a significant decrease in activities of serum AST and ALP. This observation may be an indication that *G. kola* seed is probably not toxic to the kidney and may have a protective effect on liver function.

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