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EVALUATION OF PROXIMATE, MINERALS AND PHYTOCHEMICAL COMPOSITION OF *GARCINIA KOLA* CULTIVATED IN ESSIEN UDIM, AKWA IBOM STATE, NIGERIA

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ABSTRACT

Garcinia kola is a dicotyledonous plant found in moist rain forests and swamps. It seeds are edible and are consumed for their multiple property. Samples of *Garcinia kola* seeds were analysed for their nutritional composition, minerals constituents and phytochemical composition. The proximate analyses showed that the seed sample has high level of carbohydrate 75.03%, little amount of Crude fibre 3.94%, ash content 4.17%, crude fat 3.80% and protein 3.06%. Also, a considerable level 9.28% of Moisture was shown. This composition shows that the sample could be a good source of carbohydrate, fibre, fat and protein. The phytochemical parameters carried out were flavonoids, Alkaloids, Saponins, Tannin, Oxalate, Phytate, and HCN. The result shows a high level of flavonoids (9.20%), Oxalate (8.85%) and Saponins (8.70%). Alkaloids and HCN were present in considerable amount 6.50% and 4.55% respectively. But Phytates and Tannins were present in negligible amount, 0.57% and 1.02% respectively. The mineral contents were found in moderate amount. *Garcinia kola* seed could be a good source of minerals despite the negligible amount of anti-nutrients found that could prevent the adsorption of these minerals.

KEYWORDS: *Garcinia kola*, nutritional, phytochemicals, proximate composition, Antinutrients.

INTRODUCTION

Bitter kola is one of the plants that are very important in our everyday existence especially among the elderly in the third world countries. Bitter kola is also known as Africa wonder nut. It is an angiospermae, belonging to the family Guttiferae. On chewing, Bitter kola seeds stimulate the flow of saliva (Leakey, 2001) and are widely consumed in west and central Africa. Bitter Kola is a highly valued and numerous uses which are social and medicinal; thus making the plant an essential ingredient in folk medicine. Bitter Kola is believed to be an important source of new chemical substances with potential therapeutic benefits (Eisner, 1990). Bitter Kola is considered a wonder plant as every part of it is of medicinal importance. The plant is used in folklore remedies for the treatment of ailments such as liver disorder, diarrhea, laryngitis, bronchitis and gonorrhoea (Adesina *et al.*, 1995). The bitter Kola seeds have pharmacological potency in treating stomachache, gastritis, venereal diseases, nervous system disorder and laryngitis (Ajebesone and Aina, 2004; Iwu, 1993 and Udenze *et al.*, 2012).

Bitter Kola is a perennial crop growing in the forest, distributed throughout west and central Africa (Iwu, 1993). It is widely distributed in West Africa countries, particularly in Nigeria where it is common in the South Western States and Edo State (Eka, 1971). Bitter Kola is botanically known as *Garcinia kola*. In Nigeria it is called Oje in Bokyi; efiat in Ibibio; efiari in Efik; igoligo in Idoma, Okain in Isekiri; edun in Edo (Bini); efrie in Ejagham-ekin; Cidagoro or namijin goro in Hausa; emiale in Icheve; akaan in Ijoizon; Orogbo in Yoruba and aki-ilu or adu in igbo (Burkill, 1994).

Garcinia kola is a medium-sized tree, but sometimes growing up to 12 m tall and 1.5 m wide. It is a spread forest tree with dense and heavy crown; the bole is straight, the bark is greenish-brown, thick and smooth. It has broad leaves, 5 – 10 cm long, paired at the end of twigs, broadly elliptic, very shortly acuminate, cuneate, shiny above and leathery with very distinct resinous yellow canal. The leaf has ten pairs of lateral nerves with very obscure venation between; petiole is much thickened; the stalk is stout, finely hairy in young leaves. It bears male and female flowers separately, usually between December, March, and May – August. The female flower is yellow and fleshy, globe, 1.5 cm wide; the male flower is smaller but with more prominent stamens (4 bundles), 4 sepals, 4 greenish-white petals. It

fruits between July – October (Esiegwu *et al*., 2014). It produces characteristic large fruits (6 cm in diameter), reddish yellow, skin peach-like; containing 3 – 4 seed coated brown with branched line embedded in an orange – coloured pulp; kernels are pale with resin pockets, seeds obtusely 3-sided, up to 3.8 cm by over 1.3 cm, showing a small resinous line when cutting across (Iwu *et al*., 2003).

Scientific Classification: Kingdom: Plantae; Division: Magnoliophyta; Class: Magnoliopsida; Order: Theales; Family: Clusiaceae/ Guttiferae; Genus: Garcinia; Botanical name: *Garcinia kola* Heckel (Buba *et al.*, 2016).

The aim of this research work is to quantitatively analyse the sample for Nutritional, Minerals and phytochemicals composition.

EXPERIMENTAL

Sampling and sample preparation

Garcinia kola seeds were collected from Obo-Annang, Essien Udim Local Government Area. It was then transported to the laboratory for identification by a botanist. The sample was chopped into tiny pieces with the use of a stainless steel knife in order to increase the surface area needed for the sample to dry quickly. It was then sundried for a week. After drying, the pills were then blown away remaining the seeds. The seed samples were washed with distilled water, dried and then grounded into uniform powder using master chef blender. It was stored in airtight bottle till required for analysis.

PROXIMATE ANALYSIS

To determine the moisture, ash content, crude fat, crude protein, crude fibre and carbohydrate contents of the sample seeds, the standard methods of the Association of Official Analytical Chemist were used (AOAC, 1990). Moisture content was determined by heating 5.0 g of the sample to a constant weight in a crucible placed in an air-circulating oven at 80^{o}C. The dry sample was used in the determination of other parameters. Ash content was determined by the incineration of 5.0 g sample placed in a muffle furnace maintained at 450^{o}C for 2 hrs. Crude fat were determined by exhaustively extracting 5.0 g of the sample in a soxhlet apparatus using petroleum boiling point 60^{o}C. Crude protein was determined by the Kjeldahl method. Crude fibre was obtained by digesting 5.0 g of sample with H_2SO_4 and NaOH and incinerating the residue in a muffle furnace maintained at 450^{o}C for 2 hrs. Carbohydrate was obtained by different method (AOAC, 1990).

MINERAL CONTENTS DETERMINATION

The mineral contents were determined by Atomic Absorption Spectrophotometry after dry ashing of the sample. Ash sample was transferred quantitatively into a conical flask and dissolved in 10 ml of 3% Ferric Chloride and the mixture was heated on a hot plate. The solution was then filtered into a 100 ml volumetric flask and made up to the mark with distilled water. The mineral contents (Zinc, Copper, Iron, Manganese, Cadmium and lead) of the solution were determined.

PHYTOCHEMICAL ANALYSES: Phytochemical analyses includes the determination of flavonoid, determination of Oxalate, determination of Saponin, determination of Tannin, determination of Alkaloid and determination of phytates. All of these were determined based on methods of analyses described by AOAC (1990).

RESULTS AND DISCUSSION

The result of proximate composition of the seed sample of *Garcinia kola* is shown in Table 1. The moisture content (9.28 ± 0.01%) of the sample indicates the presence of moisture in considerable amount. Food sample can be viable for microorganism growth when there is too much moisture. This accounts for most of the biochemical and physiological reactions in the plant (Guisseppe and Baratta, 2000). This value is different from what had previously reported for *Garcinia kola* by Alaje *et al.* (2014) and Adesuyi *et al.* (2012). This variation in the composition may be due to season, soil, environment and time of evaluation. The ash content of the sample (4.17 ± 0.05%) indicates the presence of ash. Ash content is an index of the total mineral content. The result obtained suggests that the seed is a good source of mineral elements.

Table 1: Proximate Composition of *Garcinia Kola* Seeds.

PARAMETERS	(%)
Moisture Content	9.28 ± 0.01
Ash Content	4.17 ± 0.05
Crude Fat	3.80 ± 0.15
Crude Protein	3.06 ± 0.01
Crude Fibre	3.94 ± 0.01
Total Carbohydrate	75.03 ± 0.02

Results are means values ± standard deviation of triplicate determinations.

Crude fat (3.80 ± 0.15%) indicates the presence of fat. Fats promote normal functions of the brain and nervous system. Lowering cholesterol levels and supporting heart health. It protects against dry eye disease. Fat is known to supply most of the energy needed by man. The crude protein content (3.06 ± 0.12%) indicates the presence of protein. Proteins often times referred to as the "Nitrogen-containing natural product", has been proved to be essential for the survival of human beings and animals (Voet *et al.*, 2008). Proteins have also been detected to be composed of building blocks called Amino acids. The sample shows a considerable amount of proteins even though its low compared to the protein level in some commonly consumed oil seed like rape seed (25%) and sun flower (28.7%) as reported by Jackson (2000).

The Crude fibre content (3.94 ± 0.10%) of the sample indicates the presence of fibre. Crude fibre content shows that the sample contains trace amount of cellulose, Hemicellulose and Lignin. These results are not in agreements with the values reported by Ghanya *et al.* (2009).

The carbohydrates content of the sample (85.03 ± 0.02%) indicates a high presence of carbohydrate. Carbohydrates are the most abundant biological molecules. They are said to be chemically simpler nucleotides or amino acid because they contain just three elements namely carbon, hydrogen and oxygen. They play important roles in the body as sources of energy as well as structural materials (Voet *et al*., 2008). The result of this research in table 1 has confirmed the *Garcinia kola* seed has a higher percentage of carbohydrate than Sorghum bicolour. L. stems flour (44.52%) as reported by Adetuyi and Akpambang (2005) and can be used as a source of carbohydrate. They also provide readily accessible fuel for physical performance and regulate nerve tissue (Whitney and Rolfes, 2005).

The mineral content of *Garcinia kola* shows a great deal of mineral composition (FIGURE 1). Minerals are essential for the maintenance of human health. The average daily reference values of recommended by USA National Institute of Health (NIH) for men and women, from 19 to 70 years, are: 1000 – 1200, 310 – 420, 4700, 1200 – 1500, 0.9, 8 – 14, 1.8 – 2.3 and 8 – 11 mg per day of Ca, Mg, K, Na, Cu, Fe, Mn and Zn respectively.

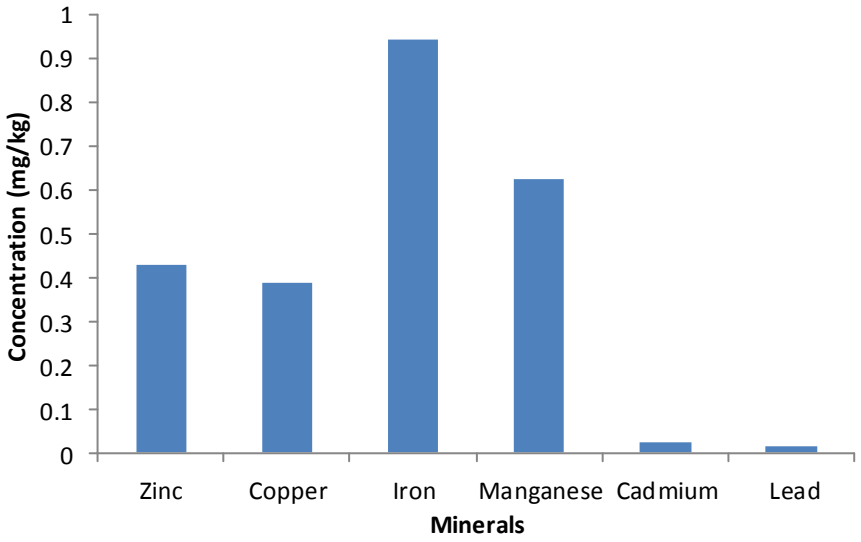

Figure 1: Mineral composition of *Garcinia kola.*

Data of minerals analysis revealed that the seeds contain abundant amount of Iron, Zinc, Manganese and Copper. From the results, it becomes evident that *Garcinia lola* seeds provide an abundance of many minerals and could be considered as a source of Calcium which was similar to those reported by Neigiz and Otles (1993), Al-jassir (1992) and Ghanya *et al.* (2009). *Garcinia kola* seeds were found to contain a significant amount of iron and the results were lower than those reported by Neigiz and Otles (1993), Al-jassir (1992) and Ghanya *et al*. (2009). High Zinc content was also observed in *Garcinia kola* seeds suggests that the seeds are high in antioxidant contents in comparison with that in the literature, current results showed lower content of Zinc than that reported by Nergiz and Otles (1993). Meanwhile, *Garcinia kola* seeds can also be considered as a source of copper. The results showed lower content of copper than that reported by Al-jassir (1992). Heavy metals such as Manganese, Cadmium and lead were present in trace amount; therefore there was no apparent toxicity effect of consuming the seeds.

The photochemical analysis (FIGURE 2) showed that the *Garcinia kola* seeds contain a mixture of phytochemicals as flavonoids, oxalate, saponins, tannins, alkaloids, phytates and HCN. From the results, *Garcinia kola* seeds showed high amount of flavonoids compare to that reported by Adesuyi *et al.* (2012). It has protective effects including anti-inflammatory, anti-oxidant, anti-viral, and anti-carcinogenic properties. They are generally found in a variety of foods such as Oranges, tangerines, berries, apples and onions (Middleton *et al.*, 2000). Garcinia kola seeds can be a good dietary source of flavonoids. High Oxalate content was also observed in *Garcinia kola* seeds, which suggests that the seeds are high in antioxidant contents. In comparison with that in the literature, the results showed high content of oxalate than that reported by Adesuyi *et al.*, (2012). And this may be attributed to the location. The seeds samples were found to contain a significant amount of saponins. The results showed lower content than that reported by Adesuyi *et al*. (2012). Some characteristics of saponin include formation of foams in aqueous solution;

cholesterol binding bitterness (Sodipo and Akiniyi, 2000).

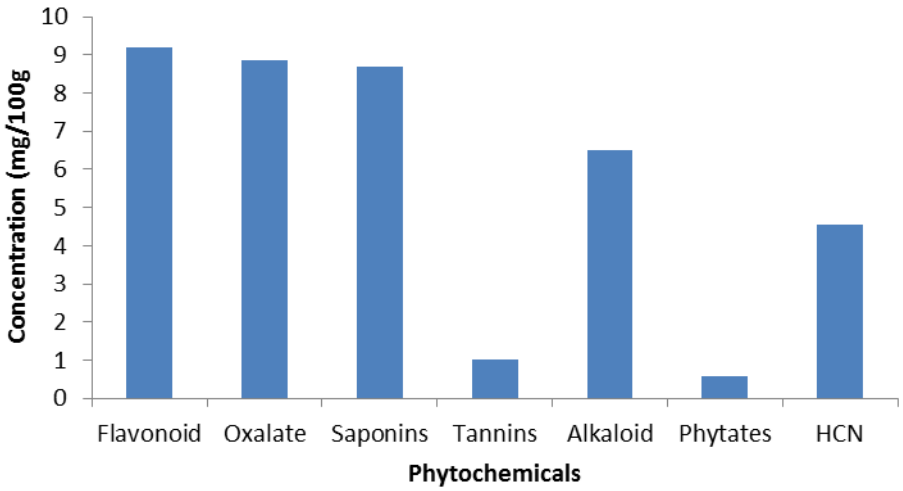

Figure 2: Phytochemical composition of the seed of *Garcinia kola.*

Alkaloids stimulate the nervous systems; others can cause paralysis, elevate blood pressure or lower it. Certain alkaloids act as pain noted to contain antimicrobial properties. *Garcinia kola* seeds can be relevant in medicine in manufacture of vaccines to prevent diseases. The high tannin content could be partly responsible for the bitter principle associated with seeds of *Garcinia kola*. Tannins have a stringent property, hasten the healing of wounds and inflamed mucous membrane (Okwu, 2004). The value of Phytate was lower than those reported for some varieties of mushrooms (Abulude *et al.*, 2001) and some foods of major consumption in Nigeria (Adeyeye *et al.*, 2000). Level of phytate was not comparable to levels reported for vegetables (Abulude *et al.*, 2001) and varieties of lupin seeds (Trugo *et al.*, 1993). Phytate contents vary considerably depending on the environment conditions, maturation and processing procedures (Griffiths and Thomas, 1981). Phytate chelates with mineral elements thereby have significant effects on the utilization of the minerals and also interfere with basic residues of proteins. Phytate has been shown to play a role in preventing colorectal carcinoma, hyperchloresterolaemia and renal calculi (Marounek *et al.*, 2000). In 1991 however, FAO/WHO recommend that HCN levels in mammals should be 10 mg/kg dry weight (10 ppm) which was much than what was obtained in this study. Fergusin *et al.* (1993) reported that phytic acid intake of 4 – 9 mg/100g is said to decrease iron absorption by 4 – 5 folds in humans.

CONCLUSION

The result of nutritional composition shows that *Garcinia kola* seeds can be used as a good source of carbohydrate and protein. Also a good source of minerals necessary for metabolic activities in the body despite the trace amount of anti-nutrients. The phytochemical composition also shows that *Garcinia kola* seed can be useful in the pharmaceutical and medical science to make vaccine and supplements that can prevent diseases. It can be useful also in various manufacturing industries as raw material. Though their antioxidant property, they may be useful to strengthen the body in oxidative stress situations and prevent various diseases that occur following a radical attack.

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