Pak. J. Sci. Ind. Res. 2003 46 (3) 145-147

Chemical Compositions and Phytochemical Screening of the Seeds of *Garcinia kola* (Bitter kola)

M F Asaolu

Department of Biochemistry, University of Ado-Ekiti, Ekiti State, Nigeria

(Received 22 September 2001; accepted 22 May 2002)

Chemical compositions and phytochemical screening of the fresh seeds of *Garcinia kola* (wet weight) have been determined. The results showed that the samples contained high moisture content 75.50% while the ash content was found to be 5.90%. Carbohydrate was 10.85%, crude fat was 14.50% and crude protein was found to be very low 4.25%. The results obtained revealed that the most abundant mineral in the seeds of *Garcinia kola* is sodium (215.10ppm). The seeds of *Garcinia kola* also contain Mg, Cd, Zn, K and Fe, however, Mn, Pb, Cu, Cd and Co were not detected. Preliminary phytochemical screening indicated the presence of phytate, tannin, oxalate, cyanate, saponins and anthraquinones with cyanate having the highest value.

Key words: Phytochemical screening, Minerals, *Garcinia kola*.

Introduction

Garcinia kola popularly known as "Bitter kola". It is commonly found in the rain forest of West Africa and semi-deciduous region. It is known by various names in Nigeria. The Yorubas call it Orogbo and the Hausas- Efiari. *Garcinia kola* is among the group of Nigerian medicinal plants used as blood tonic and cough suppressant. It is believed to clear hoarseness of the voice. It is also used as an appetite suppressant by Obese and has been found to aid digestion (Sofowora 1982).

Keeping in view the medicinal importance of *Garcinia kola*, it is very important to know its chemical composition and to identify the phytochemicals which may serve as antinutrients. Since there is scanty information on the chemical compositions and the phytochemicals screening of *Garcinia kola*, this work has been undertaken to determine the proximate mineral and phytochemical compositions of *Garcinia kola*. The data obtained from this determination would be of considerable value to dieticians, food scientists, nutritionists, traditional medical practitioners and to the general public at large.

Materials and Methods

Fresh seeds of *Garcinia kola* were purchased randomly at Ado-Ekiti, Ekiti State in Nigeria. The seeds were thoroughly screened in order to remove all the defected seeds while undefected seeds were decoated and rinsed with distilled and deionised water to waste away dirt and the remaining water was removed by draining on filter paper. The samples were blended into fine powder and kept in polythene bags at room temperature for one day prior to analyses.

Moisture contents, total ash and crude fat were determined by the methods reported by Association of Official Chemists (AOAC 1990). The carbohydrate content was obtained by the difference between crude protein and the sum of ash, fat and crude fibre (AOAC 1975), while nitrogen was determined by the Micro-Kjedahl method of Pearson (1976) and the percentage of nitrogen was converted to crude protein by multiplying with factor 6.25.

For the mineral analysis, the samples were dry ashed at 550°C. The ash was boiled with 10ml of 20% hydrochloric acid in a beaker and then filtered into a 100ml standard flask and made upto mark with distilled and deionised water. The minerals were determined from the resulting solution using atomic absorption spectroscopy (Pye Unican SP9, Cambridge, UK).

The method of Young and Greaves (1940) was used for phytate determination while tannin and oxalate were analysed by using the methods described by Makkar *et al* (1993). Cyanate content was measured by soaking 10g of powdered seed of *Garcinia kola* overnight in a solution containing 20ml distilled water, 200ml phosphate buffer (pH6) and 10ml of 2% Hg Cl_2. Five gram of hydrated $TiCl_2$ was added to the soaked mixture till the next day and the flask was connected to a steam distillation unit. A conical flask containing 50ml of 1% alcoholic NaOH was attached to the collecting end of the distillation unit and the mixture was heated in the flask.

The distillate was passed into the alkaline medium and this was continued until 200ml of distillate was obtained. The hydrogen cyanide in the distillate got fixed into the alkaline medium. The amount of cyanide was determined titrimetrically using 0.02M $AgNO_3$. 1ml of freshly prepared 0.5% w/v

dithiozone in ethanol was used as an indicator. At the end point, the indicator color changed from red to purple.

Quantitative determination of alkaloids was done using Dragendorff's reagent. A yellow precipitate was taken as evidence for alkaloids. Test for steroids was carried out by dissolving 0.5g of the sample in 2ml acetic anhydride solution followed by the addition of 1ml ice sulphuric acid. A color change from violet to blue to green which confirmed the presence of steroids (Sofowora and Odebiyi 1978). The persistent frothing test for saponins as described by Sofowora and Odebiyi (1978) was used for the presence of saponins. Test for anthraquinones was carried out using Borrtrager's test as described by Sofowora and Odebiyi (1978) while the presence of phlobatannins was detected by the methods of Oberleas (1983).

Results and Discussion

Table 1 presents the proximate chemical composition of the seed samples of *Garcinia kola* (wet weight). The percentage of moisture content of the seeds of *Garcinia kola* was high (75.50%) and this would have been responsible for the their high susceptibility to microbial attacks and low storage capacity. The seeds of *Garcinia kola* have low ash content which gives an indication that total inorganic mineral is low. The crude protein of the seeds of *Garcinia kola* is low compared with crude proteins found in protein rich foods like Soybean (36%), Cowpea (24%) (Oshodi and Fegbemi 1992) and African locust beans (42.3%) (Olaofe and Akintayo 1996). The carbohydrate content is very low as compared to the value obtained for pear millet and quinoa (56.90% and 58.10% respectively) (Oshodi *et al* 1999).

Table 2 presents the mineral content of fresh seeds of *Garcinia kola*. Sodium is the most abundant mineral. The next highest mineral component in the seeds of *Garcinia kola* is potassium followed by magnesium. This observation is in close agreement with the observation of Aletor and Aladetimi (1989).

Calcium, zinc and iron which are nutritionally important were found in a reasonable amount in the seeds of *Garcinia kola*

Table 1
Proximate analysis (%) of the seeds of *Garcinia kola* (wet weight)

Parameters	% of seeds
Moisture content	75.50
Crude protein	4.25
Crude fat	14.50
Total ash	5.90
Carbohydrate	10.85

Table 2
Mineral composition (ppm) of the seeds of *Garcinia kola* (wet weight)

Minerals	Seeds of *Garcinia kola*
Magnesium	180.15
Manganese	ND
Lead	ND
Copper	ND
Cadmium	ND
Cobalt	ND
Calcium	80.21
Zinc	10.05
Potassium	200.00
Sodium	215.10
Iron	5.15

ND, Not detected

Their values are comparable to values reported for some Nigeria agricultural crops such as Okra and Cowpea (Olaofe *et al* 1993). The high concentration of Zinc in the seeds of *Garcinia kola* could be an advantage, for instance, it has been found to be responsible for the structural stability of metalloenzymes and also good in preventing diarrhoea and pneumonia (Tietz 1986).

Manganese, lead, copper, cadmium and cobalt which are heavy metals were not detected in the seeds of *Garcinia kola*. This indicates that these minerals are not present in a detectable amount in the seeds of *Garcinia kola* and this could be of great advantage to the consumers since some of these metals like lead, cadmium etc. have been reported to be highly toxic even at low concentration (Asaolu *et al* 1997). However, the differences in mineral composition of plants have been attributed to the soils composition from where the plant grows up and mineral uptake the capacity of the plant (Asaolu 1995).

Phytochemical screening indicated the presence of saponins, tannins, oxalate, phytate, cyanate, alkaloids, steroids, phlobatannins and anthraquinones (Tables 3 and 4). The low concentration of some of these phytochemicals (phytate, tannins, cyanate and oxalate) shows that *Garcinia kola* is good for human consumption. However, the bitter taste of *Garcinia kola* shows that alkaloids are present in high concentration. This is in agreement with the work of Nesmevanov (1978).

The presence of some of these secondary plant products which are biologically important in *Garcinia kola* are responsible for its medicinal value (Sofowora and Odebiyi 1978). It may appear that all anti-nutritional factors in plants foods and feeding stuffs are phytochemicals, but not all

Table 3
Concentrations of some phytochemicals (mg/g) in the seeds of *Garcinia kola* (wet weight)

Phytochemicals	Seeds of *Garicinia kola*
Phytate	0.0460
Tannin	0.0001
Oxalate	0.0530
Cyanate	0.0560

Table 4
Phytochemicals in the seeds of *Garcinia kola* (wet weight)

Phytate	P
Tannin	P
Oxalate	P
Cyanate	P
Alkaloids	P
Steroids	A
Saponins	P
Phlobatannis	P
Anthraquinones	P

P, Present; A, Absent.

phytochemicals are anti-nutritional factors. For example, available literature suggests that dietary presence of saponins can either be beneficiary or deleterious (Aletor and Fetuga 1988). The mere presence of these phytochemicals in foods does not automatically make them unsafe for consumption, it is their consumption in excess that is deleterious.

But main problem remain still the question of what level of which toxic agents may be regarded as excess of safe for consumption is left unanswered. This continues to engage the attention of nutritional Biochemists, food Chemists and Toxicologists.

However, the results obtained from this study show that *Garcinia kola* can serve as a good source of mineral intake in our diet.

References

Aletor V A, Fetuga B L 1988 Dietary interactions of Limabean trypsin inhibitor haemaggutinin and cyanide: Effect on growth performance, nitrogen utilization and physio-pathology in growing rats. *Jour Food Comp Anal* **4** 167-174.

Aletor V A, Aladetimi O O 1989 Composition, evaluation of some Cowpea varieties and some under utilized edible legumes in Nigeria. *Die Nahrung* **33** 999-1007.

Asaolu S S 1995 Lead content of vegetables and tomatoes at Erekesan market, Ado-Ekiti. *Pak J Sci Ind Res* **8** 11-12.

Asaolu S S, Ipinmoroti K O, Adeeyinwo C E, Olaofe O 1997 Seasonal variation in heavy metal distribution in sediment of Ondo State Coastal region. *Ghana Jour Chem* **3**(1) 11-16.

Association of Official Analytical Chemists (AOAC) 1975 Official method of analysis. 12th ed AOA. Washington, DC, USA.

Association of Official Analytical Chemists (AOAC) 1990 Official method of analysis.15th ed AOA. Washington, DC, USA.

Makkar H P, Blummel M, Becken K 1993 Determination of tannins and oxalate and their correlation with chemical and protein precipitation method. *Jour Food Sci Agric* **61** 161-185.

Nesmeyanov A N 1978 *Fundamental Organic Chemistry* **4** MIR publishers Moscow 356-360.

Olaofe O, Mustapha J, Ibiyemi S A 1993 Amino acid and mineral compositions of some Nigerian Chilles. *Trop Sci* **33** 226-231.

Olaofe O, Akintayo E T 1996 Amino acids an chemical composition and functional properties of African Locust Bean. *Jour Techno-Sci* **2**(1) 31-35.

Oshodi A A, Ogungbenle H N, Oladimeji M O 1999 Chemical composition, nutritionally valuable minerals and functional properties of benniseed, pear millet and quinoa. *Inter Jour Food Sci Nutr* **50** 325-331.

Pearson D 1976 *Chemical Analysis of Food.* 7th ed Churchill Livingston, London 212-220.

Sofowora E E, Odebiyi O O 1978 Phytochemical screening of Nigerian medicinal plants. *Lloydia* **41**(3) 234-246.

Sofowora E E 1982 *Medicinal Plants and Traditional Medicine in Africa.* John Wiley and Sons NY 223-235.

Tietz N W 1986 Trace elements. In: *Textbook of Clinical Chemistry.* W B Saunders Company, Philadephia. 975-976.