

Short Communication

Proximate and nutritional composition of kola nut (*Cola nitida*), bitter cola (*Garcinia cola*) and alligator pepper (*Aframomum melegueta*)

Odebunmi, E. O., Oluwaniyi, O. O.*, Awolola, G.V. and Adediji, O. D.

Department of Chemistry, University of Ilorin, P. M. B. 1515, Ilorin, Nigeria.

Accepted 15 December, 2008

The proximate composition and the mineral content of three (3) traditional 'snacks', kolanut (*Cola nitida*), bitter kola (*Garcinia cola*) and alligator pepper (*Aframomum melegueta*) were evaluated. The results show that *C. nitida* has the highest moisture, crude fat and crude fibre contents of 66.4, 5.71 and 7.13%, respectively. Protein and ash contents were highest in *A. melegueta* (7.18 and 2.49%, respectively). *G. cola* has the least content of all nutrients considered except moisture. Generally, *C. nitida* and *G. cola* have relatively comparable nutrient compositions while the composition of *A. melegueta* is relatively different from those obtained for the other two samples. *A. melegueta* has non-detectable quantity of potassium and phosphorous but has the highest quantity of calcium (388 mg/Kg dry matter), magnesium (960 mg/Kg), iron (37.8 mg/Kg), zinc (32.93 mg/Kg) and manganese (68.53 mg/Kg). *C. nitida* has the highest content of potassium (3484.67 mg/Kg) and phosphorous (411.43 mg/Kg). *G. cola* also recorded the least content of all minerals except K and P which were absent in *A. melegueta*. Manganese was not detected in either of kola nut or bitter kola.

Key words: Traditional snacks, nuts, nutrient, mineral content.

INTRODUCTION

Kola nut, bitter kola and alligator pepper are traditional plants which are often eaten as snacks especially among the elderly in Nigeria. Kola nut belongs to the plant family *Sterculiaceae*, having about 125 species of trees native to the tropical rainforests of Africa. Of these, two species are particularly very common among the Yorubas of South Western Nigeria; these are *Cola nitida* and *C. acuminata*. Kola nut is chewed in many West African cultures, either individually or in group settings and is often used ceremonially (<http://en.wikipedia.org/wiki/kolanut>). Kola nuts contain large amounts of caffeine and theobromine and are therefore used as a stimulant (<http://en.wikipedia.org/wiki/kolanut>; Jayeola, 2001). They produce a strong state of euphoria and well being, enhance alertness and physical energy, elevate mood, increase tactile sensitivity, suppress appetite and hunger

and are used as an aphrodisiac (<http://en.wikipedia.org/wiki/kolanut>; Atfield, 1865). The caffeine in the nuts also acts as a bronchodilator, expanding the bronchial air passages, hence kola nuts are often used to treat whooping cough and asthma (<http://en.wikipedia.org/wiki/kolanut>; Blades, 2000).

Bitter kola (*Garcinia cola*) is also known as African wonder nut. It comes from *Garcinia cola* trees, which belongs to the family *Clusiaceae* and grows in coastal rainforests in the South Western and South Eastern parts of Nigeria. Traditionally, these nuts were chewed as a masticatory substance, to stimulate the flow of saliva (Leakey, 2001) but are now widely consumed as snack in West and Central Africa. The kernels of the nuts are widely traded and eaten as a stimulant (Leakey, 2001; Omode et al., 1995). Bitter kola is also rich in caffeine and theobromine and is also believed to be an aphrodisiac. Unlike other kola nuts however, bitter kola is believed to clean the digestive system, without side effects such as abdominal problems, even when a lot of nuts are eaten (Onochie and Stanfield, 1960). In folk

*Corresponding author. E-mail: laraoluwaniyi@yahoo.com.

Table 1. Nutritional composition (%) of kola nut, bitter kola and alligator pepper.

Constituents	Kola nut (<i>Cola nitida</i>)	Bitter kola (<i>Garcinia cola</i>)	Alligator pepper (<i>Afromomum melegueta</i>)
Moisture	66.40±0.08	60.48±0.06	14.53±0.17
Dry matter	33.60±0.08	39.52±0.06	85.47±0.17
Crude fat (moisture free)	5.71±0.74	4.51±0.56	2.55±0.26
Crude protein (moisture- and fat- free)	2.63±0.18	2.48±0.10	7.18±0.05
Ash	1.50±0.01	0.79±0.005	2.49±0.09
Crude fibre	7.13±0.09	5.23±0.16	5.50±0.11
Total carbohydrates (+ fibres)	28.56	35.64	73.63

Values are means ± standard deviations of triplicate determinations.

medicine, bitter kola is dried, ground and mixed with honey to make a traditional cough mixture.

Alligator pepper (*Afromomum melegueta*) is a West African spice belonging to the plant family *Zingiberaceae*. It is commonly known as guinea grain and is a close relative of the grain of paradise, which is obtained from the closely-related species, *Afromomum exscapum*. However, unlike grains of paradise which are generally sold as only the seeds of the plant, alligator pepper is sold as the entire pod containing the seeds (<http://en.wikipedia.org/wiki/kolanut>). Alligator pepper is a very popular spice used mainly as food, in brewing, and in veterinary and traditional medicine (Igwe et al., 1999). It is also believed to have purgative, galactagogue, anthelmintic and hemostatic properties and also to be very effective against schistosomiasis (<http://www.tropilab.com/nengrekondreppepre.html>).

Because the nuts and seeds described above are consumed mainly for their traditional and medicinal values, not much work has been reported on the nutritional values. This work therefore aims at providing information on the proximate and nutritional composition of these seeds.

Experimental

Samples and sample preparation

The kola nuts, bitter kola and alligator pepper used were freshly harvested and purchased from local farmers at the Ipata market in Ilorin, Nigeria and kept for some time before use. The kola nuts were cured by the traditional method of wrapping in fresh banana leaves to reduce the amount of moisture lost, the alligator pepper pods were left to dry in the sun while the bitter kolas were also wrapped in leaves. The seeds were then masticated using a mortar and pestle.

Nutritional analysis

Standard methods of the Association of Official Analytical Chemists (AOAC, 1984) were used to determine the moisture, crude protein, crude fat, total ash and crude fibre contents of each sample. Moisture content was determined by heating 2.0 g of each sample to a constant weight in a crucible placed in an oven maintained at

105°C. The dry matter was used in the determination of the other parameters. Crude protein (% total nitrogen x 6.25) was determined by the Kjeldahl method, using 2.0 g samples; crude fat was obtained by exhaustively extracting 5.0 g of each sample in a Soxhlet apparatus using petroleum ether (boiling point range 40-60°C) as the extractant. Ash was determined by the incineration of 10.0 g samples placed in a muffle furnace maintained at 550°C for 5 h. Crude fibre was obtained by digesting 2.0 g of sample with H₂SO₄ and NaOH and incinerating the residue in a muffle furnace maintained at 550°C for 5 h. Total carbohydrate was obtained by difference. Each analysis was carried out in triplicate.

Mineral content determination

The mineral contents of each sample were determined by Atomic Absorption spectrophotometry after dry ashing of the samples. Each ash sample was transferred quantitatively into a conical flask and dissolved in 10 ml of 3 N HCl 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 (K, Ca, Mg, Fe, Zn, Mn and P) of the solutions were determined using atomic absorption spectrophotometer.

RESULTS AND DISCUSSION

The result of nutritional composition (presented in Table 1) shows that alligator pepper has the least amount of moisture. This is to be expected since it is the only sample that is subjected to drying before consumption, unlike the other nuts that are prevented from losing moisture by wrapping them in fresh banana leaves. Consequently, alligator pepper has the highest solid matter. It also appears to be the most nutritious of the traditional snacks having 7.18% protein and 2.49% ash.

The nutrient composition of kola nut differs relatively from what has been reported by other workers. Jaiyeola (2001) had earlier reported 8.90% protein, 0.92% fat and 2.40% ash in the fresh nut of kola nut and Ogotuga (1975) also reported a protein content of 8.0%. Another worker also reported 69% carbohydrate, 18% crude fat and 3.1% ash by weight of dried powdered sample of kola nut (Arogba, 1999) and all of these are quite different from what is being reported in this present study.

The least protein, ash and crude fibre contents were

Table 2. Mineral composition of kola nut, bitter kola and alligator pepper (mg/kg dry matter).

Mineral	Kola nut (<i>Cola nitida</i>)	Bitter kola (<i>Garcinia cola</i>)	Alligator pepper (<i>Afromomum melegueta</i>)
K	3484.67±3.40	722.10±0.00	ND
Ca	124.40±0.33	67.07±0.12	388.00±1.63
Mg	392.00±0.82	114.83±3.47	960.00±0.00
Fe	16.43±0.26	6.10±0.43	37.80±0.16
Zn	5.24±0.02	2.30±0.08	32.93±0.12
Mn	ND	ND	68.53±0.82
P	411.43±0.05	188.57±0.37	ND

Values are means ± standard deviations of triplicate determinations.
ND, Not Detectable.

obtained in bitter kola (2.48, 0.79 and 5.23%, respectively). These values are different from what had previously been reported for bitter kola. Eleyinmi et al. (2006) reported a protein content of 3.95%, lipid of 4.33%, ash of 1.14% and a crude fibre content of 11.4% in the seed.

The varying composition reported by various workers may imply that the nutrient composition of these snacks vary with season, environment and/or condition or time of evaluation.

Table 2 shows the result of the mineral composition of the three samples. The results show that kola nut has the highest quantity of potassium which was not detectable in alligator pepper. Phosphorous was also not detectable in alligator pepper, but this seeming deficiency was compensated for in alligator pepper by its having the highest content of all other minerals tested for. Manganese was not detected in either of kola nut or bitter kola. Bitter kola recorded the least content of all minerals evaluated.

From the foregoing, one can conclude that from the results of the nutrient and mineral composition, alligator pepper is the most nutritious of the three 'snacks' investigated except for a few minerals that are absent in it. On the other hand, bitter kola is the least nutritious of these 'snacks', having the least quantity of all nutrients including minerals.

REFERENCES

- Alligator pepper. Wikipedia <http://en.wikipedia.org/wiki/kolanut>
 AOAC (1984). Association of Official Analytical Chemists. Official methods of analysis (14th ed.) Arlington, VA.
 Arogba SS (1999). Studies on kolanut and cashew kernels: moisture adsorption isotherm, proximate composition and functional properties. Food Chem. 67(3): 223-228.
 Attfield J (1865). On the food value of the kolanut – a new source of theine. Pharm. J. 6: 457.
 Blades M (2000). Functional foods or nutraceutical. Nutr. Food Sci. 30(2): 73-75.
 Eleyinmi AF, Bressler DC, Amoo IA, Sporns P, Oshodi AA (2006). Chemical composition of bitter kola (*Garcinia kola*) seed and hulls. Polish J. Food Nutr. Sci. 15(4): 395-400.

- Igwe SA, Emeruwa IC, Modie JA (1999). Ocular toxicity of *Afromomum melegueta* (alligator pepper) on healthy Igbos of Nigeria. J. Ethnopharmacol. 65(3): 203-206.
 Jayeola CO (2001). Preliminary studies on the use of kolanuts (*Cola nitida*) for soft drink production. J. Food Technol. Afr. 6(1): 25-26.
 Kolanut. Wikipedia <http://en.wikipedia.org/wiki/kolanut>
 Leakey R (2001). Potential for novel food production from agroforestry trees: A Review. <http://www.wanatca.org.au/acotanc/Papers/Leakey-1>
 Ogutuga DBA (1975). Chemical composition and potential commercial uses of kolanut, *Cola nitida* Vent. (Schott and Endlicher). Ghana J. Agric. Sci. 8: 121-125.
 Omode AA, Fatoki OS, Olagun KA (1995). Physico-chemical properties of some underexploited and unconventional oilseeds. J. Agric. Food. Chem. 43: 2850-2853.
 Onochie CFA, Stanfield DF (1960). Nigerian trees. Gov. Printer, Lagos, Nigeria. pp. 5-10.