



Comparative nutritional values of Bambara nut obtained from major markets in Minna Metropolis, Niger State, Nigeria

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ABSTRACT

The comparative nutritional values of bambara nut obtained from major market in Minna, Niger State, Nigeria were determined using standard analytical methods. The parameters investigated in proximate composition include protein, fat, fibre, moisture, carbohydrate and ash contents. The moisture content values ranged from $2.86 \pm 0.22 - 3.43 \pm 0.31\%$; crude protein $29.83 \pm 0.11 - 31.20 \pm 0.52\%$; crude fat $7.21 \pm 0.03 - 8.09 \pm 0.34\%$ and ash content $3.20 \pm 0.17 - 5.98 \pm 0.40\%$; crude fibre $3.76 \pm 0.03 - 4.70 \pm 0.09$ and total carbohydrate $48.82 \pm 0.16 - 51.56 \pm 0.21\%$ for bambara nut from the three markets respectively. The three samples contain reasonable amount of essential minerals such as Potassium, Sodium, Phosphorus, Calcium, Copper, Manganese, Iron and Zinc while Lead content was below the detection limits. Base on the mineral contents obtained from this work, it shows that, these samples can be use to meet the daily recommended intake value for man and his animal. This study therefore suggested that bambara nut can serve as a reliable foodstuff which can provide the basic nutrient we need in our body.

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Introduction

Bambara nut (*Vorandzeia subterranean* (L.) thouars) plant is a leguminous and has numerous nitrogen fixing nodules on the root. Evidence has shown that based on the root nodules, the plant supports land care provision in Africa (Okonkwo and Opara, 2010). The quest for plant with nutritional properties continues to receive attention. Bambara nut which constitutes complete food stuff is reported to contain protein, carbohydrate and lipid and can be consumed at different stages of maturation (National Research Council, 2006). The seeds can be consumed in different forms either in the immature green state or matured form. But at maturity, the seeds become very hard and therefore require boiling before any specific preparation can be carried out. However, it is a common knowledge that legume seeds generally require long cooking time for tenderization and the period varies from one legume to the other (Omoikhoje, 2008). The nut can be eaten raw when immature because it is soft and pleasant. The extract from the nut of *Voandzeia subterranean* particularly the protein extracts can be used directly in cosmetic formulations and provides specific properties and notable particular effects. The nut can be used quite freely to replace the high-priced lumps of meat without sacrificing adequate nutrition. Bambara groundnuts is grown in almost all the states of Nigeria by the traditional farmers both of male and female and consumed as a salt-boiled snack food beside maize and cowpea (Iyayi, et al., 2005).

Materials and methods

Sample Collection and preparation

Bambara groundnut seed were obtained from different markets in Minna, Niger state, Nigeria. The seeds were washed with distilled water to remove impurities and air dried on trays to achieve total dryness. The seeds were pulverized into

powdered flour using a pestle and mortar. The pulverized nut was then sieved and used for further test.

Moisture content

2 g of the sample was put into the crucible, dried in an oven at 105°C overnight. The dried samples were cooled in a dessicator for 30 minutes and weighed to a constant weight. The percentage loss in weight was expressed as percentage moisture content on dry weight basis (AOAC, 1999).

This was repeated three times.

Ash content

2.00 g of the grounded sample was placed in a crucible and ashed in a muffle furnace at 600°C for 3 hours. The hot crucibles was cooled in a dessicator and weighted. The percentage residual weighed was expressed as ash content (AOAC, 1999).

Crude lipid content

2.00 g of the sample was used for determining crude lipid by extracting lipid from it for 5 hours with petroleum ether in a soxhlet extractor.

Protein determination

Total protein was determined by the Kjeldahl method as modified by Williams, (1964). 500mg of the sample was weighed into a filter paper and put into a Kjeldahl flask, 8-10 cm^3 of concentrated H_2SO_4 were added and then digested in a fume cupboard until the solution becomes colourless. Distillation was carried out with about 10 cm^3 of 40 % NaOH. The condenser tip was dipped into a conical flash containing 5 cm^3 of 4 % boric acid in a mixed indicator till the boric acid solution turned green. Titration was done in the receiver flask with 0.01 M HCl until the solution turned red.

Crude fibre content

2.00 g of each sample were used for estimating crude fibre by acid and alkaline digestion methods with 20 % H_2SO_4 and NaOH solution.

Carbohydrate determination

The carbohydrate content was calculated using following: available carbohydrate (%), = 100 - [protein (%) + Moisture (%) + Ash (%) + Fibre (%) + Fat (%)].

Mineral analysis

Sodium and potassium were determined using Gallenkamp Flame analyzer, while calcium, magnesium, iron, manganese, zinc and copper were determined using Buch Model 205 Atomic Absorption Spectrophotometer. Phosphorus level was determined using the phosphovanado molybdate colorimetric techniques on JENWAY 6100 Spectrophotometer Pearson, (1976).

Results

Table 1 and 2 show the results for the proximate analysis and concentration of some selected mineral elements in Bambara nut from three different markets in Minna.

Table 1: The proximate composition of Bambara nut from three major Market

| Parameters | Kure market (%) | Maikunkele market (%) | Bosso Market (%) |
|--------------------|-------------------------|-------------------------|-------------------------|
| Moisture | 2.86 ±0.22 ^c | 3.43±0.31 ^a | 3.11±0.43 ^b |
| Protein | 31.20±0.52 ^a | 29.83±0.11 ^c | 30.01±0.13 ^b |
| Fat | 7.38±0.21 ^b | 7.21±0.03 ^b | 8.09±0.34 ^a |
| Ash | 5.98±0.40 ^a | 3.86±0.61 ^b | 3.20±0.17 ^b |
| Fibre | 3.76±0.03 ^c | 4.11±0.08 ^b | 4.70±0.09 ^a |
| Total carbohydrate | 48.82±0.16 ^c | 51.56±0.21 ^a | 50.89±0.15 ^b |

values are means ±SD of three determinations

Different superscripts along the same row are significantly different (P≤0.05)

Table 2: The mineral compositions (mg/100g) of Bambara nut from three major market

| Parameters | Samples | | |
|------------|--------------------------|--------------------------|--------------------------|
| | Kure market | Maikunkele market | Bosso Market |
| K | 122.91±1.02 ^b | 124.01±1.14 ^a | 122.50±1.09 ^b |
| Na | 22.40±0.46 ^b | 26.01±0.21 ^a | 22.75±0.53 ^b |
| P | 18.56±0.16 ^b | 19.00±0.91 ^a | 17.89±0.71 ^c |
| Ca | 12.75±0.42 ^b | 11.93±0.13 ^c | 13.11±0.19 ^a |
| Cu | 2.34±0.23 ^a | 2.11±0.52 ^a | 2.45±0.35 ^a |
| Mg | 4.21±0.44 ^a | 3.99±0.62 ^b | 3.01±0.13 ^b |
| Fe | 150.34±0.51 ^c | 154.08±0.01 ^b | 159.99±0.82 ^a |
| Zn | 4.89±0.11 ^a | 4.02±0.32 ^b | 3.98±0.41 ^b |
| Pb | ND | ND | ND |

values are means ±SD of three determinations

Different superscripts along the same row are significantly different (P≤0.05)

ND = Not detected

Discussions

The proximate compositions of bambara groundnut seeds were presented in Table 1. The moisture content values ranged from 2.86 – 3.43% (Kure market to Maikunkele market); crude protein 29.83 – 31.20% (Maikunkele market to Kure market); crude fat 7.21 - 8.09% (Maikunkele market to Bosso market) and ash content 3.20 - 5.98% (Bosso market to Kure market); crude fibre 3.76±0.03 – 4.70±0.09% (Kure market to Bosso market) and total carbohydrate 48.82 – 51.56% (Kure market to Maikunkele market) for bambara nut from the three markets. The results obtained in this work were close to those reported by Nwodo and Nwinyi, (2012), who observed that Bambara groundnut (*Voadzeia subterranean*) contain 2.86 ± 0.02% moisture, 32.40 ± 0.02% protein, 7.35 ± 0.02% fat, 5.78 ± 0.02% ash, 2.68 ± 0.02% crude fiber and 51.78 ± 0.02% total carbohydrates. Okonkwo and Opara, (2010) observed that the

low ash content for bambara nut shows that the food stuff contains very small amounts of micro elements. The protein level of bambara nut is significant as it can serve as a source of proteins which enhances growth and cell maintenance. The carbohydrate level is an indication that the nut has very high energy content hence it has the capacity to serve as energy given food. The low moisture content of the nut is good for its storage quality. The results revealed that bambara groundnut is an important food sources that can be exploited particularly in the developing countries where there is shortage in animal protein and under-nutrition facing many families.

Results of mineral compositions of the three samples were as presented in Table 2. The result shows that the three samples were rich in essential mineral which could be useful to human and animals in their diet. The daily requirement of sodium for male and female between 9 and 50 years is 1500mg which has been recommended as an adequate intake while after the age of 59 years, 1300mg has been considered as adequate by U.S Food and Drug Administration (Carol, 2011). The sodium content of these samples ranged from 22.40±0.46 – 26.01±0.21 (Kure market - Maikunkele market); Potassium plays an important role in the human body and sufficient amounts of it in the diet protect against heart disease, hypoglycaemia, diabetes, obesity and kidney dysfunction. Adequate intake of this mineral from the diets has been found to lower blood pressure by antagonizing the biological effects of sodium (Einhorn and Landsberg, 1988). Potassium concentration ranged from 122.50±1.09 – 124.01±1.14 (Bosso market - Maikunkele market); the intake of phosphorus helps in bone growth, proper kidney function and cell growth. It also plays a role in maintaining the body's acid-alkaline balance (Fallon and Enig, 2001). Phosphorus content was found to be 17.89±0.71 – 19.00±0.91 (Bosso market - Maikunkele market); iron deficiency is a major problem in women's diets in the developing world, particularly among pregnant women and especially in Africa (Orr, 1986). Iron concentration ranged 150.34±0.51 – 159.99±0.82 (Kure market – Bosso market); High values of zinc are usually associated with high-protein foodstuff, whereas low levels are obtained from food rich in carbohydrates (Teffo *et al.* 2007). Zinc content were found to be 3.98±0.41 – 4.02±0.32 (Bosso market – Maikunkele market), calcium 11.93±0.13 – 13.11±0.19 (Maikunkele market – Bosso market); Magnesium is needed for more than 300 biochemical reactions in the body. It helps to maintain normal muscle and nerve function, keeps heart rhythm steady, supports a healthy immune system and regulates blood sugar levels (Saris *et al.* 2000). Magnesium concentration 3.01±0.13 -4.21±0.44 (Bosso market – Kure market) and lead content was below the detection limits among the three samples. The values obtained from this work were compared to the reported values for bambara groundnut by Adeyeye and Agesin, (2007) except for iron and copper; viz: calcium ranged from 2.64 - 2.81%, phosphorus 0.06 - 0.08%, potassium 0.79 - 0.82%, sodium 0.004 - 0.005%, magnesium 0.65 - 0.68%, iron 151 - 160 ppm and copper 2.4 - 2.6 mg/kg. A recent finding has reported that seed proteins of bambara (*V. Subterranean*) have been implicated in anti-hypertensive activities (Yamada *et al.*, 2008).

In general, the high mineral contents of these samples showed that they can be consumed along with other foods in order to provide the required essential minerals for man and his farm animals.

Conclusion

The results obtained in this study shows that bambara nut contains many of the essential nutrients that are highly

recommended for human consumption. This implies that it can sustain the people living in rural part of the world and as well helps in requirements of achieving the sustainable development.

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