



# Sensory Evaluation of Bambara Groundnut (*Vignasubterranea* (L.) Verdc.) Food Products in Ibadan, Nigeria

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**Abstract** – Earlier reports of the nutrition analysis (Atoyebi *et al.*, 2015) shows potentials in Bambara groundnut (*Vignasubterranea* (L.) Verdc.) of African origin. With a view to predict the perception or sensory evaluation of its products; commercial purchase of cream coloured Bambara groundnut (BG) from Bodija market, Oyo – state, Nigeria was made into two main products (cooked Bambara groundnut beans and cooked Bambara groundnut paste ‘okpa’) and served to fifteen (15) respondents each; representing employees of the National Centre for Genetic Resources and Biotechnology (NACGRAB), Ibadan, Nigeria, serving as taste panelists / perceptionists for these products. The results obtained showed that 58.32% of the respondents preferred the look of the beans as appealing to consume while the okpa appeals to 64.27% of them. Also, the product smell and taste were scored 49.91% and 58.22 % respectively for the cooked Bambara beans, as against those for okpa, which were 85.71% and 71.42% respectively, as attested by the respondents. The overall product acceptability was scored at 62.84% of the respondents for desirability for the consumption of cooked Bambara beans, while 71.42% of them scored the same criteria for the okpa food product. The result of this evaluation indicated that developing countries, like Nigeria can tap into the immense acceptability of the Bambara groundnut food products, with the aim of improving on its sustainable utilisation and consumption towards reducing hunger, malnutrition and enhance food security in a developing country like Nigeria.

**Keywords** – Cooked Bambara Beans, Okpa, Sensory Evaluation, Utilisation.

## INTRODUCTION

Bambara groundnut (*Vignasubterranea* (L.) Verdc.) is a neglected and under-utilised species (NUS), that is often cultivated extensively by smallholding farmers of the semi-arid regions of Africa (Azam-Ali *et al.*, 2001). Sometimes, it is often intercropped with cereals, root and tuber crops, with an average yields of (650–850 kg ha<sup>-1</sup>), though this depends on the soil type and other climatic conditions (Stanton *et al.* 1966). Bambara groundnut out-yields other legumes under some non - favorable conditions, particularly under limited rainfall and on infertile soils (National Research Council 1979). The crop is predominantly grown in Africa, where it has been found to be the third most important legume crop after peanut and cowpea (Howell 1994). It is a preferred food crop by many local people, since it has been considered as a poor – man food; and secondly due to the nutrition potentials, though the cooking constraints exists for the beans. It is a

good supplement to a cereal-based diet and this makes it to be nutritionally superior to other legumes (Azam-Ali *et al.* 2001). It is a complete food, with dietary requirements to meet the daily needs of the body.

Research has shown that in most developing countries, because of the high price of meat and fish, the interest is focused on grain legumes as a source of protein. Hence, legumes like the Bambara groundnut are rich not only in proteins, but in other nutrients such as starch and fat, as well as minerals and amino acids. However, nutritional potentials in the seeds of Bambara groundnut is somehow restricted by the presence of anti-nutrients such as tannin, phytic acid and enzyme inhibitors. Different processing methods such as cooking, roasting and autoclaving, significantly affects some parameters such as the tannin content in Bambara groundnut. For example, activities such as, dehulling, soaking and boiling had being found to also have effects on the amount of tannin, as discarding cooking water had been shown to be effective in reducing the tannin content (Murevanhema, Y.Y. *et al.*, 2013). Apart from carbohydrate, protein is the highest and most important nutrient parameter in Bambara groundnut profiles.

The amino acids are the building blocks of proteins, where they serve as important precursors for its synthesis. Amino acids are biologically important organic compounds containing amine (-NH<sub>2</sub>) and carboxylic acid (-COOH) functional groups, along with a side-chain (R group) which are specific to each amino acid (Catherine *et al.*, 2013). The structural components of an amino acid are made up of carbon, hydrogen, oxygen, and nitrogen, although there are other elements, which are found in the side-chains of certain amino acids. About 500 amino acids are known, even though only 20 appear in the genetic code and can be classified in many ways. On the other hand, essential amino acid or indispensable amino acid is an amino acid that cannot be synthesized *de novo* by the organism, and thus must be supplied in its diet. They are nine in this category of amino acids, which the humans cannot synthesize. They are phenylalanine, valine, threonine, tryptophan, methionine, leucine, isoleucine, lysine, and histidine. There are also six other amino acids, which are considered conditionally essential in the human diet, meaning their synthesis can be limited under special pathophysiological conditions, such as prematurity in the infant or individuals in severe catabolic distress. These six are arginine, cysteine, glycine, glutamine, proline, and tyrosine. There are also five amino acids, which are

dispensable in humans, meaning they can be synthesized in the body. These five are alanine, aspartic acid, asparagine, glutamic acid and serine. The analysis of essential amino acids could serve important functions in metabolism; its lack in protein deficiency often results in conditions such as brain disorder in infants and young children; the immune system performing low, thus elevating risk of infection; gut mucosal function and permeability, which affects absorption and vulnerability to systemic disease; and kidney function. The other physical signs of protein deficiency include edema, failure to thrive in infants and children, poor musculature, dull skin, and thin and fragile hair. This evaluation in Nigeria on Bambara groundnut utilisation hopes to create more awareness about its nutritional attributes.



Fig. 1. Cooked Bambara groundnut beans



Fig. 2. Bambara groundnut paste 'okpa'



Fig. 3. Bambara groundnut milk

## MATERIALS AND METHODS

### *Bambara Groundnut (BG) Seed Materials*

Bambara groundnut (*Vignasubterranea* (L.) Verdc.) seed materials, cream colored variety, which is commonly eaten, with less of the anti-nutrients, of about 5 kg were purchased from the main market in Ibadan (Bodija), Oyo – state, Nigeria. These materials were kept in a hygienic condition until ready for the sensory evaluation.

### *Preparation of Cooked Bambara Beans and Product Perception*

About 500g of the cream colored seeds purchased were picked of stones, washed thoroughly with water twice and cooked using electric stove for about 5 – 6 hours. Onions, grounded pepper and palm oil (red) were used as seasoning, with a little salt to taste. After cooking, it was served to the already numbered 15 volunteer respondents, representing employees (male and female) of the National Centre for Genetic Resources and Biotechnology (NACGRAB), Moor-Plantation, Ibadan, Nigeria. After the consumption of about (70 – 100g) portion served each respondent, they were later asked to fill a little questionnaire (see annex I and II below) about their perception of the food product consumed.

### *Preparation of Cooked Bambara Paste (okpa)*

The commercially purchased seeds were picked of stones, washed in water once and spread to dry in the sun for two (2) days. The dry beans were now taken to the mill and grinded to a fine powder. The powder was now sieved to remove the shaft and to get a finer powder using 0.5mm fine mesh. Luke-warm water was now added to the powder obtained, after which it was seasoned with salt, red palm oil and pepper to taste. These were now put in a nylon sachet and tie at both ends before putting inside a cooking pot, containing small amount of water. They were now cooked for forty – five (45) minutes before serving to the panelists.

## METHODS

Fifteen (15) respondents for each of the food category were used, representing employees of the National Centre for Genetic Resources and Biotechnology, Moor-Plantation, Ibadan, Nigeria. Each of the panelist were served their respective portion of the food product (70 – 100 g), and asked to complete a questionnaire (see annex 1 and 11 below), about their perception of the food products, by filling the individual survey form / questionnaire.

## DATA ANALYSIS

Data entry was done on Microsoft excel (2010), with subsequent bar charts to explain the distribution and the perception of the respondents about the consumption of Bambara groundnut food products.

## RESULTS AND DISCUSSION

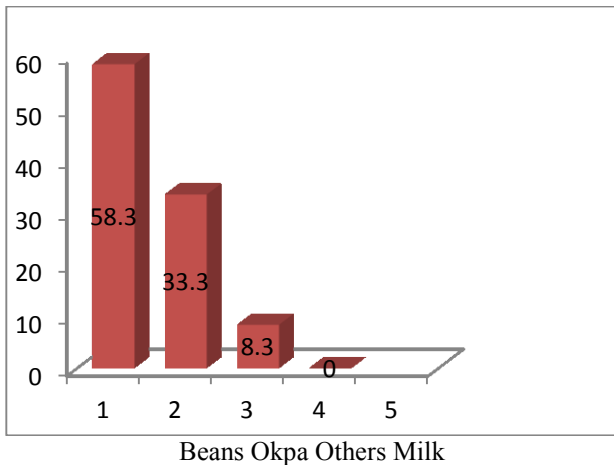


Fig. 4. Showing respondents consumption of BG products

Table 1: Showing respondents consumption of BG products alone or with another snack

Item on questionnaire	% respondents
Consumption of BG beans alone	84.6
Consumption of BG beans with another snack	15.3
Consumption of Okpa alone	76.9
Consumption of Okpa with another snack	23.1

Table 2: Taste perception of Okpa consumption by respondents

Item on questionnaire	% respondents
Fair	0
Good	28.5
Very good	50
Excellent	21.4

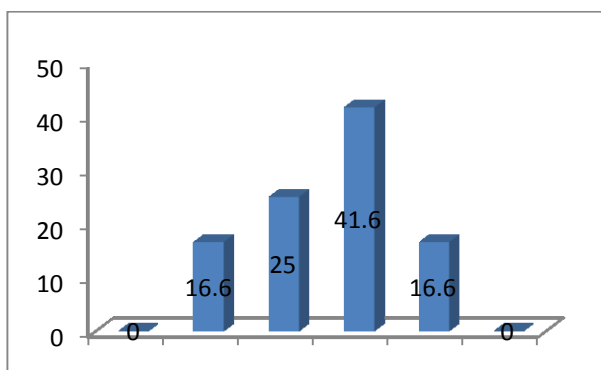


Fig. 5. Bambara groundnut (BG) beans taste perception

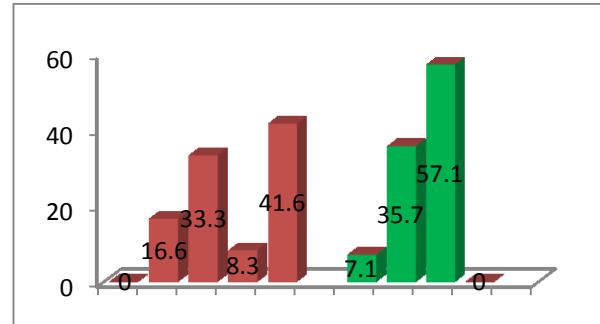


Fig. 6. Smell perception of BG cooked beans and Okpa food products respectively

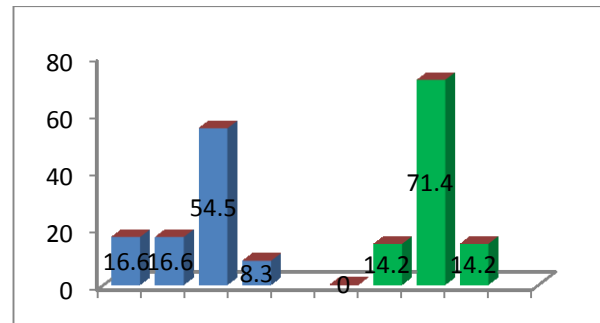


Fig. 7. Overall acceptability of BG cooked beans and Okpa respectively

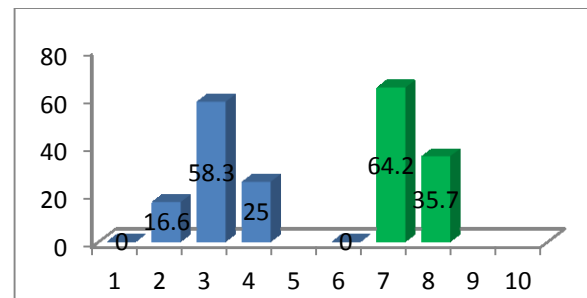


Fig. 8. Frequency of BG cooked beans and Okpa consumption respectively

The results of the evaluation showed that 84.6% of the respondents indicated that they had eaten and consumed either Bambara groundnut beans or any of its products before now. Other important products consumed by them include okpa and Bambara milk; but none had eaten dumpling, which is a common Bambara groundnut food recipe in the United Kingdom.

The perception of the panelists indicated that 84.61% of them preferred taken their choice Bambara food product alone, while 15.38% of them prefer taken it together with another snacks such as gari or bread. Also, 58.31% of the respondents prefer the look of the Bambara beans as appealing to consume, while the okpa appeals to 64.27% of the respondents. The taste of the products was scored very high and good with 58.21% of the respondents scoring well for the cooked Bambara beans as against that of okpa with 71.42%. The product smell was considered good for Bambara beans scoring 49.92% by the



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