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EFFECT OF PROCESSING ON THE PROXIMATE COMPOSITION AND MINERAL CONTENT OF BAMBARA GROUNDNUT (*VOANDEZEIA SUBTERRANEAN*)

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ABSTRACT
The study was undertaken to investigate the effect of processing on the proximate and mineral composition of Bambara groundnut (Voandzeia subterranean). Traditional processing methods namely soaking and cooking were employed. There was substantial recovery of crude protein after processing from 20.27 ± 1.41 to 23.63 ± 0.78 (g/100g dry weight). Result of the moisture content ranged from 8.70 ±2.50 to 9.5 ±0.07 (g/100g dry weight), either extract 6.85 ±0.43 to 13.11 ± 1.94 (g/100g dry weight), nitrogen free extract 51.96 ± 1.38 to 44.0 ± 3.34 (g/100g dry weight), ash content 5.37 ± 0.12 to 2.89 ± 0.59 (g/100g dry weight), and crude fibre 6.85 ± 0.33 to 4.64 ± 0.31 (g/100g dry weight) after processing values of the mineral concentrations show that potassium was significantly (P< 0.05) affected by processing while manganese was not detectable after processing. Other minerals studied were not significantly affected by processing. The results show that the processing improved the nutritional value of the nut which could serve as important component of food.

Key words: Bambara groundnut, processing, proximate composition, mineral content.

INTRODUCTION

There is great need to improve protein nutrition in a developing country like Nigeria. The high mortality rate among infants less than five years in developing countries often ascribed to infectious diseases is now known to be caused by protein malnutrition (Gbodi, 2000). Bambara groundnut (*Voandzeia subterranean*) locally called *Kwaruru* in Sokoto is used as a component of weaning foods. Bambara groundnut contains more of calcium and iron, though poor in phosphorous. It contains the vitamins thiamine, riboflavin, niacin and carotene but it is very low in ascorbic acid (Oyenuga, 1968). Bambara groundnut (*Voandzeia subterranean*) is an annual leguminous plant native to tropical Africa, where it is cultivated mainly for its edible seeds (Tindall, 1986). The nut serves as food for both man and livestock, and the leaves for fodder and green manure. The ripe seeds contain 20% crude protein, 4 – 7% fat and 50 – 60% carbohydrate (Rachie and Roberts, 1974). The focus of the study was to investigate the effect of processing (Soaking and Cooking) on the nutritive value of Bambara groundnut with the emphasis on proximate and mineral compositions.

MATERIALS AND METHODS

Bambara groundnuts were purchased at the Sokoto Central Market. The seeds were authenticated at the Crop Production Department of the Usmanu Danfodiyo University, Sokoto.

a). Sample Preparation

A portion of the dried seeds of Bambara groundnut devoid of insect pests and debris were ground into fine powder using pestle and mortar. They were then sieved through 20mm mesh iron to obtain the flour. The flour samples were kept in screw – capped jars and stored in a deep freezer for two days until needed for analysis. This was to prevent spoilage by micro–organisms.

b) Processing Techniques

This was carried out by the modified method of Fernandez *et al*. (1996). The following processing methods were employed:

i.**Soaking**

A second portion of the raw seeds was soaked for nine hours in distilled water. The proportion of seed to soaking solution was 1/3 (wt: vol). After the seeds were soaked, they were dehulled by mechanically brushing between both hands and excess solution was drained off.

ii**. Cooking**

The soaked seeds (i) above were cooked by boiling in distilled water for 35 minutes at a seed to water ratio of 1/6 (wt: vol). The cooking water was drained off and the seeds were air-dried, ground and sieved into fine powder and stored in screw-capped jars until needed for analysis.

Analytical Techniques

Proximate Analysis

Sample obtained from (a) and (b) above were subjected to proximate analysis to determine the moisture, ash, crude fibre, crude protein, either extract and nitrogen – free extract (N.F.E) using the standard method of the Association of Official Analytical Chemists (AOAC, 1980).

Mineral Analysis

Potassium and sodium contents of samples from (a) and (b) were determined using flame photometer, while phosphorous and other minerals were determined spectrophotometrically (AOAC, 1980).

RESULTS AND DISCUSSION

Table 1. Shows the results of the proximate composition of raw and processed (soaked and cooked) Bambara groundnut. The crude protein level 20.27 ± 1.41 (g/100g dry weight) recorded in the raw seed was greatly recovered after processing with a value of 23.63 ± 0.78 (g/100g dry weight). The observed increased may be due to destruction of certain antinutritional factors resulting in release of nutrients.

Ether extract significantly ($P < 0.05$) increased in the processed with a value of 13.11 ± 1.94 (g/100g dry weight) as compared to the raw with a value of 6.85 ±0.43 (g/100g dry weight). Ash content greatly reduced from 5.37±0.12 (g/100g dry weight) in the raw to 2.89 ± 0.57 (g/100g dry weight) in the processed. Crude fibre values range from 6.85 ± 0.33 (g/100g dry weight) to 4.64 ± 0.31 (g/100g dry weight) in the raw and processed respectively, while values of 8.70 ± 2.50 to 9.59 ± 0.07 (g/100g dry weight) and 51.96 ± 1.38 to 44.03 ±3.34 (g/100g dry weight) were recorded for moisture and nitrogen free extract (N.F.E) respectively for raw and Processed samples. Food processing may result in loss of nutrients or exposure of other nutrients which were hitherto unavailable in the raw food. Milner (2000) reported that processing of foods can influence the availability of nutrients either positively or negatively. Consumption of processed Bambara groundnut makes the available nutrients more digestible, absorbable and available for growth and development.

The mineral composition of the raw and processed Bambara groundnut is shown in Table 2. All the minerals investigated are present in appreciable levels except in the case of manganese, which was undetectable in the processed seeds. Processing caused a reduction in the amount of some minerals as observed in potassium (92.43 ± 1.14 to 60.91 ± 0.40) (mg/100g) ash, zinc (0.81±0.00 to 0.24 ±0.00) (mg/100g) ash, and copper (0.41±0.05 to 0.22 ±0.00) (mg/100g) ash, while manganese was not detectable after processing. Sodium, calcium, magnesium, iron and phosphorous contents were not significantly affected by processing. This is in contrast to the observation by Osho *et al.* (1995) that processing techniques such as dehulling, grinding and others contribute significantly to minerals and vitamin losses. The observed contrast may be due to possible retention of the minerals due to interactions with themselves and other food constituents.

Conclusion

This study has shown that traditional methods such as soaking and cooking affect the nutritive value of Bambara groundnut with some losses of nutrients. There is the need to carry out more work to explore the legume especially in the aspect of inherent antinutrients so that it could be fully utilized in infant weaning foods and in animal feeds with minimal risk.

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Table 1: Proximate composition of Bambara groundnut (g/100g dry weight)

Component	Raw	Processed (Soaked &Cooked)
Moisture	8.7 ± 2.50	9.59 ± 0.07
Crude protein	20.27 ± 1.41	23.63 ± 0.78
Crude fibre	6.85 ± 0.33	4.64 ± 0.31
Ether extract	6.85 ± 0.43	13.11 ± 1.94
Total Ash	5.37 ± 0.12	2.89 ± 0.57
N.F.E	51.96 ± 1.38	44.03 ± 3.34

*Mean ± standard deviation

Table 2: minerals composition of Bambara groundnut (mg/100g) nut

Component	Raw	Processed (Soaked & Cooked)
Sodium	2.19 ± 0.41	2.17 ± 0.41
Potassium	92.43 ± 1.14	60.91 ± 0.400
Calcium	0.23 ± 0.00	0.36 ± 0.58
Magnesium	7.02 ± 0.00	7.15 ± 0.04
Iron	2.51 ± 0.00	2.96 ± 0.00
Phosphorous	0.21 ± 0.08	0.28 ± 0.05
Manganese	0.06 ± 0.00	**ND
Zinc	0.81 ± 0.00	0.24 ± 0.00
Copper	0.41 ± 0.05	0.22 ± 0.00

*Mean ± standard deviation, **ND – not detectable

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