Nutritive and microbial analysis of two types of fermented locust bean (*Parkia biglobosa*)

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Abstract: Locust bean (*Parkia biglobosa*) is fermented and sold locally in Nigeria as mashed and unmashed locust bean. In this study, two forms of fermented beans were purchased from a local market in Ibadan, Nigeria. Their proximate composition and microbiological quality were determined using standard analytical methods. Our mashed locust bean was observed to contain 9.62 ± 0.33% moisture, 3.29 ± 0.35% ash, 13.30 ± 0.32% crude fibre, 39.84 ± 0.29% protein and 49.93 ± 0.36% fat while the unmashed contained 5.3 ± 0.20% moisture, 3.24 ± 0.32% ash, 17.68 ± 0.40% crude fibre, 39.14 ± 0.31% protein and 22.80 ± 0.20% fat. *Aspergillus niger*, *Pseudomonas maltophila* and *Streptococcus faecalis* were isolated from mashed samples. *Aspergillus flavus* and *Pseudomonas maltophila* were isolated from the unmashed samples. As observed, these bacterial and fungal isolates are evidences of unhygienic procedures of processing in that environment.

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1. Introduction

Locust bean, *Parkia biglobosa* or Néré is a tree of the genus *Parkia* in the family Fabaceae. In West Africa, its fruits are fermented to a condiment called "soumbala" or "dawa-dawa" (Bonkoungou, 1987). The striking red spherical inflorescences, which appear in the dry season, are often used by children for games (Burkill, 1995). The yellowish powder inside the seed pods is sweet and can be eaten without preparation and can also be made into drinks. The pods are boiled to make a black liquid used for sealing floors (Hall *et al.*, 1996). It is a perennial deciduous tree with a height ranging from 7 to 20 m, although it can reach 30 m under exceptional conditions (Hopkins *et al.*, 1984). Its seeds are fermented to make dawadawa, a black, strong-smelling, tasty food high in protein (Steinkraus, 1996).

In the tropics, especially in Nigeria, locust bean is processed locally into consumable delish and is a part of traditional dishes in most parts of the country. It is sold in the Nigerian consumables markets in two forms, the mashed and the unmashed locust bean. During the Nigerian processing of locust bean, salt is usually added to prevent microbial contamination and growth. However, inspite of procedures engaged, locust bean could still harbor loads of microorganisms especially while handling. We here present reports on the microbiological analysis and proximate composition of the mashed and unmashed locust bean sold within Ibadan, Nigeria metropolis because of its high demand.

2. Materials and Methods

2.1 Sample Collection

Two types of processed locust beans were purchased at Oja Oba market, Ibadan, Nigeria. One is locally called ñIru Woroò (whole beans) and the other ñIru peteò (mashed beans). They were identified at the Department of Botany, University of Ibadan, Ibadan, Nigeria.

2.2 Microbiological and proximate analysis

The microbial analysis was carried out at the Department of Microbiology, University College Hospital, Ibadan, Nigeria, while the proximate analysis was carried out at the National Institute of Science Laboratory Technology (NIST), Samonda, Ibadan.

Standard methods of the Association of Official Analytical Chemists (AOAC, 1995) were used to determine the moisture, crude protein, crude fat, total ash and crude fibre contents of each sample.

Quantitative and qualitative microbial analysis of the locust beans were carried out using standard methods (Olutiola *et al.*, 1991; APH, 1992; Adejuwon *et al*., 2010). Bacteria were isolated and characterized based on the gram reaction, colonial morphology and biochemical characteristics. Fungi were identified using the colors on potato dextrose agar, staining and reproductive structures using lactophenol cotton blue (Hanlin, 1990).

3. Results

Table 1 represents proximate composition of unmashed *Parkia biglobosa* while Table 2 that of mashed *Parkia biglobosa.* The ash, protein, fat and moisture contents of the mashed locust bean was higher than that of the unmashed. The crude fibre seem higher in the unmashed.

Table 1: Proximate composition of unmashed fermented locust beans (*Parkia biglobosa*) (Iru woro)

Moisture (%)	Ash (%)	Crude fibre (%)	Protein (%)	Fat (%)
5.3 ± 0.20	3.24 ± 0.32	17.68 ± 0.40	39.14 ± 0.31	22.80 ± 0.20

Values were expressed as mean ± standard deviation of triplicate determinations

Table 2: Proximate composition of mashed fermented locust bean (*Parkia biglobosa*) (Iru pete)

Moisture (%)	Ash (%)	Crude fibre (%)	Protein (%)	Fat (%)
9.62 ± 0.33	3.29 ± 0.35	13.30 ± 0.32	39.84 ± 0.29	49.93 ± 0.36

Values were expressed as mean ± standard deviation of triplicate determinations

Aspergillus niger, *Pseudomonas maltophila* and *Streptococcus faecalis* were isolated from samples of mashed *P. biglobosa. Aspergillus flavus* and *Pseudomonas maltophila* were isolated from the unmashed samples (Table 3).

Table 3: Identified isolates on locust bean samples

Sample (S/N)	Bacteria observed	Fungi observed
1 (Mashed)	*Pseudomonas maltophila*; *Streptococcus faecalis*	*Aspergillus niger*
2 (Mashed)	*Pseudomonas maltophila*; *Streptococcus faecalis*	*Aspergillus niger*
3 (Mashed)	*Pseudomonas maltophila*; *Streptococcus faecalis*	*Aspergillus niger*
4 (Unmashed)	*Pseudomonas maltophila*	*Aspergillus flavus*
5 (Unmashed)	*Pseudomonas maltophila*	
6 (Unmashed)	*Pseudomonas maltophila*	*Aspergillus flavus*

4. Discussion

Moisture, ash, fibre, protein and fat in *Parkia biglobosa* infer the nutritional value of locust bean. Previous reports reveal that dawadawa is rich in protein, lipids and vitamin B2 (Hopkins, 1983) and that fermented beans are rich in lysine (Hopkins, 1983; Steinkraus, 1996). According to Hong *et al.* (1996), *Parkia biglobosa* seeds are used as coffee substitute and they are embedded in a mealy pulp sometimes called dozim, that is high in energy value. They contains up to 29% crude protein and up to 60% saccharose, rich in vitamin C and high in oil content.

Aspergillus niger and *Aspergillus flavus* in fermented *Parkia biglobosa* infer fungal infection which could have been acquired during cultivation and harvestation or during the fermentation processes by handlers. The presence of *Streptococcus faecalis* is an evidence of faecal contamination which must definitely have been acquired during handling and processing. The presence of *Pseudomonas maltophila* is an evidence of poor unhygienic handling.

4.1 Conclusion

This study confirmed the nutritional benefits of locust bean produced by traditional method. However, the different methods of production could affect the overall nutritional components and benefits.

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