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Research Article

Proximate Parameters of Fermented *Prosopis africana* Seeds

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Abstract

Increasing incidence of malnutrition especially in Nigeria is a serious problem of concern and high cost of animal protein has directed interest towards several leguminous seed proteins as potential sources of vegetable protein for human food. Okpehe is said to contain significant amount of major and minor nutrients needed by the human body. This study was designed to ferment *Prosopis africana* seeds to produce Okpehe in the laboratory. *Prosopis africana* seeds were analyzed for their proximate composition (%) after fermentation and the result of analyses showed the presence of crude protein (27.75), crude lipids (10.52), carbohydrates (27.09), fibre, (6.76), moisture (0.03) and ash (6.04). It can be concluded that fermentation of legume seeds results in enhanced nutritional quality of the seeds and revealed that Okpehe contains large quantity of carbohydrate.

Keywords: Malnutrition, Okpehe, *Prosopis africana,* proximate composition, nutritional quality.

Introduction

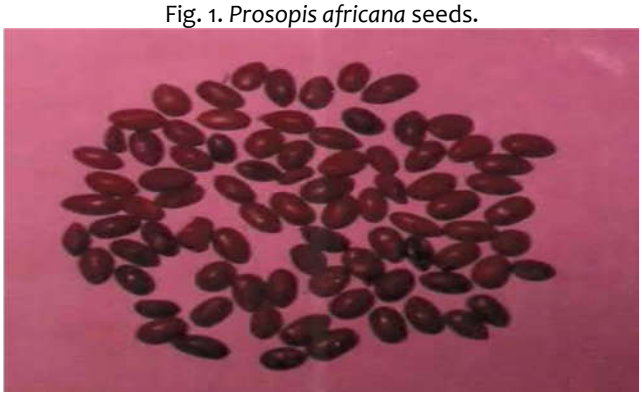
Meat and fish sources of protein have become relatively expensive. Legumes provide a singular alternative of providing plant proteins with reduced the cost of production. Legumes are processed easily and provide higher energy value and act as an alternative source of protein. *Prosopis africana* is a flowering plant species of the genus *Prosopis* found in Africa. Its common names include African mesquite and iron tree (Barminas *et al.,* 1998) and its native Nigerian names are Kiriya (Hausa), Kohi (Fulani), Sam chi lati (Nupe), Ayan (Yoruba), Kpaye (Tiv), Ubwa (Ibo) and Okpehe (Idoma) (Ogunshe *e t al.,* 2007). Seeds of *P. africana* are used in Nigeria to prepare traditional fermented soup condiment or as flavour enhancers known as Okpehe (Omafuvbe *et al.,* 1999). Fermentation markedly improves shelf-life, digestibility, nutritive value and flavours of the raw seeds. When fermented, the seeds become tasty and protein rich when seasoning. They are added to dishes directly or used as thickening agents in soups and stew (Ogbadu, 1988). Organisms actively involved in the fermentation of *P. africana* is *Bacillus* species, predominantly are *B. subtilis, B. pumilus, B. licheniformis* and *B. megaterium* (Oguntoyinbo *et al.,* 2010). In many countries in Africa including Nigeria, protein malnutrition is a major problem. The high cost of animal protein has directed interest towards several leguminous seed proteins as potential sources of vegetable protein for human food.

Prosopis africana (African mesquite) is one of the lesser known legume seed crops used as a food condiment called Okpehe. In spite of its importance as a condiment, the bio-modification which occurs during the fermentation of Okpehe is not yet fully documented. This study was designed to ferment *P. africana* seeds to produce Okpehe in the laboratory and determine the proximate analysis during the natural fermentation of Okpehe.

Materials and methods

Sample collection: Two kilograms of African mesquite (*Prosopis africana*) seeds were purchased from Kano market in Kano State of Nigeria (Fig. 1). Seeds were transported to the laboratory, Department of Microbiology, Bayero University, Kano in polythene bags.

Fig. 1. *Prosopis africana* seeds.



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Preparation of unprocessed Prosopis africana seeds for fermentation: The seeds obtained from the market were pre-cleaned by sorting out stones and debris. This was followed by washing and boiling in water for 24 h, renewing the water intermittently until the seeds became soft. The soft seeds were dehulled by removing seed coats with finger tips. The cotyledons were re-boiled for 4 h and were allowed to cool to 35°C in an earthen pot lined with sterile foil (Ogbadu, 1988). The cotyledons were later drained through sieve, cooled and wrapped with paw-paw leaves. The wrapped cotyledons were put in clean bowls covered with jute bags and then left for 3 d in an incubating unit during which natural fermentation occurred. After fermentation, the resultant product, which was brown in colour, was Okpehe, a strong-smelling mass of sticky cotyledons. The Okpehe was made into balls of 3-4 cm dia, arranged in trays and dried for 1-3 d in the sun. The Product became black after sun drying. The dried product was ground with mortar and pestle.

Drying of freshly fermented P. africana seeds using hot air oven: Sixty grams of freshly fermented seeds of *P. africana* were weighed into Petri dishes, cleaned with ethanol. The Petri dishes containing the fermented samples were placed in a hot air oven at a regulated temperature of 45°C for a period of one week. The samples were re-weighed repeatedly, until a constant weight was obtained.

Powdering blending of dried fermented seeds of P. africana: The dried fermented seeds of *P. africana* were blended into powdered form using a sterile blender. Ten grams of the powdered condiment was packaged into small plastic containers with seals sterilized with 70% ethanol. The packaged condiment was stored at refrigeration temperature (9±20°C) for further use.

Proximate analysis of powdered condiments of P. africana seeds: Proximate analyses for crude protein, carbohydrates, crude lipids, fiber, ash and moisture content were carried out on powdered condiment of *P. africana* according to AOAC (2007) methods.

Results and discussion

Prosopis africana seeds were analyzed for their proximate composition (%) after fermentation and the result of analyses showed the presence of crude protein (27.75), crude lipids (10.52), carbohydrates (27.09), fibre, (6.76), moisture (0.03) and ash (6.04) (Table 1). It can be concluded that fermentation of legume seeds results in enhanced nutritional quality of the seeds. Based on this observation, it means that Okpehe contains large quantities of carbohydrate.

Table 1. Proximate analysis of naturally fermented *Prosopis africana* seeds (% per g of sample).

Moisture content	0.03%
Ash	6.04%
Crude lipid	10.52%
Crude protein	27.75%
Crude fibre	6.76%
Carbohydrate	27.09%

Okpehe, with its characteristic appearance and aroma was produced from the spontaneous fermentation of *Prosopis africana* seeds. The mash became soft and dark with a strong ammoniacal odour after seventy two hours of fermentation. The organisms growing in the fermenting Okpehe during the fermentation produced a whitish mucilaginous substance that covered and linked the individual light brown to dark brown coloured cotyledons. These organisms increased in number as the fermentation period progressed. The involvement of a variety of microorganisms in spontaneous food fermentation is normal and does not render the product unsafe for human consumption, especially when none of the microorganisms is pathogenic to man (Oyeyiola, 2002). The growth of microorganisms during the fermentation of Okpehe is likely to have a significant influence on the quality and flavour of the final product. The organisms involved in the samples fermentation would have been introduced by chance inoculation from the environment but the initial boiling would eliminate most of the surface microflora of the *Prosopis* seeds. Boiling of the seeds before fermentation has the effect of eliminating the species responsible for an acid fermentation and encouraging a non-acid fermentation that is dominated by *Bacillus* species (Achi, 1992). The enhanced nutritional qualities are as a result of the fermentation process activities. Platt (1980) referred to this contribution by organisms in fermentations as biological ennoblement, showing increased nutrients in fermented foods over the unfermented counterparts. Similarly, Tamang (2009) reported that increased nutritional content during fermentation is as a result of probiotic functions. Nutrient enhancement in fermented foods was also reported in Indian cereal protein (Ogbadu, 1988). Odunfa (1984) and Omafuvbe *et al.* (1999) also reported that protein, fats, vitamins especially riboflavins increased significantly during fermentation of legume seeds.

Conclusion

From this study it may be concluded that fermentation of Okpehe (Africana seed) improved the nutritional value of the products as observed from the experiment.

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