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Nutritional Composition and Antimicrobial Properties of Three Nigerian Condiments

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ABSTRACT

Three Nigerian condiments were analyzed. Dried *Irvingia gabonensis* seeds and freshly fermented *Parkia biglobosa* and *Prosopis africana* were analyzed for their proximate composition, mineral contents and antimicrobial properties. The condiments were found to be very rich in protein (21.35 – 26.13%) with high energy values (351.13 – 595.05 kcal/kg). The moisture content of *P. biglobosa* and *P. africana* were very high (20.30 – 27.01%) compared to that of *Irvingia gabonensis* (3.75%) which, however, had a higher fat content (55.09%). *I. gabonensis* also had higher content of macro elements while *P. africana* was superior in micro elements. The extracts had higher anti-fungi activities but lower anti-bacterial activities. The activity index increased with the polarity of solvent of extraction, methanolic extract being the most potent with the highest inhibition activities between 22 ± 1 and 27 ± 1 for fermented *P. biglobossa*.

Keywords: Condiments, mineral composition, nutrients, antimicrobial activity, *Irvinga gabonensis*, *Parkia biglobosa*, *Prosopis africana*.

Introduction

A condiment is a relish, sauce or seasoning added to food to impact a particular flavour to the dish or to complement it. Codiments are usually introduced during cooking to aid flavouring and texture of the food though some are added prior to serving and during serving. They are generally pungent in flavour and are therefore added in fairly small quantities.

Food condiments are prepared by traditional methods of uncontrolled solid substrate fermentation resulting in extensive hydrolysis of the protein and carbohydrate components (Fetuga *et al*., 1973; Eka, 1980). Apart from increasing the shelf life and reduction in the anti-nutritional factors, fermentation markedly improves the digestibility, nutritive value and flavours of the raw seeds (Reddy and Pierson, 1999; Barimalaa *et al*., 1989).

Soups are made from varieties of leaves, pulses, nuts and condiments. They are usually eaten with staples thereby forming an essential component of the diet. The staple foods provide the calories but the soups are the main sources of other nutrients needed by man. About 80% of dietary proteins are obtained from seeds of legumes and at times this is a major source of protein for some groups. Their cooked forms are eaten as meal but they are commonly used in fermented form as condiments to enhance the flavour of foods (Odunfa, 1985; Aidoo, 1986; Oniofok, 1996). With high contents of protein, leguminous condiments serve as a tasty complement to sauces and soups and can substitute for fish or meat. In addition to the aforementioned benefits of leguminous condiments, nowadays, they are employed in dietary strategies to control obesity

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due to their high fibre, low carbohydrate and fat contents (Weintraub, 1992) rather than physical exercises (Oben, *et al*., 2008; WHO, 1998; Prentice and Jebb, 1995).

Irvingia gabonensis is a tree in the family Irvingiaceae, and is sometimes known as wild mango, African mango, or bush mango and is widely used in the preparation of various dishes in Eastern Nigeria and the West African sub-region.

Prosopis africana (Guill., Perrott. and Rich.) Taubert (Fabaceae) commonly referred to as 'kirya' in Hausa, 'ayan' in Yoruba, 'ubwo' in Igbo and 'sanchi' in Nupe is a common tropical plant. This plant has several medicinal applications in Nigeria, Mali and other African countries (Ezike *et al*., 2010; Kolapo *et al*., 2009). The fermented seed is used as soup condiment.

Parkia biglobosa (Jacq) Benth which belongs to the family *Leguminoceae* (Fabaceae) is popularly known as African locust bean tree. It is called 'Igba' or 'Irugba' by the Yoruba, 'Dorowa' by the Hausa and 'Origili' by the Igbo of Nigeria. *P. biglobosa* is known to provide an ingredient that is used in treating leprosy and hypertension. In the Gambia, the leaves and roots are used in preparing a lotion for sore eyes and decoction of the bark is used as baths for fever, hot mouth wash and toothache relief (Irvine, 1961).

Fermentation products of *P. biglobosa* are of two types; one fermentation product is achieved with the addition of *kuruu* a local catalyst made from *Hibiscus sabdariffa* and potassium carbonate (*kaun*) (Ikenebomeh, 1986; Odunfa, 1985), while the other does not involve the usage of this catalyst. The addition of the catalyst softens the bean seed faster and better. The soft fermented product is locally called *iru pete* while the hard one is called *iru woro* by the Yoruba. The two types were employed in this study. *Prosopis africana* seeds are usually fermented to produce *ogiri-okpei*. The condiments were analyzed in their ready to use forms.

Literature has reported works on the nutrients of seeds and biochemical changes during the production of condiments by fermentation, but comparative nutritional analysis between fermented seeds (condiments) of *Irvingia gabonensis*, *Parkia biglobosa* and *Prosopis africana* is scarce. This study, therefore, reports the comparative nutritional analysis and health benefits of these three West African condiments which are commonly consumed in this region. The antimicrobial study will indicate how potent these condiments can be as natural antimicrobial agents. The report of this study may serve as a guide to consumers' choice of condiment when preparing food and also an advisory to industrialists embarking on commercial production.

Material and Methods

Sample collection, preparation and extraction

Dried *Irvingia gabonensis*, fermented *Prosopis africana* and *Parkia biglobosa* were purchased from 'Pata' market in Ilorin, North Central Nigeria. The samples were cleaned by hand picking of the dirt particles and other physical contaminants. No further treatment was meted on the condiments. The samples were ground with mortar and pestle and kept refrigerated prior to analysis. The samples were divided into two parts. One portion was analyzed for proximate composition and metal ion concentration while the other was extracted with n-hexane, ethyl acetate and methanol successively allowing the sample to run dry by exposure to air at room temperature before the next more polar solvent was added. The extracts were filtered and the filtrates concentrated with rotary evaporator at a maximum temperature of 40^{o}C for methanol. The crude n-hexane, ethyl acetate and methanol extracts of the condiments were subjected to antimicrobial analysis. All chemicals used were of 'Analar' grade from Sigma or BDH.

Proximate analysis

Standard methods of Association of Official Analytical Chemists (AOAC, 2000) were used to determine the crude protein content, total ash, crude fat and moisture content of the samples. Crude protein (Total nitrogen (%) x 6.25) was