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Nigerian Soup Condiments: Traditional Processing and Potential as Dietary Fibre Sources

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Nigerian soups/sauces have watery or thick consistencies depending on their composition. A variety of condiments/ingredients are used in Southern Nigeria to modify the consistency of soups/sauces and also to add flavour. They range from starchy roots/tubers, legumes, oil seeds and nuts to fungi. The traditional processing techniques of some of these are examined. Chemical analysis showed the protein content to range from 11·5–34·2% and fat from 3·2–29·1%. Most condiments had low carbohydrate values (2·4–8·7%) but very high dietary fibre values (18·5–77·1%). Mineral values of the condiments were relatively high for Fe, Zn and P. Their potential as dietary fibre sources is discussed.

INTRODUCTION

The consumption patterns of various regions in Nigeria differ widely. While the diets of the northern states are dominated by cereals (namely, millet, corn and sorghum), legumes, nuts, seeds and starchy roots or tubers are consumed in larger quantities in the south. However, one basic similarity in the food pattern of Nigerians is the processing of cereals, starchy roots and tubers into a form of paste (foo-foo) which is eaten with soups/sauces. These soups/sauces are basically prepared with meat and/or fish (when available), oil, vegetables, crayfish, pepper and other spices and condiments. The soups have watery or thick consistencies, depending on their composition. In some parts of Southern Nigeria, some condiments/ingredients are used in soups to give them special flavour and also to alter their consistency. These include starchy roots and tubers (for example, yams and cocoyams), legumes, oily seeds, nuts and fungi.

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As a result of a growing need of the Nigerian populace to know the nutritional value of their local foods, this paper aims at studying the traditional processing and nutritional potentials of some of these soup condiments/ingredients. They include Akparata (*Afzelia africana*), Ukpo (*Mucuna urens*), Ofo (*Detarium microcarpum*), Agbara (*Mucuna pruriens*), Achi (*Brachystegia eurycoma*) and Osu (*Sclerotium* of *Pleurotus* spp.). Their potentials as food nutrients and dietary fibre sources will be discussed.

MATERIALS AND METHODS

Materials

Samples of the materials used are illustrated in Fig. 1, and described below.

Afzelia africana

A. africana is a tree plant and belongs to the family Caesalpiniaceae. The names associated with this tree include counterwood tree (English), Akparata (Ibo),

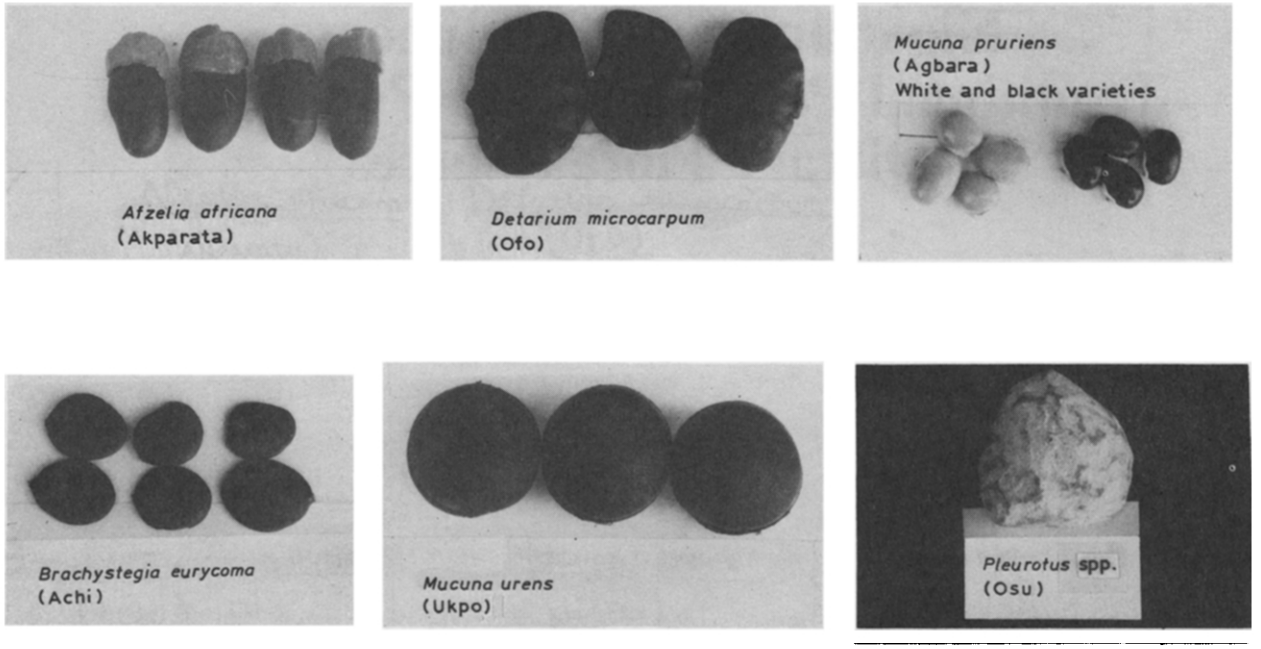

Fig. 1. Nigerian soup condiments.

Kawo (Hausa), Apa (Yoruba), Arinyan (Bini), Bachi (Nupe) and Yesa (Tiv) (Keay *et al.*, 1964). It is a large deciduous tree, bare from December to about April. The fruit is a black, woody pod, about 10·0 cm long and half as wide and often hangs on the tree for many months before opening to release the shiny black 'Mahogany bean seeds'. These seeds are arranged transversely side by side in grooves in the middle of the pod. Each seed is ellipsoid in shape, about 1·89–3·15 cm long, glossy black and has a waxy orange aril forming a cup around its base (Keay *et al.*, 1964). Traditionally the cotyledons of these seeds are used as thickening agents and flavouring in soups/sauces. The waxy orange aril is said to be a valuable source of oil used in eating yam in some areas.

Detarium microcarpum

This also belongs to the family Caesalpiniaceae. It is particularly associated with dry savannah countries. Some of the names associated with this tree include tallow tree (English), Ofo (Ibo), Taura (Hausa), Konkehi (Kanuri), Gungorochi (Nupe), Aikperlarimi (Etsako) and Agashidam (Tiv). It flowers throughout the wet season and fruits between November and January and also in May. The fruits are more or less circular and disc-shaped (drupe like), 2·52–5·04 cm, across and 2·52 cm thick with a dark-brown fairly smooth skin; they are brittle when dry, enclosing a sweet greenish pulp mixed with numerous fibres, surrounding the hard, disc-shaped, wrinkled stone containing one seed (Keay *et al.*, 1964).

Brachystegia eurycoma

Also of the family Caesalpiniaceae. This tree is commonly found along river banks and is recognized by its large size, irregular bole and huge twisted spreading branches. It also possesses a rough fibrous bark which peels off in untidy patches and often exudes a brownish buttery gum. It is commonly know as Achi (Ibo), Ukung (Efik), Akolodo (Yoruba), Okwen (Bini) and Eku (Ishan). It flowers between April and May, fruiting between September and January. The fruits are very conspicuous and persistently woody (12·6–20·16 cm long by 3·78–6·30 cm broad) thin with parallel margins or slightly broadening towards the apex; they have a short point with the thick upright stalk more or less at right angles to the pod, containing 4–6 brown, shiny flat seeds about 1·89 cm in width (Keay *et al.*, 1964).

Mucuna urens or *Mucuna sloanei*

This is locally known as Ukpo (Ibo), and Apon (Yoruba). It is an annual or biennial climber with a woody base and is grown as a compound crop in Southern Nigeria. The seeds are circular, flattened and black when dry with the hilum extending for most of the circumference. They are hard and the seed coat is extremely tough and leathery (Ezueh, 1977).

Mucuna pruriens

This is known as velvet bean in English and locally as Agbara (Ibo). It is a herbaceous annual or perennial vine, usually climbing. They are found growing wild while some are cultivated. Contact with the leaves is

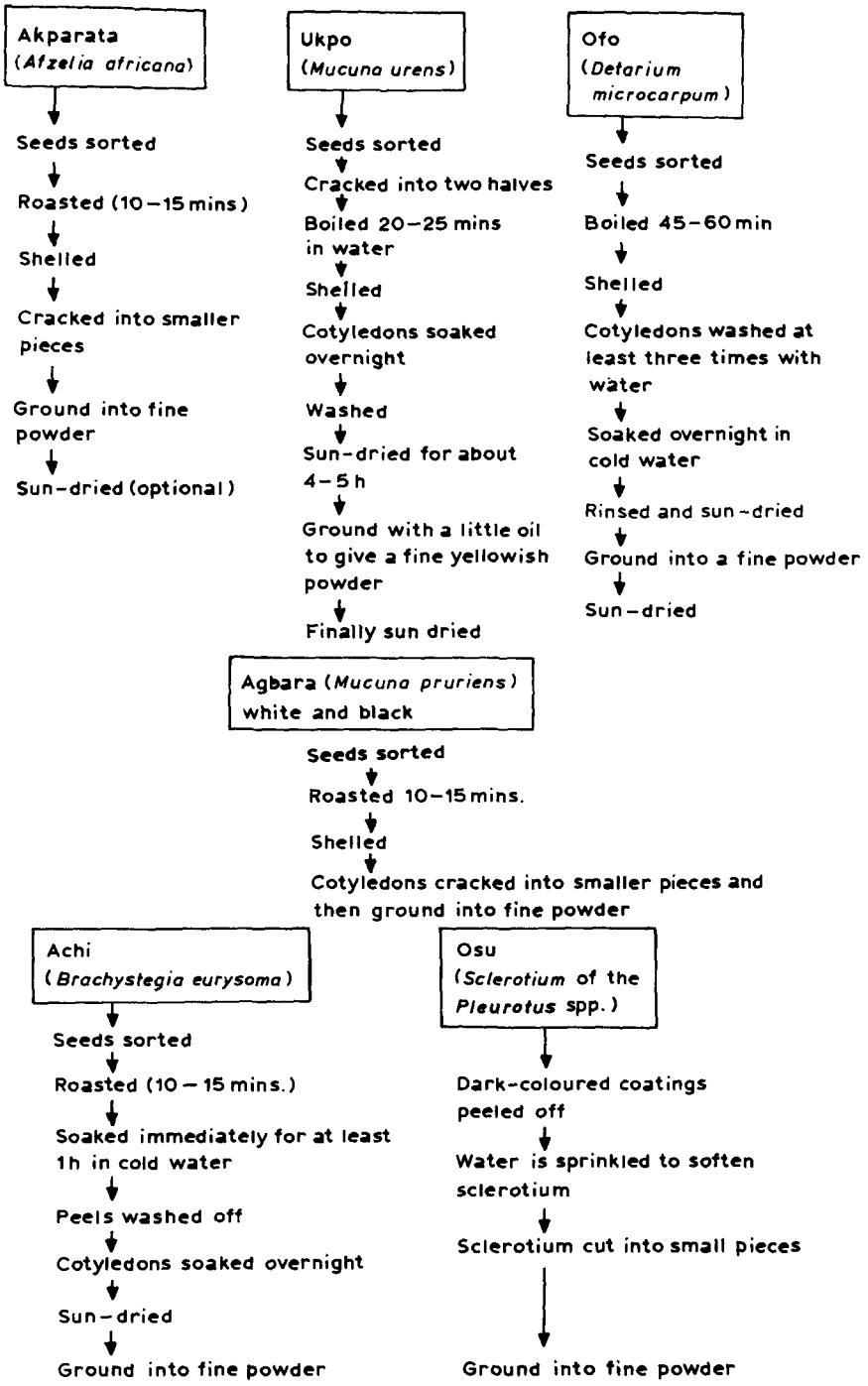

Fig. 2.

said to cause some itching/allergic reaction on the body. Two cultivars are common—the cream and black cultivars. The hilum is surrounded by a white aril. It is used mainly for feeding livestock, as a cover crop and for green manure. However, it is still used for human consumption in some areas, particularly India (Aykroyd *et al.*, 1982). In some parts of Anambra State in Nigeria it is eaten, especially during periods of scarcity, by the rural poor. If not properly cooked, the seeds are known to cause dizziness.

Sclerotium of *Pleurotus* spp.

This fungus is locally known as Osu (Ibo). The mushroom, *Pleurotus* sp., belongs to the order Agaricales which includes fungi whose fruiting bodies are called mushrooms or toadstools. It is found in association with certain living elm trees and is characterized by the possession of a globose subterranean sclerotium. This sclerotium is a hard resting body, resistant to unfavourable conditions, which may remain dormant for long periods of time and germinates upon the return of

Table 1. Proximate Composition of Samples (% per 100 g dry matter)

	Dry matter	Protein	Fat	Ash	Dietary fibre	Carbohydrate
Afzelia africana (Akparata)	86·2	20·9	29·1	3·9	37·4	8·7
Brachystergia eurycoma (Achi)	86·7	11·5	4·7	2·2	77·2	4·4
Detarium microcarpum (Ofo)	89·0	13·9	11·5	1·8	70·2	2·6
Pleurotus spp. (Osu)	81·5	13·2	3·2	1·4	71·8	10·4
Mucuna urens (Ukpor)	89·8	21·2	17·8	2·4	51·10	7.5
Mucuna pruriens (cream) (Agbara)	91·9	33·2	3·8	3·6	22·3	37·1
Mucuna pruriens (black)	94·6	34·2	3·7	3·5	18·5	40.1

favourable conditions. In some parts of Southern Nigeria, the sclerotium is milled together with melon seeds (*Citrullus vulgaris*) and used in preparing soup/sauce. At times, this mixture is moulded into patties which are cooked and dropped in soups/sauces as meat substitutes or eaten as snacks (Nwokolo, 1987).

Collection of samples

All samples, with the exception of the two cultivars of *M. pruriens* (Agbara) were purchased from the Nsukka local market. The seeds of *M. pruriens* were bought from Ibagwa market, near Nsukka, Nigeria.

Figure 2 is a diagramatic illustration of the traditional processing procedures followed. Processed samples were stored in air-tight plastic bottles prior to analyses.

Chemical analysis

Milled samples were analysed for moisture, protein, fat and ash, according to standard procedures (AOAC, 1984). The factor 6·25 was used throughout for conversion of nitrogen to crude protein. Carbohydrate content was calculated by difference. Dietary fibre (DF) was assessed by a modification of the enzyme–gravimetric method (Prosky *et al.*, 1985), after cold-defatting of samples with more than 5% fat. Water-soluble components were precipitated from the filtrate with 95% (v/v) ethanol and recovered by filtration. All filtrations were done on a Fibretec E 1023 Filtration Module (Tecator, Hoganas, Sweden) with Celite 545 as a filtering aid.

Mineral analysis was done by dry ashing followed by analysis of iron (Fe), zinc (Zn), and calcium (Ca), using an atomic absorption spectrophotometer (AAS) (Perkin-Elmer 372, Perkin Elmer Ltd, Beaconsfield, Buckinghamshire, England). Phosphorus (P) was determined by the vanadomolybdate colorimetric method (AOAC, 1984). All analyses were done in duplicate and mean values presented.

RESULTS AND DISCUSSION

The proximate compositions of the samples analysed are shown in Table 1. Previous work on some of these was done in their raw states, e.g. *M. pruriens* (Farinu, 1986; Oyenuga, 1968) and *M. sloanei* (Afolabi *et al.*, 1986). The results presented here are based on the compositions of the samples in the processed forms in which they are utilized. From the data presented in Table 1, crude protein for *A. africana* and all the Mucuna cultivars falls within Boulter's (1977) definition of protein plants with values ranging from 20·9–33·2% dry matter. Values for *B. eurycoma* (11·5%), *D. microcarpum* (13·9%) and *Pleurotus* spp. (13·2%), were lower, but comparable to those of commonly consumed cereals.

The high fat content of *A. africana* (29·1%) makes this plant a potential source of vegetable oil and is comparable to the fat contents of dehulled soya bean seed (20·4%) and cotton seed (20–26·2%) (Gohl, 1981). This value may be higher when the whole seed is considered, since its waxy orange aril contains considerable amounts of oil. The relatively high fat content of *M. urens* was a result of the addition of palm oil during processing. Palm oil was added to avoid darkening with time.

Ash content of the samples ranged from 1·4–3·9% with *Pleurotus* spp. having the lowest value. Those of *A. africana* and the *Mucuna* spp. were comparable to values for most legume seeds.

Carbohydrate contents of most of the samples were low (2·6–10·4%), except for *M. pruriens* with values of 37·1–40·1, similar to most edible legumes. The implication of the low value is that these thickening agents have very low percentages of reducing and non-reducing sugars.

The most significant finding of this work is the high dietary fibre (DF) contents of the samples analysed, with values ranging from 18·5–77·8% dry matter. Table 2 shows the soluble and insoluble dietary fibre (SDF and IDF) components of some of the samples. With

Table 2. Soluble and Insoluble Dietary Fibre Components of Selected Samples (g/100 g dry matter)

Sample	Soluble DF	Insoluble DF	Total DF
Afzelia africana (Akparata)	24·9 (66·6)[a]	12·5 (33·4)	37·4
Brachystegia eurycoma (Achi)	51·3 (66·5)	25·9 (33·5)	77·2
Detarium microcarpum (Ofo)	50·0 (71·2)	20·2 (28·8)	70·2
Mucuna urens (Ukpor)	38·4 (75·1)	12·7 (24·9)	51·1
Pleurotus spp. (Osu)	0·70 (1·00)	71·1 (99·0)	71·86

[a] Values in parentheses represent percentage of total dietary fibre.

the exception of the *Pleurotus* spp., *A. africana*, *B. eurycoma*, *D. microcarpum* and *M. urens* have very high percentages of soluble dietary fibre with values of 66·6%, 66·5%, 71·2% and 75·1%, respectively, as against 1% for *Pleurotus* spp. The importance of this finding in human nutrition can be far-reaching. It is clearly known that certain physiological responses have been associated with the consumption of DF, e.g. increase in faecal bulk, lowering of plasma cholesterol, a blunting of the post-prandial increase in plasma glucose, and a lowering of nutrient bioavailability. However, these physiological effects appear to depend heavily upon the source and composition of DF. Studies have shown that viscous polysaccharides (SDF) can slow the rate of gastric emptying (Schwartz *et al.*, 1982). Also within the small intestine, viscous polysaccharides, which can form a gel matrix, may slow absorption by trapping nutrients, digestive enzymes, or bile acids in the gel matrix and by slowing mixing and diffusion in the intestine. Leeds *et al.* (1979) have shown, through animal experiments, that viscosity is necessary for gums to blunt the rise in plasma glucose after a glucose load. Thus, the SDF component of these samples appears to be very significant.

Table 3 lists the mineral composition of the condiments/ingredients. All samples appeared to have relatively high values for Fe, Zn and P, with *M. urens* having the highest value for Fe. This may account for the darkening property associated with it. Calcium values were higher in *A. africana* (339 mg/100 g DM) and *D. microcarpum* (116 mg/100 g DM). The mineral levels of these samples might have been higher but for the long soaking and washing during processing.

Although the nutritional values of these samples appear good, their contribution to nutrient intake of population groups may be questionable since, with the exception of *M. pruriens* and *Pleurotus* spp. the rest are consumed in small quantities in soups/sauces. The proximate composition and amino acid profile of *Pleurotus* spp. have been studied by Nwokolo (1987). It is said to be poor in nutrient and exceptionally low in cystine, lysine, methionine, serine and arginine. However, its use should not be discouraged, especially when compared with other thickening agents like boiled yam and cocoyam pastes. Moreover, the high IDF component has some nutritional significance. *M. pruriens* is a legume seed that is associated with the very poor and is known to cause allergic reactions when the leaves are touched and dizziness when the partially cooked seeds are eaten. From the data presented here, this legume compares favourably (nutritionally) with other edible legumes and efforts should be made to develop process-

Table 3. Mineral Composition of Samples (mg/100 g dry matter)

Samples	Fe	Zn	Ca	P
Afzelia africana (Akparata)	11·1	4·3	338	488
Brachystegia eurycoma (Achi)	10·5	1·9	13·7	250
Detarium microcarpum (Ofo)	6·9	2·5	116	360
Pleurotus spp. (Osu)	7·3	5·1	8·6	286
Mucuna urens (Ukpor)	14·2	3·3	26·5	271
Mucuna pruriens (cream) (Agbara)	9·1	6·0	30·0	476
Mucuna pruriens (black)	9·2	4·5	23·6	490

ing techniques that could eliminate the toxic factors and therefore gain more acceptance.

Finally, *A. africana, B. eurycoma, D. microcarpum* and *M. urens* have great nutritional potentials, especially as DF sources. These are worth exploiting for the therapeutic cure of various physiological conditions. The potential of *A. africana* as a vegetable oil source should also not be overlooked.

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