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Sensory Evaluation and Proximate Analysis of African Yam Bean (*Sphenostylis stenocarpa* Harms) moimoi

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ABSTRACT: A moimoi-like dish, similar to the very popular steamed cowpea dish, was produced from the African Yam Bean (AYB). The AYB moimoi was compared with cowpea and soybean moimoi by a panel of eight (8) judges. The samples were compared for taste, colour, aroma texture and overall acceptability. For texture, aroma and overall acceptability, cowpea moimoi ranked highest followed by AYB moimoi and lastly soybean moimoi. Colour wise, AYB moimoi was preferred over cowpea moimoi followed by soybean moimoi. Texture wise, AYB and cowpea were scored equally followed by soybean moimoi. Proximate analysis of the product revealed total carbohydrate content of 40.8%, crude protein 18.4%, Ash, 7.1%, crude fibre 8.3%, crude fat 25.4% and moisture content, 20%. @ *JASEM*

The leguminous plants have met the need for an affordable and available source of protein. They contribute about 18% of the world's protein requirement (Jalil and Tahir; 1973). These plants range from the well known (major) and well utilized cowpea (Vigna unguiculata) and Soybean (Glycine max) to the lesser known (minor) and under utilized wing bean (Psophocarpus tetragonlobos) and the African Yam Bean (Strepnostylis stenocarpa), to mention a few. Recent studies have shown that these minor legumes are highly nutritious and are used as feeds, cover crops, green manures and natural fertilizers (Okigbo, 1973). These legumes are about 2-3 times richer in protein than cereals and some of them are rich in oil (Aylward and Jul, 1975). In Nigeria the cowpea bean is highly utilized. It is boiled with condiments, or boiled alone and eaten with stew. It is also used in the preparation of Akara balls (a fried dish) and moimoi a steamed dish. Nutritionally, the AYB compares favourably with the cowpea bean. Cowpea bean contains 61-66% carbohydrates, 24-25% proteins and 1-2% fat (Bressoni, 1985). AYB seed contains 62.6% carbohydrates, 19.5% protein and 2.5% fat (Okigbo, 1973). It is also reported to contain high levels of lysine and menthionine (Okigbo, 1973). Inspite of its composition, the AYB has a low consumption rate. This is mainly due to its long cooking time, about 145mins. (Nwokolo, 1996) compared with the 60mins cooking time of cowpea. It is for this reason that alternative methods of preparing the AYB are being sought. Moimoi is a very popular cowpea (Vigna sp.) product in Nigeria consumed by all segments of the society except infants (Adeniji and Potter, 1980). This is a report of the preparation of a moimoi-like dish from African Yam Bean, its sensory evaluation and proximate analysis.

MATERIALS AND METHODS

SOURCE OF BEAN SEEDS: The marble variety of the African Yam Bean was used in this study. The seeds were purchased from a local market in Aba, Abia State. Cowpea and soybean seeds were also bought in the same market. All bean seeds were stored in airtight plastic containers in the refrigerator, prior to use. Storage in the refrigerator was to avoid weevil infestation.

TABLE 1: Moimoi Recipe

Ingredients	Quantity
African yam bean	50g
Red pepper	10g
Onions	10g
Salt	7g
Water	150ml
Red Palm oil	18ml
Maggi Cube	1

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MOIMOI PREPARATION: The AYB moimoi was prepared by modifying the cowpea recipe of Onurah, 1983 (Table1 and Figure 1). Fifty (50) grammes of the AYB seed was soaked in 200ml of tap water for a period of 12-16 hours. The seeds were manually dehulled by rubbing them between the palms. The bean was rinsed thoroughly with clean water. Ten (10) grammes each of red pepper and onions were added to the dehulled beans and blended with 150ml of warm water (70°C) to produce the paste. The locally fabricated milling machine was used in Rumuokwuta market, Port Harcourt, Rivers State. Eighteen (18mls) of palm oil, 7g of salt and one cube of maggi were added. The resultant paste was dispensed (¾ full) into 250ml plastic containers and steamed for about 1hour using a one-ring butterfly kerosene stove. After a cook period of 45mins to 1hour, the AYB moimoi was firm to the touch, therefore, ready for consumption. In addition, cowpea and soybean moimoi were also prepared using the same weight of condiments.

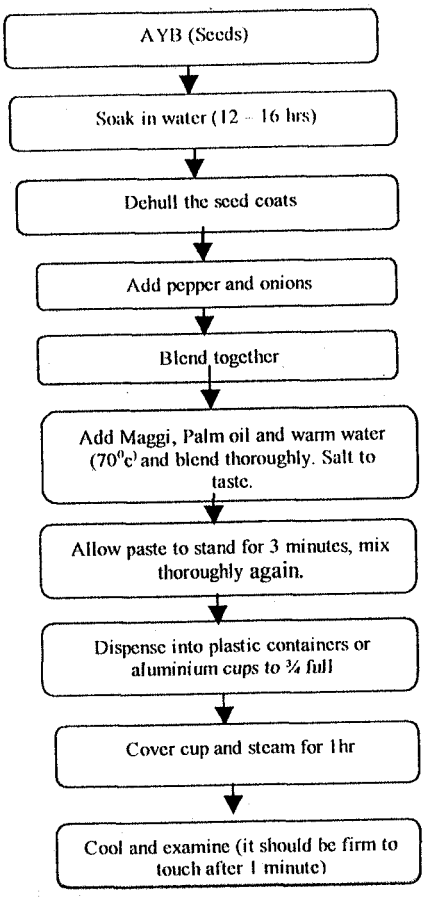

Fig 1: Steps in the Preparation of AYB Moimoi-Like Product (Adapted from Onurah, 1983).

PROXIMATE ANALYSIS

Samples of AYB moimoi were analysed for moisture content, total nitrogen, crude protein, ash crude fibre and carbohydrate.The air oven method of Osborne and Voogt was employed in the moisture content determination. The sample was dried to a constant weight in an airtight oven (104°C). The empty dish and the lid were dried in the oven for 15min and transferred to a dessicator to cool. The empty dish was weighed to the nearest mg. About 1g of the sample were then transferred to the dish. The lid was replaced and the dish and its contents weighed as rapidly as possible to the nearest mg. The lid was then removed and the dish and content placed in the oven, avoiding contact with the wall. The sample was dried for several hours. The dish was then removed from the oven, the lid replaced, cooled in a dessicator and reweighed when cool. The dish and sample were dried further for 1hr to ensure that a constant weight had been attained and the moisture content was calculated

Total nitrogen and crude protein were determined using the Macro Kjeldahl method of Osborne and Voogt, 1978.One(1)g of the sample was weighed and transferred into the Kjeldahl flask. Few chips of antibumping granules, 4g digestion catalyst and 20mls concentrated sulphuric acid were added and the flask was held at an angle 45o with a retort stand on an electro-thermal heater. The flask was heated gently for fronting to occur and subside, then, the heat was increased to about 250°C. The digestion was carried out within 2-6hrs by which time the entire sample was digested completely. The digest was cooled to room temperature and diluted to 100ml volume with distilled water. For the distillation,

20ml aliquot of the digest was transferred into a round-bottomed distillation flask. This flask was connected to a Liebig condenser through a mono-arm steel head (adaptor) .The Liebig condenser was connected to a receiver flask through a receiver adaptor. Ten (10) mls of 2% boric acid and 2drops of double indicator were pipetted into the receiver flask. Thirty (30) mls of 40% sodium hydroxide was injected into the distillation flask through a cork with the aid of a syringe. The flask was heated for 10mins to distil the contents. The distillate was collected in the boric acid and titrated with 0.1M hydrochloric acid. The volume of HCL added was recorded as the titre volume. The percentage Nitrogen was calculated as:

$$\%N_2 = \frac{\text{Titre value} \times 1.4 \times 100 \times 100}{1000 \times \text{wt. of sample in g} \times 20\text{ml aliquot of digest}}$$

%Protein= %N x 6.25
1.4= N_2 equivalent to 0.1N HCL used in titration
100=Total volume of digest

$$\text{Extractable Fat (\%)} = \frac{W_3 - W_2}{W_1} \times 100$$

W_3= weight of flask with fat (g)
W_2=weight of flask without fat (g)
W_1=Weight of sample before drying (g)

The lipid content was determined using the Fishwick and Wright method of 1977. The fat was extracted with petroleum ether using the soxhlet method. The solvent was removed by evaporation and the residue i.e fat, weighed. The sample was dried in an air oven at 100°C for 5mins, cooled in a dessicator and weighed. The formular below was used for the calculation,

The Osborne and Voogt method of 1978 was used in determining the ash content. In summary, 1g of the dried sample were added to an already weighed porcelain crucible. The total weight of the crucible and sample was taken. The crucible was pre-heated with an electric heater for the initial decomposition of organic matters present in the sample. The crucible with the charred sample was placed in a muffle furnace and ashing was allowed for 6hrs at a temperature of 630°C.The sample was allowed to cool to room temperature (29±30°C), and the crucible, lid and ash, re-weighed.

$$\text{Ash (\%)} = \frac{\text{Weight of Ash } (W_2)}{\text{Weight of sample ashed } (W_1)} \times 100$$

W_2=Weight of crucible with ash-weight of empty crucible.

The crude fibre was determined using the Osborne and Voogt method of 1978. 1g of the sample was weighed into a conical flask and 200ml of 1.25% of boiling sulphuric acid, added within 1min. The contents of the flask were filtered through a Buchner funnel prepared with a wet 12.5cm filter paper. The sample was washed back into the original flask with 200ml of 1.25% Naoh and boiled for 30mins. All insoluble matter was transferred to the sintered crucible and treated till acid free. The sample was again washed and dried at 100°C to a constant weight. It was then ashed in a muffle furnace at 550°C/hr. The crucible was then cooled in a dessicator and reweighed.

$$\text{Fibre content (\%)} = \frac{W_2 - W_3}{W1}$$

W_1
W_2 = Weight of insoluble matter (g);
W_3 =Weight of ash(g) ;
W_1 =Weight of sample (g)

Total carbohydrate was determined by the difference between 100% and crude protein (%), crude fibre (%), ash(%) and lipid(%).

SENSORY EVALUATION: A panel of 8 judges, three males and five females, aged between 20 and 30 years, performed sensory evaluation. These were all students residing in the students' hostel. These students were chosen on the basis of their familiarity with the cowpea moimoi.

STATISTICAL ANALYSIS: The samples were evaluated using the Ranking method as described by Ngoddy and Ihekoronye, 1985. A score of 1 indicated the best quality and 3, the least desirable. These values were then converted to scores according to the method of Fisher and Yales as cited by Ngoddy and Ihekoronye, 1985. Finally these scores were subjected to analysis of variance at 5% significant level.

RESULTS

The results of the sensory evaluation of the sample compared with cowpea moimoi and soybean is summarized in Table 2.

Table 2: Organoleptic Evaluation of Cowpea, African Yam Bean and Soybean Steamed Pastes (Moimoi)

Sample (Moimoi)	Number of Observation	Panel (Mean Score)				Overall Acceptability
		TASTE	COLOUR	AROMA	TEXTURE	
Cowpea	8	8	14	13	13	8
African yam Bean	8	16	12	15	13	16
Soybean	8	24	22	20	22	24

Note: 1 for the best, 2 for the next and 3 for the least favoured.

Table 3: Proximate Composition of AYB Moimoi

VARIABLE COMPONENT	VALUE (%)
Total Carbohydrate	40.8[a,b]
Crude Protein	18.4[a]
Crude Fibre	8.3[a]
Crude Fat	25.4[a]
Moisture Content	74[c]

Key: a = on dry weight b = calculated by difference c = on fresh weight basis

The results showed that taste wise; moimoi from cowpea had the highest acceptability closely followed by AYB moimoi. The soybean moimoi was the least accepted. Colour wise, the AYB moimoi was the most favoured. For aroma and overall acceptability, the cowpea moimoi was scored highest, closely followed by AYB moimoi, then soybean moimoi. Texture wise, AYB moimoi and cowpea moimoi were scored the same; soybean moimoi had the least acceptance. The results of the proximate analysis on "AYB" moimoi are as presented in table 3. Total carbohydrate content was found to be 40.8%, crude protein content was 18.4% ash content, 7.1% crude fibre content, 8.3%, crude fat, 25.4% and moisture content, 20%.

DISCUSSION

Legumes are of importance to the low socio-economic group (which constitutes a larger percentage of the population) among whom there is usually a high incidence of protein and energy malnutrition (Akroyd and Doughty, 1969). Animal protein is seldom affordable by the poor in developing countries; hence legumes usually provide a cheap and sometimes only source of protein (Siegel and Fawcett, 1976). For example 1kg of chicken cost ₦270.00, 1kg of goat meat, ₦380.00, 1kg of beef, ₦370.00, 1kg of croaker fish, ₦350.00, one cup of cowpea fluctuates between ₦10.00 and ₦19.00. One (1) cup of AYB cost ₦10.00. The AYB is widely available in the Southern States of Nigeria. It contain high protein content 19 – 22%, (Ezueh, 1984; Ofuya, 1991), but grossly underutilized. One major reason for this underutilization is its hard-to-cook characteristic. Using the one ring Butterfly kerosens stove, the cowpea bean cooked in 45 minutes. It took the AYB 140 minutes to cook (Otah, 1999). Cooking time was reduced by soaking the beans in tap water, 4% NaCl, 4% iodized salt or 1% potash. These treatments reduced the cooking time by 18%, 45%, 41% and 59% respectively (Otah, 1999). Having taken care of this major setback, the next step was to develop alternative methods of utilizing this yam bean. Evans and Boulter, 1974, Obizoba and Soyzey, 1989, Njoku et al, 1989, and Ofuya et al, 1990, have all shown that AYB seed, through adequate and appropriate processing, can be converted to new products. It is for this reason that an attempt was made at preparing this AYB moimoi and studying some of its characteristics.

After soaking and dehulling the AYB bean, the cooked time was 1 hour. This is about the same time that it takes the popular cowpea moimoi to cook on

the same equipment. The AYB moimoi that was prepared compared favourably with the widely accepted cowpea moimoi. Sensory evaluation studies showed that cowpea moimoi was highly favoured closely followed by AYB moimoi. This was not unexpected as the word "moimoi" is synonymous with steamed cowpea paste and is a very popular dish in Southern Nigeria (Mcwatters, 1983; Ngoddy, et al,, 1989). In other words panelists were probably accustomed to cowpea moimoi. AYB moimoi was better in texture, than cowpea moimoi. The low performance of soybean moimoi, texture wise may be attributed to its low starch or carbohydrate content, 32% compared to 61% of cowpea (Bresson, 1985). It is the carbohydrate or starch content of the paste that genatilizes during steaming, giving the product its characteristic firmness. Genatilization comes as a result of swelling of the starch granules during heating (which disrupts the intermolecular hydrogen bond) which is due to the incorporation of additional water (Ngoddy and Ihekoronye, 1985). Okigbo, 1973 described the moisture content, fat and ash of the AYB as 10.6% (Dry Weight), 2.5% and 2.8% respectively. The moimoi prepared in this study had much higher water content of 74% (fresh weight). This is as a result of the appreciable percentage of water that is used in the preparation of the product (Omonigho and Ugboh, 1998). The differences in the fat content between the AYB seeds and the "moimoi" was due to the addition of red palm oil to achieve the normal reddish colour of moimoi (McWatters, 1983). In conclusion we report the preparation of a moimoi-like dish from the AYB. From this study, it can be inferred that AYB moimoi will be an acceptable addition to the menu, especially in the Southern region of Nigeria, where the bean is, in abundance. This dish is another addition to "cheaper and affordable" sources of alternative protein.

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