Introduction

Although many studies on food composition have been carried out in Nigeria (Oke, 1968; Addo, 1983; Eka and Holbs, 1987; Oyeleke, 1983 and 1988; Ajayi and Korede, 1991) most of them have found the nutrient composition of individual vegetables, cereals or tubers. There are few studies known to us on the chemical composition of commonly consumed dishes in Nigeria (Toma and Tabekhia, 1979) and in these there was no mention of the recipes used having been standardized.

Nutritionists have therefore been obliged to rely on published food composition tables (Platt, 1962; Leung, 1968; Paul and Southgate, 1978) to assess the nutrient content of these dishes. These tables provide information only on raw food and many of the ingredients commonly used in Nigerian dishes are not listed.

Many of the commonly consumed Nigerian dishes have local variations and include ingredients available in the locality. It is also true that the ingredients have different names in the different regions. For example “dada-wa” (fermented locust beans) in the north of the country is called “iru” among the Yorubas of the west of the country (Anthonio and Isoun, 1982). These variations have been shown to be a function of the socio-economic status of the cook and may also depend on factors such as educational level, prevailing food taboos, cultural and religious practices, price, season, nutritional knowledge, etc. (Ogbeide, 1974; Bender and Bender, 1982).

The purpose of this study is therefore to standardize recipes for ten common Nigerian dishes and to determine their proximate composition. The dishes are: Burabisko, Jollof rice, Agbono soup, Stewed beans and fried plantain, Bean pudding, Melon seed and vegetable soup, Ikokore, Eba imoyo, Yam and eggs and Yam pottage.

Materials and methods

Recipe collection

Reports of several food intake studies (Addo, 1983; Adekolu-John et al., 1985; Oguntona et al., 1985; 1987) in Nigeria were used as a source from which a listing of Nigerian dishes was compiled. Information on the recipes of these meals was then obtained by the use of pretested questionnaires which were...
administered to housewives living in the major towns (Abeokuta, Ibadan, Ijebu-Ode) of south-west Nigeria. The 200 respondents were from the three main regions in Nigeria – i.e. North, East and West. All the completed questionnaires were then numbered randomly and three recipes from each zone were then selected for each dish by systematic sampling. One recipe for each dish was also extracted from a textbook (Anthonio and Isoun, 1982; Olaore, 1980; Vincent, 1962) to obtain a total of ten recipes for each dish. The means of the ten recipes were then calculated to obtain the amounts of each ingredient used for the standardized recipe.

### Preparation of the dishes

Ingredients used for the preparation of the dishes were purchased from three of the most popular markets in Abeokuta (Kuto, Omida and Itoku).

The dishes were prepared using the ingredients listed in Table I. Preparation and cooking were performed using the following standardized recipes at the kitchen facilities of the Department of Home Science and Management of the University of Agriculture, Abeokuta.

#### I. Cereal-based dishes

**Burabisko.** The millet was cleaned and ground to a fine powder. It was then dissolved in some cold water to form a paste. One litre of water was brought to the boil and the dissolved millet added while stirring vigorously.

**Jollof rice.** The meat was washed, cut and seasoned with half of the onions, thyme, curry, white pepper and salt and then boiled for 45 minutes. The stock was kept while the meat was removed and slightly fried in hot groundnut oil for five minutes and set aside. The peppers, three-quarters of the tomatoes and three-quarters of the remaining onions were ground and added to the meat stock. Other ingredients such as tomato purée, groundnut oil, margarine, salt, bouillon cube, curry powder, thyme, fried meat were all added and cooked for 15 minutes. The washed rice was then added to the boiling mixture and cooked over a low heat for 45 minutes until the rice was cooked. The remaining tomatoes and onions were sliced and added, covered and allowed to simmer for ten minutes.

#### II. Legumes/nuts/seeds-based dishes

**Agbono soup.** The agbono nuts and crayfish heads were blended into a fine powder. The bitter leaves were shredded, washed and squeezed to remove the bitter taste with the aid of salt. The asa fish was washed first with warm water and then with cold water. The ground mixture of agbono nuts and fish was then added to 30ml of heated palm oil while stirring to avoid lumps. Hot water was gradually added while mixing. The ground pepper, bouillon cube and chopped okra were then added and allowed to cook at medium heat for 20 minutes. The bitter leaves together with the asa fish were then added and was allowed to cook for another three minutes. Finally the salt was added.

**Beans (ewa).** The beans were thoroughly washed and together with the shredded onions were allowed to boil for 45 minutes over a low heat. Ground pepper, palm oil and salt were then added to the beans. They were then allowed to simmer for further 15 minutes while stirring.

**Fried plantain (dodo).** The plantain was peeled, diced and fried in hot groundnut oil until golden brown. The fried plantain was then removed from the fire and the excess oil drained with the help of absorbent paper.

**Bean pudding (moin-moin).** The beans were soaked in water for five minutes, dehulled and soaked for another five minutes to soften. They were then ground together with peppers and onions. The fish was boiled for ten minutes, flaked and deboned. The ground beans were then mixed with all the ingredients and whisked with a wooden spoon for five minutes. The mixture was then poured into oiled metal containers (empty milk tins) and arranged in a steamer. Water was added to the steamer. The pot was partly covered and the contents steamed for 30 minutes while replenishing the water in the steamer constantly.

**Melon seed and vegetable soup (efo elegusi).** The meat was washed and cut into pieces, seasoned with salt and, together with half of the chopped onions, boiled for 45 minutes. The peppers, tomatoes and remaining onions were ground together and kept. The egusi was also ground separately. The oil was heated and the meat and stock with the other ingredients except spinach, egusi and salt, added to the oil and cooked for 25 minutes. The egusi and salt were then added and cooked for another ten minutes stirring.
### Table I Ingredients and quantities used in the standardized dishes

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity</th>
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<tbody>
<tr>
<td><strong>I. Cereal-based dishes</strong></td>
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<tr>
<td><strong>1. Burabisko</strong></td>
<td>Ground millet 160g, Water 1,000ml</td>
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<tr>
<td><strong>2. Jollof rice</strong></td>
<td>Pepper (capsicum annum, large, sweet, tatatse) 80g, Pepper (capsicum frutescens, small, hot, atarodo) 80g, Tomatoes 201g, Onions 140g, Meat (beef) 611g, Margarine 40g, Bouillon cubes 2g, Curry powder 2g, Thyme (dried leaves) 2.5g, White pepper (powder) 2g, Tomato purée 35g, Salt 22.5g, Rice (long grain) 480.0g, Groundnut oil 120ml</td>
</tr>
<tr>
<td><strong>II. Legumes/nuts/seeds-based dishes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>3. Agbono soup</strong></td>
<td>Agbono nuts 80g, Dried asa fish 30g, Cray fish 5g, Palm oil 30ml, Dry ground pepper 10g, Bitter leaves (vernonia amygdalina) 20g, Okra (hybiscus esculentus L) 10g, Bouillon cubes 2, Water 500ml, Salt 4g</td>
</tr>
<tr>
<td><strong>4. Stewed beans and fried plantain (ewa and dodo)</strong></td>
<td>Beans (ewa) Beans (vigna ungciculate, cow-pea) 360g, Tatatse 40g, Atarodo 30g, Palm oil 75ml, Salt 9g, Fried plantain (dodo) Plantain 820g, Groundnut oil 100ml</td>
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<tr>
<td><strong>5. Bean pudding (moin-moin)</strong></td>
<td>Beans 314g, Tatase 40g, Atarodo 30g, Tomato purée 35g, Fresh fish 13, Groundnut oil 80ml, Salt 15g</td>
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<tr>
<td><strong>6. Melon seed and vegetable soup (efo elugusi)</strong></td>
<td>Meat (beef) 550g, Melon seeds (egusi, citrullus vulgaris) 227g, Onions 84g, Tomatoes 140g, Tomato purée 35g</td>
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(Continued)
occasionally. Finally the shredded spinach leaves were added and the soup simmered for seven minutes while stirring.

III. Tuber-based dishes

7. Eba imoyo

Gari 240g
Tomatoes 80g
Atarodo 15g
Onions 40g
Palm oil 30ml
Water 1,500ml
Fish 40g
Shrimps 8g
Bouillon cubes 4

8. Ikokore

Water yam 1,195g
Dry fish 85g
Cray fish 10g
Dried ground pepper 20g
Salt 4g
Palm oil 30ml
Water 1,000ml

9. Yam and eggs

Yam (discorea rotundata) 160g
Eggs (medium sized) 5
Fish 40g
Groundnut oil 30ml
Salt 2g
Flour 100g

10. Yam pottage (asaro)

Yam 1,130g
Tomatoes 100g
Tatatse 47g
Atarodo 20g
Onions 90g
Dried fish 136g
Spinach 50g
Bouillon cubes 1
Salt 12g

Table I

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Tatatse</td>
<td>42g</td>
</tr>
<tr>
<td>Atarodo</td>
<td>30g</td>
</tr>
<tr>
<td>Dried fish</td>
<td>126g</td>
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<tr>
<td>Palm oil</td>
<td>150ml</td>
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<tr>
<td>Fermented locust beans (iru)</td>
<td>20g</td>
</tr>
<tr>
<td>Bouillon cubes</td>
<td>1</td>
</tr>
<tr>
<td>Spinach (amaranthus caudatus)</td>
<td>235g</td>
</tr>
<tr>
<td>Salt</td>
<td>18g</td>
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<tr>
<td>Stock from boiled meat</td>
<td>550ml</td>
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</tbody>
</table>

Table I shows the ingredients and quantities used in the preparation of the ten standardized Nigerian dishes. The table includes ingredients such as Tatatse, Atarodo, Dried fish, Palm oil, Fermented locust beans (iru), Bouillon cubes, Spinach (amaranthus caudatus), Salt, and Stock from boiled meat. The quantities are given in grams or milliliters, depending on the ingredient.
water was boiled together with some of the fish and the dried pepper for ten minutes. The grated yam was then added in lumps and allowed to simmer for 30 minutes. The rest of the ingredients were then added and allowed to simmer for a further five minutes.

Yam and eggs. The yam was peeled, washed and cut into thin small pieces and then soaked in salted water for ten minutes. The fish was cleaned, boiled, deboned and flaked, and then added to the whisked eggs. Vegetable oil was heated in a frying pan. Yam pieces were then dipped into flour and then the egg mixture and finally fried for 15 minutes.

Yam pottage (asaro). The yam was peeled, washed, weighed and cut into cubes (1”). The cubed yam, together with the ground tomatoes-peppers mixture and sliced onions, was boiled for 15 minutes. Palm oil, together with bouillon cubes, dried deboned fish and salt, was added and cooked for another ten minutes.

The washed and shredded vegetables were then added to the yam mixture and simmered for another five minutes. Afterwards the yam pottage was stirred with a wooden spoon to mash some of the yam pieces that had formed lumps. The mixture was allowed to simmer for a further five minutes.

**Consumer acceptability test**

All the dishes were subjected to consumer acceptability tests. Panellists who were familiar with the dishes were chosen from among the students and staff of the University of Agriculture Abeokuta. Panellists filled out questionnaires after each session. They evaluated attributes such as taste, flavour, consistency, colour and appearance of the dishes.

All the consumer tests were carried out in the early afternoon between noon and 2 p.m. daily. For each dish four panellists participated on three different occasions. The temperature and size of the samples were uniform. The walls of the test area were painted white, the place was clean and odour free, fluorescent light provided uniform illumination while the panellists were independent of each other and free of distractions. The evaluation scores were rated from five down to one according to the level of acceptance or rejection of the dishes (ASTM, 1968). The acceptability level for this study was three and any attribute that fell below this figure was considered unacceptable.

**Proximate composition analyses**

After the consumer acceptability tests, each meal was cooled to room temperature, homogenized using an electric blender and moisture content was determined. The dried meals were packed in moisture-resistant polythene bags and kept at 0°C prior to analysis of their proximate composition. All the analyses were done in triplicate.

**Moisture content determination**

This was done (AOAC, 1990) by drying samples to constant weight in an electric oven at 110°C (30 hours). Moisture content was then calculated as per cent water loss as follows:

**Calculation**

\[
\text{Moisture content} \% = \frac{W_a - W_b \times 100}{W_a}
\]

\(W_a\) : initial weight

\(W_b\) : weight after drying

**Ash content determination**

This was done using the AOAC (1990) method. Dried samples were incinerated in a muffle furnace at 550°C for six hours.

**Calculation**

\[\text{Ash} \% = \frac{\text{weight of ash} \times 100}{\text{weight of dry sample}}\]

**Crude protein determination**

This was carried out using the automated semi-micro Kjeldahl Method (AOAC, 1990). 0.2g of the sample plus 0.8g of the digestive mixture plus 10ml of concentrated H₂SO₄ were gently heated in the fuming chamber until digest was clear. The cooled digest was transferred to a 250ml volumetric flask and quantitatively diluted to the mark. 20ml of digested solution plus NaOH and Na₂S₂O₃ were distilled. The distillate was collected in 10 per cent Boric acid with Screen methyl-red as an indicator and titrated with 0.05M sulphuric acid.
Calculation

% Nitrogen = \frac{(titre - blank) \times 0.05 \times 1.4}{\text{weight of sample}}

The conversion factor used was 5.7 for beans and fried plantain and 6.25 for all other dishes.

Fat content determination

The automated Soxhlet method was used (AOAC, 1990). The fat was extracted from the dried sample (2g) using petroleum ether (40-60 boiling range) as a solvent. Each extraction lasted eight hours; at the end the flask containing the oil was cooled and weighed.

Calculation

% weight of fat = \frac{W_2 - W_3}{W_1} \times 100

W_1: weight of sample
W_2: weight of flask before extraction
W_3: weight of flask plus oil after extraction.

Crude fibre determination

This was done using the trichloroacetic acid method (AOAC, 1990). 1g of sample plus 100ml of Trichloroacetic reagent was boiled and refluxed for 40 minutes. The content was cooled and filtered. The residue was washed with hot water six times and one time with industrial spirit. The residue was dried for 12 hours at 105°C. The cooled dry residue was weighed and ashed at 600°C for six hours then cooled and weighed.

Calculation

% crude fibre = \frac{\text{difference in weight} \times 100}{\text{sample weight}}

Table I shows the ingredients used in preparing the standardized dishes while Tables II and III list the results of acceptability tests.

The dishes were all well accepted: the lowest acceptability score was 3.73 for the appearance of Eba imoyo while the highest was 4.9 for the taste of melon seed and vegetable soup, as well as Yam pottage and the colour of stewed beans and fried plantain. The overall acceptability ranged from 3.85 (Burabisko) to 4.64 for Agbono soup.

The proximate composition of the dishes is shown in Table IV. The dish with the highest protein content (49.2g) is bean pudding (moin-moin) while the one with the lowest is burabisko. This is not surprising since burabisko is made of millet without any addition.
while bean pudding contains beans, a good source of protein plus fish.

The dishes with the highest fat content are melon seed and vegetable soup (52.13g) and agbono soup (45.70g) both contain ingredients with high fat content, e.g. melon seeds, (oil is extracted from these seeds and the agbono nuts).

The dishes with the highest and the lowest fibre content are made with beans, i.e. stewed beans and bean pudding. The difference is in the preparation – the beans in bean pudding are dehulled while the whole bean is used in the stewed beans.

In general all the dishes are good sources of energy and protein, except maybe burabisko, but this is hardly eaten on its own. Most times it is accompanied by a soup which provides the protein.

When comparing the energy and protein content of these dishes with the FAO/WHO/ UNU (1985) recommendations (Table V), it is noticed that they are in good standing since the usual amounts eaten are larger than 100g. For example, 300g of Yam pottage would thus provide 30 per cent of the RDA for energy and 100 per cent of the protein in a single meal.

**References**

Proximate composition of ten standardized Nigerian dishes

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