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Full Length Research Paper

Nutritional and elemental analysis of warankasi (fermented milk product) sold in Lagos metropolis

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Abstract

An investigation was carried out to determine the nutritional and elemental analysis of warankasi (fermented milk product) sold in three (3) market locations Mushin, iyan-oba and Oshodi. Studies on the physicochemical parameters of pH and %lactic acid for warankasi in all the various locations ranged from 4.8-5.2 and 0.232%-0.270% respectively. The moisture, ash, protein, fats and carbohydrate content ranged as 63.6%-68.4%,6.4%-7.2%, 20.13%-21.09%, 3.0%-5.2% and 1.11%-4.27% respectively in all the various location studied. Mineral content of potassium, sodium, calcium, magnesium and iron (mg/100g) for samples obtained from Mushin was 6.82, 3.29, 10.07, 5.00, 5.63 respectively; and for samples obtained from Iyan-oba, it was 5.2, 2.63, 8.79, 4.65, and 4.38 respectively; and for samples obtained from Oshodi, was 6.37, 2.23, 9.07, 12, and 5.00 respectively. The significance of the nutrients and elements found in warankasi is discussed.

Keywords: Warankasi, physicochemical, nutritional, elemental, lactic acid.

INTRODUCTION

In the developing countries and indeed in the sub-Saharan Africa (except East Africa), the production of milk and milk product is limited, scarce and expensive. In Nigeria for example, dairy industry on a large scale is nonexistent and the few dairy and cattle ranches are scattered over the northern states, while in the southern regions, production of fresh cow milk is limited to agricultural research and experimental stations. Nonetheless, the production of cheese curd from fresh milk is well practised in the northern states, while the practice has also been extended to some bordering states in the south. Moreover, it is well known that milk can be extracted from soybeans and other similar legumes. It is also conceivable that milk can be obtained from *Cucurbitae* plant seeds (e.g. melon seeds), which are wildly grown in Nigeria. May that be so, this would offer very cheap sources of vegetable milk which can be used as substitutes for whole milk in the production of cheese curds.

Warankasi is a soft unripened cheese like material made from cow's milk by coagulating the proteins with Sodom apple juice to obtain the curd. The local production of warankasi dates back for a long time and used as a mode of preservation of milk by the nomadic Fulani women. Nowadays, the practice is still in existence and exercised by others who have access to fresh milk. (Ogundiwin and Oke, 1993).

Many developing countries are suffering from shortages of fluid milk and other dairy products due largely to climate conditions, breeding practices and prevalent diseases from parasites. These shortages have in no small measures adversely affected the protein intake of both infant children and adults. However, in order to ensure the cheese is produced and made available for consumption, researchers have investigated the use of local substitutes such as vegetable protein for animal protein. Fashakin and Unokiwedi, (1992), Oyenuga and Fetuga (1995) have developed local substitutes for animal proteins i.e. vegetable proteins from water melon seed (*Colocynthis vulgaris*).

The Sodom-apple juice contains a rennet-like enzyme which was isolated and identified as calotropain (Ibiama and Griffiths 1997). The enzyme produce activities which do not stop at milk clotting but leads to the breakdown of the primary covalent bonds in milk proteins. It is also well known that milk proteins gelation is generally considered

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irreversible, resulting from enzyme reaction of rennet and other proteases (Gangali and Bhalerac, 1995). It could also be initiated by heat or cation reactions, whereby formation of paracaseinates occurs (Gangali and Bhalerac, 1995). The coagulated curds tend to lose water or synerese on standing (Schmidt and morris,1994).

Warankasi is a fermented milk product that is consumed by just a few majority of Nigerians. Also, most of the consumers of the product do not have an insight knowledge of its nutritional status. Hence, the need to create awareness to the majority of its consumers of its nutritional value becomes necessary so as to meet up with the protein demand by the people.

Hence, the objectives of the project are as follows;

To carry out nutritional and elemental analysis of warankasi sold in the local market.

To speculate on the significance of its nutritional status and hence its ability in meeting the nutrient needs of the body.

MATERIALS AND METHODS

Collection of samples

Warankasi was collected in plastic bowl from three market locations; Mushin, Iyana-oba and Oshodi, all in Lagos metropolis, Lagos state, Nigeria. The samples were taken to the laboratory for immediate analysis of its nutritional and elemental components.

Determination of the physicochemical analysis of samples

Determination of the pH: 5g of each sample was weighed along with about 50ml of the water in which it was preserved. This was manually homogenised using mortar and pestle. The samples were later filtered using whatman No. 1 filter paper and the supernatant dispensed into a 50ml beaker. The pH of the homogenate suspension was determined using a pH meter (Unican 9450 model). The pH meter was used after its initial standardisation using appropriate buffers of pH 4.0 and 7.0 (Fashakin and Unokiwedi, 1992).

Determination of total titratable acidity

25ml of the homogenate suspension used for the pH determination was taken into 50ml Erlenmeyer conical flask, 3 drops of phenolphthalein indicator was added and thereafter titrated using 0.1M sodium hydroxide until a purple colouration was obtained (Oyewole 1990). The total titratable acidity was calculated as follows,

$$\% \text{ Lactic acid} = \frac{\text{Titre value} \times \text{Normality of Alkali} \times 9}{\text{Volume of sample}}$$

Determination of the proximate composition

Proximate analysis for moisture,ash,fat, protein and carbohydrate were carried out as outlined in A.O.A.C 1990 method of analysis

Determination of carbohydrate content (By difference): This was obtained by subtracting from 100, the sum total of the percentage moisture, ash, protein, and fat. The remainder value is the carbohydrate content of the sample.(A.O.A.C 1990).

Mineral analysis in the samples

(Ca, Mg, Mn, K, Na, and Fe).

The above mineral content were determined using the method as described below:

10g of each sample were incinerated to a white ash at 550^0C in a muffle furnace for 4 hours,cooled and the ash was washed into 250ml beaker with 30ml of concentrated trioxonitrate (v) acid evaporated to dryness on staem bath,the residue was further heated for 30 minutes,thereafter the sample was dissolved in 40ml of hydrochloric acid(HCl) at ratio 1:1 and digested about 2 hours on a hot plate magnetic stirrer.1ml of dilute hydrochloric acid was further added to the sample and boiled for about 1hour,filtered while hot with whatman no 4 filter paper,washed with HCl and the volume made up to 100ml with distilled water. The minerals (calcium,magnesium, manganese , potassium, sodium, and iron)were determined using spectrometry method of Atomic Absorption Spectrophotometer(AAS)(Model Phillip Pu9100x) with a hollow cathode lamp and afuel rich flame(air-acetylene).Samples were aspirated and the mean signal responses were recorded at each of the element respective wavelength.

Calculation:

The concentration of each element was calculated as follows:

Concentration (mg/100g):Standard concentration x sample absorbance x100.

Standard absorbance x weight of sample

RESULTS AND DISCUSSION

The pH value of the various warankasi samples were as shown in Table 1. The result showed that all the samples were in the acidic range of pH value with samples obtained from Oshodi being most acidic with a pH value of 4.8. the significance of acidic pH value in foods cannot be overemphasised especially for fermenting foods as they help in the preservation of food samples (Uriah and Izuagbe 1990). pH is a measure of acidity or alkalinity of a product sample (Pearson, 1994). Similar pH values were reported by earlier workers on fermented food samples (Olasupo, 2001; Fasakin and Unokiwedi, 1992).

Table 1. pH of warankasi

Locations	pH value
Mushin	5.2
Iyana oba	5.0
Oshodi	4.8

Above results were average of two determinations.

Table 2. Total Titrable Acidity of warankasi

Locations	Volume of sample (ml)	1st reading (Titre mls)	2nd reading (Titre mls)	Average reading (Titre mls)	% Lactic acid
Mushin	25.00	6.5	6.4	6.45	0.232
Iyana oba	25.00	7.0	5.2	7.10	0.256
Oshodi	25.00	7.5	7.5	7.50	0.270

Table 3. Moisture Content o Warankasi

Sample locations	Weight of samples (g)	Weight of sample + petri-dish before drying	Weight of sample + petri-dish after drying	% moisture
Mushin	5.00	24.79	21.59	64.0
Iyana-oba	5.00	29.49	26.31	63.
Oshodi	5.00	30.91	27.49	68.4

Table 4. Ash Content Warankasi

Sample locations	Weight of samples (g)	Weight of empty crucible (g)	Weight of crucible + ash (g)	% Ash
Mushin	5.00	65.00	65.32	6.4
Iyana-oba	5.00	65.00	65.36	7.2
Oshodi	5.00	65.00	65.34	6.8

Table 5. Protein content of warankasi

Sample locations	Weight of sample (g)	1st reading titre (mls)	2nd reading titre (mls)	Average titre reading (mls)	% N_2	% Protein (%N_2 x 6.25)
Mushin	1.00	23.00	23.00	23.00	3.22	20.13
Iyana-oba	1.00	24.00	24.20	24.10	3.37	21.09
Oshodi	1.00	23.80	23.50	23.65	3.31	20.6

The lactic acid content of the warankasi obtained from various markets were as shown in Table 2, all the samples were observed from the study of the submits to observations of Fasakin and Unokiwedi, (1992), that had low levels of acidity in both warankasi and waragushi samples. The low levels of acidity could be due to changes in the lactic acid formed during ripening and these are often converted to other flavouring compounds during the formation of cheese curds (Fasakin and Unokiwedi, (1992), Singh and Mittal, 1994).

Studies on the moisture content of the warankasi samples obtained from various locations are as shown in Table 3. All the samples had very high moisture content with samples from Oshodi having the highest with 68.4%. the high moisture content as observed from the sample may probably be as a result of the moisture content of the milk used for processing and subsequent formation of the thick curd. The result submits to the observations made by previous workers on warankasi (Fasakin and Unokiwedi, (1992); Ogundiwin and Oke, 1993). Moisture content is a measure of the water content in a product sample. Also according to Aworh and Akinniyi, 1999, the moisture content accounts for the textural property of the product sample.

The ash content of warankasi obtained from various market locations are as shown in Table 4. The result showed that the ash content was highest in samples obtained from Iyana-oba with 7.2%. The significance of the ash content in food samples cannot be overemphasised as they account for the mineral constituents in a product sample (Gaman and Sherrington, 1998).

The protein contents of warankasi sold in various locations are as shown in Table 5. The protein contents

Table 6. Fat content of warankasi

Sample locations	Weight of samples (g)	Weight of empty cup (g)	Weight of cup + extracted oil	% Oil
Mushin	5.00	30.00	30.26	5.2
Iyana-oba	5.00	30.00	30.23	4.6
Oshodi	5.00	30.00	30.15	3.0

Table 7. Carbohydrate content of warankasi (by difference)

Sample locations	moisture	% ash	protein	fat	%carbohydrate
Mushin	64.0	6.4	20.13	5.2	4.27
Iyana-oba	63.6	7.2	21.09	4.6	3.51
Oshodi	68.40	6.8	20.69	3.0	1.11

Table 8. Mineral content of warankasi from Mushin

Elements	Standard conc. (ppm)	Standard Absorbance	Sample absorbance	Sample concentration (mg/100g)
Potassium	2	0.179	0.061	6.82
Sodium	2	0.358	0.059	3.29
Calcium	2	0.141	0.071	10.07
Magnesium	2	0.172	0.043	5.00
Iron	3	0.048	0.009	5.63

Table 9. Mineral content of warankasi from Iyana-oba

Elements	Standard conc. (ppm)	Standard Absorbance	Sample absorbance	Sample concentration (mg/100g)
Potassium	2	0.179	0.053	5.92
Sodium	2	0.358	0.047	2.63
Calcium	2	0.141	0.062	8.79
Magnesium	2	0.172	0.040	4.65
Iron	3	0.048	0.007	4.38

of all the samples were very high with Iyana-oba warankasi having the highest with 21.09%. The results agree with the work done of Fasakin and Unokiwedi, (1992).

Proteins are regarded as complex nitrogenous organic substances that form an important part of living tissues. According to Gaman and Sherrington, (1998), FAO recommended an average daily intake of 0.6g/kg of body weight per day. The high level of protein as observed from warankasi thus gives an indication that they could meet up with the protein requirement required by the body. Unfortunately, these products are not eaten as staples in developing countries but as snacks (Metwalli et al., 1992). Functionally, proteins are important in foods as they help in the growth and development of the body (Kathleen *etal*, 1996). Effects of protein deficiency are most noticeable in children and include poor growth, damage to the brain and liver and a deficiency disease known as kwashiorkor which is highly prevalent in Africa (Gaman and Sherrington, 1998).

The fat content of the samples from various locations were as shown in table 6. The result revealed that samples obtained from Mushin had the highest fat content of 5.2%. Significantly, fats are used by cells of organs and glands to provide energy and in the synthesis of some of their secretions (Kathleen et al., 1996).

The carbohydrate content as shown in Table 7 showed that samples of warankasi obtained from Mushin had the highest with 4.27%. Significantly, carbohydrate provides energy to the body.

The mineral elements of warankasi fro Mushin, Iyana-oba and Oshodi were as shown in tables 8, 9 and 10 respectively. Warankasi samples obtained from Mushin had calcium as the highest element with 10.07mg/100g and sodium the least with 3.29mg/100g (Table 8). For samples obtained from Iyana-oba, the calcium was also the highest with 8.79mg/100g and sodium the least with

Table 10. Mineral content of warankasi from Oshodi

Elements	Standard conc. (ppm)	Standard Absorbance	Sample absorbance	Sample concentration (mg/100g)
Potassium	2	0.179	0.057	6.37
Sodium	2	0.358	0.040	2.23
Calcium	2	0.141	0.064	9.07
Magnesium	2	0.172	0.044	5.12
Iron	3	0.048	0.008	5.00

2.63mg/100g (Table 9), and for Oshodi sample, calcium was also highest with 9.07mg/100g and sodium the least with 2.23mg/100g (Table 10). Differences in the mineral elements in the cheese curds as presented may be due to variations in the processing methods employed. Similar reports were presented by earlier workers on the mineral composition of warankasi (Hoyen and Koale, 1997, Farrow et al., 1999, Fasakin and Unokiwedi, 1992). The significance of these elements is to reveal their presence despite the thermal processing of milk to obtain the cheese curds. The significance of these elements in their food value cannot be overemphasised. Both calcium and potassium are necessary for the formation of bone and teeth in growing children (Gaman and Sherrington, 1998). Magnesium is also useful in the formation of bone structure in the body. Calcium ions have also been implicated with clotting process (Gaman and Sherrington, 1998). Iron has been found to be involved in the formation of haemoglobin (Kathleen et al., 1996).

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