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REGULAR ARTICLE

PROXIMATE, PHYTOCHEMICAL, AND SENSORY EVALUATION OF "UZA-AKWUAGWORAGWO" TRADITIONAL FOOD OF NKANU PEOPLE IN ENUGU STATE, NIGERIA

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ABSTRACT

Proximate, phytochemical, and sensory evaluation of "uza-akwuagworagwo" traditional food were investigated using standard methods. Proximate composition result revealed the presence of moisture (10.00±1.90%), crude fiber (17.87±1.10%), and crude protein (39.81±2.84%). Phytochemicals found present were alkaloids (1.71±0.10 mg/100g), flavonoids (3.68±0.00 mg/100g), and tannins (0.64±0.12 mg/100g). Sensory evaluation attributes of the food such as appearance (5.31±0.29), taste (7.00±1.02), color (6.22±0.92) and overall acceptability (6.10±0.31) were also observed in the study. The high protein content of the studied food could mean that it can contribute significantly to daily protein requirement of the body when consumed. The low levels of phytochemicals found in the food could be an added health advantage. The sensory evaluation of the food compares to those of other traditional foods. This study has revealed the proximate, phytochemical, and sensory evaluation of "uza-akwuagworagwo" traditional food of Nkanu people in Enugu State, Nigeria.

Keywords: Cuisines, Ethnic national, Proximate composition, Sensory evaluation, Traditional foods

INTRODUCTION

The desire to survive followed the existence of man on this planet Earth [1-2]. From time immemorial, the attribute of searching for different medicinal therapies [3-5] and foods has been associated with man [1]. Food has been defined comprehensively as any material which when ingested, digested and assimilated provides the body with energy, promotes growth and replaces worn out cells [6-11]. According to Amadi *et al.* [11], foods can be rooted on tradition and custom of the people. They can bear continental names such as African foods, European foods, Japanese foods, and etcetera; and also country names such as Nigerian foods, Ghanaian foods, and Ethiopian foods [2, 9, 12-13]. Such foods are mostly of plant origin, with phytochemicals and phytonurients [14-17].

Most African foods are recognizable cuisines that are specific to a particular set of people [18]. In Nigeria for instance, most foods are associated with a particular ethnic national, group, locality, community or society [17]. According to Amadi *et al.* [19], such foods are known as traditional foods [12, 20]. Traditional foods are valued because they showcase the cutlery tradition of the people and have a lot of benefits on health [13, 20-25]. However, many factors limited the transfer of knowledge on how they are prepared as well as their benefits on consumption [10, 26-29].

"Uza-akwuagworagwo" traditional food is among the traditional foods with limited knowledge on how they are prepared as well as their benefits on consumption due to change in lifestyle and taste. "Uza-akwuagworagwo" is a traditional food consumed by the people of Nkanu in Enugu State, Southeastern Nigeria. Nkanu people speak Igbo as their dialect. The people of Nkanu are mainly farmers while few are traders. This traditional food unifies and projects the tradition and custom of Nkanu people. With the renewed interest on traditional foods, there is need to extend the study on traditional foods to accommodate those ones that are still in existence, unravel their possible health benefits on consumption and acceptability.

The present study is geared towards this area, and

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investigated the proximate, phytochemical and sensory evaluation of "Uza-akwuagworagwo" traditional food.

MATERIALS AND METHODS

Sample collection

"Uza-akwu" (brown mung beans, botanitically known as *Vigna radiate*), palm oil, pepper, crayfish, onion, salt, smoked fish, and maggi spice were purchased from a local market within Nkanu.

Procedure of "Uza-akwuagworagwo"

Tiny stones and debris were first removed from the purchased one kilogram of "uza-akwu". The stone and debris free "uza-akwu" was further separated into good and damaged ones. The damaged ones got discarded while the good ones were soaked into a bowel of water for twelve hours to shorten cooking hours. The soaked "uza-akwu" was then placed in a pot and four litres of water was added and then boiled for three hours and thirty minutes before it was confirmed consumption fit. The remaining water used in cooking "uza-akwu" was filtered off into an empty clean container. One and half (1.5) grams of ground pepper, 100g of smoke fish, 250 ml of palm oil, 18g of ground crayfish, 8g of maggi spice, and 100g of onions in sliced form were added and mixed together with the cooked "uza-akwu". While mixing the whole components, the filtered water earlier used in cooking the "uza-akwu" was gradually added at interval. Finally, 75g of salt was added to taste and mixed to form "uza-akwuagworagwo" ready to be served.

Preparation of sample for analysis

The prepared "uza-akwuagworagwo" was oven dried at 70 °C for 48 h, the dried food sample was grinded using hand mill device to ground sample, which was stored in an air tight container till needed for analysis.

Proximate analysis

Moisture, crude protein, crude fat, ash, fibre and available carbohydrate content of the studied sample was determined using the methods of AOAC [30]. Atwater factor method as described by Onyeike *et al.* [31] was used for evaluation of the energy values of the studied sample.

Determination of percentage free fatty acid

Ten gram of sample was weighed into a 100 ml round-bottomed flask and refluxed with 6 ml of methanolic solution of NaOH (0.5 mol/l). Ten ml of heptane was then added and heated for one more minute. The heater was switched off and saturated solution of NaCl was added and shaken in a circular fashion. The flask was allowed to cool for phase separation. One ml of the upper layer of the separated phase was pipette into gas chromatograph for analysis.

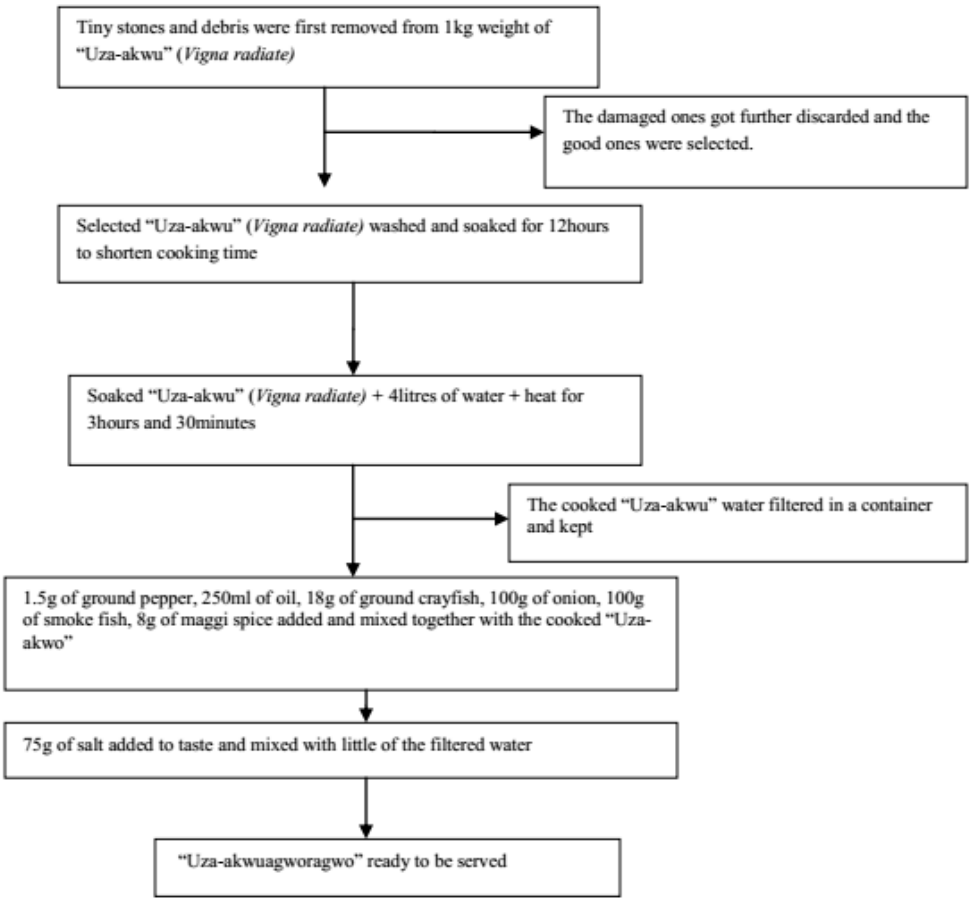

Fig. 1: Flow-chart for preparation of "uza-akwuagworagwo" traditional foods

Determination of total vitamin

Five grams of the sample was weighed into an extraction bottle and 20 ml of the extractant (1:1) of methanol and ethanol was added. The mixture was sonicated at 30 °C for 1hr. The extract was decanted and 10 ml of hexane was added to the extract. Five ml of trifluoroacetic acid was added to mixture and refluxed for 10 min. The extract was read on UV-visible spectrophotometer at a wavelength of 280 nm. Aqueous stock solution of vitamins were prepared and used to calibrate the equipment, and the concentration of the total vitamins was calculated from the calibration graph.

Phytochemical analysis

Alkaloids, saponins, tannins, glycosides, and flavonoids of the studied sample were screened using the methods of Harborne [32] whereas their quantitative determinations were done using the methods of AOAC [30].

Sensory evaluation

The sensory evaluation of the studied food was conducted in Department of Chemical Sciences (Biochemistry Unit) Laboratory where the food was prepared. Twenty students, seven mothers, six non-teaching members of staff and six lecturers of Rhema University were randomly selected and trained. Each of the panelists was seated in an individual compartment from distraction and was served the freshly prepared "uza-akwuagworagwo". The judges evaluated the sample for flavour, taste, colour, texture and overall acceptability using a nine point hedonic scale, where 9 was the highest score and 1 the lowest. This was done in line with the method described by Amadi *et al.* [33] and Onwuka [34].

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of "uza-akwuagworagwo" traditional food. The observed moisture (10.00±1.90%) in the studied food is higher than that of "nduduagworagwo" [29] but lower than those of "onunu" and "mgbam" [19], and "tarhana sample with whole meal flour (85.90±0.20%) traditional foods. High moisture content in food has been shown to encourage microbial growth [7, 14, 21; 29, 35]. The implication of this could be that the studied food sample may have relatively long shelf-life against "onunu", "mgbam", and "tarhana sample with whole meal flour but a lower one against "nduduagworagwo". According to Akubugwo *et al.* [36], ash content in foods of plant origin is an index of mineral contents. Ash content of "uza-akwuagworagwo" (4.12±0.20%) is higher than that of "onunu" [11], lower than that of "mgbam" (6.85±0.14%) [19] and could be compared to that of "nduduagworagwo" (4.84±0.01%) [13] traditional foods. "uza-akwuagworagwo" is rich in protein. The crude protein (39.81±2.84%) of the studied food sample is higher than that of "nduduagworagwo" (12.12±0.04%), and "onunu" (13.12±1.42%); but is comparable to that of "mgbam" (30.63±0.23%) traditional foods of Nigerian origin. The high protein content of the studied food could be indication that the food can contribute significantly to daily human protein requirements, usually about 23-56g [37]. The observed crude fat (21.00±3.07 %) was next to the highest after crude protein in terms of proximate contents of the studied food sample. The crude fat content is the highest when compared to those of "nduduagworagwo" (18.75±0.06 %), and "onunu" (11.65±0.53%) but lower than that of "mgbam" (36.35±2.32%) traditional foods. Studies revealed that the usage of traditional food can reduce the incidence of many life style diseases [38-41]. These benefits could be derivable by consuming the studied food sample which recorded highest fiber content of 17.87±1.10%, when compared to those of "nduduagworagwo" (3.15±0.09 %), "onunu" (9.90±1.03%), and "mgbam," (3.78±0.12%) traditional foods. Recorded available carbohydrate for "uza-akwuagworagwo" (15.68±0.32 %) is lower than of "nduduagworagwo" (59.00±0.01%) but higher than those of "onunu" (3.80±0.26%) and "mgbam" (6.8±0.14%) traditional foods. The calculated energy value for the studied food sample (251.96±2.80 %) could be an indication that the food is not a good energy giving food when compared to those of "nduduagworagwo" (453.19±0.15 Kcal/100g), "onunu (348.25±4.12Kcal/100g) and "mgbam" (499.39±48.73 Kcal/100g).

Table 1: Proximate composition of "uza-akwuagworagwo" traditional food

Proximate composition	"uza-akwuagworagwo"
Moisture content (%)	10.00±1.90
Ash content (%)	4.12±0.20
Crude protein (%)	39.81±2.84
Crude fat (%)	21.00±3.07
Crude fiber (%)	17.87±1.10
Available carbohydrates (%)	15.68±0.32
Energy value (Kcal/100g)	251.96±2.80

Values are mean and standard deviations of triplicate determinations.

Table 2: Percentage total free fatty acid and total vitamins of "uza-akwuagworagwo" traditional food

Parameter (%)	"uza-akwuagworagwo"
Total free fatty acid	14.98±1.20
Total vitamins	26.14±0.74

Values are mean and standard deviation of triplicate determinations.

Different authors have reported the importance of consuming food rich in fatty acids [8, 2, 42-44] and vitamins [6, 9, 18, 29, 45-49]. A lot of benefit has been given to having fatty acids in foods consumed by humans. Among such benefits are their roles in brain and eye development especially in growing fetus during pregnancy. They also promote the general well-being of the body through maintenance of good health [41, 44, 50-51]. The roles of vitamins in the body cannot be overstated. Vitamins are known to maintain skin, mucus membrane, bones, teeth, hairs, vision, and reproduction. Others include their roles in nervous system, facilitating the release of energy from carbohydrates, helping in blood production and acting as antioxidants that protect cell wall [52-56]. By having total free fatty acids (14.98±1.20%) and total vitamins (26.14±0.74%) in the studied food as stipulated in table 2, here lies the possible benefits of consuming the food as mentioned above.

"uza-akwuagworagwo" traditional food showed the presence of important phytochemicals such as alkaloids, flavonoids, tannins, saponins, and phenols when it was screened (table 3). Okaka and Okaka [6] noted that alkaloids, flavonoids, tannins, saponins, and others are mostly biosynthesized intrinsic components and sometimes contribute to food colour and flavor. The concentrations of the detected phytochemicals were subsequently determined quantitatively and presented in table 4. Observed alkaloids (1.71±0.10 mg/100g) for the studied food sample is lower than that of "onunu" (5.06±1.05 mg/100g) and could be compared to that of "mgbam" (1.82±0.10 mg/100g) [19]. Flavonoids content of "uza-akwuagworagwo" (3.68±0.00 mg/100g) is the lowest compared to those of "onunu" (23.76±0.18 mg/100g) and "mgbam" (77.88±2.00 mg/100g). Observed tannins (0.64±0.12 mg/100g), saponins (0.94±0.31 mg/100g) and phenols (0.04±0.00 mg/100g) for "uza-akwuagworagwo" were the lowest when compared to those of "onunu" and "mgbam" traditional foods of Ikwerre ethnic national in Nigeria [19]. It has been noted that under certain circumstances, phytochemicals in food materials are beneficial to the body. For instance, tannins are effective against wound healing and inflamed mucous membranes [57-58]. The beneficial effect of saponins has been reported by Seigler [59], Sadipo and Akiniyi [60], Osuagwu *et al.* [61], Stone, and Sidel [62], and Enig [63]; while some of the negative impact on food materials has also been reported by Duru *et al.* [64] and Duru *et al.* [65].

Sensory evaluation has been noted as a scientific method that evaluates dishes for improvements, and determines acceptable and unacceptable nature of food samples [66]. Table 5 shows the sensory evaluation of "uza-akwuagworagwo" traditional food. From the Table, attributes of sensory evaluation for the food were appearance (5.31±0.29), taste (7.00±1.02), aroma (7.31±0.29), texture (5.70±1.01), colour (6.22±0.92), and overall acceptability (6.10±0.31). Sensory evaluation compares similarities and differences among dishes and food products [63]. The studied food sample had a poor appearance (5.31±0.29) when compared to those of "nduduagworagwo" (7.59±0.25) and "ntiti-ikpa" (7.35±0.67) traditional foods. The texture (mouth feel) is low compared to those of "ntubiri" and "ntiti-ikpa" traditional foods while its taste, aroma, colour and overall acceptability could be compared to those "nduduagworagwo", "ntubiri" and "ntiti-ikpa" traditional foods of Nigerian origin.

Table 3: Phytochemical screening of "uza-akwuagworagwo" traditional food

Phytochemical content	"uza-akwuagworagwo"
Alkaloids	++
Flavonoids	++
Tannins	+
Saponins	+
Phenols	+

Table 4: Phytochemical composition of "uza-akwuagworagwo traditional food

Parameters (mg/100g)	"uza-akwuagworagwo"
Alkaloids	1.71±0.10
Flavonoids	3.68±0.00
Tannins	0.64±0.12
Saponins	0.94±0.31
Phenols	0.04±0.00

Values are means and standard deviation of triplicate determinations.

Table 5: Sensory evaluation of "uza-akwuagworagwo" traditional food

Attributes	"uza-akwuagworagwo"
Appearance	5.31±0.29
Taste	7.00±1.02
Aroma	7.31±0.29
Texture(Mouth feel)	5.70±1.01
Colour	6.22±0.92
Overall acceptability	6.10±0.31

Values are mean and standard deviation of 39 panelists.

CONCLUSION

"uza-akwuagworagwo" is a protein rich food and could contribute significantly to the daily protein requirement of the body. Also, the low levels of the observed phytochemicals in the food could be an added health advantage on consuming the food, while its overall acceptability compares with those of other traditional foods of Nigerian origin. This study has revealed the proximate, phytochemical, and sensory evaluation of "uza-akwuagworagwo" and traditional food of Nkanu people in Enugu State, Nigeria.

Fig. 2: Picture of a freshly prepared "uza-akwuagworagwo

Fig. 3: Picture of ground "uza-akwuagworagwo

Fig. 4: Picture of oil extracted from "uza-akwuagworagwo" used for fatty acid analysis

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