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EFFECT OF PROCESSING METHOD ON THE PROXIMATE AND MINERAL COMPOSITION OF PRAWN (*PENAEUS NOTIALIS*)

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Abstract

Prawn (*penaeus notialis*) was subjected to different processing method. The proximate, mineral and the pH contents were determined using standard methods of analysis. The mean values of the proximate composition were in percentage: protein 24.31%; moisture 35.10%; fat 7.25%; crude fibre 10.50%; ash 13.32% and carbohydrate 9.52% for the fresh sample. Protein 24.95%; moisture 16.56%; fat 6.34%; crude fibre 7.43%; ash 16.09% and carbohydrate 28.63% were recorded for the sundry sample. The boiled sample recorded moisture content of 38.33%; protein 18.83%; ash 15.21%; while the crude fibre and fat content ranged between 5 and 7%. The smoked sample recorded the lowest protein, moisture, fat and crude fibre content of all the processed samples. The values were 15.64, 11.72, 4.67 and 5.65% respectively. The carbohydrate content of the smoked sample is extremely higher than other processed sample 44.56%. The various mineral contents of the samples such as K, Ca, Mg and Na of the processed samples ranged between 200 to 1500mg/100g. The values of iron content were seen to be extremely lower than other mineral constituent and it ranged between 20 to 26mg/100g. The pH values ranged between 4 and 8. Sundry sample had the highest protein, ash, crude fiber and mineral contents of the entire processed sample. However, it was observed that prawn after sundried, retained its nutrient contents which may serve as a good source of protein, Ash, crude fiber and some mineral such as Ca, Mg, K and Fe, because of their high content in the sample and this high contents may satisfy the nutritional need for consumers.

Key words: Prawn, Mineral, Proximate, Boiled, Smoked

INTRODUCTION

Prawns are crustaceans, of the sub-order dendrobranchiata. They differ from other, similar crustaceans, such as Caridea (shrimp) and Stenopodidea (boxer shrimp) by the branching form of the gills and by the fact that they do not brood their eggs, but release them directly into the water. Sagestid shrimp Acetes japonicas are omnivorous in feeding [1]. They may reach a length of over 330 millimetres and a mass of 450 grams and are widely fished and farmed for human consumption. The annual world production of prawn, around 6 million tons [2], makes this market very attractive and has encouraged the development of farming of many species in several countries [3]. [4] Identified five species of shrimp; Acetes indicus, Acetes japonicas, Acetes intermedius, Acetes vulgaris and Acetes serrulatus. Marine prawn farming is an important global aquaculture industry with a production greater than 1 million metric tons for the year 2000 [5]. The black tiger shrimp *penaeus monodon* is a new entrant in the Gulf of Guinea along the West Africa coast [6]. A number of species belonging to the genus Penaeus have been produced commercially by aquaculture [7]. The contribution of farming to global shrimp production rose from a mere 6% in 1970 to 26% in 1990 [8], and in 2006 it accounted for as much as 70 percent of shrimps and prawns (penaeids) produced worldwide.

The main brackish water areas in Nigeria extends from the Lagos lagoon through Mahin in Ondo State to the Niger Delta in the South-East of Nigeria. In this metropolis there occur numerous prawns [9]. The economic importance of prawn production to the community includes source of food, provision of employment and source of raw materials to manufactures. Because of its low price and easy availability, Prawns have become the major source of animal protein to the low income earners. [10]. However, this research is aiming at determining the proximate and mineral composition, as well as evaluating the effect of processing method on proximate and mineral composition of prawn (*penaeus notialis*).

MATERIALS AND METHODS

The prawn samples (*Penaeus notialis*,) were purchased from fishermen in Igbokoda, a town in Ondo State, Nigeria. The prawns (*Penaeus notialis*) were identified at the department of animal production and health Federal University of Technology, Akure. Nigeria.

Preparation of samples

The fresh samples of prawns (*Penaeus notialis*) were carefully washed with distilled water, and divided into four portions; the first portion was left raw (untreated), the second portion was sundry for 4 days, the third portion was boiled for 3 minutes and the fourth portion was smoked dried.

The fresh sample (raw samples) were prepared by weighing 100g of the fresh sample in a clean aluminum foil paper, the boiled sample were prepared by boiling 100g of the fresh sample for 3 minutes, the sundry was done by putting 100g of the samples in a clean aluminum foil paper and sundried . The smoking was done by placing 100g of the raw sample on a clean aluminum tray and place on top of smoke coming out of wood fire.

All the four samples subjected to various treatments were ground in a Kenwood blender and kept in dry containers prior to analyses. Proximate analyses of the samples were determined using the methods described by [11]. The pH was measured using pH meter. Atomic absorption spectrophotometer (pye Unicam SP9 AAS) was used for the determination of mineral content such as calcium, magnesium, potassium, iron. Etc. [12].

RESULTS

Table 1. shows the proximate composition of the fresh and the various processed samples of prawn (*Penaeus notialis,*). The moisture contents was 35.10% for the fresh sample, 16.56 for the sundried, 38.33% for boiled and 11.72% for the smoked sample. The crude protein was 24.31% for the fresh sample, 24.95% for the sundried, 18.83% for boiled and 15.64% for smoked sample. The fresh sample has the fat content value of 7.25%, the sundried sample record the highest fat content of all the processed samples 6.34% while the smoked sample record the lowest value 4.67%. The crude fibre content values of 10.50%, 7.43%, 6.36% and 5.65% was recorded for the fresh, sundried, boiled and smoked sample respectively. The ash contents value for the fresh sample was 13.32%, 16.09% for the sundried, 15.21% for boiled and 17.76% for smoked sample. The fresh sample had the lowest carbohydrate content 9.52%, while the smoked sample had the highest 44.56% . The pH value of the fresh was 8.50 and that of the sundried, boiled and smoked samples are 5.65, 7.50 and 4.50 respectively.

Table 1. Proximate composition and the pH of the fresh and the various processed samples of prawn (*Penaeus notialis,*)%.

Samples	Moisture Content	Protein Content	crude fat	Crude fiber	Ash content	CHO Content	pH
Fresh	35.10 ± 0.01^{b}	22.31 ± 0.00^{a}	7.25 ± 0.00^{a}	10.50 ± 0.12^{a}	13.32 ± 0.01^{b}	9.52 ± 0.01^{c}	8.50 ± 0.01^{a}
Sundry	16.56 ± 0.00^{a}	24.95 ± 0.01^{b}	6.34 ± 0.01^{a}	7.43 ± 0.37^{a}	16.09 ± 0.02^{c}	28.63 ± 0.01^{b}	5.63 ± 0.03^{a}
Boiled	38.33 ± 0.01^{c}	18.83 ± 0.01^{b}	5.43 ± 0.02^{b}	6.36 ± 0.21^{c}	15.21 ± 0.00^{b}	15.84 ± 0.02^{a}	7.50 ± 0.02^{b}
Smoked	11.72 ± 0.01^{b}	15.64 ± 0.01^{a}	4.67 ± 0.01^{a}	5.65 ± 0.01^{b}	17.76 ± 0.12^{c}	44.56 ± 0.02^{a}	4.50 ± 0.04^{c}

Values are mean of triplicate determination

Table 2. shows the mineral composition of the fresh and the various processed sample of prawn (*Penaeus notialis,*) sundried sample had the highest potassium content of all the processed sample 342mg/100g followed by boiled sample 335 mg/100g, while the smoked sample record the lowest values 250mg/100g. The sodium content for the fresh sample was 230mg/100g, 240mg/100g for sundried sample, 210 mg/100g for boiled sample and 245 mg/100g for smoked sample. The calcium content was 1300 mg/100g for the fresh, 1450 mg/100g for the sundried, 1500 mg/100g for boiled and 1150 mg/100g for smoked sample. Magnesium content of sundried sample was highest of all the processed sample 650 mg/100g followed by that of the boiled sample 570 mg/100g, while the smoked samples record the lowest value. The iron content of all the samples were observed to be generally low compared to other mineral constituent of the prawn (*Penaeus notialis,*) sample. The values are 20, 26, 24 and 22 mg/100g for the fresh, sundried, boiled and smoked samples respectively.

Table 2. Mineral composition of fresh and the various processed samples of prawn (*Penaeus notialis,*) mg/100g.

Samples	K	Na	Ca	Mg	Fe
Fresh	350.75±0.12[a]	230.28±0.00[b]	1300.24±0.01[b]	540.33±0.01[c]	20.04±0.01[b]
Sundry	342.78±0.01[a]	240.35±0.01[a]	1450.50±0.02[a]	650.54±0.03[b]	26.13±0.12[a]
Boiled	335.75±0.00[b]	210.22±0.01[b]	1500.00±0.01[b]	570.35±0.02[b]	24.01±0.01[b]
Smoked	250.50±0.01[b]	245.35±0.00[c]	1150.10±0.01[c]	515.23±0.12[b]	22.15±0.03[c]

Values are mean of triplicate determination

DISCUSSION

Prawn (*Penaeus notialis,*) are usually consumed after processing which resulting in an increasing palatability, digestibility, keeping quality and safety for consumption. During processing some nutritive values may be reduced and some increased while in some cases antinutrient substances may be reduced depending upon the processing methods [13].

The results of this study however, showed that prawn (*Penaeus notialis,*) generally has high protein content, with the sundry sample having the highest protein content followed by the boiled sample, while the smoked sample record the lowest protein content. The high protein content can be compared with those reported for black sea fish [14]. [15] reported increase in proximate protein content of fermented crab. The high protein content is important in the body as it helps in the replacement of worn out tissue and regulation of body metabolism. [16] reported increase in protein content of processed *Termitomyces robustus*. The lower protein contents of the boiled and smoked samples may be as a result of the heating effect which can results in protein denaturing. [17] reported decrease in protein content of smoked Macrones nemurus.

It can be observed from the results that there is a reduction in fat content of all the processed samples. The reduction in fat content may be due to its breakdown resulting in increase in aroma, texture, taste and colour to the processed prawn (*Penaeus notialis,*). This is as a result of breakdown of lipid to fatty acids and glycerol by the enzyme lipase.[18]. [19] reported change in fat content of cooked breaded fish fillers.

The crude fibre content of the fresh sample 10.50% is seen to be higher than that of the entire processed sample. The sundried sample has the highest crude fibre of the entire processed sample, while the smoked sample has the lowest content and this may be as a result of the heating effect on the sample. The high crude fibre content of the fresh and sundried sample has a nutritional advantage in that it will assist in reducing constipation in the human consumer.

The fresh and the processed samples have high ash content. The higher values of the ash content is an indicator that the samples may have a reasonable quantity of mineral elements. High ash content has been observed in Shrimps found in Lagos lagoon. [20].

It can be observed from the results, that the moisture contents of the fresh and the boiled samples is higher than that of the sundried and smoked sample. The high moisture content is in accordance with what was recorded by [21]. They reported 43.20% for (*Penaeus specie,*). However, the low moisture contents of the sundried and the smoked sample may be as a result of the heating effect on the sample.

The carbohydrate content of the fresh sample was observed to be low 9.52% compare to processed sample and this may be as a result of high moisture content, while that of the smoked sample was observed to be the highest 44.56%, the higher value may be as a result of the low moisture content due to the heating effect.

In general the percentage values of the proximate composition such as protein 24.31%, fat 7.25%, Moisture 35.10%, crude fibre 10.50%, and ash 13.32% of the fresh sample of prawn (*Penaeus notialis,*) was in agreement with what was reported by other workers such as [21].

The values of the various minerals obtained from both the fresh and the various processed samples shows significant difference either increasingly or decreasingly.

From the result it shows that the sample may serve as a good source of calcium, magnesium, sodium and potassium because of their higher content in the sample. [22] reported increase in mineral content of cucumber after processing. The higher content may satisfy the nutritional need for consumer because their values are reasonably high. This mineral if present in diet is important for the metabolic activities, transmission of nerve impulses, rigid bone formation and regulation of water and salt

balance among others. The high potassium content is important as potassium is essential for nervous systems, maintenance of correct rhythm of heart beat, clothing of blood [23].

The iron content of both the fresh sample and the various processed sample of the prawn (*Penaeus notialis,*) was observed to low compared with the values recorded for other mineral contents. This is in agreement with what was reported by, [24]. They reported 28mg/100g for (*Penaeus specie,*).

CONCLUSION

In recent time attention has been drawn to the various processing and preservation methods employed in processing and preserving prawn prior consumption.

The results obtained from this research shows that different methods has been employed in prawn processing prior consumption, the result also revealed the effect of the processing method on the nutrient contents of prawn (*Penaeus notialis,*).

The result of this study showed that, sun drying of prawn (*Penaeus notialis,*) prior consumption will help to retain the protein, ash, crude fibre and minerals contents such calcium, magnesium, potassium and iron and preserve it for future use.

It is however, important to conclude that sun drying of prawn (*Penaeus notialis,*) prior consumption will not only help in retaining the nutrient content and the keeping quality, but also serve as a valuable and economical means of preserving it for future use.

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