NUTRITIONAL COMPOSITION OF THE PINK SHRIMP (*Penaeus notialis*) AND TIGER SHRIMP (*Penaeus monodon*) FROM LAGOS LAGOON, SOUTHWEST NIGERIA

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Abstract

Shrimps are an excellent source of protein, yet are very low in fat and calories, making them a very healthy choice of food. This study attempts to compare the proximate compositions and mineral contents of Penaeus monodon and Penaeus notialis using standard analytical methods. Results of proximate composition revealed that, percentage mean values for crude protein, carbohydrate, fat, crude fibre, ash and moisture levels in Penaeus monodon were 9.21± 0.03, 13.15 ± 0.18, 4.67 ± 0.05, 1.21 ± 0.12, 3.53 ± 0.06 and 68.24 ± 0.11 respectively while the levels of carbohydrate, crude protein, fat, crude fibre, ash and moisture values for Penaeus notialis were 9.77 ± 0.04, 6.09 ± 0.05, 2.68 ± 0.06, 2.88 ± 0.06, 4.89 ± 0.03 and 73.71 ± 0.18 respectively. Both shrimp species were high in all the micro and macro minerals analyzed. However, calcium, zinc and phosphorous values were significantly higher ($P < 0.05$) between both species. It was concluded that although both shrimps are of different species and the nutrient levels in P. monodon were higher in some cases, nutritional differences between these two species in most cases are however not statistically different ($P > 0.05$).

Key words: Shrimp, Proximate Composition, Mineral Content, Lagos

Introduction

Shrimps have become one of the major sources of animal protein to the low income earners. It is high in protein, low in saturated fat and calories, and have a good flavor, and apart from supplying good quality proteins and vitamins A and D, it also contains several dietary minerals such as Fe, Ca etc. which are beneficial to man and animals (Ravichandran, *et al.*, 2009). Shrimps have also been identified as a rich source of vitamin B12, selenium, ω-3 highly unsaturated fatty acids (HUFA) and astaxanthin (Venugopal, 2009) which has been shown to provide antioxidant support to both the nervous system and musculoskeletal system. In addition, some animal studies have shown decreased risk of colon cancer to be associated with astaxanthin intake, as well as decreased risk of certain diabetes-related problems. (George Mateljan Foundation, 2015).

Nigeria is among tropical countries endowed with rich shrimp resources. According to Dublin-Green and Tobor (1992), the coastal waters of Nigeria are characterized by abundance of important living resources including shrimps, predominantly members of the family penaeidae. Economically, the importance of shrimp production in Nigeria and most especially along the coastal communities includes the provision of employment, source of food, source of income, source of tool to rural development and source of raw materials to manufactures. However, Literature reports are scarce on the comparative nutritional chemical composition of our indigenous shrimp species (*Penaeus notialis*) and the exotic species (*Penaeus monodon*) in the southwestern part of Nigeria thus, the objective of this study is an attempt to assess the nutritional quality of these shrimp species.

Materials and Method

Samples of the pink shrimp (*Penaeus notialis*) and tiger shrimp (*Penaeus monodon*) were collected from local fishermen at Makoko Jetty along the Lagos lagoon environment, Southwest of Nigeria (Lat 6° 29'N and 3° 23'E). Samples were washed with de-ionized water to remove any adhering contamination and drained under folds of filter paper. Samples were then immediately preserved using iced packed cooler and transferred immediately to the Biochemistry laboratory of the college of medicine, Lagos State University teaching Hospital. The washed shrimps were wrapped in aluminum foil and frozen at- 4°C for two days before samples were prepared for analysis.

Determination of Proximate Composition

Sampled specimens were grounded using an electric grinder after chopping with mortar and pestle. The grounded portion were weighed separately and used for chemical analysis. Estimation of moisture content by hot air oven method, lipid by Bligh and Dyer 1959, protein by lowry *et al.*, 1951, Carbohydrate by Morris, 1948, and minerals were analysed by A.O.A.C., 1990.

Statistical Analysis

Biological data resulting from the experiment were presented as means ± SE and analyzed by one way analysis of variance (ANOVA) using the SPSS (statistical Package Computer, Software 2004 version Chicago Illinoise, USA). Duncan's multiple range test for least significant difference was deployed to compare differences among individual means. Differences were regarded as significant at $P < 0.05$ (Zar, 1999).

Results and Discussion

The proximate composition of fresh samples of *P. monodon* and *P. notialis* is presented in (Table 1). According to Ockerman, 1992, proximate composition varies with species and is influenced by season, water temperature and spawning cycle. In this study, the moisture content of *P. monodon* *and P. notialis* were 68.24 ± 0.11 and 73.71 ± 0.18 respectively mg/kg. The percentage crude protein recorded was higher (9.21%) in *P. monodon* than (6.09%) recorded for *P. notialis*. Similarly, carbohydrate values were higher in *P. monodon* (13.15%) than (9.77) recorded for *P. notialis*. Varadharajan and Soundarapandian 2014, reported that in crustaceans, lipids are not only the main organic reserve and source of metabolic energy but also indispensable in maintaining cellular integrity. In this study, the lipid contents were higher in *P. monodon* with a value of (4.67%) when compared with the value of 2.68% recorded for *P. notialis*. The ash contents value were 3.53% and 4.89% for *P. monodon* and *P. notialis*. *P. monodon* had the lowest crude fibre content (1.21%) while the highest value (2.88%) was recorded for *P. notialis*.

Table 1: Proximate composition of *Penaeus monodon* and *Penaeus notialis* (%)

Parameters	Sample (A) *P. monodon*	Sample (B) *P. notialis*
CHO %	13.15 ± 0.18	9.77 ± 0.04
PROTEIN %	9.21 ± 0.03	6.09 ± 0.05
CRUDE FAT %	4.67 ± 0.05	2.68 ± 0.06
MOISTURE %	68.24 ± 0.11	73.71 ± 0.18
ASH %	3.53 ± 0.06	4.89 ± 0.03
CRUDE FIBRE %	1.21 ± 0.12	2.88 ± 0.06

(Results are the mean value of triplicates ± standard error)

Table 2: Mineral composition of *Penaeus monodon* and *Penaeus notialis* (%)

Minerals	Sample (A) *P. monodon*	Sample (B) *P. notialis*
Na	117.25	199.2
K	89.1	52.45
Ca	142.15	134.8
Mg	128.8	174.8
Zn	45.55	42.1
Cu	1.05	3.7
Fe	41.25	28.05
P	233.7	242.3
Mn	2.6	3.7

Marine foods are very rich sources of mineral components (Kumaran *et al.*, 2012). Table 2 shows the mineral composition of *P. monodon* and *P. notialis*. Among the nine nutrient elements investigated the most abundant was Phosphorous (P) followed by Magnesium (Mg), Calcium (Ca) and Sodium (Na). The phosphorous content for *P. notialis* was 242.3 mg/100g and that recorded for *P. monodon* was 233.7 mg/100g. The magnesium content in *P. notialis* was 174.8 mg/100g while that recorded for *P. monodon* was 128.8 mg/100g. The calcium content recorded for *P. notialis* was 134.8 mg/100g while that for *P. monodon* was 142.2 mg/100g. The sodium content recorded for *P. notialis* was 199.2 mg/100g while that recorded for *P. monodon* was 117.3 mg/100g. Values for K, Zn, Cu, Fe and Mn recorded for *P. notialis* and *P. monodon* were 52.45 mg/100g, 42.1 mg/100g, 3.7 mg/100g, 28.05 mg/100g, 3.7 mg/100g and 89.1 mg/100g, 45.55 mg/100g, 1.05 mg/100g, 41.25 mg/100g, 2.6 mg/100g respectively.

The levels of protein in *P. monodon* is higher when compared to the levels recorded for *P. notialis* however, levels were not significantly different ($P > 0.05$) this is similar to the findings of Karuppasamy *et al.*, 2014. The high protein

content of the shrimp species in this study may be related to the high protein contents of their common diets as they fed mostly on fish items, crustaceans, molluscs, algae and diatoms (Osibona, 2005). Likewise, lipid levels were higher in *P. monodon* when compared to the levels recorded for *P. notialis*. Differences were however not significantly different as lipid values are lower than those reported by Bello, 2013.

The values of the various minerals obtained from both shrimp species shows a significant difference either increasingly or decreasingly as all the samples examined in this study contained appreciable concentrations of Na, K, Ca, Mg, and P, suggesting that these shrimp species are a good source of nutrient minerals. The levels of micro minerals (Zn, Cu, Fe and Mn) analyzed were also within tolerable limits. The levels of K, Na, Mg, Cu, Fe and Mn in *P. notialis* were higher than in *P. monodon* although differences were not significantly different ($P > 0.05$). This is similar to the report of Emmanuel, 2008 and Adeyeye, 2000. Furthermore, the levels of Ca, Zn and P recorded for both species of shrimps in this study are significant different ($P < 0.05$). *Syama et al., 2013 reported values for Ca, Mg, P, K, Na, Cu and Mn for P. monodon as 107.3 ± 1.96, 58.5 ± 1.38, 303.4 ± 3.22, 259.6 ± 3.25, 176.1 ± 3.04, 9.18 ± 4.62 and 50.5 ± 1.64 respectively which is also similar to the findings of this study.*

The variations recorded in the concentration of the different nutritional components of both shrimps examined in this study could have been as a result of the rate at which these components are available in the water body and the ability of the fish to absorb and convert the essential nutrients from the diet or the water bodies where they live (Adeniyi *et al.*, 2012, Yeannes and Almandos, 2003). These findings are in line with the report of Adewoye *et al.* (2003) and Fawole *et al.* (2007). In conclusion, *Penaeus notialis and Penaeus monodon examined in this study are* good sources of proteins and mineral supply. Although both shrimps are of different species and the nutrient levels in *P. monodon* are higher in some cases, differences between these two species are however not statistically different.

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