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DETERMINATION OF PROXIMATE AND MINERAL CONTENTS OF CRAB (*CALLINECTES AMNICOLA*) LIVING ON THE SHORE OF OJO RIVER, LAGOS, NIGERIA

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ABSTRACT

The tissue, crunchy and walking legs of crab *callinectes amnicola* were investigated for their Proximate (protein, ash, fat and moisture content) and mineral composition (calcium, iron and zinc). The crude protein determined by microkjeldahl method ranged between 19.2-28.3 g/100 g and the study showed that the crab sample are rich in protein with highest observed in crab tissue (28.00 ± 0.071 %) while the walking legs are (19. 233 ± 0.066%) and the crunchy (19.820 ± 0.069%) respectively. Crude fiber and crude fat were determined gravimetrically and by extraction method using soxhlet extractor were found to ranged from 0.02-11.70 % and 0.6-1.020 %. The crude fiber is higher in the walking legs with a value of 11.070 ± 0.037 % compared to tissue and the crunchy part with a value of 0.023 ± 0.071% and 6.680 ± 0.074% respectively. The moisture content ranged from 67.37 ± 0.226% to 70.046 ± 0.049% in all the parts analyzed. Ash content recorded an average value of 1.040 ± 0.017%, 1.300 ± 0.001 % and 1.041 ± 0.002% in crunchy, walking legs and tissue respectively. Calcium, iron and zinc were quantified using atomic absorption spectrophotometer. The concentration of the mineral varied for calcium highest amount ranging from 850 µg/g in the tissue to 900 µg/g in the crunchy which is followed by iron ranging from 690 µg/g tissue to 820 µg/g in the crunchy part of the crab. On the other hand zinc showed the lowest concentration which ranged from 128 µg/g in the tissue to 388 µg/g in the walking legs. The concentrations of the mineral content were within the allowed daily requirement for zinc, iron and calcium per day respectively. Therefore, the crab *callinectes amnicola* could be a balanced human diet and could be employed as an alternative dietary supplement of protein and mineral matter minerals in the body. Hence the consumption of crabs would help to prevent nutritional deficiencies in the future.

Key words: Proximate composition, Crabs, Calcium, Iron, Food supplement, Nutrient analysis.

INTRODUCTION

The use of marine resources for human consumption has improved rapidly worldwide. In general, seafood products, which include crustacean shellfish have been praised for their health supporting characteristics. Shellfish are nutritionally precious sources of various minerals and high quality protein[1,2]. Though the nutritional composition of numerous commercially harvested species of crab has been partially described, shellfish vary widely in their nutrient content[1]. Crabs, among numerous other invertebrates are considered as an essential shell fishery product[3]. Majority of these water animals are also found in the

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tropical water, they also occupy unique position in the agricultural sectors of these sea animals from all sources rose from 580,000 million tons in 1978. It has been claimed that sea animals may contribute 40% of animal protein for average Nigerian[4].

Crab of various species may be classified into *callinectes amnicola*, *octopode africana*, s*ersema specie*, *sodononates africana*. *Callinectes amnicola* is used as food while *ocypode africana* is used as baits. The pincers is commonly consumed as food in the main body and as baits for fish. Crabs mostly occur at the month of estuaries and in the main river channel[5]. They constitute a nuisance by damaging set nets in water. *Callinectes amnicola* occur throughout the year with peaks in June to October in the main channel and the estuaries and from April to December in the creek. In Delta state, Nigeria, crabs attracts highest price in the December when the females are burying with eggs[6]. *Callinectes amnicola* is well distributed in almost all rivers and channels, and are caught near the shore by coastal fishermen[5]. *Callinectes amnicola* is one of those with commercial value in African countries. The chemical composition and nutritive value of crab meat have been extensively investigated in various parts of the world[3,7-8]. Crab is highly nutritious and healthy owing to its protein content, unsaturated fatty acids, carbohydrates and mineral composition[8]. Therefore determining of the proximate and composition mineral elements of crab specie has a great importance due to the good effect on human health. The prospective health benefits related to crab consumption are because of the presence of proteins, vitamins and unsaturated essential fatty acids. Crab (*callinectes amnicola)* is also good source of various minerals. Therefore, it is so essential to human health. From these minerals, Ca and Fe are necessary to maintain an optimal bone development, more of both minerals being required during childhood and growing stages to prevent rickets and osteomalacia[9]. Ca also has an essential role in blood clotting, muscle contraction and nerve transmission. Iron (Fe) is an important mineral; it is required to help our red blood cells deliver oxygen to the rest of the body. Iron is essential for many proteins and enzymes that maintain good health, transporting oxygen in the blood to all parts of the body as well as proper functioning of the liver[10].

Zinc is a constituent of many enzymes and is essential for the proper function of these various enzymes. Zinc is essential for the metabolism and structural stability of nucleic acids. Zinc has been associated with a variety of bodily functions such as the wounds healing, reproduction, growth and maintenance of glucose tolerance in the body[11].

The aim of this study was to demonstrate the nutritive value and thereby to encourage an increase in the consumption and utilization of these species in Nigeria.

Material and method

Materials

The specie of crab was purchased from the fishermen at the riverside in Ojo, Lagos, Nigeria and transported immediately to the laboratory for analysis. Crab samples were separated into three parts which are tissues within the legs (tsu), thorax (trx) and the abdomen (abd) including all the content of digestive system without separation. .

Proximate analysis

The moisture content of crabs was determined by drying the various parts in an oven at 105°C until a constant weight was obtained[12,13]. Crude protein content was calculated by converting the nitrogen content, determined by Kjeldahl's method (6.25 x N)[12]. Fat content was determined by the acid hydrolysis Soxhlet system using the method described by the AOAC[12,13]. Ash content was determined by dry ashing in a furnace oven at 600°C for 10 h. The carbohydrate content was estimated subtracting the sum of the weight of protein, fiber and ash from the total dry matter. All determinations were done in triplicates.

Mineral analysis

Samples for mineral determination, the samples were digested in HNO_3/HCl. The elements, Ca, Fe and Zn, were measured by atomic absorption spectrophotometry (AAS) using a Varian Spectra atomic absorption spectrophotometer, Buck Scientific 210 GVP model. All determination was done in triplicates and we also add spike samples to verify the accuracy of the procedure.

RESULTS AND DISCUSSION

Table 1: Showing the proximate composition of Callinectes amnicola (%)

Sample	Moisture (%)	Ash (%)	Fat (%)	Crude fibre (%)	Protein (%)	Carbohydrate (%)
Crunchy chest						
A1	70.460	1.04	0.010	6.690	19.80	2.00
A2	70.082	1.03	0.009	6.89	19.890	2.03
A3	70.380	1.039	0.100	6.680	19.70	2.010
Mean	70.310±0.049	1.04±0.017	0.060±0.050	6.686±0.074	19.820±0.069	2.013±0.016
Walking legs						
B1	65.956	1.30	0.001	11.100	19.200	2.443
B2	65.994	1.229	0.004	11.100	19.201	2.402
B3	65.904	1.301	0.002	11.101	19.299	2.390
Mean	65.951±0.049	1.300±0.001	0.002±0.017	11.070±0.037	19.233±0.066	2.413±0.028
Tissue						
C1	67.588	1.040	1.020	0.020	28.010	2.318
C2	67.138	1.043	1.022	0.030	28.001	2.762
C3	67.407	1.041	1.020	0.021	28.000	2.511
Mean	67.377±0.226	1.041±0.002	1.021±0.002	0.023±0.008	28.000±0.071	2.50±0.022

Result of proximate composition of Callinectes amnicola is shown in Table 1. The study reveals the percentage moisture content averaged value of between 67.377 ± 0.226% and 70.310 ± 0.049 % in the parts analyzed. The obtained result is in agreement with the average value of 67.37% reported for callinectes sapidus (blue crab) as well as for sea bass and sea bream (*sparus aurata*)[10,14-16] but lower than the average value 76.89% reported for callinectes sapidus and 76.72 reported for sea bass[7,16-17] which may be attributed to the influence of the season and water temperature. This may also be a disadvantage in terms of shelf life of the sample. The moisture value (70.31%) was found to be higher in the crunchy chest part than other parts of the crab (55.95-67.38%), Skonberg et al.[1] found out that the moisture content of leg and claw meat in green crab (*Carcinus maenus*) is 78.9-79 %.

The ash content averaged value between 1.040 ± 0.002% and 1.040 ± 0.017 % was obtained in all the parts analyzed with highest value recorded by walking leg. The result obtained was found to be below

the value reported earlier[3,7,16,18]. This is a measure of the mineral element in the sample. However, these values are in agreement with average value reported by Kelly et al.[13] The crab contains a good level of protein (19.800± 0.069 % – 28.000 ± 0.071%). The average protein content obtained in this study is higher than the average value reported for *portunus pelagicus*[19]. Also higher than the value recorded for *Eriphia verrucosa*[18]. The highest protein content was observed in the tissue with a value of 28.00 % which is similar to earlier report[3]. Hence, protein is essential in the diets as it is one of the basic building blocks of the body in terms of providing bones and muscles strength, endurance and immunity.

Fat content obtained in this study was found to be low in all the parts analyzed (0.060 ± 0.050%, 0.002 ± 0.001 % and 1.020 0 ± 0.002%). The crab tissue (1.029 %) possessed a substantial higher fat than the crunchy chest (.060 %) and walking legs (0.002) respectively. The obtained values is higher than that reported by Kucukgulmez[16] but was found to be lower than the fat content reported by Nalan et al.[3] It important to note that they essentially play a vital role in the structural and biological, function of the cells and to transport fat soluble vitamin in the body. Crude fiber averaged content is lower in tissue compared to crunchy and walking legs respectively (0.023 ± 0.008%, 6.690 ± 0.074% and 11.070 ± 0.037%). On the other hand carbohydrate content ranged from 2.013 ± 0.016% – 2.530 ± 0.022%) in all the parts analyzed.

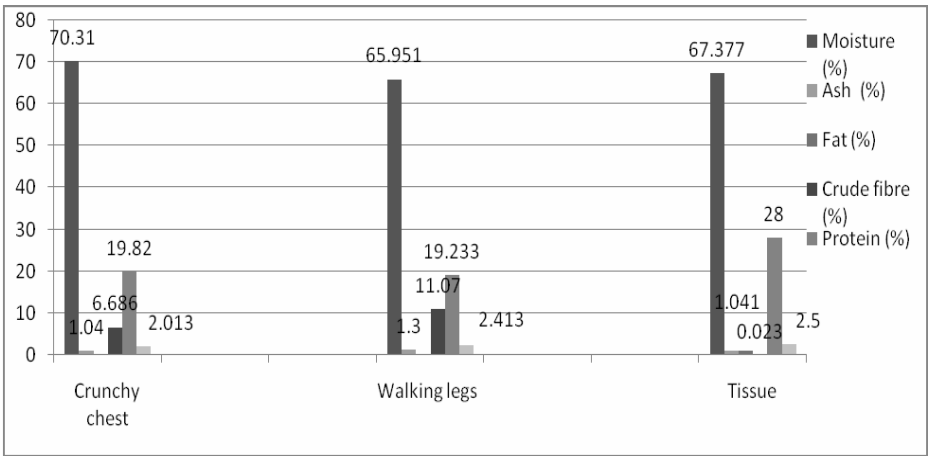

Fig. 1: Bar chart showing the mean proximate composition in different part of the crab (callinectes amnicola)

The mineral contents of the crab *callinectes amnicola* are listed in Table 2. Significant differences in mineral content were observed between crunchy chest, walking legs and tissue of the analyzed sample claw. Calcium (Ca) was the predominant element among minerals analyzed. Crunchy chest had considerably higher Ca concentrations than tissue and the walking legs respectively. The concentration of the minerals varied, for calcium highest amount ranging from 850 µg/g in the tissue to 900 µg/g in the crunchy chest was observed which is followed by iron ranging from 690 µg/g tissue to 820 µg/g in the crunchy chest part of the crab. On the other hand zinc showed the lowest concentration which ranged from 128 µ/g in the tissue to 388 µg/g in the walking legs. The concentration of minerals in tissue as well as other part of the crab species can be influenced by a number of things such as food source and the environment (water chemistry, salinity, temperature and contaminants), seasonal and biological differences (species, sexual maturity size, age and sex)[20,21]. The differences in mineral contents of the crabs utilized for this recent work and those reported in the literature are thought to be due to the above mentioned reasons[1,3,20-21]. High concentration of calcium (Ca) was achieved in the parts of the crab (*callinectes amnicola)* investigated in this study hence can act as an efficient osmoregulator.

Table 2: Mineral element composition of callinectes amnicola

Element µg/g	Crunchy chest	Walking leg	Tissue
Zinc	348 ± 1.80	388 ± 0.51	128 ± 0.30
Calcium	900 ± 0.25	800 ± 0.32	850 ± 1.04
Iron	820 ± 0.85	740 ± 1.10	690 ± 0.81

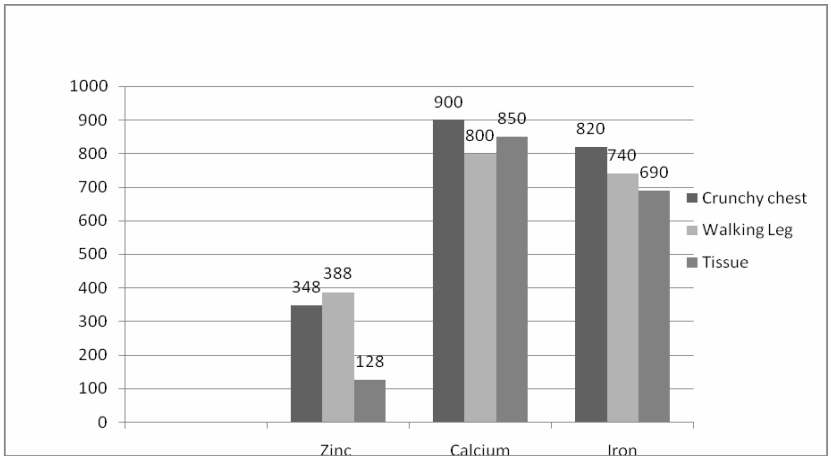

Fig. 2: Bar chart showing the mean mineral composition in different part of the crab (callinectes amnicola)

CONCLUSION

The results obtained in this present study have demonstrated that crunchy chest, walking legs and tissue of crab (callinectes amnicola) were highly nutritious in terms of protein, major and essential mineral elements such as zinc (Zn), calcium (Ca) and iron (Fe), which are abundant when compared the recommended daily allowances in the Food and Nutrition Board National Council. It can then be infered that the crabs (callinectes amnicola) could be employed as a supplement of protein and mineral matter so as to balance human nutrition. Hence the consumption of crabs (callinectes amnicola) would help to prevent nutritional deficiencies in the future

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