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RESEARCH ARTICLE

COMPARATIVE STUDIES ON THE FOOD AND MINERAL CONTENT OF THE SHELL OF EGERIA RADIATA (BIVALVIA) AND CRASSOSTREA RHIZOPHOREA (PERECYPODE) OF LAMEILLEBRANCHA OF THE CROSS RIVER, NIGERIA

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ABSTRACT

The food and mineral contents of the two bivalves species (Egeria radiata and Crassostrea rhizophorea) in Cross river, Nigeria were investigated. The following result obtained from this study revealed that the moisture content of E. radiata and C. rhizophorea was 20.47% and 21.37%, crude protein was 1.43% and 2.53%, fat was 0.05% and10.05%, crude fibre was 0.03% and 0.03%, ash was 13.5% and 15.5%, carbohydrate was 58.85% and 60.62% , energy was 241.55J and 253.1 while the mineral content of E. radiata and C. rhizophorea shows the significant difference ($P<0.05$) in Ca+, Na+, K, Mg, while in Zn, Pb, Cu, Fe, P and Mn were similar ($P>0.05$). Egeria radiata and Crassostrea rhizophorea shell is an excellent source of nutrients with sufficient amount of substances that facilitate body repairs, rapid growth and good health to mankind.

Key words: *Egeria radiata*, *Crassostrea rhizophorea*, food value, mineral content.

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INTRODUCTION

Shellfish are forms of sealife regarded as food by humans. They are classified into molluscs, crustaceans and echinoderms (Ponder, 2008). Seafoods such as oyster (*Crassostrea rhizophora*), clam (*Egeria radiata*), periwinkle (*Tympanostomus fuscatus and Tympanostomus fuscatus var. radula*), and whelk (*Buccimum undatum*) belong to the mollusc's family. Molluscs have more varied forms than any other animal phylum (Haszpruner, 2001). They include gastropods (snails, slugs, periwinkles, whelks and others), bivalves (clams, oysters, and others), cephalopods (squids), and other lesser-known but similarly distinctive subgroups (Haszpruner, 2001). The majority of species still live in the oceans, from the seashores to the abyssal zone, but some form a significant part of the fresh water fauna and the terrestrial ecosystems (Ponder and Lindberg, 2008) Molluscs are extremely diverse in tropical and temperate regions, but can be found at all latitudes (Giribet *et al.,* 2006). About 80% of all known molluscs are gastropods (Ponder, 2008). Molluscs are natural part of the diet that contain high level of several important nutrients and are excellent sources of protein to both riverine communities and the entire population at large, as they occur abundantly in the brackish and fresh water (Ayo, 2008).

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Seafood is known to contain 12.00% - 18.58% of protein (Altschul, 1976). Periwinkle had also been reported to contain as much as 60.93% protein (dry matter), when compared to whole hen's egg (Umoh and Bassir, 1977). Shellfish are rich in long-chain polyunsaturated fatty acids (omega-3) eicosapentaenoic and docosahexaonoic acids (Bresgen et al. 2010). Their ash content is about 5.84% (Obande et al., 2013). they are rich in essential micronutrients such as calcium (129.18mg/100g), magnesium (31.19mg/100g), potassium (71.13mg/100g), phosphorus (60.52mg/100g), iron (10.90mg/100g), and zinc (1.31mg/100g) as reported earlier by Obande *et al*., (2013). This makes molluscs a ready source of food for eradicating "hidden hunger". Hidden-hunger is a micronutrient deficiency that exists in populations where food supply is adequate in terms of meeting energy requirements and yet people are not considered "hungry" (FAO, 2003). Millions of people suffer ill health due to dietary deficiencies, while Nigeria is blessed with a lot of these seafoods which, if studied and properly harness, will go a long way in raising the nutritional status of the diets of populations around Cross River State and other coastal states within the Niger Delta region of Nigeria, and the World at large. But, there is paucity of information on the nutrient composition of these seafoods, their potentials as possible sources of nourishment for human and animals have been assumed rather than ascertained or established. Thus, the objective of this work was to determine

the food value and mineral content of the shell of *Egeria radiata* (Bivalvia) and *Crassostrea rhizophora* (Perecypode) of Lameillebrancha of the Cross River, Nigeria.

MATERIALS AND METHODS

Collection and preparation of samples: The Shell of *E. radiata* and *C. rhizophorea* were gotten from the market sellers at watt market, Calabar, Cross river state. They were taken to Central Laboratory, Faculty of agriculture, University of Calabar for proximate indices.

Laboratory Analysis: The food value and mineral composition of *E. radiata* and *C. rhizophorea* shell were determined according to A.O.AC (AOAC, 2012).

Treatment of Sample

The two species; *E. radiata* and *C. rhizophorea* shell were dried in an oven of about 75 for 10hours after for further blending to powder from where there proximate composition was analysed for protein, moisture, fat, crude protein, moisture, fat, crude fibre and ash and the mineral composition were determine by spectrometry method for calcium, magnesium, phosphorus, iron and manganese.

RESULTS

Food value and mineral content of *E. radiata* and *C. rhizopphorea*

The proximate analysis of *E. radiata* and *C. rhizophorea* shell are shown in the Table 1. The moisture content of the shell of *E. radiata* was 20.47% and 21.37% in the C. rhizoporea. Crude protein value of *E. radiata* was 1.43% and 2.53% for *C. rhizophorea.* Fat content was 0.05% for *E. radiata* and 0.05% for *C. rhizophorea* . Crude fibre of *E. radiata* was 0.03% and 1.30% for *C. rhizophorea*. Ash content of *E. radiata* was 13.54% and 15.54% for *C. rhizophorea*. Carbohydrate for *E. radiata* was 58.85% and 60.62% for *C. rhizophorea*.

Energy for *E. radiata* was 241.55J and 218.84J for *C. rhizophorea*. The proximate composition of the shell of *E. radiata* and *C. rhizophorea* shows the significant difference ($p<0.05$) in moisture, protein, fat, ash and carbohydrate while the crude fibre of the shell of both species was smaller ($P>0.05$) (Table 1). The mineral content of the shell of *E. radiata* and *C. rhizophorea* shows the significant difference ($P<0.05$) in Ca+, Na+, Pb Mg, and Mn while in Fe were similar ($P>0.05$) (Table 2).

Fig. 1. Picture of clam (*Egeria radiata*)

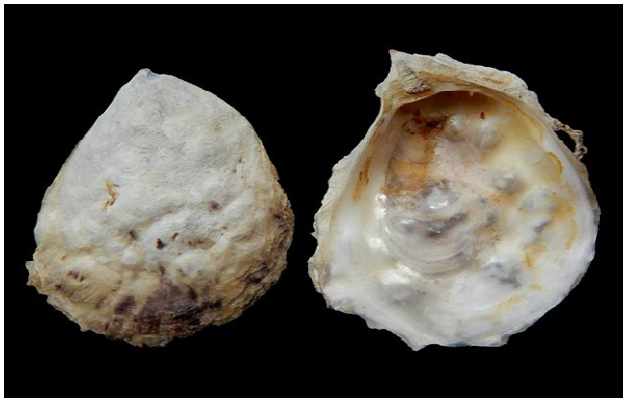

Fig. 2. Image of *Crassotrea rhizophorea*

Table 1. Proximate composition of *E. radiata* and *C. rhizophorea* shell. Dry sample of the Cross river, Nigeria (%)

Source	Moisture	Protein	Fat	Crude fibre	Ash	Carbohydrate	Energy
E radiata	20.47±0.4[a]	1.43±0.31[a]	0.05±0.03a	0.03±0.03[a]	13.54±0.39[a]	58.85±9.53a	241.55±38[a]
C. rhizophorea	21.37±0.25[b]	2.53±0.2[b]	0.05±0.04[b]	1.30±0.26[a]	15.54±0.04[b]	60.62±0.18[b]	218.84±0.97[b]

*column with different alphabet are significantly different

Table 2. Mineral composition of *E. radiata* and *C. rhizophorea* shell in cross river, Nigeria (Mg/100g)

PARAMETERS	E. radiate	*C. rhizophorea*
Calcium	52.23±0.32[a]	39.5±2.26[b]
Sodium	3.13±0.03[b]	2.43±0.04[a]
Zinc	0.26±0.07[a]	0.24±0.05[b]
Lead	2.39±0.07[b]	0.24±0.05[a]
Copper	0.11±0.04[a]	0.09±0.03[b]
Potassium	4.16±0.05[a]	9.71±0.07[b]
Magnesium	19.51±0.34[a]	23.39±0.44[b]
Phosphorus	9.43±0.31[b]	0.30±0.05[a]
Iron	0.79±0.04[a]	1.38±0.04[a]
Manganese	2.49±0.04[b]	0.11±0.41[a]

*column with different alphabet are significantly different

Statistical Analysis

The data obtained were subjected to one way analysis of variance laid in a completely randomized design in triplicates. Significantly different treatment was separated by Duncan Multiple Range Test at 5% probability level.

DISCUSSION

Protein is the major structural component of cells and is responsible for the building and repair of body tissues. The protein content of the two species ranged from 1.43% for *E. radiata* to 2.53% for *C. rhizophorea*, showing significant

(P<0.05) variation in their protein content. Low protein contents show that their shells are poor in protein. The moisture content of the two species ranged from 20.47% for *E. radiata* to 21.37% for *C. rhizophorea*, showing significant (P<0.05) variation in their moisture content. These variations in moisture content of molluscs could be due to the effect of environment as reported by Osibona *et al*. (2006). Fat content of *E. radiata* and *C. rhizophorea* was 0.03%. Lipids are highly efficient as sources of energy and they contain more than twice the energy of carbohydrates and proteins (Okuzumi and Fujii, 2000). However, the lipid content in *E. radiata* and *C. rhizophorea* was less than that reported by Ananda *et al.* (Ananda Kumar, 1989), the crude fibre in *E. radiata* and *C. rhizophorea* was 0.03%. There was no significant difference (P>0.05) in the crude fibre of the two species. Carbohydrate content of *E. radiata* was 58.85% and that of *C. rhizophorea* was 60.62%, this is at variance with 7.66% carbohydrate reported earlier by Obande *et al.,* (Obande, 2013).

Mineral Composition

The results in the present work had revealed that the shell of *E. radiata* and *C. rhizophorea* are rich sources of micronutrients: calcium, magnesium, potassium, sodium, phosphorus, iron, zinc, and iodine, as shown in Table 2. *E. radiata* shell has the highest value for calcium. Although, a Calcium value of 52.23mg/100g as obtained in this study compares favourably with the report of Davies and Jamabo (Davies and Jamabo, 2016), for periwinkle and oysters, respectively. Calcium in addition with other micro minerals and protein can help in bone formation with calcium acting as principal contributor. Calcium is important in blood clotting, muscles contraction and in certain enzymes in metabolic processes (Abulude, 2006). The low concentration of sodium in the shell of *E. radiata* and *C. rhizophorea* in this study does not reinforce its place as good for muscle functioning. This is attributed to low levels of sodium in the water and therefore less trophic transfer and accumulation of this metal in the shell of these species. However the values obtained from this study is lower than that which was reported by Ehigiator and Akise, (2016). Although sodium is important for muscle functions and electrolyte balancing, it is not usually a problem in mineral deficiencies as it is frequently used to salt food. The zinc content ranged from 0.26 – 0.53mg/100g, these values were lower than 1.21mg/100g reported earlier for aquatic snail (Fox and Cameron, 1980). Zinc is an important micronutrient needed for healthy skin, reproductive and immune function (Okuzumi and Fujii, 2000). Potassium is needed in fluid balance and regulation of nerve impulse conduction, regular heart beat and cell metabolism (Möttönen and Uhari, 1997). Potassium plays a vital role in regulating the pH, osmotic pressure, water balance, nerve impulse transmission and active transport of glucose/amino acid (Okuzumi, 2000). The values for potassium were between 4.16mg/100g and 9.71mg/100g, while phosphorus content ranged from 0.30 – 9.43mg/100g. The phosphorus content of molluscs compares to that recorded for beef (156), liver (313), eggs (218) and milk (95) mg/100g (Fox, 1980). Magnesium content of the two species ranged from 19.51mg/100g – 23.39mg/100g, these values were higher than 0.25 - 0.59mg/100g reported earlier for periwinkle and oysters (Okuzumi and Fujii, 2000). This disparity in the magnesium concentration could be attributed to the difference in their feeding habits and other environmental factors (Okuzumi and Fujii, 2000). The two species are thus shown to be good sources of magnesium, an essential micronutrient needed for nervous system health (Möttönen M and Uhari, 1997). The value for iron ranged between 0.79 and 1.38mg/100g, 27.61mg/100g iron content of molluscs reported by USDA (USDA, 2005), and 9.69-29.50mg/100g reported for periwinkle and oysters (Okuzumi, M. and Fujii, 2000). Iron content of 6.79 - 11.0mg/100g for molluscs had also been reported earlier (Obande et al., 2013). Iron is important for red blood formation, therefore molluscs can be recommended for pregnant women and children (Obande, 2013).

Conclusion

From the study, the shellfish show good composition of minerals which are of great necessity to health and growth of the body. Helping tissues, muscles and nerves as well as absolute metabolism of the body therefore its consumption should be encouraged.

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