

Distribution of Macro Minerals in Four Prawns from the Coastal Water of Ondo State, Nigeria

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Abstract: Macro mineral contents of calcium, magnesium, sodium, potassium and phosphorus were determined in four prawns: *Procambis clarkii*, *Palaemon* sp. *Macrobrachim vollen hovenii* and *Penaeus notalis* from the coastal water of Ondo State, Nigeria using standard methods of analysis. The mineral levels ranged as follows (mgL⁻¹): Mg 330-525, Na 165-189, K 176-200, Ca 534-823 and P 210-315. Low variabilities were recorded for all the mineral ratios. There was evidence of mineral bioconcentrations in all the samples. All the prawn samples were good sources of dietary mineral.

Key words: Distribution, prawns, coastal water, Nigeria

INTRODUCTION

Prawn is one of the popular seafood widely consumed in southern part of Nigeria mostly among the middle and low income groups. Prawn has great importance in food consumed by human and animals. It is valuable in the diet, because apart from supply of good quality proteins and vitamins A and D, it also contains several dietary mineral such as Ca, Fe etc, which are beneficial to human and animals.

Minerals that are required in relatively large amounts in the body are commonly grouped as major or macro elements. These minerals are essential components which are required in enzymatic biochemical activities in the body. The mineral ratios are very important in health at times they could pose as threat if their proportions are high. Ratios of 8.1 and 2.2 of Ca/P and K/ (Ca + Mg), respectively are capable of inducing metabolic disorder^[1]. A value of 3 to 4 for Na/K is considered the most adequate for normal perfection of protein during growth^[2].

The main brackish water areas in Nigeria are found along the coarser zones which are characterized by expansive estuarine lagoon and mangrove swamps fronted by beach ridge barriers this extends from the Lagos lagoon through Mahin in Ondo State to the Nigeria Delta in the South-East of Nigeria^[3]. The survey on the mineral contents of prawns was conducted on these obtained from Lagos lagoon^[4,5]. Although research study has been carried out on fishes obtained from coastal water of Ondo State^[6], but there is dearth of knowledge on prawns obtained from this same area and there are no published information on their mineral ratios. This study

therefore describes the macro mineral compositions and mineral ratios of prawn species from the coastal water of Ondo State, Nigeria. It is hoped that the results would contribute to existing nutrition data.

MATERIALS AND METHODS

The prawn species (*Procambis clarkii*, *Palaemon* sp. *Macrobrachim vollen hovenii* and *Penaeus notalis*) examined in this study were obtained from fishermen in Igbokoda, Ondo State, Nigeria in 2003. They were washed with distilled water, dried and homogenized. A portion of each homogenous sample was removed to determine the mineral content. Minerals were analyzed using solution obtained by dry ashing the samples at 550°C for 2 h in a muffle furnace and dissolving it in distilled water with a few drops of conc. HCL in a volumetric flask. Na and K were measured with Corning, UK, model 405 flame photometer^[7]. Mg and Ca were determined with a Perkin Elmer 306 USA atomic absorption spectrophotometer and phosphorus was determined using spectronic 20. All determinations were in triplicates. Results were statistically analyzed^[8].

RESULTS AND DISCUSSION

The mineral levels of the samples are shown in Table 1. Calcium content range from 534 mg 100 g⁻¹ (*M. vollenhovenii*) to 823 mg100 g⁻¹ (*P. specie*). Magnesium was found to be between 330 mg100g⁻¹ (*M. vollenhovenii*) to 525 mg 100 g⁻¹ (*P. clarkii*). Potassium was high and it ranged between 176 mg 100⁻¹ to

Table 1: Mineral contents of samples analyzed (mg 100 g⁻¹) DM

Mineral	<i>P. clarkii</i>	<i>P. specie</i>	<i>MV</i>	<i>P. not</i>	Water ^a	Mean	±SD	CV (%)
Mg	525	430	330	480	320	417	90.5	21.7
Na	184	183	165	189	172	178.6	9.8	5.5
K	193	200	176	192	188	189.8	8.8	4.7
Ca	623	823	534	582	572	526.8	277.0	5206
P	253	315	268	210	150	239.2	62.4	26.1
K/ (Ca + Mg)	0.16	0.16	0.20	0.18	ND	0.18	0.02	10.9
Ca Mg ⁻¹	1.19	1.91	1.62	1.22	ND	1.49	0.35	23.2
Ca P ⁻¹	2.46	2.61	1.99	2.78	ND	2.46	0.34	13.8
K Mg ⁻¹	0.37	0.47	0.53	0.40	ND	0.44	0.07	16.2
Mg Ca ⁻¹	0.84	0.52	0.57	0.82	ND	0.69	0.17	24.2
Na K ⁻¹	0.95	0.92	0.94	0.98	ND	0.95	0.03	2.6
K Ca ⁻¹	0.31	0.24	0.33	0.33	ND	0.30	0.04	14.1

ND-Not determined, ^a-concentration in mgL⁻¹ MV- *Mvollenhovenii*, P. not-*P. notialis*

Table 2: Bioconcentration factors of the metals in the prawns samples analyzed

Mineral	<i>P. clarkii</i>	<i>P. specie</i>	<i>M.V</i>	<i>P. not</i>	Mean	±SD	CV (%)
Mg	1.64	1.34	0.03	1.50	1.34	0.26	19.0
Na	1.07	1.06	1.96	1.10	1.05	0.06	5.7
K	1.03	1.06	0.94	1.02	1.01	0.05	5.1
Ca	1.09	1.44	0.93	1.02	1.12	0.22	19.9
P	1.69	2.10	1.79	1.40	1.75	0.29	16.5

MV-*Mvollenhovenii*, P. not-*P. notialis*

200 mg 100 g⁻¹. High values were also recorded for sodium and phosphorus. Good ratios existed between calcium and phosphorus in all the samples analyzed. The results obtained were within the ranged reported for prawns^[5], but the values were lower than those obtained for some fish species^[9,10] and higher than values obtained for *Illisha Africana* fish^[11].

The variability in the mineral contents may be due to climate, geographical location of catch, session of the year, sex, feeding habits of species and so many other factors. The samples were good sources of Ca, Mg, K and Na. This means that the samples contained most of the important minerals which will meet the recommended daily allowance requirements in conjunction with other foods.

Calcium tends to be a kind of coordinator among inorganic elements, if excess amount of potassium, magnesium and sodium are present in the body of the prawns; calcium is capable of assuring a corrective role. Calcium in conjunction with phosphorus, magnesium, manganese, vitamins A, C and D, chlorine and protein are involved in their body and bone formation, but calcium is the principal contribution. The normal level of calcium in the diet should be maintained throughout life. Plant and animal tissues are rich sources of potassium, thus a dietary lack is seldom found, for sodium, the mineral is widely distributed in foods with plants containing less than animal sources.

Table 1 depicts the results of mineral ratios. All the values were low; this fact is supported with the low values recorded for the standard deviation and coefficient of variations. The results of the mineral ratios compared with literatures^[1,2,12-15]. It was documented that Ca/P ratio

Table 3: Correlation coefficients of animals in prawn samples

Mg	Na	K	Ca	P
Mg				
Na	0.878			
K	0.622	0.820		
Ca	0.3.9	0.449	0.811	
P	0.300	0.123	0.234	0.643

must be at least 1 in order to assure good absorption of both Ca and P^[13]. The values obtained for the sample were above 1 indicating that consumers of these prawn samples are assured of the absorption of both. The results observed for K/(Ca + Mg) indicated that all the prawn samples were within the safe limit of 8.1. If these prawns are consumed there would be no fear of metabolic disorder.

The bioconcentration factor of the sample is shown in Table 2. Low factors were obtained in these minerals (Mg 1.03-1.64, Na 0.96-1.10, K 0.94-1.06, Ca 0.93-1.44 and P 1.40-2.10). This may be due to high quantity of such minerals in the water sample. These low bioconcentration values were in agreement with the observation recorded for fish^[11]. The differences in the values showed the ability of the prawn samples to concentrate minerals differently in their body. The mineral concentration observed here are consistent with the biological magnification hypothesis^[16].

Correlation analysis Table 3 revealed that some of the elements were correlated with almost all the others high correlations were found between Na and Mg (0.88), Na and K (0.82), K and Ca (0.81) and Ca and P (0.64). There were no significant differences (p = 0.05) recorded

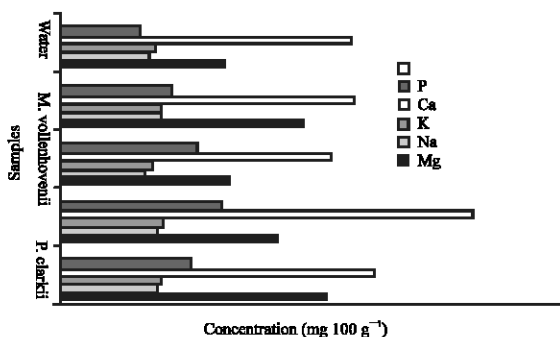


Fig. 1: Frequency distribution of selected minerals in the samples

in all the minerals recorded. The frequency distributions of selected minerals in the samples are shown in Fig 1.

CONCLUSION

The data presented here were based on relatively few samples with economical and nutritional value. Although this investigation provides practical and very useful information on the composition of some widely consumed prawn species from the coastal water of Ondo State, much greater sampling of individual species is needed to establishing standards for composition if these macro mineral are consumed regularly a significant portion of the recommended dietary allowance could be provided.

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