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Original Research Article

Vitamin and Mineral Contents in Shrimps, Oysters and Periwinkles Harvested from Brass Local Government Area in Bayelsa State, Nigeria

Ezomoh, O. O.[1], Bigbo, F. M.[1], Loveday, E.[1], Wodu Ebizimor[1*]

[1]Department of Biochemistry, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria

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Abstract: Sea foods have been a very good source of nutrients to man. In this research, the nutritional value of three sea foods namely shrimps, oysters and periwinkles obtained from Brass Local Government Area, Bayelsa State were investigated. Vitamins were analyzed with HPLC, while the minerals were determined using AAS. From the findings, phosphorus is the most concentrated mineral in the three seafood studied, with significantly ($p \geq 0.05$) higher concentrations of 3112.860ppm±15.204, 2117.863ppm±22.625 and 2906.524ppm±31.850 in shrimp, oyster and periwinkle respectively. The least concentrated minerals were iron and zinc with values of 0.031ppm±0.000 and 0.043ppm±0.001 for Shrimp, 0.056ppm±0.002 and 0.112ppm±0.021 for oyster and 0.056ppm±0.005 and 0.026ppm±0.000 for periwinkle respectively. Despite the fact that oil exploitation activities in Bayelsa state results in pollution, Shrimps, oysters and periwinkles from the study still can still serve as sources of vitamins and minerals, hence, the findings of this study can be applied to future research on human nutrition.

Keyword: Vitamins, Mineral, Shrimps, Oysters, Periwinkles.

INTRODUCTION

Seafood is a healthful choice for people of all ages—growing children, pregnant women, active adults, and the elderly (Reames, 2012). Micronutrients present in seafood satisfies the micronutrients deficiency of humans and prevent many disorders due to micronutrients deficiency (Mohanty *et al*., 2016) because the essential vitamins and minerals found in seafood include niacin, pyridoxine, vitamin E, cobalamin, thiamin, riboflavin, zinc, phosphorus, magnesium, iron, copper, potassium and selenium (Reames 2012). In addition, nutrients in seafood are known to have anticancer effects (Liao and Chao, 2009). Indeed, the nutritional and health aspects of functional foods reduce the risk of lifestyle- associated diseases (Gheorghe *et al*., 2019).

This study was carried out to evaluate the vitamin and mineral contents of *Farfantepenaeus notialis* (pink shrimp), *Crassostrea gasar* (oyster) and *Tympanotonus fuscatus* (periwinkle) from Brass Local Government area of Bayelsa State in Nigeria.

MATERIAL AND METHODS

Sample Collection and Preparation

Fresh shrimps, periwinkles and oysters (seafoods) harvested from Brass Local Government Area, Bayelsa State (40 18'N, 60 14'E) were put in crushed ice in insulated container and taken to the laboratory and were preserved in the refrigerator prior to analysis. The samples were thoroughly washed with deionized water before being dried in an oven.

Vitamins and Mineral Analysis

Water-soluble and fat-soluble vitamins were assayed in High Performances Liquid Chromatography under optimized conditions.

Water-soluble vitamins were extracted by adding 0.100g of ground sample and 80ml of deionized water into 100ml volumetric flasks. After ultrasonic extraction for 15min, the deionized water was added to the meniscus mark. Fat- soluble vitamins on the other hand were extracted by adding 0.125g of ground sample was and and 8ml of CH_3OH-CH_2Cl_2 into10ml volumetric flasks and after 15 minutes of ultrasonic extraction, CH_3OH-CH_2C1_2 was added to make it up to the mark.. The prepared sample solution was stored in

***Corresponding Author:** Wodu Ebizimor
Department of Biochemistry, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria

the dark. Prior to injection, the solutions were filtered through a 0.2µm filter (Millex-GN).

The mineral assay was done with the standard AOAC (2005) and Paul *et al*., (2014) using atomic absorption spectrophotometer (AAS) (Thermo Fisher, M Series).

Statistical Analysis

The SPSS software was used to analyse data obtained from the study.

RESULTS AND DISCUSSION

Vitamin content in milligram per 100 grams is reported in table 1. Among the fat-soluble vitamins, vitamin E has the highest concentration of 31.010mg/100g E-2, 108.700mg/100g E-2 and 131.300mg/100g E-2 for shrimp, oyster and periwinkle respectively. The least concentrated fat-soluble vitamin is D with values of 37.450mg/100g E-2, 0.039mg/100 E-2 and 0.084mg/100g E-2 for shrimp, oyster and periwinkle respectively. Although Holick, (2008) reported that seafood contains a considerable amounts of vitamin D. The average dietary intake of vitamin D is at least 1000 international units (IU) or equivalent to 25 mg per day (Lu *et al*., 2007). From the results above however, both shrimp, oyster and periwinkle are very poor sources of vitamin D.

In the vitamin B-complex group, vitamin B3 concentration is the highest in shrimp (450.000mg/100g E-2), oyster (273.600mg/100g E-2) and periwinkle (312.500mg/100g E-2); while the vitamin with lowest concentrations is B9. Vitamin C concentration is very low in periwinkle (9.936mg/100g E-2) but high in shrimp (2.437mg/100g E-2) and oyster (3.883mg/100g E-2). The vitamins present in seafood have been reported by Liu (2003) to be readily available to the body compared to that from plant sources.

Table 1: Concentration (mg/100g) of fat-soluble vitamins in shrimp, oyster and periwinkle

	Shrimp		**Oyster**		**Periwinkle**	
Vitamins	Retention Time (min)	Amount (mg/100g) $x10^{-2}$	Retention Time (min)	Amount (mg/100g) $x10^{-2}$	Retention Time (min)	Amount (mg/100g) $x10^{-2}$
A	17.090	9.610	17.063	7.666	17.026	8.500
D	19.097	37.450	19. 101	0.039	19.105	0.084
E	19.515	31.010	19.520	108.700	19.522	131.300
K	21.497	0.063	21.508	0.118	21.501	0.182

Table 2: Concentration (mg/100g) of water-soluble vitamins in shrimp, oyster and periwinkle

	Shrimp		**Oyster**		**Periwinkle**	
Vitamins	Retention Time (min)	Amount (mg/100g) $x10^{-2}$	Retention Time (min)	Amount (mg/100g) $x10^{-2}$	Retention Time (min)	Amount (mg/100g) $x10^{-2}$
B1	17.767	11.840	17.782	18.030	17.669	30.260
B2	18.762	3.928	18.767	16.280	18.768	41.460
B3	12.362	450.000	12.455	237.600	12.557	312.500
B5	22.596	35.760	22.615	52.780	22.605	90.530
B6	13.739	15.520	13.790	22.360	13.883	10.660
B9	20.533	0.000	20.247	0.004	20.538	0.004
B12	23.467	0.685	23.463	1.542	23.470	2.357
C	16.035	243.700	16.030	3.883	16.040	9.936

Mineral Content

The concentrations (ppm) of minerals in shrimp, oyster and periwinkle can be seen in Table 3. The table shows both micro minerals and macro minerals. For the micro minerals, we have iron, copper, selenium, manganese and zinc; for the macro minerals we have magnesium, phosphorus, sodium, calcium and potassium. Phosphorus is the most concentrated mineral in the three seafood studied. Its concentration is significantly ($p \geq 0.05$) higher than that of other minerals as can be seen in table 3. Its concentration in shrimp is 3112.860ppm±15.204; in oyster, 2117.863ppm±22.625 and 2906.524ppm±31.850 in periwinkle. The least concentrated minerals were iron and zinc with values of 0.031ppm±0.000 and 0.043ppm±0.001 for Shrimp, 0.056ppm±0.002 and 0.112ppm±0.021 for oyster and 0.056ppm±0.005 and 0.026ppm±0.000 for periwinkle respectively (table 3). Therefore, the concentration of phosphorus for the three seafood studied were significantly ($p \geq 0.05$) higher compared to other minerals in the study. This finding agrees with the study carried out by Bernard *et al*., (2016). The seafood studied are rich in phosphorus, which is very important as it is a component of DNA and RNA, phospholipids and it forms part of plasma membranes (Akram *et al*., 2020). Also, the concentrations of iron and zinc were significantly lower than the other minerals studied. Seafood studied are also rich in manganese and copper,

while sodium, potassium, calcium and selenium are also present in the samples in this study. Selenium is very important to humans; however, it is toxic at high levels. The amount of selenium present in the samples studied is appropriate. It helps in the normal activity of the thyroid where it serves as a cofactor in the metabolism of thyroid hormones (Holben and Smith, 1999). Selenium is also involved in reducing methylmercury toxicity (Ralston and Raymond, 2010). It's deficiency on the other hand. is associated with a high rate of cardiovascular disease related deaths and high risk of kidney disorders and cancer (Holben and Smith 1999). Vitamin and mineral profile for the three sea food in the present study have a similar trend, except for vitamin C concentration that is significantly low in periwinkle.

Table 3: Mineral content in ppm of three seafood samples

Mineral	Shrimp	Oyster	Periwinkle
Magnesium	0.462±0.001 [a]	0.590±0.191 [a]	0.359±0.010 [a]
Iron	0.031±0.000 [b]	0.056±0.002 [b]	0.056±0.005 [b]
Copper	10.852±1.380 [c]	19.966±5.037 [c]	11.112±0.352 [c]
Selenium	0.484±0.111 [a]	0.421±0.100 [a]	0.887±0.308 [d]
Manganese	48.586±0.975 [d]	35.853±8.402 [d]	58.776±13.532 [e]
Sodium	3.712±0.642 [e]	2.105±0.130 [e]	3.681±0.725 [d]
Calcium	1.035±0.537 [e]	0.834±0-200 [a]	3.422±0.816 [d]
Potassium	2.438±0.380 [e]	2.913±0.189 [e]	2.714±0.501 [d]
Zinc	0.043±0.001 [b]	0.112±0.021 [a]	0.026±0.000 [b]
Phosphorus	3112.860±15.204 [f]	2117.863±22.625 [f]	2906.524±31.850 [f]

Values are presented as Mean±SD of triplicate determinations. Means with same superscript letters in the same column are not statistically different at 95% confidence limit.

CONCLUSION

This study has shed light on the vitamin and mineral contents of shrimp, oyster and preriwinkle. The three seafood studied are rich in vitamin B3, while shrimp alone is very rich in vitamin C, other vitamins however are present in small amounts. The seafood studied is very rich in phosphorus. Finally, the findings of this study can be applied to future research on human nutrition and food composition.

Figure 1: Chromatogram of vitamins in shrimp

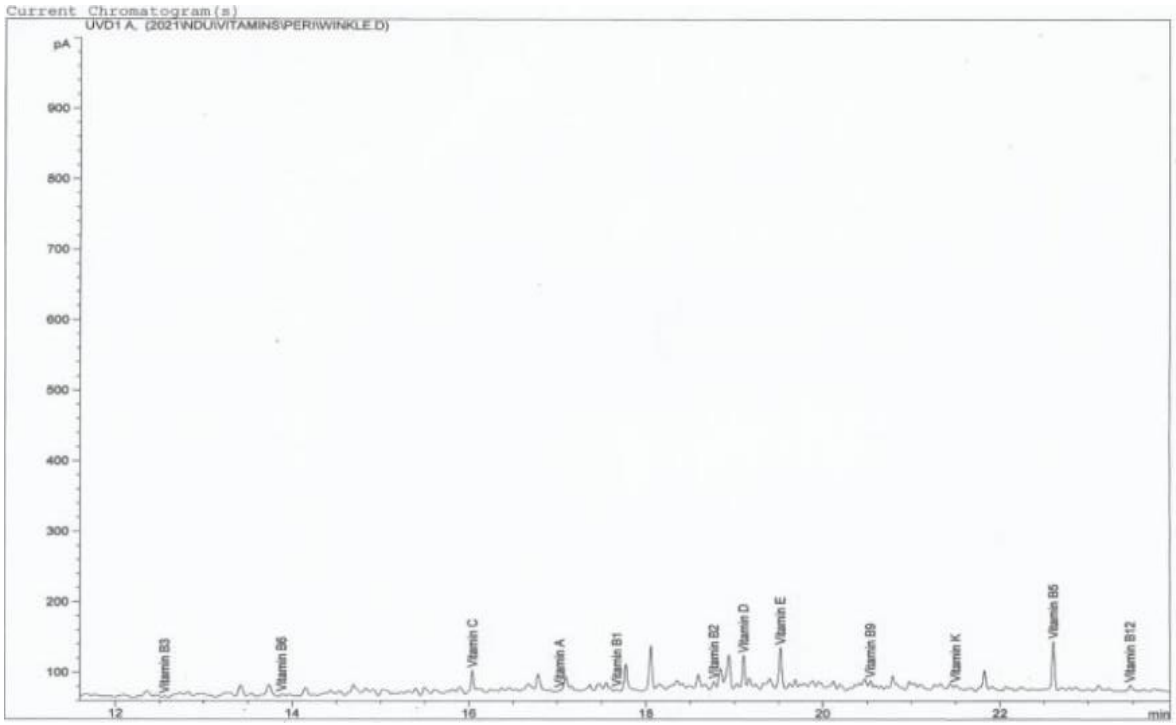

Figure 2: Chromatogram of vitamins in periwinkle

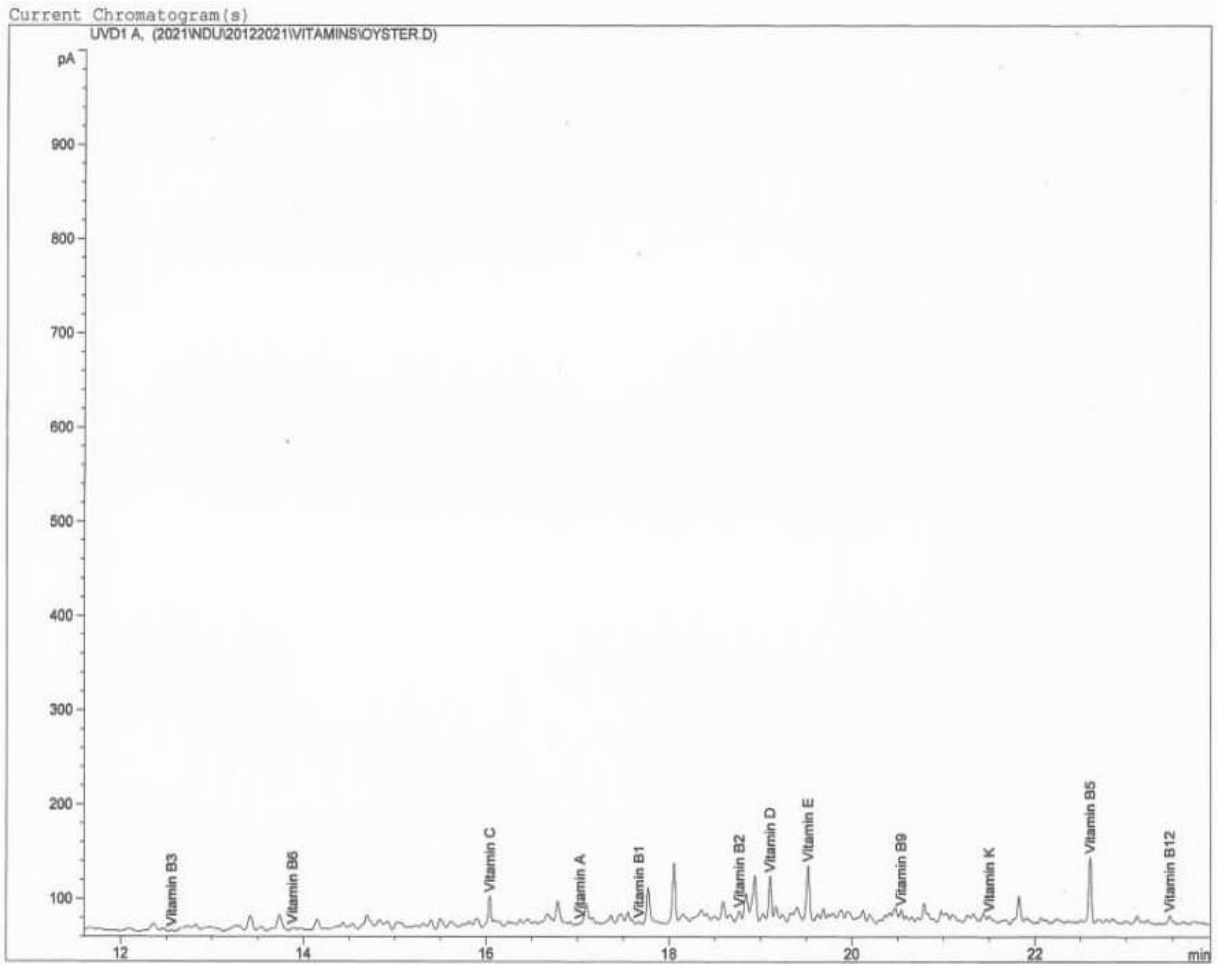

Figure 3: Chromatogram of vitamins in oyster

DISCLOSURE OF CONFLICT OF INTEREST

Authors declare no conflict of interest.

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