NUTRITIONAL PROFILE OF COMMONLY CONSUMED SHRIMPS IN RIVERS STATE, NIGERIA

ABSTRACT

Shrimps and other marine species are crucial to global food supply, economically valuable and nutritionally beneficial. This research compared the nutritional and anti-nutritional profile of two shrimp species, *L. setiferus* and *L. stylirostris* harvested from Isaka Creek, Port Harcourt. Fresh shrimps were purchased from fishermen and dried at the Creek, then transported to the laboratory for analysis. Shrimp species were prepared, labeled and grinded to powder form using mortar and pestle. Using standard analytical methods; Proximate composition, Vitamins, Amino acids, Fatty acids and Anti-nutrients were determined. Statistical analysis (one-way ANOVA) revealed significant variations ($p < 0.05$) between species in nutritional and anti-nutritional levels: *L. setiferus* exhibited higher values of Protein (18.41%-14.99%), Fiber (3.40%-1.93%) and Moisture content (7.64%-10.53%), whereas *L. stylirostris* was higher in Carbohydrates (72.55%-64.66%) and Lipids (1.14%-0.87%). *L. setiferus* demonstrated superior concentration of Vitamin C (6.594-3.820mg/100g), Vitamin A (0.092-0.062mg/100g), Vitamin K (0.247-0.122mg/100g) and some B-Vitamins (including B_3, B_6 and B_7) compared to *L. stylirostris. L. setiferus* also showed elevated values of saturated fatty acids (including Caprylic, Lauric, Palmitic and Arachidic acids) and key anti-nutrients such as Saponins and Flavonoids. Conversely, *L. stylirostris* revealed a superior profile in essential and non-essential amino acids (including Leucine, Isoleucine, Methionine, Lysine, Tryptophan, Histidine) with significant amounts of unsaturated fatty acids and elevated levels of Phytate and Lectins. This study provides a strong nutritional foundation considering specie-specific differences in nutrient and anti-nutrient availability which is important for the optimal use of these shrimps in various feeding strategies.

Keywords: Shrimps, *L. setiferus, L. stylirostris*, Proximate, Vitamins, Amino acids, Fatty acids, Anti-nutrients.

INTRODUCTION

Shrimps, a vital component of marine biodiversity, are a significant source of protein and other essential nutrients for human consumption in many countries of the world (Akinwumi *et al*., 2023). The increasing demand for seafood, particularly shrimp, has led to a surge in their production and consumption. In Nigeria, shrimps commonly referred to as crayfish represent a highly nutritious food source offering substantial amounts of protein, essential fatty acids, vitamins, and minerals thus contributing significantly to dietary needs (Adeyeye *et al*., 2010). The biochemical composition of shrimps varies between species and is influenced by factors such as age, size, maturity, food availability, feeding habits, environmental factors and processing methods (Ukpatu & Udoh 2017). Amongst the various species of shrimps, *Litopenaeus setiferus* (white shrimp) and *Litopenaeus stylirostris* (blue shrimp) are two of the most commercially important species found in tropical and subtropical waters. These species are not only a valuable food source but also contribute significantly to the economy of the coastal communities through fishing and aquaculture (FAO 2021; Lui *et al*.,2021). They are used in a variety of culinary dishes, such as soups, stews, salads, and stir-fries, to enhance flavor, texture, and nutritional value. Additionally, dried shrimps serve as a shelf-stable ingredient for ready-to-eat meals and snack products (Nguyen *et al*., 2019). The consumption of shrimps has been linked to improved biological and nutritional quality beneficial to health, including reduced inflammation, depression elimination, improved cardiovascular health, enhanced immune function. (El-sherif *et al.*, 2021; Ibironke *et al*., 2018). Shrimps are rich in protein, an essential nutrient for growth, repair, and maintenance of body tissues, they also contain lipids which provide energy and help absorb vitamins, micronutrients, such as vitamins and minerals, which play a crucial role in maintaining optimal health and preventing chronic diseases (Cui *et al.*, 2020). Shrimps may also contain anti-nutritional factors that can affect the bioavailability of these nutrients and potentially impact human health. Anti-nutritional factors are naturally occurring compounds that can limit the nutritional value of foods interfering with nutrient absorption, metabolism or utilization (Ibiama *et al.*, 2024).

This comparative study of the nutritional and anti-nutritional composition of dried *L. setiferus* and *L. stylirostris* harvested from Isaka Creek contributes to existing knowledge on the nutritional value of these species for consumption. It also offers valuable insights on the role of shrimp urbanization in addressing food security.

MATERIALS AND METHODS

STUDY AREA

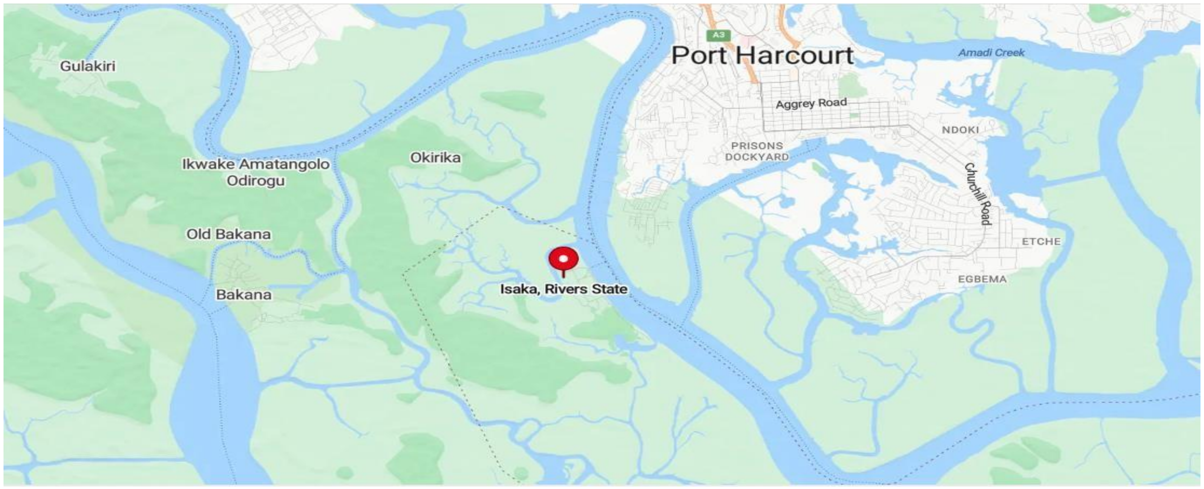

Fig 1- Study Area

Map of Isaka Creek (sourced from Googlemaps)

Isaka Creek located in Port Harcourt, Nigeria was selected for this study. Isaka Creek is a distributary in Nigeria located at Latitude 4° 44' north and Longitude 7° east situated nearby the communities of Abisaka and Okrika. The Creek is a habitat for a diverse array of aquatic species, including shrimps. The creek's unique location, where freshwater and marine environments converge, fosters a rich and productive ecosystem that supports an abundance of marine life.

SAMPLE COLLECTION, IDENTIFICATION AND PREPARATION

Life shrimps were harvested from the Isaka Creek, Port harcourt, Rivers state. Shrimp species (*L. setiferus* and *L. stylirostris*) were identified based on species identification sheets given by Food and Agriculture Organization (FAO 2020). Fresh shrimps were dried at the creek and transported in aerated containers to the Austino-research and analysis laboratory. Dried samples of *L. setiferus* and *L. stylirostris* were ground to powder using mortar and pestle.

DETERMINATION OF THE PROXIMATE COMPOSITION

Proximate compositions such as crude protein, crude fat, carbohydrate, moisture content, crude fiber and ash content were measured using the method of Association of Official Analytical Chemists (AOAC, 2000). Nitrogen was determined by the micro-kjeldahl method and the percentage nitrogen was converted to crude protein by multiplying with 6.25. Carbohydrate was determined by difference.

DETERMINATION OF FAT AND WATER SOLUBLE VITAMIN

Vitamin contents (A, K , C, B_1, B_2, B_3, B_5, B_6, B_7, B_9 and B_{12}) were determined using High Performance Liquid Chromatography Shimadzu-1700 UV-Visible double beam spectrophotometer Prominence series (HPLC) with 1 cm matched quartz cell. All the processes used were according to the standard procedure used by Ezomoh *et al.*(2022).

DETERMINATION OF ESSENTIAL AND NON ESSENTIAL AMINO ACIDS

Essential and non-essential amino acids were determined using Agilent 6890 Gas Chromatograph with Agilent 5975 Mass Selective Detector. All the processes used were according to the standard procedure used by Li *et al*.(2018).

DETERMINATION OF SATURATED AND UNSATURATED FATTY ACIDS

Fatty acids were determined using Agilent 6890N Gas Chromatograph with Agilent 5975 Mass Selective Detector. Extraction of samples was done with petroleum ether using the Soxhlet extraction method.

DETERMINATION OF ANTI-NUTRIENTS

Flavonoid was determined using the method described by harborne (1973), Saponin was determined using the method of Obadoni & Ochuko (2001). Phytates was determined using UV spectroscopy according to procedure reported by Okwakpam *et al*. (2023). Oxalates was determined using standard procedure permanganate oxidation method by Karamad *et al.*(2019). Lectins were determined using hemagglutination assay.

STATISTICAL ANALYSIS

Data was expressed as mean ± standard deviation of triplicate determination. One Way analysis of variance (ANOVA) was utilized to test for significance using SPSS (statistical program for social sciences) window software version 22.2. Where the effect of a factor was significant, the results were compared using multiple comparison by Tukey's test in order to determine the differences between two means.

RESULTS

Proximate composition of dried *L. setiferus* and *L. stylirostris*

The results of the proximate composition of dried *L. setiferus* and *L. stylirostris* harvested from Isaka Creek, Port Harcourt are presented in Table 1. The results showed the mean protein content in samples as 18.41±0.02 % and 14.99±0.02%. Lipid content as 0.87±0.01% and 1.14±0.01%. Carbohydrates content in samples as 64.66±0.01% and 72.55±0.04%. Ash content was 2.12±0.02% and 1.74± 0.02%. Crude fibre was 3.40± 0.02% and 1.93± 0.02%. Moisture content was 10.53±0.02% and 7.65±0.02% in *Litopenaeus setiferus* and *Litopenaeus stylirostris* respectively.

Table 1: Proximate analysis of *Litopenaeus* setiferus and *Litopenaeus stylirostris*

PARAMETERS (%)	*Litopenaeus* setiferus	*Litopenaeus stylirostris*
Ash content	$2.12±0.02^a$	$1.74±0.02^a$
Moisture Content	$10.53±0.02^a$	$7.65±0.02^b$
Crude Lipid	$0.87±0.01^a$	$1.14±0.01^a$
Crude Protein	$18.41±0.02^a$	$14.99±0.02^b$
Crude Fiber	$3.40±0.02^a$	$1.93±0.02^b$
Carbohydrate	$64.66±0.01^a$	$72.55±0.04^b$

Values are expressed as means ± deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

Vitamin Composition (mg/100g) of dried *L. setiferus* and *L. stylirostris*

The results of some fat and water soluble vitamins present in dried *L. setiferus* and *L. stylirostris* is as shown in Table 2. Vitamin A content was 0.092±0.001and 0.062±0.001mg/100g. Vitamin K was 0.247±0.001 and 0.122±0.058mg/100g. Vitamin C was 6.594±0.001 and 3.820±0.002mg/100g. Vitamin B_1 was 0.370±0.002 and 0.526±0.002mg/100g. Vitamin B_2 was 1.049±0.002 and 1.381±0.002mg/100g. Vitamin B_3 was 0.146±0.002 and 0.120±0.002mg/100g. Vitamin B_5 was 0.063±0.002 and 0.115±0.001mg/100g. Vitamin B_6 was 0.062±0.046 and 0.035±0.002mg/100g. Vitamin B_7 was 0.273±0.002 and 0.186±0.002mg/100g. Vitamin B_9 was 0.043±0.001 and 0.113±0.001mg/100g. Vitamin B_{12} was 0.030±0.002 and 0.020±0.002mg/100g in *L. setiferus* and *L. stylirostris* respectively.

Table 2: **Concentration of selected vitamins in *Litopenaeus setiferus* and *Litopenaeus stylirostris* (mg/100g)**

Vitamin (mg/100g)	***Litopenaeus setiferus***	***Litopenaeus stylirostris***
Vitamin A	0.092±0.001[a]	0.062±0.001[b]
Vitamin B_1	0.370±0.002[a]	0.526±0.002[b]
Vitamin B_2	1.049±0.002[a]	1.381±0.002[b]
Vitamin B_3	0.146±0.002[a]	0.120±0.002[b]
Vitamin B_5	0.063±0.002[a]	0.115±0.001[b]
Vitamin B_6	0.062±0.046[a]	0.035±0.002[b]
Vitamin B_7	0.273±0.002[a]	0.186±0.002[b]
Vitamin B_9	0.043±0.001[a]	0.113±0.001[b]
Vitamin B_{12}	0.030±0.002[a]	0.020±0.002[a]

Vitamin C	6.594±0.001[a]	3.820±0.002[b]
Vitamin K	0.247±0.001[a]	0.122±0.058[b]

All data are presented as means ± SD of triplicate determinations. The results were considered significant at P values of less than 0.05 ($P \leq 0.05$).

Concentration of essential amino acids in dried *L. setiferus* and *L. stylirostris*

The result of essential amino acids concentration of *L. setiferus* and *L. stylirostris* respectively as expressed in g/100g is shown in Table 3. The concentration of Valine was 2.42±0.01 and 2.63±0.02g/100g, Leucine was 4.38±0.01 and 6.74±0.02g/100g, Isoleucine was 1.76±0.01 and 9.95±0.03g/100g, Methionine was 3.53±0.01 and 8.73±0.02g/100g, Phenylalanine was 0.84±0.01 and 4.43±0.02g/100g, Glutamine was 5.28±0.01 and 3.53±0.03g/100g, Tryptophan was 4.43±0.01 and 7.81±0.02g/100g, Histidine was 1.75±0.01 and 8.64±0.01g/100g.

Table 3: Essential Amino Acid Concentration of dried *L. setiferus* and *L. stylirostris*

Amino Acids (g/100g)	*Litopenaeus Setiferus*	*Litopenaeus Stylirostris*
Valine	2.42±0.01 [a]	2.63±0.02 [a]
Leucine	4.38±0.01 [a]	6.74±0.02 [a]
Isoleucine	1.76±0.01 [a]	9.95±0.03 [b]
Methionine	3.53±0.01 [a]	8.73±0.02 [b]
Phenylalanine	0.84±0.01 [a]	4.43±0.02 [b]
Lysine	1.55±0.01 [a]	6.91±0.02 [b]
Glutamine	5.28±0.01 [a]	3.53±0.03 [b]
Tryptophan	4.43±0.01 [a]	7.81±0.02 [b]
Histidine	1.75±0.01 [a]	8.64±0.01 [b]

Values are expressed as means ± standard deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

Concentration of non-essential amino acids in dried *L. setiferus* and *L. stylirostris*

The result of the non-essential amino acids concentration of *L. setiferus* and *L. stylirostris* respectively as expressed in g/100g is shown in Table 4. Results obtained revealed the concentration of Alanine as 2.65±0.01 and 4.53±0.03, Glycine as 5.73±0.01 and 11.04±0.02 Proline as 0.37±0.01 and 5.42±0.02, Serine as 1.61±0.01 and 5.99±0.03, Aspartic acid as 1.24±0.01 and 2.93±0.02, Cysteine as 2.75±0.01 and 9.72±0.01, Glutamic acid as 2.53±0.01 and 2.90±0.02, Asparagine as 3.84±0.01 and 1.73±0.02, Glutamine as 5.28±0.01 and 3.53±0.03, Arginine as 1.92±0.01 and 4.85±0.02, Tyrosine as 0.39±0.01 and 2.53±0.01.

Table 4: Non- Essential Amino acid Concentration of *L. setiferus* and *L. stylirostris*

Amino Acids (g/100g)	*Litopenaeus setiferus*	*Litopenaeus stylirostris*
Alanine	2.65±0.01[a]	4.53±0.03[b]
Glycine	5.73±0.01[a]	11.04±0.02[b]
Proline	0.37±0.01[a]	5.42±0.02[b]
Serine	1.61±0.01[a]	5.99±0.03[b]
Aspartic acid	1.24±0.01[a]	2.93±0.02[a]
Cysteine	2.75±0.01[a]	9.72±0.01[b]
Glutamic acid	2.53±0.01[a]	2.90±0.02[a]
Asparagine	3.84±0.01[a]	1.73±0.02[a]
Glutamine	5.28±0.01[a]	3.53±0.03[b]
Arginine	1.92±0.01[a]	4.85±0.02[b]
Tyrosine	0.39±0.01[a]	2.53±0.01[b]

Values are expressed as means ± standard deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

Concentration of saturated fatty acids of dried *L.setiferus* and *L.stylirostris*

The percentage saturated fatty acids concentration in *L.setiferus* and *L.stylirosis* is as shown in Table 5. The value of Caprylic acid in respective species was 4.82±0.01 and 1.86±0.05%, Pelargonic acid was 3.41±0.02 and 0.78±0.04%, Capric acid as 7.91±0.02 and 4.64±0.04%, Undecylic acid was 1.52±0.01 and 2.87±0.03%, Lauric acid as 4.52±0.01 and 2.72±0.01%, Tridecylic acid was 5.86±0.02 and 5.83±0.02%, Tridecylenic acid was 9.19±0.03 and 2.52±0.02%, Pentadecyclic acid was 10.50±0.01 and 9.84±0.02%, Palmitic acid 0.89±0.03 and 0.74±0.02%, Margaric acid was 2.43±0.01 and 7.53±0.01%, Stearic acid 1.49±0.02 and 5.19±0.02%, Nonadecylic acid was 0.67±0.02 and 2.92±0.02%, Arachidic acid 8.19±0.01 and 4.74±0.03%, Lignoceric acid was 1.24±0.04 and 0.63±0.01%.

Table 5: **Saturated fatty acids composition of dried *L. setiferus* and *L. stylirostris***

Saturated fatty acids (%)	***Litopenaeus Setiferus***	***Litopenaeus Stylirostris***
Caprylic acid	4.82±0.01[a]	1.86±0.05[b]
Pelargonic acid	3.41±0.02[a]	0.78±0.04[b]
Capric acid	7.91±0.02[a]	4.64±0.04[b]
Undecylic acid	1.52±0.01[a]	2.87±0.03[a]
Lauric acid	4.52±0.01[a]	2.72±0.01[b]
Tridecylic acid	5.86±0.02[a]	5.83±0.02[a]
Tridecylenic acid	9.19±0.03[a]	2.52±0.02[b]
Pentadecyclic acid	10.50±0.01[a]	9.84±0.02[a]
Palmitic acid	0.89±0.03[a]	0.74±0.02[a]
Margaric acid	2.43±0.01[a]	7.53±0.01[b]

Stearic acid	1.49±0.02[a]	5.19±0.02[b]
Nonadecylic acid	0.67±0.02[a]	2.92±0.02[b]
Arachidic acid	8.19±0.01[a]	4.74±0.03[b]
Lignoceric acid	1.24±0.04[a]	0.63±0.01[b]

Values are expressed as means ± deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

Concentration of unsaturated fatty acids in dried *L. setiferus* and *L. stylirostris*

The percentage unsaturated fatty acids concentration in *L.setiferus* and *L.stylirosis* is as shown in Table .6. The value of Undecylenic acid in respective species was 3.21±0.02 and 1.65±0.03%, Myristolenic acid was 2.66±0.01 and 5.78±0.01%, Oleic acid was 2.31±0.02 and 8.54±0.02%, Paullinic acid was 3.62±0.01 and 2.52±0.01%, Eicosadienoic acid was 5.44±0.02 and 1.84±0.02%, Arachidonic acid was 1.24±0.02 and 3.53±0.03%, Erucic acid was 1.51±0.02 and 1.94±0.02%, Eicosapentaenoic acid was 3.62±0.02 and 2.82±0.01%, Docosahexaenoic acid was 1.58±0.01 and 1.54±0.02%, Nervonic acid was 0.52±0.01 and 0.84±0.03%.

Table .6: **Unsaturated fatty acids composition of dried *L. setiferus* and *L. stylirostris***

Unsaturated fatty acids (%)	***Litopenaeus Setiferus***	***Litopenaeus Stylirostris***
Undecylenic acid	3.21±0.02[a]	1.65±0.03 [b]
Myristolenic acid	2.66±0.01[a]	5.78±0.01 [b]
Oleic acid	2.31±0.02 [a]	8.54±0.02[b]
Paullinic acid	3.62±0.01[a]	2.52±0.01[a]
Eicosadienoic acid	5.44±0.02 [a]	1.84±0.02[b]

Arachidonic acid	1.24±0.02[a]	3.53±0.03[b]
Erucic acid	1.51±0.02[a]	1.94±0.02[a]
Eicosapentaenoic acid	3.62±0.02[a]	2.82±0.01[a]
Docosahexaenoic acid	1.58±0.01[a]	1.54±0.02[a]
Nervonic acid	0.52±0.01[a]	0.84±0.03[a]

Values are expressed as means ± deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

Concentration of Anti-nutrients in dried *L. setiferus* and *L. stylirostris*

Antinutritient composition of dried *L. setiferus* and *L. stylirostris* as expressed in percentage is shown in Table 7. The results revealed Phytate concentration as 0.84±0.01% and 1.34±0.12%, Flavonoid as 1.26±0.01 and 0.97±0.01%, Oxalate as 0.33±0.02 and 0.27±0.02%, Saponnin as 2.97±0.02 and 1.54±0.02%, Lectins as 3.71±0.01 and 4.86±0.01% in shrimp species L. setiferus and L. stylirostris respectively.

Table 7: **Anti Nutrient composition of dried *L. setiferus* and *L. stylirostris***

Anti Nutrients (%)	***Litopenaeus Setiferus***	***Litopenaeus Stylirostris***
Phytate	0.84±0.01[a]	1.34±0.12[b]
Flavonoid	1.26±0.01[a]	0.97±0.01[b]
Oxalate	0.33±0.02[a]	0.27±0.02[a]
Saponnin	2.97±0.02[a]	1.54±0.02[b]

Lectins	3.71±0.01 [a]	4.86±0.01 [b]

Values are expressed as means ± deviation of three replicates. Values with different superscript in the same row are significantly different while values with same superscript within a row are not significantly different ($p<0.05$).

DISCUSSION

The proximate composition analysis of *L. setiferus* and *L. stylirostris* harvested from Isaka Creek, Port Harcourt, revealed significant differences in their nutritional profiles providing a comprehensive overview of the nutritional properties of these shrimps species. Results as shown in Table 1 revealed both L. setiferus and L. stylirostris as good sources of protein, with mean protein content ranging from 14.99% to 18.41%. *L. setiferus* was found to have more higher protein content (18.41 ± 0.02%), compared to *L. stylirostris* (14.99 ± 0.02%). This relatively high protein content indicates the usefulness of both shrimp species as a valuable source of protein in the diet. Findings from this study were higher compared to Liu *et al.*(2021) whose shrimp protein content varied by part and species(12.33-15.09%), with *Litopenaeus vanname*i having the highest content (15.09%) and *Macrobrachium rosenbergii* having the lowest (12.33%).

The lipid content was relatively low, ranging from 0.87% to 1.14%. No significant difference was observed between both species.

The carbohydrate content is relatively high, ranging from 64.66% to 72.55% in *L. setiferus and L. stylirostris* respectively. With *L. stylirostris* significantly higher (72.55%) than *L. setiferus* (64.66%). This may be attributed to the presence of chitin, a polysaccharide found in the exoskeletons of crustaceans. The high chitin levels in crustaceans can be processed (deacetylation) into chitosan which exhibits valuable properties such as biodegradability, biocompatibility, and antimicrobial effects (Guo *et al*., 2019; Kritchenkov et al., 2021). The ash content, which represents it's mineral content, is relatively low, ranging from 1.74% to 2.12%. Reports by Lui *et al*. (2021) were higher compared to this study (8.18-13.45%). The crude fiber ranged from 1.93% to 3.40% with *L. setiferus* significantly higher (3.40%) compared to *L. stylirostris*(1.93%).

The moisture content varied between the two species, with *L. setiferus* having a higher moisture content (10.53%) compared to *L. stylirostris* (7.65%) indicating that *L. setiferus* may be more susceptible to spoilage. This difference may be attributed to various factors, including differences in species, harvesting season, or processing methods (Silver *et al*.,2014).

The analysis of fat and water-soluble vitamins in dried *L. setiferus* and *L. stylirostris* reveals varying levels of essential vitamins. Findings showed that Vitamin C is the most abundant vitamin in both species, with *L. setiferus* significantly higher (6.594mg/100g) compared to *L. stylirostris* (3.820mg/100g). Vitamin B2 is also prominent, with *L. stylirostris* having higher levels (1.381mg/100g) compared to *L. setiferus* (1.049mg/100g). Vitamin B1 and B7 are present in notable amounts, while Vitamins A, K, B3, B5, B6, B9, and B12 are present in smaller quantities. The differences in the vitamin content between the two species may be attributed to factors such as diet and processing methods. Findings from this study were less compared to studies by Ezomoh *et al*.(2022).

Amino acids are building blocks of proteins and proteins are the building blocks of life. The analysis of essential and non-essential amino acids in *L. setiferus* and *L. stylirostris* revealed distinct differences in their amino acid profiles. *L. stylirostris* had higher concentrations of most essential amino acids, including Leucine, Isoleucine, Methionine, Phenylalanine, Tryptophan, and Histidine. In contrast, *L. setiferus* had higher levels of Glutamine. For non-essential amino acids, *L. stylirostris* had higher concentrations of Alanine, Glycine, Proline, Serine, Aspartic acid, Cysteine, Arginine, and Tyrosine, while *L. setiferus* has higher levels of Asparagine. Findings from this study in comparison to the study by Akinwumi *et al*.(2023) highlights *L. stylirostris* as more nutritious in amino acids compared to reported species(*P. monodon, P. longirostris, P. atlantica, M. macrobrachion*).

The analysis of saturated and unsaturated fatty acids in *L. setiferus* and *L. stylirostris* revealed distinct differences in their fatty acid profiles, which can have significant implications for their nutritional value and potential health benefits. The results show that *L. setiferus* has higher concentrations of saturated fatty acids, such as Caprylic acid (4.82% vs 1.86%), Pelargonic acid (3.41% vs 0.78%), Capric acid (7.91% vs 4.64%), Lauric acid (4.52% vs 2.72%), Tridecylenic acid (9.19% vs 2.52%), and Arachidic acid (8.19% vs 4.74%). These fatty acids are important for various biological functions, including energy production and cell membrane structure. In contrast, *L. stylirostris* has higher levels of other saturated fatty acids, such as Undecylic acid (2.87% vs 1.52%), Margaric acid (7.53% vs 2.43%), Stearic acid (5.19% vs 1.49%), and Nonadecylic acid (2.92% vs 0.67%). The finding from this study revealed that *L. stylirostris* has higher concentrations of certain unsaturated fatty acids, such as Myristolenic acid (5.78% vs 2.66%), Oleic acid (8.54% vs 2.31%), Arachidonic acid (3.53% vs 1.24%), Erucic acid (1.94% vs 1.51%), and Nervonic acid (0.84% vs 0.52%). These unsaturated fatty acids are important for various biological functions, including heart health, inflammation regulation, and brain function. In contrast, *L. setiferus* has higher levels of other unsaturated fatty acids, such as Undecylenic acid (3.21% vs 1.65%), Paullinic acid (3.62% vs 2.52%), and Eicosadienoic acid (5.44% vs 1.84%).

The analysis of the antinutrient composition in dried *L. setiferus* and *L. stylirostris* revealed varying levels of phytate, flavonoid, oxalate, saponnin, and lectins. *L. stylirostris* has higher levels of phytate (1.34% vs 0.84%) and lectins (4.86% vs 3.71%) compared to *L. setiferus*. In contrast, *L. setiferus* has higher levels of flavonoid (1.26% vs 0.97%), saponnin (2.97% vs 1.54%), and slightly higher levels of oxalate (0.33% vs 0.27%). The presence of these antinutrients can affect the nutritional value and bioavailability of nutrients in the shrimp species. Phytate, for example, can bind to minerals, reducing their absorption. Lectins can interfere with nutrient absorption and potentially cause gastrointestinal issues. Saponnins and flavonoids may have both positive and negative effects, depending on the state of health. Researchers have shown that flavonoids possess a dual nature, noting that while they can interfere with nutrient absorption by binding to metals (Zinc and Iron) and inhibiting digestive enzymes, they also exhibit beneficial properties as acting as antioxidants and antibiotics (Ibiama *et al.*, 2024).

CONCLUSION

The analysis of *Litopenaeus setiferus* and *Litopenaeus stylirostris* reveals their potential as valuable nutritional resources, with high protein content and varying levels of other essential nutrients. However, the presence of anti-nutritional factors, such as flavonoids, phytate, saponins and lectins warrants consideration to maximize their benefits while minimizing potential risks. The distinct nutritional profiles of these species can inform their use in food products, animal feed, and other applications. Future studies should focus on optimizing processing and storage methods, exploring seasonal variations, and investigating the impact of environmental factors on their nutritional composition to fully harness their potential.

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