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Chemical Composition, Amino Acid, Fatty Acid and Mineral in *Callappa Lophos:* Ecological and Human Health Implications

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Abstract The present study demonstrate the nutritional values of *C. Lophos* in terms of proximate composition, amino acids, fatty acids and minerals composition in edible part. The *C. Lophos* was separated into two part one body which contain shell and muscles and other appendages which contain claws and lags. The *C. Lophos* body and appendages has the suitable quantity of protein, carbohydrate, fat, ash, and moisture in the percentages of (1.117%, 1.203%), (0.301%, 0.436%), (3.247%, 2.723%), (0.145%, 0.175%) and (4.215%, 3.701%) respectively. Entirely seventeen amino acid were found where nine essential amino acids (EAA) and eight non-essential amino acids (NEAA). The maximum concentration of EAA Lysine was detected in both of body (0.0451%) and appendages (0.0407%) part and in minimum of EAA Valine was found in body (0.0163%) and EAA Tryptophan (0.0092%) in appendages. The NEAA Glutamic acid was observed in maximum concentration in both of body (0.0491%) and appendages (0.0512%) and NEAA Asparagine observed in minimum concentration in both of body (0.0059%) and appendages (0.0057%). The quantity of saturated fatty, mono saturated, poly saturated , and trans fatty acid in body and appendages were found in the percentages of (.701%, 0.821%), (0.634%, 0.742%), (0.686%, 0.798%) and (0.042%, 0.1321%) respectively. Entirely six mineral were detected in *C. Lophos* body and appendages where Calcium (11.67%, 12.35%) observed in maximum concentration. The result revels that the *C. Lophos* are one of the nutritionist food and aim of this study to encourage people to increase the utilization of these *C. Lophos* in large scale.

Keywords: *Callappa Lophos, chemical composition, amino acid, fatty acid, mineral*

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1. Introduction

The marine food for human consumption has tumid rapidly through worldwide day by day. The marine food is an essential sources of valuable nutrients such as protein, carbohydrate, minerals, amino acids, fatty acids [1,2] which are considered as healthy, safe, nutritious and balanced diet (WHO 2003).

Crab are one of the most popular marine food throughout the world. The nutritional value of crab has been widely studied in various region of world. Crab gain much interest among the world due to its nutritional values [4,5,6,7]. Crab are having the sufficient sources of nutrient such as protein, carbohydrate, amino acids, fatty acids and minerals [8,9,10,11]. Protein is an important nutrients for human body and essential amino acid composition is one of the most valuable nutritional qualities of protein. To evaluate protein quality, amino acid score method is used where a tested protein amino acid patterns compared with that of reference protein. The driven amino acid compared with the requirements of amino acid for preschool-aged children. If the protein score effectively support with a young children growth and development, it will meet the requirements of older children and adults (FAO/WHO/UNO 1985). Pathogenesis of many diseases occurs due to high level of amino acid [13,14]. The balanced composition of fatty acid in human diet is good for good health [15].The unsaturated fatty acids have been shown to be beneficial in reducing coronary heart disease, cancer, and to improve the response to inflammatory diseases, like eczema, psoriasis and rheumatoid arthritis [14,16,17]. The minerals like Ca, Mg, Fe, Zn, K, and Na are compulsory for human health. Minerals of Calcium (Ca) and Irons (Fe) are basic components for bone development, more of both minerals being required during childhood and growing stages to prevent Rickets and Osteomalacia disorder. Zinc (Zn) act as a constituent for proper function of various enzymes. Zn has essential effect for the metabolism and structural stability of nucleic acid [18,19,20].

In this manuscript, we evaluate the composition of protein, carbohydrate, fat, fatty acid, amino acids,

minerals, ash and moisture of C. Lophos body and appendages part. The result revels that the *C. Lophos* is one of the nutritionist food for human diet. The main objective of this study is to encourage people to increase the utilization of these *C. Lophos* in large scale.

2. Materials and Methodology

2.1. Source of the Crabs and Sampling Procedure

Mature *C. Lophos* were collected from local market which thoroughly washed with de-ionized water and dissected to obtain shell, muscles (body) legs, claws (appendages) part. The body and appendages part from each *C. Lophos* were subsequently stored separately at -70°C for later analysis.

2.2. Estimation of Protein

Total protein content in *C. Lophos* body and appendages were analyzed with the Folin-Ciocaltue Phenol method of Lowry et al (1951). Approximately 50gm for both body meat and appendages part of *C. Lophos* were taken to extracted protein.

2.3. Estimation of Carbohydrates

The phenol sulfuric acid method of Dubois et al. was used to estimate the total carbohydrate of *C. Lophos*.

2.4. Estimation of Amino Acid

Amino acids in *C. Lophos* was estimated by using the method of Baker et al. in the high performance liquid chromatography.

2.5. Fatty Acid Analysis

For fatty acid analysis, fat was extracted using the method of Bligh et al. from 50gm of body and appendages part meat of *C. Lophos.* The identification and quantification of fatty acids were done using Gas Chromatography.

2.6. Estimation of Minerals

The described method of Guzman and Jimenez (1992) was used to determine the composition of protein in *C. Lophos* body and appendages part.

3. Result and Discussion

3.1. Chemical Proximate Analysis

In this investigation, the proximate composition containing protein, carbohydrate, fat, ash and moisture contents of *C. Lophos* were estimated according to appendages which contain claw and legs and body contain shell and muscles. The composition of proximate analysis is shown in Table 1. It was revealed that the value of protein (12.03 mg/50gm) carbohydrate (4.36 mg/50gm) and ash (1.75mg/50gm) in appendages are higher than body. On the other hand fat (32.47 mg/50gm) and moisture (42.15 mg/50gm) in body are higher than appendages. Figure 1 shows the percentage of proximate composition in *C. Lophos* body and appendages part. The protein content in this work almost similar to previous work [21]. E.I. Adeyeye et al. [21] reported that 22.1mg/100gm and 18.6mg/100gm protein content were found in male and female *Sudananautes africanus africanus.* There are a little variation between protein content in this investigation and previous work [21] due to geographical location [22]. In this present investigation, the carbohydrate content was found in body (0.301%) and appendages (0.436%). This result revealed that the percentage of carbohydrate in appendages is higher than body part. Xugen Wu et al. [23] reported that the carbohydrate content were found in blue swimmer crab in percentage of 0.20%, 0.14% in female and male meat, 0.62%, 0.53% in female and male hepatropancreas and 0.78% in female gonads. The carbohydrate concentration are vary due to food and feeding pattern of carbs from different region. The level of carbohydrate content in *C. Lophos* is in optimum level. The concentration of ash content in body part and appendages were found 0.145% and 0.175% which indicate the mineral concentration in species [24,25]. Moronkola et al. [26] reported the concentration of ash in crunchy chest, walking legs and tissues sample were 1.04%, 1.30%, and 1.041 % which are higher than *C. Lophos* ash content. The moisture content were found in *C. Lophos* body 42.15mg/50gm and 37.01mg/50gm. Sudhakar M et al. [27] was found 77.8 mg/100gm (female), 77.4 mg/100gm (female), 74.6 mg/100gm (male), 77.3mg/100gm (male) moisture content in *Cancer pagurus* which collected from Scottish coast and English Channe. The variation of ash and moisture content in *C. Lpohos* might be most probably depend on the size of the species investigated for the separate studies or seasonal conditions at the time of investigation conducted.

Table 1. Proximate analysis of *C. Lophos* contains protein, carbohydrate, fat, ash, moisture (mg/50gm)

Component	Body	Appendages	Total
Protein	11.17	12.03	23.2
Carbohydrate	3.01	4.36	7.37
Fat	32.47	27.23	59.7
Ash	1.45	1.75	3.2
Moisture	42.15	37.01	79.16

3.2. Estimation of Essential and Non-essential Amino Acid

In this investigation, we found totally seven-tine amino acid in *C. Lophos*. In total amino acid, there are nine essential and eight non-essential amino acid were detected. The content of essential and non-essential amino acid are shown in Table 2 and Table 3. In EAA Lysine (0.451 and 0.407 mg) were detected in maximum concentration in body and appendages and minimum value of Valine and Tryptophan (0.163 and .092 mg) were detected in body and appendages of C. Lophus. Important EAA of Taurine

was found in both parts of *C. Lophos*. In NEAA Glutamic (0.491 and 0.512 mg) was the maximum concentration in body and appendages of *C. Lophus* and Glycine (0.103 and 0.152 mg) was the minimum concentration in body and appendages part of *C. Lophos*. The result of EAA and NEAA revealed that the *C. Lophos* has potential source for food value due to presence of essentials amino acids. Figure 2 and Figure 3 shows the percentage of essentials and non-essentials amino acids in *C. Lophos* body and appendages part.

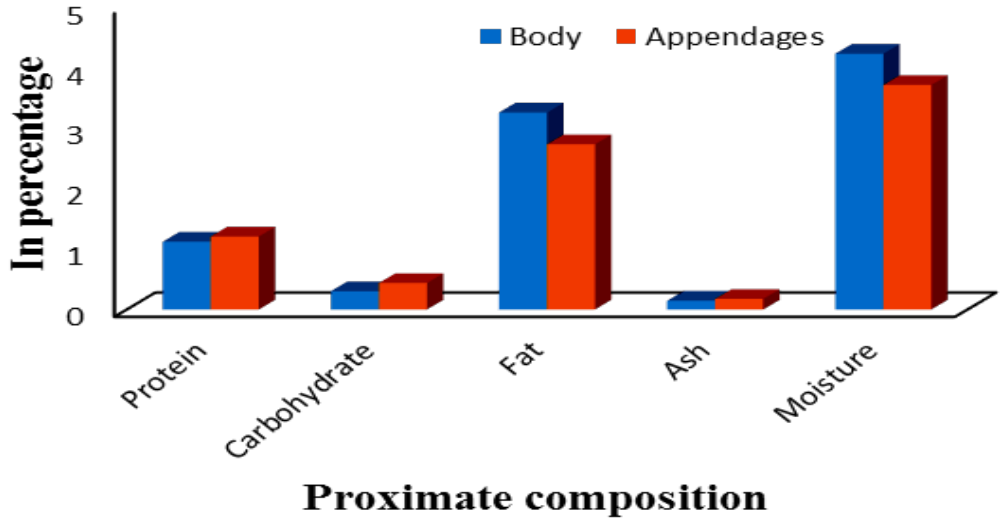

Figure 1. Proximate composition of *C. Lophos* body and appendages in percentage

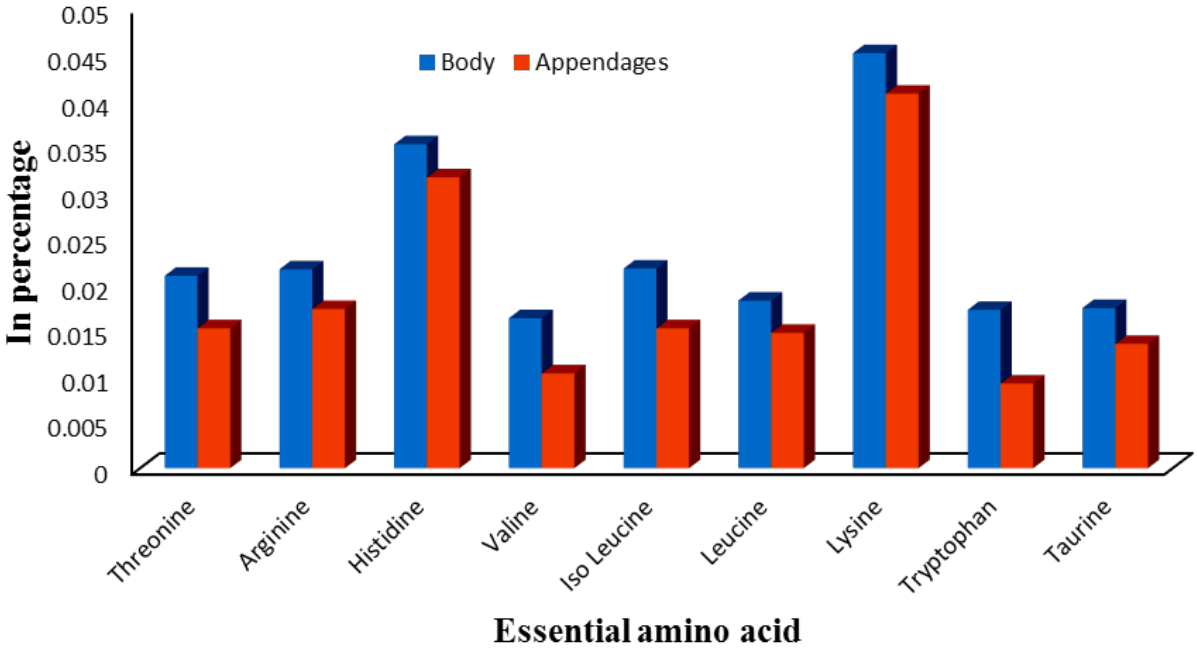

Figure 2. Composition of essentials amino acid of *C. Lophos* body and appendages part in percentage

Table 2. Essential amino acids composition of *C. Lophos* in body and appendages (mg/50gm)

S. no	Essential amino acids	Body	Appendages	Total
1	Threonine	0.209	0.152	0.361
2	Arginine	0.216	0.173	0.389
3	Histidine	0.352	0.316	0.668
4	Valine	0.163	0.103	0.266
5	Iso Leucine	0.217	0.152	0.369
6	Leucine	0.182	0.147	0.329
7	Lysine	0.451	0.407	0.858
8	Tryptophan	0.172	0.092	0.264
9	Taurine	0.174	0.135	0.309

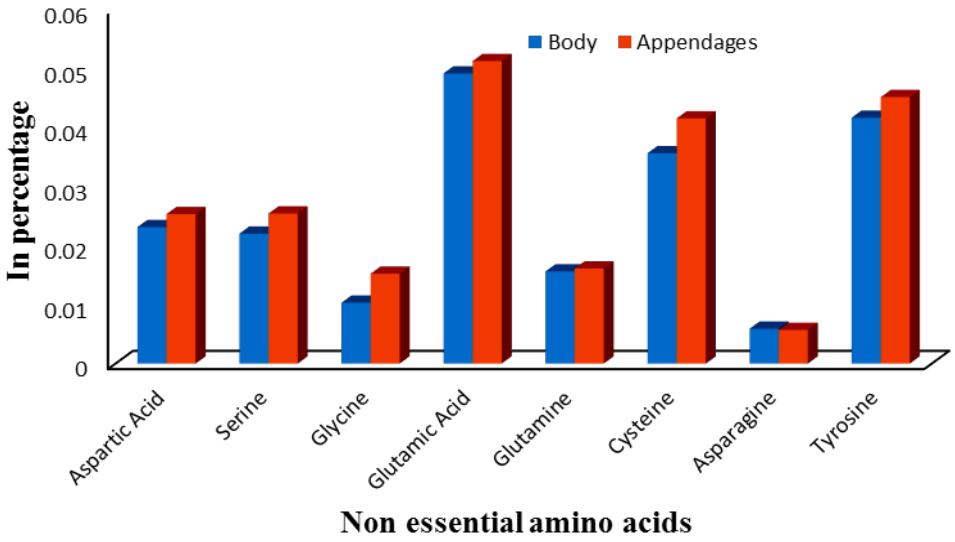

Figure 3. Non-essential amino acids composition of *C. Lophos* body and appendages part in percentage

Table 3. Composition of non-essential amino acids of *C. Lophos* in body and appendages (mg/50gm)

S. no	Non-essential amino acid	Body	Appendages	Total
1	Aspartic Acid	0.231	0.253	0.484
2	Serine	0.22	0.254	0.474
3	Glycine	0.103	0.152	0.255
4	Glutamic Acid	0.491	0.512	1.003
5	Glutamine	0.156	0.161	0.317
6	Cysteine	0.356	0.415	0.771
7	Asparagine	0.059	0.057	0.116
8	Tyrosine	0.416	0.451	0.867

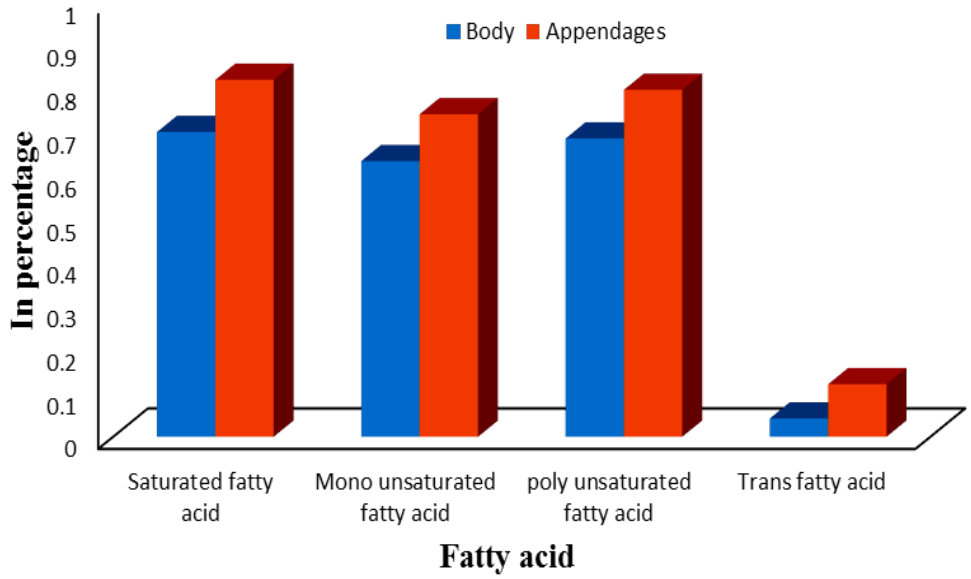

Figure 4. Composition of fatty acid in *C. Lophos* body and appendages in percentage

Table 4. Composition of fatty acids of *C. Lophos* in body and appendages (mg/50gm)

S. No	Fatty acid	Body	Appendages	Total
1	Saturated fatty acid	7.01	8.21	15.22
2	Mono unsaturated fatty acid	6.34	7.42	13.76
3	poly unsaturated fatty acid	6.86	7.98	14.84
4	Trans fatty acid	.42	1.21	1.63

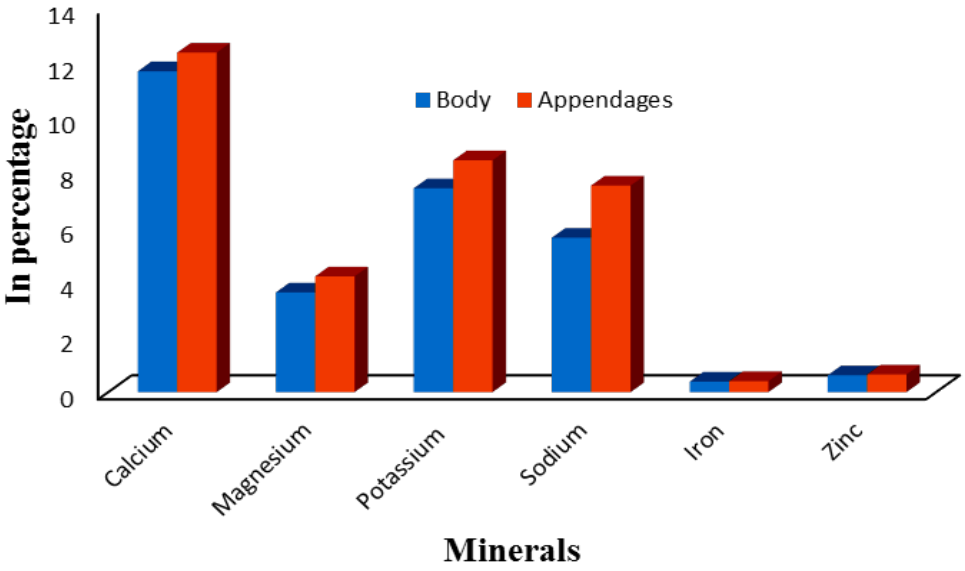

Figure 5. Composition of minerals in *C. Lophos* body and appendages in percentage

Table 5. Composition of minerals of *C. Lophos* in body and appendages (mg/50gm)

S. No	Minerals	Body	Appendages	Total
1	Calcium	116.7	123.5	240.2
2	Magnesium	36.24	42.1	78.34
3	Potassium	74.13	84.31	158.44
4	Sodium	56.13	75.12	131.25
5	Iron	3.83	4.01	7.84
5	Zinc	6.13	6.42	12.55

3.3. Estimation of Fatty Acid

In this study, saturated, mono unsaturated, poly unsaturated and tran's fatty acid were found in body and appendages part of *C. Lophos*. Composition of fatty acid are shown in Table 4. Saturated fatty acid (8.21 mg) was high quality in appendages than body and maximum values then other fatty acids. On the other hand tran's fatty acid has minimum values in both appendages and body part of *C. Lophos*. The percentages of fatty acids in C. Lophus body and appendages part shown in Figure 4. In this investigation, the total fatty acid composition were found in values of 1.522% of saturated fatty acid, 1.376% of mono unsaturated fatty acid, 1.484% of poly unsaturated fatty acid and 0.163% of Tran's fatty acid. Sudhakar et al. [28] reported that saturated fatty acid (palmitic acid 0.81% and stearic acid 0.29%), mono saturated fatty acid (oleic acid 0.99%) and polyunsaturated fatty acid (linoleic acid 1.11% and alpha linoleic acid 0.70%) were found.

3.4. Estimation of Minerals

In this study we have traced six minerals (Calcium, Magnesium, Potassium, Sodium, Zinc and Iron) in body and appendages of *C. Lophos*. The concentration of traced minerals are shown in Table 5. The concentration of minerals are in percentage of Calcium 240.2mg/ 50gm, Magnesium 78.34mg/50gm, Potassium 158.44 mg/50gm, Sodium 131.25 mg/50gm, Iron 7.84mg/50gm and Zinc 12.55mg/50gm respectively. Calcium was observed as major elements of appendages and body part. Iron 3.83 mg was traced in low level in the body part of *C. Lophos*. The percentages of minerals in C. Lophos are shown in Figure 5. Similar investigation were conducted in various species. Marques et al. [29] were observed the mineral quantity of *Maja brachydactyla* was shows 1350 µg/1gm of Calcium, 90.9 µg/1gm of Magnesium, 10000 µg/1gm of Potassium, 8346 µg/1gm of Sodium, 210 µg/1gm of Iron, and 830 µg/1gm of Zinc. Our investigation result has variation to Marques et al. [29] investigation. This variation might be connected to the size of the species investigated for the separate studies or geographical locations or seasonal conditions at the time of investigation conducted.

4. Conclusion

In summary, this investigation highlighted that the nutritional quality of *C. Lophos* body and appendages part. The body and appendages part were valuable sources of protein, carbohydrate, fatty acid, amino acid, and minerals for human diet. Additionally appendages are richer in protein, minerals, fatty acid, and non-essential amino acids. On the other hand body part are richer in essential amino acids. In generally, the *C. Lophos* are not consuming as nutritional food by the all group of community and *C. Lophos* are also considered as a low cost crab. This investigation revealed that the *C. lophos* crab are capable to compete with more economically consumed species for human in terms of nutritional values.

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