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BIOCHEMICAL COMPOSITION AND NUTRITIONAL VALUE OF MARINE GASTROPOD *Babylonia zeylanica* FROM PUDUCHERRY, SOUTH EAST COAST OF INDIA

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Abstract

Life is composed of lifeless chemical molecules. The living matter is composed of mainly of inorganic and organic compounds. Nutrients are the important biochemical compounds necessary for all the biological activities of any living system. Gastropods molluscs are potential sources of valuable proteins, carbohydrates and minerals and abundantly available in India. Regarding the biochemistry of gastropod molluscs, only limited studies were carried out from Puducherry, East Coast of India. Hence, the proximate composition, minerals and Vitamins profile of the Indian Babylon, *Babylonia zeylanica* from Thengaithittu landing centre, Pondicherry, Southeast coast of India were investigated with a view to provide nutritional data for dietary planning. Mean values for the proximate composition (dry weight basis) were protein 41.53 %, carbohydrate 17.34 %, lipid 7.2 %, free fatty acids 1.98 % and ash 1.18 %. This gastropod belonged to high- protein low- fat category. Calcium and Vitamins (Vit-A, Vit-B2 and Vit-C) were found maximum in the muscle. *Babylonia zeylanica*, thus constitutes a source of high protein as well as an ideal dietetic fish food.

Key words: Gastropods mollusks, Nutritional quality, *Babylonia zeylanica*, Proximate composition, High protein and Puducherry coast

1. Introduction

Molluscs form one of the earliest recorded groups of living organisms. Their presence on planet earth since the Paleozoic era 540 million years ago has been proved beyond doubt. Abundance, size and diversity and their dual roles as predators and prey make molluscs an indispensable component of tropical marine ecosystems. With more than 80,000 species, the phylum Mollusca was second only to the phylum Arthropoda. From India, a total of 3271 species of molluscs belonging to 220 families and 591 genera have been documented and of these 1900 are gastropods, 1100 bivalves, 2210 cephalopods, 4l polyplacophorans and 20 scaphopods (Appukuttan, I996). The Indian Babylon, *Babylonia zeylanica* has a very smooth shell with high spire, rounded whorls, slightly impressed sutures and a large ovate body whorl. Though the shell bears distinctive brownish patches on white background, the major characteristic is the violet staining at the fasciole. The species was distributed in Indian and Sri Lankan waters.

India has a long coast line of 8129 km with rich marine fishery resources consisting of chiefly of fishes, crustaceans and molluscs. There is a high demand for animal protein due to population explosion. Molluscs form a cheap alternate animal protein which can be utilized either for human consumption or as fish meal or

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manure. Due to lack of awareness, molluscs are not popular food in India. The knowledge on biochemical composition of any edible organisms was extremely important since the nutritive value was reflected in its biochemical contents (Nagabhushnam and Mane, 1978). Consumption of marine molluscs provides an inexpensive source of protein with a high biological value, essential minerals and vitamins.

The nutrient components such as protein, carbohydrate, lipid (fats and oils), vitamins and minerals are chemical compounds essential for the growth and good-health of the living body (Pigott and Tucker, 1990). Nutrition is defined as "nourishing or being nourished especially, the series of processes by which an organism takes in and assimilates for promoting growth and replacing worn or injured tissues" (Webster, 1984). The ratio of carbohydrate was less when compare to the other nutrients such as proteins and lipids in animal tissues, especially in aquatic animals (Babu *et al.*, 2010). Lipids are the major sources of metabolic energy and essential materials for the formation of cell and tissue membranes (Sargent, 1995). This edible specimen, *Babylonia zeylanica* are found at muddy bottoms of deeper waters beyond 50 m and mostly available at the east coast of India. Hence, in the present study has been made on attempt to estimate the proximate composition of *Babylonia zeylanica* through estimating their major biochemical components such as total protein, carbohydrate and lipid content in the whole body tissue apart from free fatty acids, ash, vitamins and minerals content.

2. Materials and Methods

2.1. Preparation Tissue material

Live specimens of Gastropods, *Babylonia zeylanica* were collected from Thengaithittu landing centre (Lat. 11.912º and Long. 79.821º) Puducherry Southeast Coast of India. Thengaithittu fishing harbor was the major mechanized fish landing centre which was situated about 5 km away from the wholesale market towards south from Puducherry. The landing center having with the Mechanised boats, gill-netters and catamarans mostly land their catches in the morning. The morning market at this landing centre functions from 6.00 a.m. to 10.00 a.m. The collected fresh molluscs were preserved with ice and transported to the laboratory and identified by the standard literature of Subba Rao (2003). The animals were carefully removed from the shells and washed with tap water followed by distilled water then allowed to dry in oven at 60 °C. The dried samples were subjected to biochemical estimation.

2.2. Proximate composition

The proximate compositions of the experimental samples were determined by using standard methods *viz*., protein (Lowry *et al*., 1951), carbohydrate (Dubois *et al*., 1956) and lipid (Folch *et al*., 1956). Estimation of Free Fatty acids was determined by using standard chemical titration method. The ash content was determined by incinerating/burning the pre-weighed test sample (1 g dry weight) in a muffle furnace at 560 °C (AOAC, 1995) for a period of 5 hours. The residue was weighed and the percentage was calculated.

2.3. Mineral estimation

The minerals were estimated by following the method of Guzman and Jimeneza (1992).

2.4. Vitamin estimation

The vitamins were estimated. Both the fat soluble vitamins A, D, E and K and the water soluble vitamins B1, B2, B6, B12 and C were analyzed in the HPLC (Merk Hitachi L-74000) following the method described by Sadasivam and Manickam (1996). The folic acid was estimated by following the calorimetric procedure of Sethi (1997). The pyridoxine, panthothenic acid and vitamin B12 were estimated by following methods suggested in USP NF 2000 Asian edition. All the above biochemical analyses were done in triplicate samples.

3. Results

3.1. Proximate composition

The percentage composition of total protein, carbohydrate, lipid, free fatty acids and ash in the dried body tissue of *Babylonia zeylanica* are presented (Fig -1). The total protein was found ranging between 40.33 and 42.05 % on Dry Weight Basis (DWB). Whereas, the total carbohydrate content was found varying from 16.02 to 18.15 % on DWB. The lipid content was ranging from 6.81 % to 8.17 % in head on DWB. Free fatty acids were found to be varying between 0.97 to 2.51 %. At the same time, ash content was ranging from 0.72 to 2.39 %. The results of the present study revealed that the protein composition was high, followed by carbohydrate and lipid.

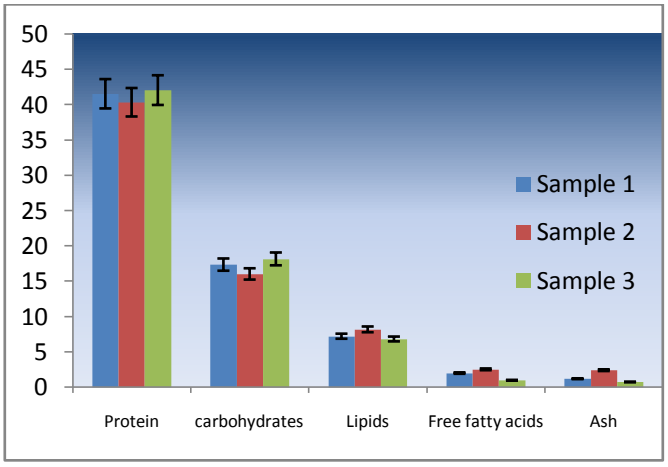

Figure – 1: Proximate composition of *Babylonia zeylanica* (%)

3.2. Vitamin estimation

The details of the vitamins detected in body tissue of *Babylonia zeylanica* are presented in Figure - 2. Among them, vitamin A (6.51mg/g) followed by vit-B_2 (4.12 mg/g) and vit-C (2.14 mg/g) were found in higher levels, whereas vitamin E and B_6 were noticed as lower levels in tissue (2.2 mg/g and 0.92mg/g).

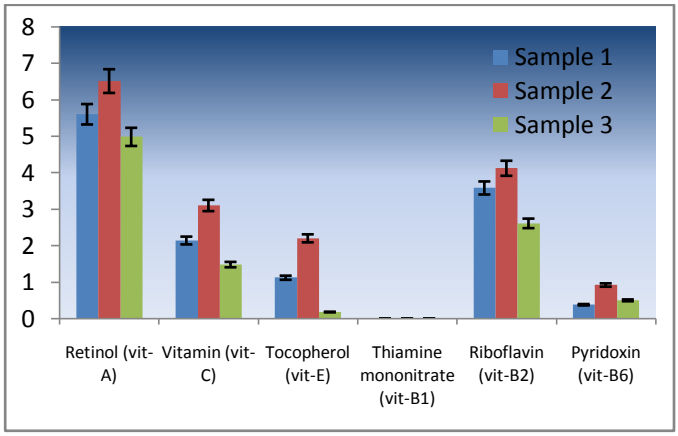

Figure – 2: Vitamin content of *Babylonia zeylanica* (mg/g)

3.3. Mineral estimation

The quantity of minerals was reported in the body tissue *Babylonia zeylanica* are given in Figure - 3. Totally, 3 minerals were detected. Among them, Calcium (5.09 mg/g) followed by Chloride (1.57 mg/g) and Magnesium (1.04 mg/g). Whereas, Ammonia was found absent totally.

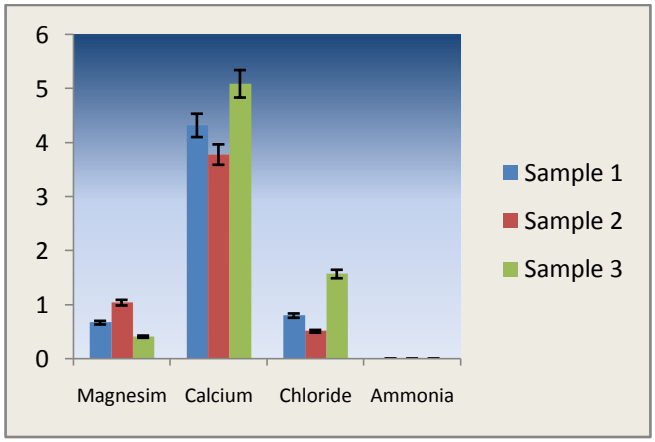

Figure - 3: Mineral content of *Babylonia zeylanica* (mg/g)

4. Discussion

Foods from the sea have for hundreds of years been a source of high quality protein. Biochemical studies are much more important from the nutritional point of view. The biochemical constituents in animals are known to vary with season, size of the animal, stage of maturity, temperature and availability of food etc. Biochemical components such as protein,

carbohydrates and lipids are essential for body growth and maintenance. Protein was essential for the sustenance of life and exists in largest quantity of all nutrients as a component of the human body (Okuzumi and Fujii, 2000).

The present study revealed that the maximum level of protein content was 41.53% *Babylonia zeylanica*. Similarly, in the mollusc - *Hemifusus pugilinus* was reported to contain a high amount of protein ranging from 40 to 78 % (Ananda Kumar *et al.,* 1986). Srilatha *et al.* (2013) reported the maximum level of protein content in *Meretrix casta* was found as 45.67 % and 39.58 %. Rajakumar (1995) observed that the *Rapana rapiformis* protein value to be 44.8 % in males and 46.1 % in females. Arularasan *et al.* (2010) reported that the protein ranged from 45.45 % to 67.88 % in males and 46.02 % to 72.36 % in females of *Strombus canarium.* Periyasamy *et al.* (2011) investigated that the maximum level of protein content in *Babylonia spirata* body tissue was 53.86 %. Babu *et al.* (2010) assessed the percentage of protein which was ranged from 19.25 to 27.9 % in the Mesogastropod, *Bursa spinosa.* The protein content of *Pythia plicata* varied from 29.80 % to 15.71 % was reported by Shanmugam *et al.* (2006). Arularasan (2009) contributed the percentage of protein ranged from 47.86 to 70.18 % in gastropod males and 49.64 to 72.21 % in females of *Strombus canarium.*

Carbohydrates are a group of organic compounds including sugars, starches and fiber.

It is the major source of energy for animals. In the present study, *Babylonia zeylanica* recorded the percentage of 17.34 % carbohydrates in the body tissue. Srilatha *et al.* (2013) reported the maximum level of carbohydrate content in *Meretrix casta* was 10.13 %. Thivakaran (1988) estimated maximum levels (5.31 %) of carbohydrate in *L. quadricentus* and (4.69 %) in *N. pyramidalis*. Shanmugam (1991) reported the carbohydrate in *Pythia plicata* values from 0.89 % to 3.04 %. In *Babylonia zeylanica,* generally the carbohydrate content was found to be high when compared to other molluscs.

The lipids are highly efficient as source of energy, in that they contain more than twice the energy of carbohydrate and proteins. In the present study, lipid content of tissue was 7.2 %. Srilatha *et al.* (2013) reported the maximum level of carbohydrate content in *Meretrix casta* as 1.34 & 2.11%. Rajakumar (1995) reported on lipid content in *R. rapiformis* range from 0.85 -2.12 % in male and 0.95 - 2.96 % in female. Nirmal (1995) found the highest level of lipid 10.38 % in *Babylonia zeylanica* and 1.97 % in *Pleuroploca trapezium* respectively.

Vitamins are organic chemical compounds essential for promoting growth, reproduction and maintenance of normal body health and function. Pigott and Tucker (1990) stated that the flesh of fish and shell fish flesh in nut considered to be important sources of vitamin A while high of at fishes and shell fish (e.g. eel, mackerel end bivalve) contain moderate amounts. In the present study, in *Babylonia zeylanica* body tissue showed the dominance of vitamin A, Vit-B_2 and vitamin C which constituted Vit-A - 5.6 %, Vit-B_2 - 3.58 % and Vit-C - 2.14 %. Ajayabhaskar (2002) estimated the vitamin level from three species of bivalve namely *P. viridis*, *C. madrasensis* and *M. casta* and found vitamin B1, B2 and B_6 as 0.11, 031 & 0.31 respectively. Shellfish covered in the present study showed a good vitamin profile as the levels required for good health.

Minerals are the chemical elements, which are involved in the building of organisms and are necessary for its proper functioning. Totally, 3 macro minerals in *Babylonia zeylanica* were detected. Among the macro minerals, calcium (4.32 %), Chloride (0.8 %) and Magnesium (0.67 %) were observed at higher and Ammonia at lower levels in body tissue, whereas other macro-minerals sodium and manganese were in negligible level. Coombs (1974) reported more than 40 % of soluble copper and zinc in the oyster *Ostrea edulis*. Lowe and Moore (1979) localized Zn and Fe in lysosomes of a number of cell types in *Mytilus edulis*. Rajagopal *et al.* (1993) explained the importance of Ca, Mg and K in the human nutrition. Devadas (1994) reported that sea foods in general are excellent sources of I, Ca, P, Na, Fe, Zn and oysters are good sources of Fe and Cu. Minerals in different species of pearl shells from South China Sea were rich, particularly in Ca, P and Zn contents (Laihao *et al*., 1999). Shellfish can absorb minerals directly from the

aquatic environment through gills and body surface. In the present study, tissue showed higher level of calcium and good source of minerals. The malnutrition problem in our country can be overcome by effective utilization of nutrient rich molluscan seafood.

5. Conclusion

In general, seafood is one of the most nutritionally balanced foods. The seafood diet

helps to control weight and goes a long way towards preventing heart diseases. Studies on amino and fatty acid composition of commercial seafood in India are limited. This might be due to lack of awareness on benefits of these nutrients particularly from shellfish tissue. The nutritional values of bivalve are not brought to the limelight so far, so consumption of these nutrient rich bivalves has not attracted attention. From the above observation, it was clear that the body tissue of in *Babylonia zeylanica* with rich nutritive value can be used for alternate source as a regular sea food which supplies nutrients for the growing children, pregnant women and people suffering from malnutrition. This clearly indicated that marine gastropod, *Babylonia zeylanica* tissue is value food due to high quality protein. The edible body tissue is thus, an excellent source of high protein, low – lipid content but enriched with essential vitamins and minerals. With respect to the above facts, it is clear that of *Babylonia zeylanica* can be taken regularly as animal protein supplement or nutritive seafood which supplies all vital nutrients for the growing children, pregnant women and people suffering from malnutrition.

6. References

1) Ajayabhaskar, D. 2002. Nutritional evaluation of molluscan sea food. Ph. D., Thesis, Annamalai University, India, Page: 129.

2) Ananda Kumar, S., Amutha Rani, G., Gladys Chandra Leela, A and Pragatheswaran, V. 1986. Biochemical studies on a little known marine gastropod *Hemifusus pugilinus* Born (Volemidae). *Journal of the Marine Biological Association of India*, 28: 1 - 2.

3) Appukuttan, K. K. 1996. Marine molluscs and their conservation. In: Marine Biodiversity Conservation and Management (Eds. N.G. Menon and C.S.G.Pillai) CMFRI, Cochin: 66-78.

4) Arularasan, S., Lyla, P.S., Kesavan, K and Ajmal Khan, S. 2010. Recieps for the Mesogastropod - *Strombus canarium. Advanced Journal of Food Science and Technology*, 2: 31 - 35.

5) Babu, A., Kesavan, K., Annadurai, D and Rajagopal, S. 2010. *Bursa spinosa* - A Mesogastropod Fit for Human Consumption. *Advanced Journal of Food Science and Technology*, 2(1): 79 - 83.

6) Coombs, T. L. 1974. The nature of zinc and copper complexes in the 545 oyster *Ostrea edulis*. 28: 1 – 10.

7) Dubois, S. 1898. Uber die Abhangigkeit des Higrnewitchtes von der Korpergross bei den Saugethieren. *Arch. F. Anthropol*., 25: 1 - 28.

8) Folch, J., Lees, M and Stanley, S. 1956. A simple method for the isolation and purification of total lipids from animal G.H. tissues. *Journal of Biology and Chemistry*, 226: 497 - 509.

9) Guzman, H. M and Jimenez, C. E. 1992. Contamination of coral reefs by heavy metals along the Caribbean coast of Central America (Costa Rica and Panama). *Marine Pollution Bulletin*, 24 (11): 554 – 561.

10) Laihao, L., Shigians, D., Peigily, C., Xiangiang, W., Yanyan, G and Maojiar, W. 1999. Evaluation on nutrition components of pearl shell meat. *Journal of Fish*, 23 (4): 392 - 397.

11) Lowe, D. M and Moore, M. N. 1979. The cytochemical distributions of zinc (Zn II) and iron (Fe III) in the common mussel, *Mytilus edulis*, and their relationship with lysosomes. *Journal of Marine Biology*, 59: 851 - 858.

12) Lowry, O. H., Rosebrough, A. L., Farr, L and R. J. Randall. 1951. Protein measurement with

the Folin-phenol reagent. *Journal of Biological Chemistry,* 193: 265 - 275.

13) Nagabhushanam, R and Mane, V. H. 1978. Seasonal variation in the biochemical composition of *Perna viridis* at Ratnagiri on the West Coast of India. *Hydrobiologia*, 57 (3): 69 - 72.

14) Nirmal, A. 1995. Biochemical studies on prosobranchian gastropods *Babylonia zeylanica* (Neogastropods: Buccinidae: Fasciolariidae), Tamil Nadu, India.

15) Okuzumi, M and Fujii, T. 2000. Nutritional and functional properties of squid and cuttlefish. 35th Anniversary of Commemorative Publication. 223pp.

16) Periyasamy, N., Srinivasan, M., Devanathan, K and Balakrishnan, S. 2011. Nutritional value of gastropod *Babylonia spirata* (Linnaeus, 1758) from Thazhanguda, Southeast coast of India. *Asian Pacific Journal of Tropical Biomedicine,* S249 - S252.

17) Pigott, G. M. and B.W. Tucker. 1990. Seafood - Effects of technology on nutrition. *Marcel Dekker*, Inc. New York and Basel. 2 – 33.

18) Rajagobal, S., Lyla, P. S and Ajmalkhan, S. 1993. Seafood - the nutritional insurance. *Seafood Experiment Journal*, 45 - 46.

19) Devadas, R. 1994. Foods of aquatic origin in human nutrition and their importance in the Indian context. Symposium on Nutrients and Bioactive Substances in Aquatic Organisms. Cochin, India, 16: 177 - 194.

20) Rajakumar, T. 1995. Studies on *Rapana rapiformis* (Born) from Parangipettai coastal water, India [Dissertation Tamil Nadu, India: Annamalai University 185].

21) Sadasivam, S and A. Manickam. 1996. Biochemical methods. II edition, New Age international (P) Ltd., Publisher, New Delhi, 179 - 186.

22) Sargent, J. R. 1995. Origins and function of egg lipids nutritional implications. In; Bromage. N. R. R. J. Roberts. (Eds)., Broodstock Management and Egg and Larval Activity. Black Well Sciences, 353 - 372.

23) Sethi, P. D. 1997. Quantitative analysis of drug in pharmacological formulations 3rd edition, 589 - 590.

24) Shanmugam, A. 1991. Variation in the major biochemical constituents in a salt marsh snail, *Pythia plicata* (Grey) in relation to its reproductive cycle, *Mahasagar*, 24 (2): 113 – 118.

25) Srilatha, G., Chamundeeswari, K., Ramamoorthy, K., Sankar, G and Varadharajan, D. 2013. Proximate, Amino Acid, Fatty Acid and Mineral Analysis of Clam, *Meretrix casta* (Chemnitz) from Cuddalore and Parangipettai Coast, South East Coast of India. *Journal of Marine Biology and Oceanography*, 2: 2.

26) Subba Rao, N. V. 2003. Indian sea shells (Part-1): Polyplacophora and Gastropoda. Records in Zoology Survey, India.

27) Thivakaran, G. A. 1988. Studies on littorinids *Littorina quadricentus* (Philippi) and *Nodilittorina pyramidalis* (Gastropoda: Prosobranchia) from Tranquebar rocky shore, South-east coast of India. Ph. D. thesis, Annamalai University, India, 179 pp.

28) Webster, P.C., 1984. Proceedings of the Reading University Conference on n-3 Fatty acids, Reading, England.