Original Research Paper

Volume - 15 | Issue - 05 | May - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Zoology

EFFECT OF COLD SHOCK ON NUTRITONAL PROFILE(PROTEIN, CARBOHYDRATE AND LIPID) OF MARINE SHRIMP FOUND IN THE LOCAL MARKET OF REMUNA, BALASORE

Nibedita Mohapatra* P. G. Department of Zoology, Akir Mohan University, Nuapadhi, Balasore, Odisha, 756019 India. *Corresponding Author

Bhagyashree Padhiary P. G. Department of Zoology, Fakir Mohan University, Nuapadhi, Balasore, Odisha, 756019 India

ABSTRACT Fish sample were collected from local market of Remuna, Balasore, Odisha and a total 5 different species (n>10) of fishes were collected randomly namely, *Macrobarchium rosenbergii*, *Penaeus indicus*, *Penaeus monodon*, *Penaeus merguiensis* and *Nematopalaemon tenuipes* and prepared for laboratory analysis. Result shows that protein content is highest in *P. indicus* with 0.59 mg/g tissue weight (59%) as compared to others, while carbohydrate content is highest in *P. merguiensis* having 0.0034 mg/g tissue weight (0.34%). In case of lipid the content is maximum in *P. indicus* containing 0.038 mg/g tissue weight (3.8%). It is further concluded that with freezing at particular day interval in a month that is at 7 th, 14 th, 21th and 30 th day the content of carbohydrate, lipid and protein are relatively low as compared to the fresh ones. It doesn't follow a trend but varies with the individual. The purpose of this project is to find out and compare the nutritional composition of the commercially available shrimps and prawns and study the effect of cold shock (freezing) on its nutrient content. Based on the results, it can be said that the shrimps are highly nutritious in nature with high protein content, and are a healthy choice of food to be consumed by people worldwide.

KEYWORDS : shrimps, cold shock, protein, carbohydrate, lipid

INTRODUCTION

Aquatic foods like fishes, crabs, shrimps along with some species of molluscs like octopus etc are consumed in different parts of the world. (Islam *et al.,* 2017). Consuming prawn and shrimps can help to lead a healthy life by ensuring proper metabolism. Also, it helps in reducing the chances of heart diseases and increases the longevity of life. So, overall, it has significant impact on human body. However, food with a lower ratio of PUFAs/SFAs is usually taken as inappropriate for human consumption, as it may result in an increased risk of high blood cholesterol level (Sreelakshmy *et al.,* 2024). The Indian decapod crustaceans revealed that 117 species of prawns live in marine areas that are subject to commercial fishing, and there are now 122 penacoid species present in Indian waters, accounting for 34.9% of world 's species diversity (Jayalaxmi & Santhanam; 2013). The reported global production of aquaculture and fisheries in 2020 was 2.14 billion metric tons. Nevertheless, the COVID-19 restrictions, the catches of lobsters, tuna, shrimp, and cephalopods persisted at their peak levels in comparison to the capture fisheries in the year 2020 (FAO, 2020 and FAO, 2022). According to Silva and his colleagues, shrimp residues hold significant potential for utilization in the food industry to recover bioactive compounds and add value. They have significant importance due to their unique nutritional composition, which varies greatly from species to species (Jawahar and Shankar,2023; Ibrahim,2023) Fresh and clean shrimps can be served either cooked or uncooked with sauce. From a nutritional standpoint, shrimps are high in protein, low in saturated fat4 and calories, and have a neutral flavour. Due to these characteristics, shrimps form a natural additive in salads, pastas, curry, soups and stir-fried dishes. Shrimps have also been identified as a rich source of vitamin B12, selenium, ω-3 highly unsaturated fatty acids (HUFA) and astaxanthin, a potent natural antioxidant (Venugopal, 2009). Despite the several nutritional parameters of shrimp based on which it can be considered as a healthy food, there is reluctance among dieticians and health professionals as well as consumers because of its relatively higher cholesterol (Rabinson, 2009: Assamann, 1999).

MATERIALS AND METHODS

Collection And Preparation Of Sample:

The samples of 5 different species (n>10) were collected from the local market of Remuna namely, *Macrobarchium rosenbergii, Penaeus indicus, Penaeus monodon, Penaeus merguiensis* and *Nematopalaemon tenuipes* were collected and prepared for biochemical assay in the laboratory. Muscles of the shrimps were dissected using blades and scissors. About 10% homogenate prepare with distilled water. The supernatant of the tissues was collected after centrifugation at about 4000 RPM for 10 minutes. The above process of supernatant extraction of preserved fishes were continued to be done at an interval of every 7 days for 28 days.

Methods

The three essential food value parameters which is the basis or in other words the backbone of nutrition are proteins, lipids and carbohydrates were estimated by Lowry *et al*., (1951), Folch *et al*., (1957) and Anthrone method accordingly.

RESULT

The present investigation illustrated that the protein content is highest in *Penaeus indicus* with 59.4 %, followed by *N. tenuipes* (55.4 %), *P. merguiensis* (47.6 %), *P. monodon (*44.2 %) and lowest in *M. rosenbergii (*38.2 %). It is observed that on freezing, the protein content gradually decreases. It shows a significant deterioration in protein level observed in a month which is seen in fig 1. The lipid content was low as compared to protein. The highest lipid content is seen in *P. indicus* (3. 82 %), followed *by P. merguiensis* and *N. tenuipes* (3.55 %), *M. rosenbergii* (3.08 %) and lowest *in P. monodon* (1.98 %). It is also observed that with subsequent freezing effect at specific days, the lipid content shows a declining pattern which can be clearly seen in fig 2. carbohydrate content was highest in *P. merguinesis* (0.34 %), then *M. rosenbergii* (0.27 %), *P. indicus* (0.16 %), *P. monodo* (0.15 %) and lowest in *N. tenuipes* (0.13 %). Corresponding graph (fig 3) shows the decline in carbohydrate content due to effect of cold shock(freezing).

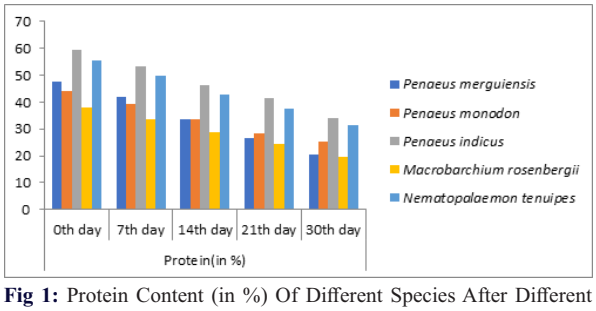

Fig 1: Protein Content (in %) Of Different Species After Different Days Interval

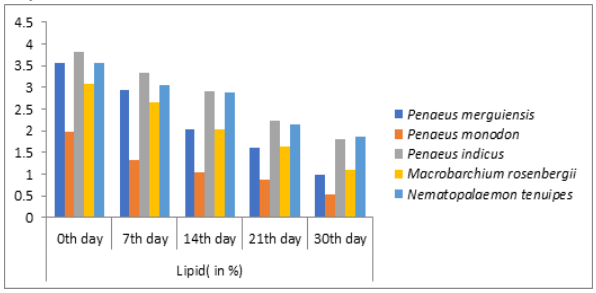

Fig 2: Lipid Content (in %) Of Different Species After Different Days Interval

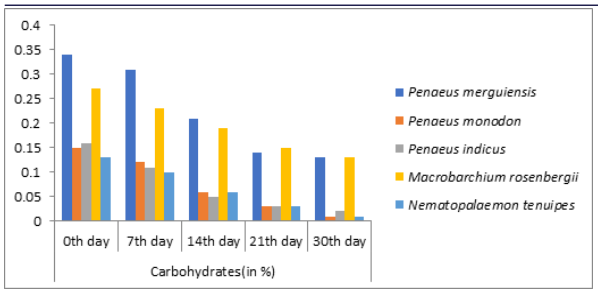

Fig 3: Carbohydrate Content (in %) Of Different Species After Different Days Interval

DISCUSSION

Fish vary greatly in their proximate makeup between species and even among individuals of the same species (Stansby, 1962). Individual differences are typically found to be correlated with variables including hydrologic level, sex, reproductive cycle, capture period, and food availability. Prawn composition varies due to variations in the feed that is supplied to different farms (Habashy, 2009). Protein is necessary for bodily tissue formation, maintenance, and normal function. Its contents are seen to be a valuable resource for assessing physiological norms (Diana,1982). The reason can be the lipolysis or lipid hydrolysis in the samples. Carbohydrates are believed to be utilized first among the organic nutrients in order to generate the required energy (Heath, 1987). Here it is observed that the protein, lipid and carbohydrate decreased after 7^{th},14^{th},21^{th} and 30^{th} respectively when they are treated with freezing.

CONCLUSION

Shrimps are a good source of protein followed by lipid and carbohydrates. It acts as a highly nutritious source for common people and is affordable by all. It helps in eradicating hunger and malnutrition. In terms of value, shrimp is currently the most significant fishery commodity that is traded globally. It was observed from the comparative nutritional profile (protein, lipid and carbohydrate) of the samples on different day interval (0^{th} day, 7^{th} day, 14^{th} day, 21^{st} day and 30^{th} day) that this has high nutritional value. Balasore uses a variety of fish aquaculture techniques to contribute significantly to the economic growth of India; among these is the cultivation of prawns. The market demand, prices, export/import laws, and productive costs are some of the factors that affect prawn culture's sustainability and profitability. So, it provides huge employment opportunities and has significant increase in national income.

REFERENCES

1. Assmann, G. *et al.,* (**1999**). Coronary heart disease: reducing the risk: a worldwide view. Circulation, 100, 1930–1938; doi: 10.1161/01.CIR.100.18.1930.
2. Carney, C., Is shrimp high in cholesterol; http://www.ehow.com/facts_5474631_shrimp-high-cholesterol.html
3. Diana JS (**1982**). An experimental analysis of the metabolic rate and food utilization of northern pike. Comp. Biochem. Toxicol. 59:989-993.
4. FAO. The State of World Fisheries and Aquaculture (SOFIA) (**2020**). *Sustain. Action Rome*. 2020, 1–225. Published online . DOI: 10.4060/ca9229en.
5. FAO. The State of World Fisheries and Aquaculture (SOFIA) (**2022**). *Towar*. Blue TranFsform. Rome. Published online 2022, 1–267. DOI: 10.4060/cc0461en.
6. Folch J., Less M., Sloane G.W.S., (**1957**). "A simple method for the isolation and purification of total lipids from animal tissue". J. Biol. Chem, 226:497 5.
7. Habashy M.M. (**2009**). Growth and body composition of juvenile freshwater prawn, *Macrobrachium rosenbergii*, fed different dietary protein/starch ratios. National Institute of Oceanography and Fisheries, Fish Research Station, El-Qanatar El-Khairya, Cairo, Egypt.
8. Heath AG (**1987**). Water pollution and fish physiology. In Physiological Energetic. Ed. Boca Raton, FL: 131-163, CRC Press, USA.
9. Ibrahim, N.K. **(2023).** Comparative study on the nutritional value of some penaeid shrimps from the Western Mediterranean coast of Egypt. *Alfarama J. Bas. Appl. Sci.* , *4*, 391–403.
10. Jawahar, L.S.; Sankar, T.V. **(2023)** Comparative Study of Biochemical Composition and Nutrient Profile of Four Species of Penaeid Shrimps. *Fishery Technol.* , *60*, 2582–2632.
11. Lowry O.H., Rosenbrough, N.J., Farr AL, Randall RJ. **(1951)** "Protein measurement with the folin Phenol reagent". J Biol. Chem,:193:265-275.
12. Robinson, C. H., **(1954).**The low cholesterol, low fat diet. Am. J. Clin. Nutr.,2, 353–355.
13. Silva, D. M. L. E.; Damasceno, K. S. F. S. C.; Ribeiro, P. P. C.; Alcântra, M.; Cordeiro, A.; Passos, T. **(2021**). Chemical Characteristics and Antioxidant Activity of Astaxanthin Extracted from Shrimp Residues Using Soybean Oil. *J. Braz. Chem. Soc*. 32(6), 1277–1285. DOI: 10.21577/0103-5053.20210030.
14. Sreelakshmy, S., Chakraborty, R.D.; Chakraborty, K.; Dhara, S. **(2024).** Biochemical analysis and nutritional profile of *Plesionika semilaevis*, a deep-sea shrimp from the Arabian Sea. *J. Food Compos. Anal.* , *128*, 106034.
15. Stansby, M.E. **(1962**). Proximate composition of fish. In Fish in nutrition. Ed. Heen, E and Kreuzer, R : 55-60, Fishing News (Books) Ltd, London.
16. Sriket, S., Benjakul, P., Visessanguan, W., Kijroongrojana, K. (**2007**). Comparative studies on chemical composition and thermal properties of black tiger shrimp (*Penaeus monodon*) and white shrimp (*Penaeus vannamei)* meats. Food Chem. 103:1199-1207.
17. Tanuja, R. (**1996**). Some aspects of biology and utilization of the mantis shrimp Oratosquilla neppa from Cochin waters. Ph.D. Thesis, Cochin University of Science and technology, India. P. 87.
18. Usydus, Z., Richert, S.J., Adamczyk, M., Szatkowska, U. (**2011**). Marine and farmed fish in the Polish market: Comparison of the nutritional value. Food Chem. ; 126:78-84.
19. Venugopal, V. (ed.) (**2009**), In Marine Products for Healthcare: Functional and Bioactive Nutraceutical Compounds from the Ocean, CRC Press, London, , pp. 221–239.
20. Yanar, Y., Celik, M. (**2006**). Seasonal amino acid profiles and mineral content of green tiger shrimp (*Penaus semisulcatus,* De Haan, 1844) and speckled shrimp (*Metapenaus monoceros*, Fabricus 1789) from the Eastern Mediterranean sea. Food Chem. 94:33-36