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BIOCHEMICAL STUDIES ON THE FRESHWATER BIVALVE MUSSEL *PARREYSIA CYLINDRICA*

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ABSTRACT

Biochemical composition of the different body tissues taken from the freshwater bivalve mussel *Parreysia cylindrica* collected from the Girna river of Maharashtra was found out. A comparative analysis of the biochemical contents was carried out on seasonal basis. Overall results highlight that the mussel under the investigation is nutritionally rich and can be used as food or feed.

KEYWORDS: freshwater mussel, *Parreysia cylindrica*, biochemical studies, Maharashtra.

INTRODUCTION

India has a rich diversity of shellfish such as oysters, clams, and mussels in both marine and freshwater bodies. In India, marine species make up majority of food item and the consumption of freshwater mussels is generally avoided. Even though, there are more than 52 different species of freshwater mussels in our country[1], they continue to remain neglected and not preferred as a food item. So as the world continues to find more energy rich food sources, there lies an urgent need to explore the nutritional richness of such neglected resources and create an awareness in the society.

Parreysia cylindrica (Phylum: Mollusca, Class: Bivalvia, Order: Unionida, Family: Unionidae) is a bivalve mussel that was known to be endemic to the freshwater bodies of the Maharashtra state, India. There is not much information about its exact distribution and population status in the state as well as in India.[2] Recently, Padidela and Thummala reported its presence in the state of Telngana.[3] There are very few scientific reports available on this

species and recent studies have been mainly focused on studying its toxicological aspects[4,5] and analgesic and wound healing activities.[6] Although, a couple of biochemical studies have been carried out on the animal under study in the past, a thorough tissue wise and season wise investigation is unavailable in recent years, perhaps owing to the difficulty in finding these mussels. In view of this, the present study was undertaken to investigate the nutritional richness of *P. cylindrica* by studying biochemical composition of its different body parts so as to make people aware about its nutritive value.

MATERIALS AND METHODS

Samples of *P. cylindrica* were collected from Girna river near Chalisgaon, Jalgaon District, Maharashtra state. 50 healthy samples were hand collected for biochemical studies. They were transported alive to the laboratory in Mumbai, cleaned and then the animals were maintained in glass aquarium tanks for 24 hr to acclimatize them before the analysis. After opening the shells, different tissues such as gonads, mantle, foot, adductor muscles and gills were carefully dissected out and accurately weighed on a digital balance.

Biochemical estimation of different body parts was carried out thrice in the year in three different seasons using standard protocols and following the methodology by Maurya *et al*.,[7] Readings taken in April, August and December represented the seasons Summer, Monsoon and Winter respectively. Protein content was estimated according the method described by Lowry *et al*.,[8] Glycogen was estimated using anthrone reagent on dry weight basis following the method of Zwaan and Zandee.[9] The final glycogen value was found out by multiplying glucose value by 0.927.[10] Lipid was estimated by sulphophosphovanillin method using Cholesterol as a standard.[11] Free amino acids were estimated using ninhydrin reagent whereas the total Nitrogen content was estimated using micro-kjeldahl apparatus on wet weight basis.

RESULTS AND DISCUSSION

Results for biochemical studies in *P. cylindrica* indicated that different tissues were found to have different concentrations of bioconstituents and these concentrations vary seasonally.

Total Protein content

Results clearly indicated that *P. cylindrica* could be a good protein source. Foot of the mussel was found to contain the maximum protein concentration of 64.84% in the summer season whereas the lowest reading of 40.09% was recorded from the mantle tissue in monsoon

(Table 1 and Fig. 1). Results are on similar lines with those reported by Patil [4] and Tambe [5] who observed the protein concentration in different tissues of *P. cylindrica* to vary from 44.8 to 54.15%. Mean protein concentration in different tissues under study was recorded in the following order- Foot > Gills > Gonads > Adductor muscle > Mantle. Highest protein content was seen in summer (pre- monsoon) season while least was seen in monsoon with intermediate values in winter (post-monsoon) season which suggest the appropriate season for the mussel harvest to be used a protein rich food. Such a trend of seasonal variation in protein was also reported in *P. cylindrica* by Padidela and Thummala.[3]

Table 1: Seasonal variation in total protein content in different body parts of *P. cylindrica.*

Tissue	Summer	Monsoon	Winter
Mantle	46.03	40.09	44.45
Foot	64.84	60.92	63.19
Adductor muscle	48.11	43.25	45.81
Gonads	50.39	47.77	50.03
Gills	56.71	51.87	52.83

Glycogen content

Since glycogen is considered as the best suitable storage product in invertebrates as well as in vertebrates, studying its content in the tissues of any animal is very important. Foot of the mussel was found to contain the maximum glycogen concentration of 32.46% in the summer season whereas the lowest reading of 21.44% was recorded from the gonadal tissue in monsoon (Table 2 and Fig. 2). Following order was observed for tissue wise glycogen concentration – Foot > Mantle > Gills > Adductor muscle > Gonads. So results of the present study indicate that *P. cylindrica* has a higher glycogen content than other freshwater mussels from Maharashtra such as *Corbicula regularis* (around 20%) and *Lamellidens corrianus* (around 29%) on dry weight basis as reported by Mudkhede [12] and Yusufzai [13] but slightly lower glycogen content than *Parreysia favidens* (around 35%) as reported by Shandilya *et al.*[14]

Like protein content, the glycogen content was also found to fluctuate seasonally. Maximum concentration was observed in summer, intermediate values in post - monsoon or winter months whereas lowest concentration was observed in monsoon season. Seasonal changes in the glycogen content have been attributed to spawning and gametogenesis and are known to

reach its peak in the summer season. Similar observations have been made in the present study and also by Maurya *et al*., [7] in freshwater mussel *P. corrugata*.

Table 2: Seasonal variation in total glycogen content in different body parts of *P. cylindrica.*

Tissue	Summer	Monsoon	Winter
Mantle	32.09	23.91	28.91
Foot	32.46	24.73	29.35
Adductor muscle	31.87	22.29	27.94
Gonads	30.95	21.44	27.03
Gills	32.28	23.87	28.79

Lipid content

Concentration of lipid in different tissues of *P. cylindrica* indicated that gonadal tissue had maximum amount (6.36%) in summer (April) while lowest amount of 3.88% was estimated in mantle tissue in the month of December (winter/pre-summer) (Table 3 and Fig. 3). Padidela and Thummala (2015) reported lipid content in the whole body meat of *P .cylindrica* as 6.63 and 5.34%.[3] However, researchers did not report tissue wise variations in lipid concentrations but overall results are in agreement. Average lipid content in different tissues was found to vary in the following order- Gonads > Foot > Gills > Adductor muscle > Mantle. Highest lipid concentration for all the tissues was recorded in the summer season whereas lowest was in the winter season. Intermediate values were seen in monsoon. In the present study, the highest lipid content was found in gonadal mass in the month of April which is in accordance with Jadhav and Lomte[10], Thorat[15], Upadhye[16] and Maurya *et al*.,[7] who also reported that the lipid content in different freshwater mussels was on the higher side during the period of gonadal development and low during spawning period, indicating that the lipids get accumulated in the developing gonads.

Table 3: Seasonal variation in total lipid content in different body parts of *P. cylindrica.*

Tissue	Summer	Monsoon	Winter
Mantle	4.96	4.23	3.88
Foot	6.19	5.97	5.25
Adductor muscle	5.70	5.13	4.69
Gonads	6.36	6.29	5.67
Gills	5.82	5.41	4.83

Total Free Amino Acids content

In *P. cylindrica*, highest concentration of free amino acids as 0.52 was recorded in gonadal tissue in summer while lowest concentration of 0.24 was recorded from mantle tissue in

winter (Table 4 and Fig. 4). Average content of total free amino acids was found to vary in the following order- Gonads > Adductor muscle > Foot > Gills > Mantle. So overall results suggest that the mussel tissue can be a good source of free amino acids. Karadkhele[17] and Upadhye[16] have also made similar observations in the freshwater mussel *P. corrugata*.

Table 4: Seasonal variation in total free amino acids in different body parts of *P. cylindrica.*

Tissue	Summer	Monsoon	Winter
Mantle	0.31	0.26	0.24
Foot	0.47	0.32	0.31
Adductor muscle	0.49	0.37	0.34
Gonads	0.52	0.41	0.35
Gills	0.42	0.30	0.27

Total Nitrogen content

In case of total nitrogen content, the gonadal tissue was found to contain maximum concentration of 13.23% in winter while the lowest amount of 7.22% was observed in the mantle tissue in monsoon (Table 5 and Fig. 5). Mean protein concentration in different tissues under study was recorded in the following order- Gonads > Adductor muscle > Gills > Foot > Mantle. The highest amount was seen in winter season in the month of December while least was seen in monsoon with intermediate values in summer months. It is suggested that the maximum values of total nitrogen indicate maturity whereas the decreased values coincide with the spawning of mussels. Similar observations were also made by Karadkhele[17] and Padidela and Thummala.[3]

Table 5: Seasonal variation in total nitrogen content in different body parts of *P. cylindrica.*

Tissue	Summer	Monsoon	Winter
Mantle	8.65	7.22	10.36
Foot	10.44	7.95	11.41
Adductor muscle	11.29	9.57	12.95
Gonads	11.82	10.86	13.23
Gills	10.87	8.21	12.72

Fig. 1: Seasonal variation in total protein content in different body parts of *Parreysia cylindrica.*

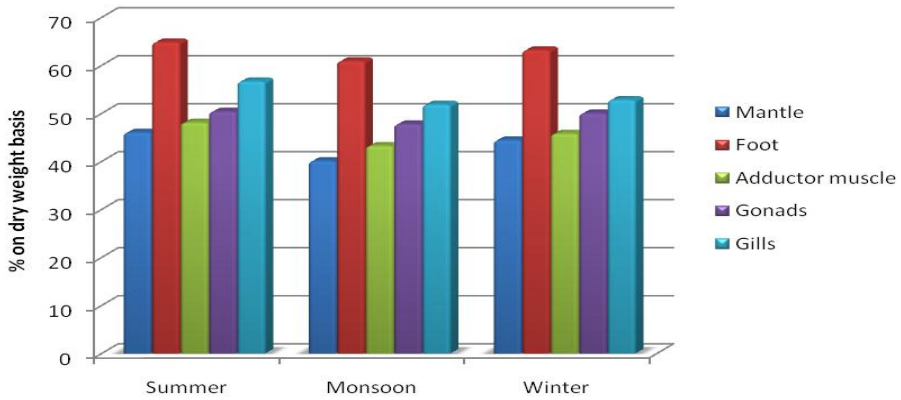


Fig. 2: Seasonal variation in glycogen content in different body parts of *P. cylindrica.*

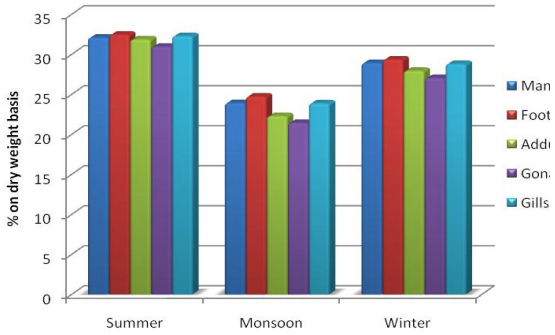


Fig. 3: Seasonal variation in lipid content in different body parts of *P. cylindrica.*

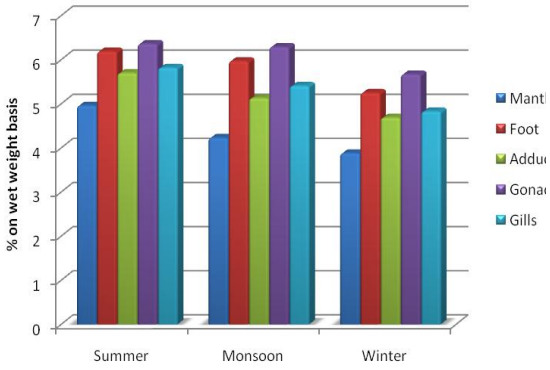


Fig. 4: Seasonal variation in free amino acid content in different body parts of *P. cylindrica.*

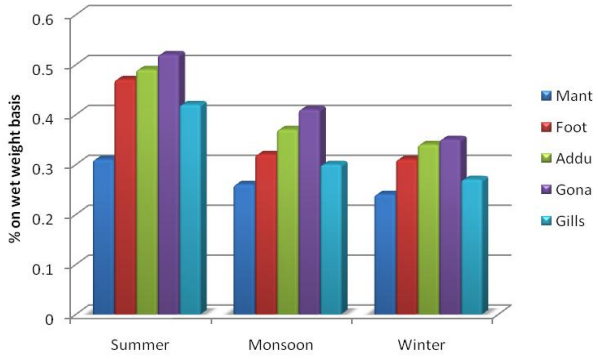
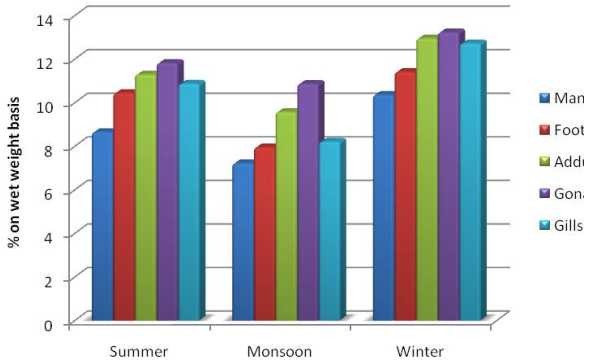


Fig. 5: Seasonal variation in total nitrogen content in different body parts of *P. cylindrica.*



CONCLUSION

Based on the results of the present investigation, we can conclude about the nutritional richness of *P. cylindrica*. Therefore it is suggested that the animal can be used as a protein rich food, as an animal feed and also for feeding aquaculture fish or even as a fertilizer for improving the soil fertility. However, one has to understand that as these animals are filter feeders, they can accumulate pathogens in their tissues. Therefore, it is recommended that such mussels should only be consumed after pathological studies of their soft body mass.

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REFERENCES

1. Subba Rao NV. Handbook of freshwater molluscs of India. Zoological Survey of India, Kolkata, India, 1989; 1-289.
2. Bogan AE, Madhyastha A, Köhler F, Rintelen T. The IUCN Red List of Threatened Species., 2011; e.T173039A6962310.
3. Padidela S, Thummala RR. World Journal of Pharmacy and Pharmaceutical Sciences, 2015; 4(4): 1388-1401.
4. Patil AG. Rec. Res. Sci. Tech., 2011; 3(3): 140-142.
5. Tambe RS. Indian Journal of Applied Research, 2014; 4(10):595-597.
6. Swapna P. Indian Journal of Applied Research, 2015; 5(6): 443- 445.
7. Maurya CB, Magare VN, Kulkarnii CK. Int. J. Pure App. Biosci., 2015; 3(4): 265-270.
8. Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. J. Biol. Chem., 1951; 193: 265-275.
9. Zwaan A de, Zandee DY. Comp. Biochem. Physiol., 1972; 43A: 53-58.
10. Jadhav ML, Lomte VS. Rivista Idrobiologia, 1982; 21: 1-3.
11. Barnes H, Blackstock J. Journal of Experimental Marine Bioloy and Ecology, 1973; 12: 103-118.
12. Mudkhede LM. Some biological aspects of the clam, *Corbicula regularis*. Ph. D. Thesis, 1974; Marathwada University, Aurangabad.
13. Yusufzai S. Effect of diets on *Lamellidens corrianus* (Lea, 1834) and some spects of pearl culture in captivity. Ph. D. thesis, 2005; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.
14. Shandilya MV, Lomate VS, Patel SI. Bionano Frontier, 2010; 3(2): 201-204.
15. Thorat DH. Reproductive Physiology of the Freshwater Bivalve, *Parreysia corrugata* Ph. D. Thesis, 1990; Marathwada University, Aurangabad.
16. Upadhye MV. Study of the biology and genetic diversity of pearl producing freshwater bivalve *Parreysia corrugata* (Muller) of Maharashtra. Ph. D. thesis, 2010; University of Mumbai.
17. Karadkhele SV. Studies on Nitrogenous constituents and Nitrogen metabolism in freshwater bivalves. Ph. D. thesis, Swami Ramanananda Teertha Marathwada University, Nanded., 2002.