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Research Article

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Biochemical Studies to investigate the nutritional content of the freshwater mussel *Parreysia corrugata*

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ABSTRACT

The present work highlights the biochemical composition of the different body tissues taken from the freshwater bivalve mussel Parreysia corrugata collected from the Godavari river, Nanded district, Maharashtra. The study was carried out in three different seasons for a comparative analysis. Overall results support the nutritional richness of the study animal.

Key words: *freshwater mussel, Parreysia corrugata, biochemical studies, nutrition*

INTRODUCTION

Bivalves (shellfish) from marine and freshwater bodies are regularly consumed as food in a number of countries in the world and for their continuous production and supply, their aquaculture has emerged as a highly productive industry in a number of East Asian, European and American countries.

In India, however, only a few species of marine clams and oysters are preferred as a food item and practice of consumption of freshwater mussels is quite uncommon. In spite being widespread in our country, it is generally observed that freshwater mussels are eaten by people from economically lower classes. A possible reason for this could be that people are not aware of the fact that these mussels can be consumed and they are rich in terms of nutritional content[1].

Parreysia corrugata is a bivalve widely distributed in freshwater bodies of Indian sub-continent. In India, *P. corrugata* is known to be present in states like Punjab, Bihar, Madhya Pradesh, Orissa, Karnataka and Maharashtra. This species is reported to be medicinally important[2] and used by aboriginal people to control blood pressure[3]. It is also used in cement, lime, button, toys and cosmetic industries. In certain parts of the country, it is consumed as food by poor people. Recently, successful pearl production has been reported using this species in the state of Orissa[4].

A perusal of literature indicates that there are several reports available on biochemical studies on marine and freshwater bivalves[5,6,7]. However, there are only a couple of recent reports available which support the nutritional richness of *P. corrugata*[8,1]. So the present investigation was carried out to investigate the biochemical composition of different body parts of *P. corrugata* so as to make people aware about its nutritive value.

MATERIALS AND METHODS

Samples of *P. corrugata* were collected from Godavari river near the city of Nanded, Maharashtra state. 40 samples having a shell length ranging from 30-40 mm 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 precision balance.

Biochemical estimation of different body parts was carried out thrice in the year in three different seasons using standard protocols. Protein content was estimated according the method described by Lowry *et al*.,[9]. Glycogen was estimated using anthrone reagent following the method of Zwaan and Zandee[10]. Glycogen content was found out by multiplying glucose value by 0.927[11]. Lipid was estimated by sulphophosphovanillin method using Cholesterol as a standard[12]. Free amino acids were estimated using ninhydrin reagent whereas the total Nitrogen content was estimated using micro-kjeldahl apparatus.

RESULTS AND DISCUSSION

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

Total Protein content

In case of total protein content, highest concentration of 20.421 was recorded in the gonadal tissue in the month of April (pre-monsoon/summer) while lowest reading of 15.479 was recorded from the mantle tissue in the month of August (monsoon season) (Table 1 and Fig. 1). Mean protein concentration in different tissues under study was recorded in the following order- Gonads > Adductor muscle > Gills > Foot > Mantle. Highest amount was seen in summer season while least was seen in monsoon with intermediate values in winter (post-monsoon) months. So overall results are on similar lines as reported by Karadkhele[8] and Upadhye[1] who also suggested that this mussel is good source of protein. Results are also in agreement with those made by Nagabhushanam and Mane[13] who reported that the protein content in the whole body of bivalve mussels showed correlation with the reproductive state of the mussels and concluded that when the gonads were fully mature, the protein level was at maximum and it declined during spawning.

Glycogen content

Glycogen is known to be the best suitable storage product in invertebrates as well as in vertebrates. Estimation of glycogen content in different tissues showed that its maximum amount was seen in foot tissue in April (7.779%) while least amount was recorded in adductor muscle in August (3.993%) (Table 2 and Fig. 2). Following order was observed for tissue wise glycogen concentration – Foot > Mantle > Gills > Gonads > Adductor muscle. Mudkhede[14] reported maximum amount of glycogen in freshwater mussel, *Corbicula regularis* to be 19.7% of dry weight whereas Yusufzai[5] reported that the glycogen content in the whole body tissues of freshwater mussel *L. corrianus* was found to vary from 20.21-29.36% on dry weight basis. Compared to these, *P. corrugata* was found to contain lower concentrations of glycogen when calculated on wet weight basis. Glycogen content was 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.

Lipid content

Concentration of lipid in different tissues of *P. corrugata* indicated that gonadal tissue had maximum amount (8.672) in summer (April) while lowest amount of 3.242 was estimated in mantle tissue in the month of December (winter/pre-summer) (Table 3 and Fig. 3). 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 month of April (pre-monsoon) whereas lowest was in the month of December (winter). Intermediate values were seen in monsoon months. 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[11] and Thorat[15] who also reported that the lipid content was high during the period of gonad development and low during spawning period, indicating that the lipids were accumulated in the developing gonads.

Total Free Amino Acids content

In case of content of total free amino acids, highest concentration of 0.697 was recorded in gonadal tissue in December (winter/post monsoon) while lowest concentration of 0.385 was recorded from mantle tissue in August (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. Maximum content in the majority of tissues was recorded in April which decreased and reached lowest value in monsoon. The values then again increased in December. Results are significantly higher than those reported by Karadkhele[8] who reported that the free amino acid content in *P. corrugata* was 0.26-0.361 % on wet weight basis in different tissues but almost on similar lines to Upadhye[1].

Total Nitrogen content

Gonadal tissue was found to contain maximum amount (14.321) of total nitrogen in December while the lowest amount of 6.162 was observed in mantle tissue in August (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. The peak values coincide with maturity whereas the decreased values coincide with the spawning activity[5,16].

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

Tissue	April	August	December
Mantle	16.292	15.479	15.877
Foot	16.516	16.234	16.723
Adductor muscle	19.442	18.132	18.694
Gonads	20.421	18.692	18.993
Gills	16.789	16.199	15.926

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

Tissue	April	August	December
Mantle	7.424	4.741	6.424
Foot	7.779	5.397	6.428
Adductor muscle	6.641	3.993	4.493
Gonads	6.722	4.269	4.729
Gills	7.192	4.939	5.252

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

Tissue	April	August	December
Mantle	3.788	3.777	3.242
Foot	7.462	6.243	5.914
Adductor muscle	4.141	3.829	3.577
Gonads	8.672	8.101	6.892
Gills	4.450	3.984	4.156

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

Tissue	April	August	December
Mantle	0.421	0.385	0.409
Foot	0.598	0.562	0.613
Adductor muscle	0.650	0.617	0.642
Gonads	0.684	0.638	0.697
Gills	0.576	0.520	0.548

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

Tissue	April	August	December
Mantle	7.432	6.162	9.769
Foot	9.390	7.817	11.256
Adductor muscle	11.893	9.478	13.865
Gonads	12.616	10.996	14.321
Gills	9.712	8.366	11.034

Fig. 1 Seasonal variation in total protein content in different body parts of *P. corrugata*

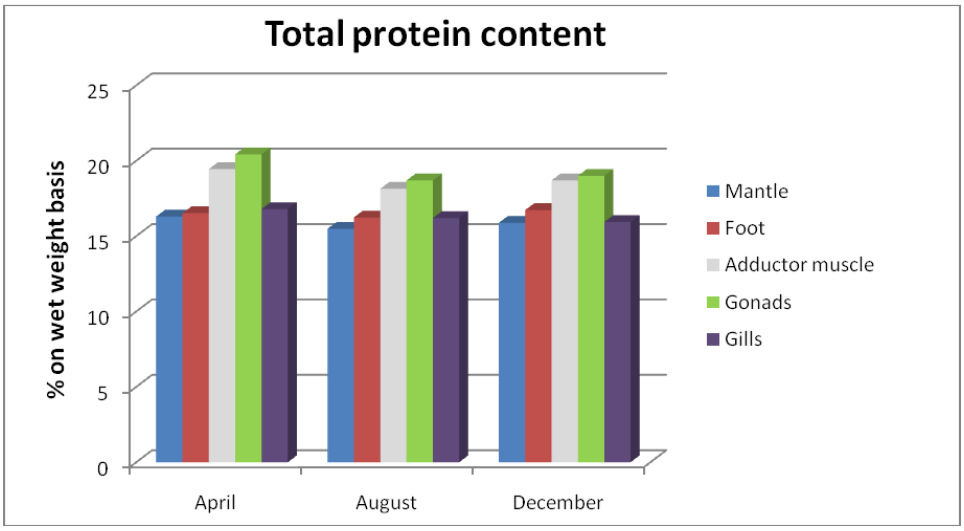


Fig. 2 Seasonal variation in total glycogen content in different body parts of *P. corrugata*

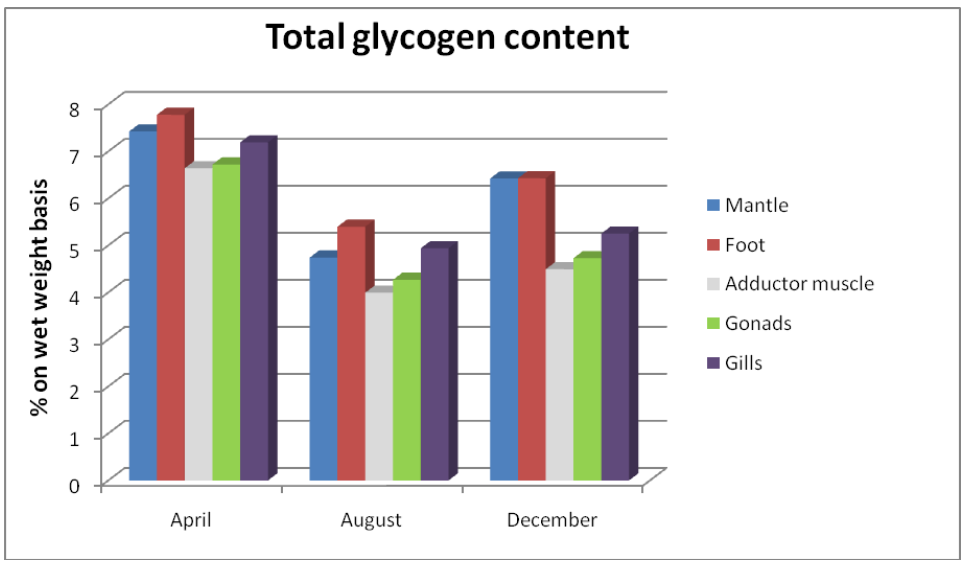


Fig. 3 Seasonal variation in total lipids content in different body parts of *P. corrugata*

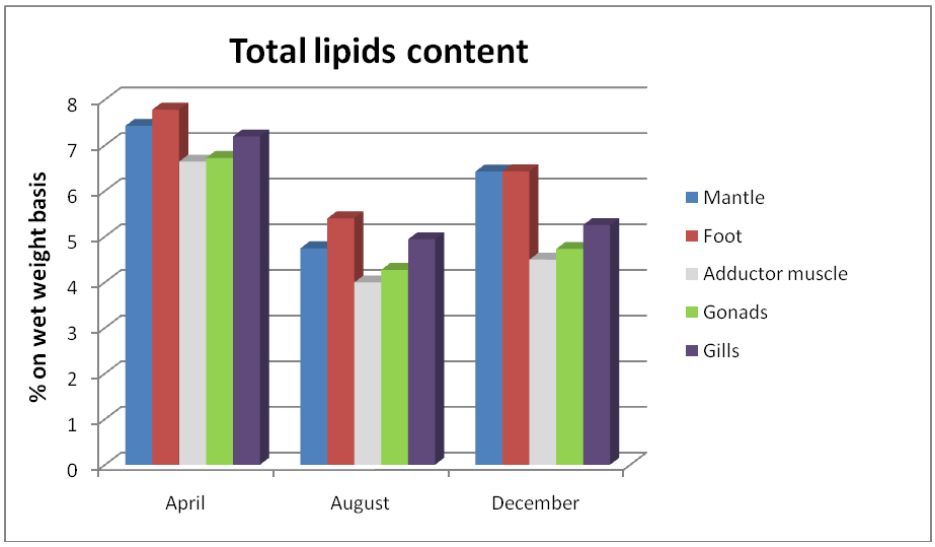


Fig. 4 Seasonal variation in total free amino acids in different body parts of *P. corrugata*

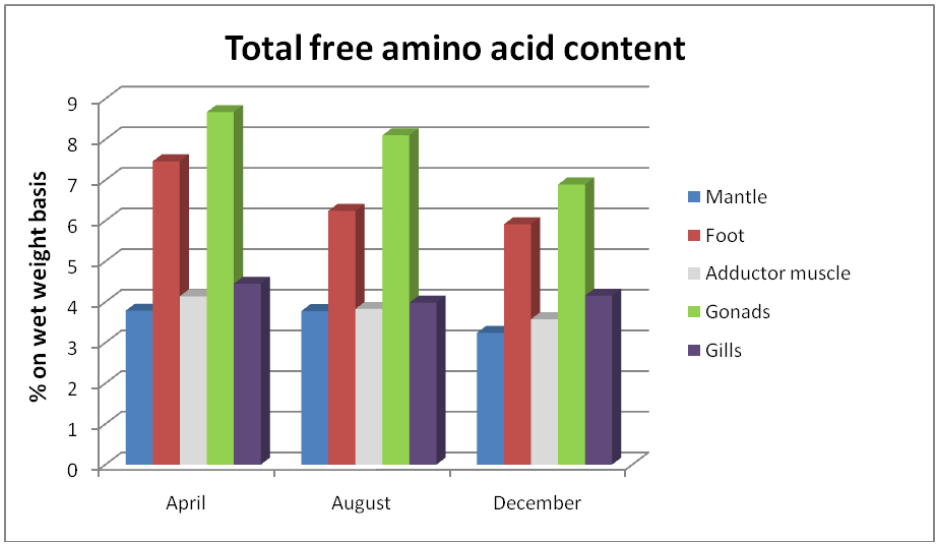
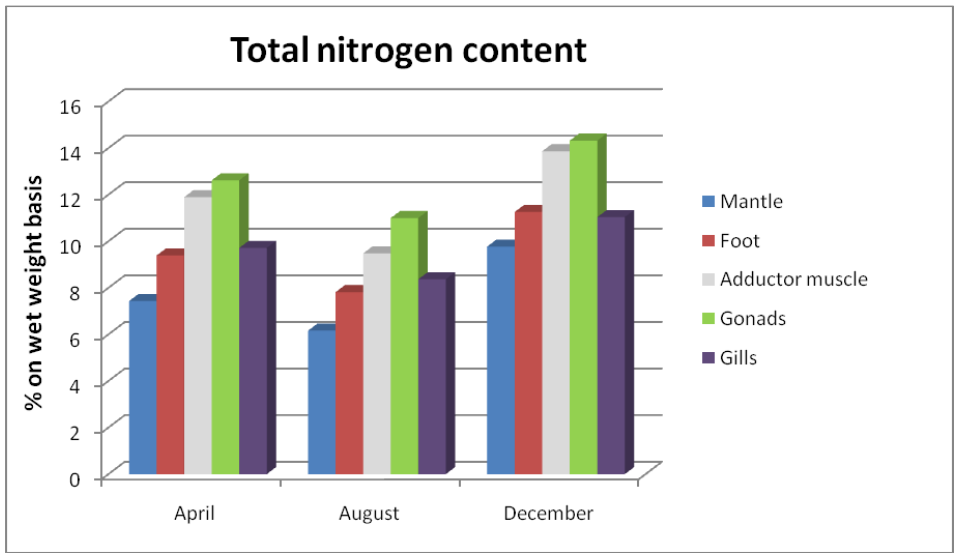


Fig. 5 Seasonal variation in total nitrogen content in different body parts of *P. corrugata*



CONCLUSION

The nutritional richness of *P. corrugata* can be well recognized from the present investigation. So the animal can be used as a protein rich food, as a feed for animals such as pigs, chickens and also for feeding aquaculture fish. The body mass of the animal can also be used as a fertilizer, rich in protein and nitrogen for improving the soil fertility. However, as these animals are filter feeders, can accumulate pathogens in their bodies so ideally should only be consumed after pathological studies of their tissues.

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