



Studies on some Biochemical Composition of Estuarine Clam, *Meretrix Meretrix* from Ratnagiri Coast, Maharashtra

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ABSTRACT

In present study shows the seasonal biochemical variations in different tissues of *M. meretrix*. In summer and monsoon seasons the glycogen content was decreased as compared with winter season. Glycogen level fell during spawning and later recovered with gametogenesis. Protein content in different tissues in winter and monsoon season was high as compared with summer season. Protein contents values observed high during the period of spawning. In summer and monsoon seasons, the lipid content was increased but decreased in winter season. The lipid content level was high at the period of spawning.

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Introduction

Bivalves play an important role in the ecosystem equilibrium and constitute an important economic endpoint. They are important representatives of the primary consumers in limnic systems and, therefore, an important link in the aquatic food chain. In bivalves, changes in the biochemical constituents are pronounced, which are cyclic with reproduction, since great amount of energy must be channelized to the gonad during reproduction. From India, many investigators reported seasonal changes in biochemical content in marine bivalves, Nagabhushanam and Dhamne (1977) on *Paphia laterisulca*, Patare (1998) in *M. meretrix*, Salunkhe (1999) on *S. cuculata* from Deogad and Aachara coast of Sindhudurg district and Suryavanshi (2002) in *Crassostrea cattukensis*. The accumulation and utilization of energy reserves during the sexual period were closely related to the environmental conditions and availability of high quality food (Deslous Paoli et.al. 1982; Whyte and Englar, 1982; Heral et. al., 1984). Sessile suspension feeding organisms can experience short term and long term changes in environmental conditions such as temperature, salinity and suspended particulate matter (Armstrong 1958, Berg and Newell, 1986). Frechette and Bourget (1985) have described a gradient in particulate organic matter in the benthic boundary layer above a bed of mussel *Mytilus edulis* and have suggested that, mussel growth is food limited.

Some recent studies suggested the complex interactions of temperature, food quality and quantity (Berthelin et.al., 2000). Jeffery et.al. (2003) has also showed same seasonal variation in the reproductive activity and biochemical composition of the pacific oyster (*Crassostrea gigas*). Camacho et.al.(2003) studied energy balance, gonadal development and biochemical composition in the clam *Ruditapes decussatus*. Uzaki et.al. (2003) reported changes in mortality rate and glycogen content of manila clam *Ruditapes philippinarum* during the development in oxygen deficient waters. In the present study was undertaken in order to evaluate seasonal variations of the main tissues

components (glycogen, protein, and lipid) in the edible mollusk *M. meretrix* sampled at Kalbadevi estuary.

Material and Methods:

For the biochemical study, the clam, namely *Meretrix meretrix* (Linnaeus) from Kalbadevi estuary, Ratnagiri, were selected. The length and weight range was 4.0 – 4.8 cm and 30 – 38 gm respectively. After collection, the clam were brought to the laboratory and kept for acclimatization in the plastic containers, containing filtered aerated estuarine water for 48 hours, during this period water was changed thrice in a day.

For estimation of biochemical components the various tissues like gill, mantle, gonads (male and female), hepatopancreas and adductor muscles of the clams were removed, and extra water was soaked by using blotting paper. These tissues were weighed and used for the estimation of biochemical components like protein was by using Folin phenol method (Lowry et.al., 1951); glycogen (De Zwaan and Zandee, 1972); total lipids (Barnes and Blackstock, 1973) calorimetrically in different seasons.

Result

Glycogen

In winter season, the glycogen content was maximum in mantle (6.848 ±0.168) followed by gonad (6.820 ±0.326), foot (6.617 ±0.413), hepatopancreas (4.388 ±0.203), adductor muscle (4.231 ±0.122), siphon (2.863 ±0.027), and gill (2.733 ±0.140). In summer season, glycogen content was maximum in foot (3.510 ±0.240) followed by hepatopancreas (3.447 ±0.120), siphon (3.445 ±0.202), adductor muscle (3.371 ±0.291), mantle (3.326 ±0.202), gill (3.186 ±0.005) and gonad (2.848 ±0.055). In monsoon season, glycogen content was maximum in mantle (10.348 ±0.798) followed by adductor muscle (8.220 ±0.105), siphon (6.902 ±0.125), foot (6.800 ±0.134), hepatopancreas (5.373 ±0.265), gonad (4.579 ±0.085) and gill (3.925 ±0.118) (Table-1).

Protein

The protein content in different body tissues in winter season was maximum in gonad (38.16 ±0.989) followed by

Table 1. Seasonal changes in glycogen of *M. meretrix* (mg / 100mg wet weight tissue).

Tissues Seasons	Mantle	Adductor Muscle	Foot	Gonad	Hepato-pancreas	Siphon	Gill
Winter	6.848 ±0.168	4.231 ±0.122	6.617 ±0.413	6.820 ±0.326	4.388 ±0.203	2.863 ±0.027	2.733 ±0.140
Summer	3.326 ±0.202	3.371 ±0.291	3.510 ±0.240	2.848 ±0.055	3.447 ±0.120	3.445 ±0.202	3.186 ±0.005
Monsoon	10.348 ±0.798	8.220 ±0.105	6.800 ±0.134	4.579 ±0.085	5.373 ±0.265	6.902 ±0.125	3.925 ±0.118

Table 2. Seasonal changes in total proteins of *M. meretrix* (mg / 100mg wet weight tissue).

Tissues Seasons	Mantle	Adductor Muscle	Foot	Gonad	Hepato-pancreas	Siphon	Gill
Winter	33.464 ±0.818	35.556 ±1.566	31.518 ±2.169	38.16 ±0.989	27.81 ±1.695	32.63 ±0.636	22.93 ±2.205
Summer	28.290 ±0.742	44.037 ±1.776	34.422 ±1.007	33.57 ±0.623	26.73 ±0.545	24.07 ±1.000	26.59 ±0.791
Monsoon	40.807 ±1.389	41.84 ±0.990	34.482 ±0.452	32.52 ±0.795	33.619 ±0.568	34.77 ±1.634	26.96 ±0.064

Table 3. Seasonal changes in total lipid of *M. meretrix* (mg / 100mg wet weight tissue).

Tissues Seasons	Mantle	Adductor Muscle	Foot	Gonad	Hepato-pancreas	Siphon	Gill
Winter	1.795 ±0.285	1.557 ±0.444	2.046 ±0.062	2.469 ±0.502	3.576 ±0.415	1.583 ±0.385	1.766 ±0.152
Summer	2.121 ±0.016	1.813 ±0.166	1.896 ±0.225	2.466 ±0.404	4.343 ±0.218	3.26 ±0.017	2.356 ±0.273
Monsoon	2.504 ±0.181	1.822 ±0.155	1.936 ±0.056	2.510 ±0.160	5.586 ±0.422	2.053 ±0.061	2.280 ±0.180

adductor muscle (35.556 ±1.566), mantle (33.464 ±0.818), siphon (32.63 ±0.636), foot (31.518 ± 2.169), hepatopancreas (27.81 ±1.695) and gill (22.93 ±2.205). In summer season, protein content was maximum in adductor muscle (44.037 ± 1.776) followed by foot (34.422 ± 1.007), gonad (33.57 ± 0.623), mantle (28.290 ±0.742), hepatopancreas (26.73 ±0.545), gill (26.59 ±0.791) and siphon (24.07 ±1.000). In monsoon season protein content was maximum in adductor muscle (41.84 ± 0.990) followed by mantle (40.807 ± 1.389), siphon (34.77 ±1.634) foot (34.422 ±0.452), hepatopancreas (33.619 ± 0.568), gonad (32.52 ±0.795) and gill (26.96 ± 0.064) (Table -2).

Lipid:

Lipid content in winter season, was maximum in hepatopancreas (3.576 ± 0.415) followed by gonad (2.469 ±0.502), foot (2.046 ±0.062), mantle (1.795 ±0.285), gill (1.776 ±0.152), siphon (1.583 ±0.385) and adductor muscle (1.557 ±0.444). In summer season, lipid content was maximum in hepatopancreas (4.343 ±0.218) followed by siphon (3.26 ±0.017), gonad (2.466 ±0.404) gill (2.356 ±0.273), mantle (2.121±0.016), foot (1.896 ±0.225) and adductor muscle (1.813 ±0.166). In monsoon season, lipid content was maximum in hepatopancreas (5.586 ±0.422) followed by gonad (2.510 ±0.160), mantle (2.504 ±0.181), gill (2.280 ±0.180), siphon (2.053 ±0.061), adductor muscle (1.822 ±0.155) and foot (1.936 ±0.056) (Table-3).

Discussion

The biochemical constituents such as glycogen, protein, and lipid are the major energy source of animals. In present

investigation these biochemical were studied seasonally in *Meretrix meretrix* from Kalbadevi estuary along Ratnagiri coast. The changes in the composition of the biochemical constituents of animals vary not only with environmental change but also with seasons.

The glycogen content in the clam, *Meretrix meretrix* was increased in the winter season and low in the summer and monsoon season. In clam glycogen content was increased in gonad, foot and mantle in winter and monsoon seasons indicating greater utilization of this product for metabolic purpose. Glycogen is regarded as the major form of energy reserve in bivalve, which markedly decreased in ovaries and testis during maturation in bivalves, *Mytilus edulis* (De Zwaan and Zandee, 1972). Decrease in the glycogen content was noticed in the vesicular connective tissue, which depends on glycogenolysis during gametogenesis (Mathieu and Lubet, 1993). Glycogen is an important component for the development of gametes as energy and triglycerides source (Osada and Mori, 2000).

In winter and monsoon season, the protein content was maximum than the summer season, might be due to the adverse environmental conditions. In the present study it was observed that protein content change according to season, physiological status of clam and environmental stress. In present study, *Meretrix meretrix* during winter and monsoon seasons showed high protein content in gonad, adductor muscle, hepatopancreas, mantle and siphon while low in gill. In summer season protein content in all the tissues was decreased. The gonad and adductor

muscle in this clam showed high protein content in winter and monsoon seasons, while low in summer. It may be due to coinciding spawning period, Nagabhushanam and Dhamane (1977) found that, in *Paphia laterisulca*, protein content remained relatively high throughout the year, where as it was increased in fully mature condition of clams. In *C. gryphoides* high protein values were observed throughout the year, but the period of spawning the protein level get decreased (Durve and Bal, 1986). Baker and Hornbach (2001) studied that *A. ligamentina* and *A. plicata* has different patterns of seasonal biochemical composition.

Lipid content in clam was increased in summer and monsoon seasons, whereas it was low in the winter season. Maximum lipid content was found in the hepatopancreas and gonad in monsoon and summer season. The importance of lipid in energy metabolism of bivalves has been reported for some species, such as *Patinopecten vessoensis* (Takashi and Mori 1971). In adult bivalves, lipids are stored mainly in gonads; it constitutes the main component of reproductive material (Gabbot, 1975; 1976).

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