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# SEASONAL CHANGES IN BIOCHEMICAL CONSTITUENTS IN DIFFERENT BODY TISSUES OF FRESHWATER BIVALVE MOLLUSC, *LAMELLIDENS MARGINALIS* (LAMARK) FROM PRAVARA RIVER IN MAHARASHTRA

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In the present study, variations in organic constituents in different soft body parts of *Lamellidens marginalis* found in Pravara River near Aurangabad was observed during different seasons. As environmental condition changes, it shows an effect on biochemical constituents in the tissues like mantle, hepatopancreas, foot and gonad. Protein is found to be maximum in gonads throughout all the three seasons, whereas mantle shows minimum values of protein. There is great fluctuation in the values of glycogen present in all the four body tissues during different seasons. During summer season, maximum glycogen is found in gonad, whereas during monsoon, maximum glycogen is found in foot. During winter season, maximum glycogen is observed in mantle and foot. Similarly, mantle and foot shows maximum amount of lipid during summer season and gonad shows maximum values of lipid during monsoon and winter seasons.

**Key words** : *Lamellidens marginalis*, protein, glycogen and lipid.

## INTRODUCTION

The freshwater bivalve molluscs are suspensory feeders on the primary stage of food chains, hence they notably influences the organization and functioning of ecosystems. Also, they perform efficient role in transformation of energy in food chains coupled with their sessile mode of life. Seasonal changes in biochemical composition have been reported by many workers. Ansell *et al.* (1964), De Zwann & Zandee (1972) and Gabbott & Bayne (1973) determined seasonal changes in biochemical composition of adductor muscle, mantle, siphon and foot in *Mercenaria mercenaria* and *Mytilus edulis*. From India, relatively very few investigators such as Bidarkar (1975) on *Crassostrea cucullata*, Dhamne (1975) on *Paphia laterisulca*, Nagabhushanam & Mane (1975 & 1978) on *Mytilus viridis* have reported changes in the biochemical composition correlating with annual reproductive cycle of bivalves. Protein is a versatile, complex and fragile macromolecule with high molecular weight. It serves as fuel to yield energy and also play a vital role in every aspect of the structural and functional characteristics of the organism. Glycogen synthesis and breakdown appear to occupy a central position being controlled by extrinsic and intrinsic factors, thereby altering the physiological state of the organism. Glycogen serves as reservoir of the chemical energy which is to be increased or decreased according to the need of the organism. Lipids are responsible for variety of functions in molluscs. Lipid composition in different tissues has been reported by Trumen & Pekkarinen (1990) in *Macoma balthica*. Vedpathak (1989) observed fortnightly and monthly changes in biochemical composition in freshwater molluscs. In recent times, investigations on the physiological and biochemical responses of the molluscs to environmental agents have been expanded significantly.

The review of above literature shows that there is no adequate information about freshwater mollusc, *Lamellidens marginalis* from different rivers of Maharashtra. Hence, the present study was carried out to understand the changes in biochemical composition through regular collection of animals from Pravara River at Pravara Sangam, near Aurangabad.

## MATERIALS AND METHODS

The freshwater bivalve mollusc, *Lamellidens marginalis* were collected from the banks of Pravara River at Pravara Sangam, 50 Km away from Aurangabad, in summer season (April - May), monsoon season (August - September) and winter season (December - January) over a period of one year. Adult bivalves (75 - 80 mm in shell length) were selected for laboratory experiments. Immediately after bringing to the laboratory, the shells of these bivalves were brushed and washed with fresh and clean water to remove algal biomass, mud and other waste material. The cleaned animals were then kept for depuration for 12 hrs in laboratory conditions under constant aeration. For biochemical analysis, animals were dissected and soft body tissues like mantle, hepatopancreas, foot and gonads were removed. 100 mg of each wet tissues were taken for biochemical analysis. Protein was determined by the method proposed by Lowry *et al.* (1951), using Bovine Serum Albumin (BSA) as standard. The glycogen content was estimated according to method proposed by De-Zwann & Zandee (1972), using glucose as standard. The method used for determination of lipid was sulpho - phospho - vanilline method proposed by Barnes & Blackstock (1973). The results are expressed as milligram content per 100 mg. of wet tissue. Triplicate values of each biochemical constituents were subjected for statistical confirmation using student't' test (Dowdeswell, 1957). Standard deviations were calculated during each season.

## RESULTS

Biochemical analysis observed during experimental work has been given in Table I to Table III. Protein is found to be maximum in gonads throughout all the three seasons. During summer season, gonad shows 10.691±0.416 mg/100 mg of wet tissue in the month of May, whereas it shows values 10.232±0.398 in April. Protein is also observed to be maximum in foot during summer season, as compared with monsoon and winter seasons. During monsoon, values of protein in gonad (8.766±0.249) and foot (7.469

**Table I :** Changes in the protein contents from different tissues of *Lamellidens marginalis* collected during different seasons.

| Tissues | Summer season | | Monsoon season | | Winter season | |
|---|---|---|---|---|---|---|
| | April | May | August | September | December | January |
| Mantle | 5.854 ±0.165 | 5.428 ±0.168 | 5.744 ±0.197 | 5.419 ±0.172 | 3.286 ±0.142 | 3.314 ±0.148 |
| Hepato-pancreas | 6.283 ±0.177 | 6.116 ±0.172 | 5.998 ±0.166 | 5.243 ±0.161 | 3.478 ±0.124 | 3.584 ±0.127 |
| Foot | 8.546 ±0.369 | 8.725 ±0.371 | 7.469 ±0.288 | 7.623 ±0.212 | 5.287 ±0.217 | 5.438 ±0.221 |
| Gonad | 10.232 ±0.398 | 10.691 ±0.416 | 8.766 ±0.249 | 8.962 ±0.262 | 6.689 ±0.243 | 6.246 ± 0.276 |

Figures indicate values in mg/100mg weight of wet tissue; ± Standard Deviation.

**Table II :** Changes in the glycogen contents from different tissues of *Lamellidens marginalis* collected during different seasons.

| Tissues | Summer season | | Monsoon season | | Winter season | |
|---|---|---|---|---|---|---|
| | April | May | August | September | December | January |
| Mantle | 10.374 ±0.313 | 10.469 ±0.357 | 10.646 ±0.423 | 10.913 ±0.378 | 9.743 ±0.279 | 9.649 ±0.186 |
| Hepato-pancreas | 12.314 ±0.247 | 12.867 ±0.271 | 8.861 ±0.198 | 9.337 ±0.223 | 6.411 ±0.113 | 6.670 ±0.129 |
| Foot | 11.982 ±0.298 | 11.705 ±0.276 | 14.473 ±0.591 | 14.390 ±0.524 | 9.872 ±0.469 | 10.216 ±0.415 |
| Gonad | 13.119 ±0.327 | 13.693 ±0.314 | 12.219 ±0.334 | 12.698 ±0.307 | 5.296 ±0.259 | 5.368 ±0.247 |

Figures indicate values in mg/100mg weight of wet tissue; ± Standard Deviation

**Table III :** Changes in the lipid contents from different tissues of *Lamellidens marginalis* collected during different seasons.

| Tissues | Summer season | | Monsoon season | | Winter season | |
|---|---|---|---|---|---|---|
| | April | May | August | September | December | January |
| Mantle | 9.264 ±0.258 | 8.973 ±0.121 | 3.727 ±0.133 | 3.891 ±0.157 | 3.268 ±0.127 | 3.738 ±0.131 |
| Hepato-pancreas | 5.153 ±0.114 | 5.341 ±0.147 | 3.424 ±0.124 | 3.873 ±0.159 | 4.503 ±0.141 | 4.417 ±0.127 |
| Foot | 9.471 ±0.186 | 9.613 ±0.153 | 6.348 ±0.211 | 5.818 ±0.247 | 5.119 ±0.223 | 4.729 ±0.261 |
| Gonad | 6.432 ±0.213 | 6.647 ±0.245 | 8.411 ±0.285 | 9.314 ±0.232 | 7.263 ±0.298 | 6.832 ±0.272 |

Figures indicate values in mg/100mg weight of wet tissue; ± Standard Deviation.

±0.288) are nearly equal. The values of protein in mantle show a constant decrease. It is found to be 5.854±0.165 in April and 5.428±0.168 in May, which decreases to 5.419 ±0.172 in September. Mantle tissues show minimum protein (3.286±0.142) during winter season. Similar pattern is observed for protein contents in hepatopancreas. It shows maximum values in April (6.283±0.177) and minimum in December (3.478±0.124) (Table I).

Glycogen is found to be maximum in gonad (13.693±0.314 mg/100 mg of wet tissue) during summer season. Glycogen shows small variation in all the four body tissues during summer season. The values of glycogen in mantle are 10.374±0.313 in April and 10.469±0.357 in May, whereas hepatopancreas shows the values 12.314±0.247 in April and 12.867±0.271 in May. During monsoon season, maximum glycogen is found in foot. The foot shows maximum values (14.473±0.591) in August and (14.390±0.524) in September. During monsoon, hepatopancreas shows minimum values of glycogen (8.861±0.198) in August and (9.337±0.223) in September. During winter season, gonad shows sudden decrease in glycogen contents. The gonad shows minimum values of glycogen (5.296±0.259) in December and (5.368±0.247) in January. Mantle and foot show similar values of glycogen in winter season (Table II).

Lipid is found maximum in mantle and foot during summer season. The values of lipid observed in mantle are 9.264±0.258 in April and 8.973±0.121 in May, whereas in foot it shows values 9.471±0.186 in April and 9.613±0.153 in May. The lipid contents in mantle and foot shows large decrease during monsoon and winter seasons. During monsoon, gonad shows maximum amount of lipid (9.314±0.232) in September, whereas it is minimum (3.424±0.124) in hepatopancreas in August. During winter season, maximum amount of lipid is found in gonad (7.263±0.298) in December and minimum in mantle (3.268±0.127) in December (Table III).

## DISCUSSION

The present study revealed that, there is significant variation in the biochemical composition in different body tissues according to seasonal changes. Organic constituents like protein, glycogen and lipids act as key substances for different metabolic activities. Protein is the main organic nutrient used to build up different body tissues. It is observed that protein contents are significantly accumulated in gonad and foot during summer season. Mantle shows decreased amount of protein, which may be due to exposure to high environmental temperature. All the tissues show constant protein contents in monsoon season, which is correlated with highest body activities of animal during this season. All the body organs show minimum protein values in winter season, which may be due to sedentary life without much activities.

The amount of glycogen present in different tissues is closely linked with food availability and gonadal development. Glycogen is found maximum is gonad during summer season, which shows the development of gonads to attain maturation. Hepatopancreas shows large amount of glycogen during summer season, which is utilized as reserve material during unavailability of food. Glycogen contents are increased in foot and mantle during monsoon season. This is due to increase inflow and turbidity of water and to cope up with new environmental change. Similar results are observed by Pandit (2005) in *Lamellidens marginalis* of Godavari River. Lipid is found to be more in mantle and foot during summer season. Due to exposure of mantle and foot to high temperature in summer season, the lipid molecules may be deposited in large amount in these tissues. During monsoon season, gonad shows maximum amount of lipid, which is correlated with the maturation of gonadal follicles and time of spawning.

The study revealed that in terms of energy conservation, the organism would be expected to make compensatory adjustments to both the components of energy gain and energy loss in the fate of changes in the environmental conditions (Vedpathak, 1989).

Thus, in the present study on *Lamellidens marginalis*, it is observed that organic constituents present in different body tissues shows seasonal changes and are correlated with the change in environmental conditions along with development of reproductive cycle.

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