

Seasonal Metabolic Variation of Protein in Freshwater Bivalve *Lamellidens Marginalis* (Lamarck, 1819)



Zoology

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ABSTRACT

Proteins are important organic substances required by an organism in tissues building and repair. Under extreme stress conditions, proteins have been known to act as the energy supplier in metabolic pathways and biochemical reactions. In the present investigation Protein is found maximum in gonads throughout summer season, increasing in rainy and minimum in winter season followed by mantle, hepatopancreas, Add. Muscle and gill i.e., Gonad> Mantle> Hepatopancreas> Add. muscle>Gill.

1. INTRODUCTION

Proteins are most abundant intracellular macro-molecules and constitute over half the dry weight of most organisms. They occupy a central position in the architecture and functioning of living matter. They are intimately connected with all phases of chemical and Physical activity that constitutes the life of the cell. Therefore they are, essential to cell structure and cell function. The interplay between enzymatic and non-enzymatic proteins governs the metabolic harmony (Lehinger, 1984). They are also involved in major physiological events to maintain the homeostasis of the cell. Therefore, the assessment of the protein content can be considered as a diagnostic tool to determine the physiological process of the cell (Kapil and Ragothaman, 1999; Munshigeri, 2003). Proteins are essential nutrients for the human body. They are one of the building blocks of body tissue, and can also serve as a fuel source. As a fuel, proteins contain 4 kcal per gram, just like carbohydrates and unlike lipids, which contain 9 kcal per gram.

Proteins are polymer chains made of amino acids linked together by peptide bonds. During human digestion, proteins are broken down in the stomach to smaller polypeptide chains via hydrochloric acid and protease actions. This is crucial for the synthesis of the essential amino acids that cannot be biosynthesized by the body (Genton et.al, 2010).

2. MATERIAL AND METHOD

Bivalves *Lamellidens marginalis* sample (75-80 mm in shell length) were obtained from fishermen's catch. In the present study they were collected from Godavari River (Nanded) of Maharashtra in India in the year 2014. Immediately after bringing to laboratory, hard shells of these freshwater bivalves were brushed and washed with fresh and clean water to remove algal biomass, mid and other waste material. The cleaned animals were then kept for depuration for 12 hrs in laboratory conditions under constant aeration. For protein analysis, animals were dissected and soft body tissues like mantle, hepatopancreas, gonad, Adductor muscle and gill 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 and values of proteins were expressed in terms of mg protein/gm wet weight of tissue.

3. RESULTS AND DISCUSSION

Protein estimation observed during experimental work has been given in Fig 1 for *Lamellidens marginalis*.

Protein content in *Lamellidens marginalis*:

1) Gonad protein: -

The seasonal changes in the protein content in gonad of *L. marginalis* are shown in (Figure No. 1). The percentage of protein was found to be maximum in summer and varies from 11.1121±0.5214 to 14.1320±0.7204, increasing in rainy season and varies from 6.1317±0.7324 to 10.1320±0.4105, whereas it is minimum in winter season and varies from 3.2472±0.6214 to 6.3600±0.2201.

2) Mantle protein: -

The seasonal changes in the protein content in mantle of *L. marginalis* are shown in (Figure No. 1). The percentage of protein was found to be maximum in summer and varies from 10.1242±0.3302 to 13.1257±0.9306, increasing in rainy season and varies from 4.1520±0.8319 to 9.4361±0.4621, whereas it is minimum in winter season and varies from 3.1341±0.2253 to 5.1463±0.3424.

3) Hepatopancreas protein: -

The seasonal changes in the protein content in hepatopancreas of *L. marginalis* are shown in (Figure No. 1). The percentage of protein was found to be maximum in summer and varies from 8.1622±0.4371 to 10.1533±0.6314, increasing in rainy season and varies from 4.1281±0.4264 to 8.5248±0.6132, whereas it is minimum in winter season and varies from 3.4204±0.4100 to 6.4207±0.7342.

4) Add. Muscle protein: -

The seasonal changes in the protein content in Add. Muscle of *L. marginalis* are shown in (Figure No. 1). The percentage of protein was found to be maximum in summer and varies from 8.1021±0.2010 to 11.0900±0.7380, increasing in rainy season and varies from 8.1301±0.1021 to 10.1436±0.3071, whereas it is minimum in winter season and varies from 4.1310±0.3621 to 6.3210±0.3421.

5) Gill protein: -

The seasonal changes in the protein content in gill of *L. marginalis* are shown in (Figure No. 1). The percentage of protein was found to be maximum in summer and varies from 9.1271±0.3631 to 11.2421±0.3320, increasing in rainy season and varies from 7.6521±0.5432 to 9.2611±0.6730, whereas it is minimum in winter season and varies from 3.5461±0.2321 to 5.1021±0.2326

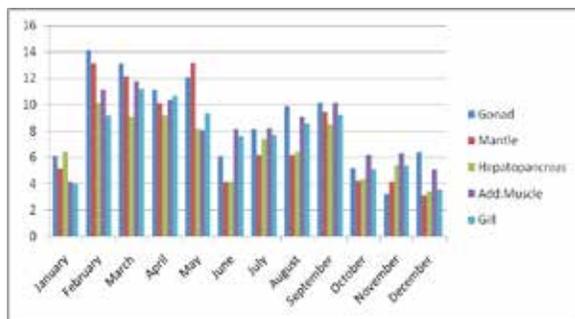


Fig 1: Monthly variation in protein content of *Lamellidens marginalis*

The present study revealed that, there is significant variation in the biochemical composition in different body tissues according to seasonal changes. Seasonal changes in protein content may be of great importance in relation to energy metabolism necessary for growth and reproduction (Lodeiros et al., 2001). Organic constituents like protein act as key substances for different metabolic activities. Protein is the main organic nutrient used to build up different body tissues. All the tissues show increasing order protein contents in rainy season, which is correlated with highest body activities of animal during this season. And due to increase inflow and turbidity of water and to cope up with new environmental change. It might be due to favourable environmental lots of food availability and the period of growth with the gonadal development. Similar conclusions were reported in *M. edulis*, in British water by Williams, 1969 and Mane and Nagabhushanam, 1978.

The protein seems to be its only alternative resource of energy under conditions of food scarcity. During May 1st and 2nd fortnight the drastic environmental condition results in recovery of gonad tissue. Protein content decrease in gonad and hepatopancreas, during this period was seen in *L. corrianus* from Godavari River by (Muly, 1988). Thus, food availability may be the important source of nutrients required for the gonadal repining process. Seasonal variation in temperature and availability of food appear to be closely related to energy available for growth and reproduction in other bivalve species (Smaal et al., 1997). In *E. exalbida* from Ushuaia Bay, shell growth in spring (Lomovasky et al., 2002). Whereas the protein content showed a significant increase in Winter February 2001, however, it might be due to favorable environmental condition, lots of food availability and the period of growth with the gonadal development.

The relative content of protein vary seasonally. These changes are principally related to the reproductive cycle and the season

maximum shell growth. Similar characteristics have been observed in other bivalve *Lyropecten (Nodipecten) nodosus* (Lodeiros et al., 2001). The protein seems to be its only alternative resource of energy under conditions of food scarcity. However, it cannot be certain without further studies and proper investigation about the possible advantage of using protein as an energy reserve and the mechanisms of regulation (e.g., anti-freezing proteins). In Summer May 2000 the protein content was significantly low due to drastic environmental condition the rise in temperature, scarcity of food availability, starvation effect and endogenous role of hormone as the removal of cerebral ganglion maybe responsible of decrease in protein content.

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