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Research Article

Analysis of Nutrition in Freshwater Bivalve Mussels, *Lamellidens corrianus*, Following Cerebralectomy

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ABSTRACT

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The three main macronutrients—glucogen, lipids, and proteins—play a crucial role in all metabolic processes by acting as an effective source of energy and vital fatty acids. They also have a substantial nutritional and physiological impact. Gills play an extremely effective role in freshwater bivalves since they are the filter feeders. Both exogenous and endogenous influences have an impact on life processes. This study's objective was to look into the influence of the brain ganglia on the macronutrient of freshwater mussel and gill contents of *Lamellidens corrianus*, as the gills are the most efficient organ for obtaining energy and are regulated by a variety of ganglions, including the cerebral, visceral, and pedal ganglions.

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1. Introduction

In the past, humans have universally subdued beetles for food, beauty, and pearls. Globally, freshwater mussels can be found in both lotic and lentic environments. Because they act as filter feeders, regulating nutrient recycling and creating a trophic connection between primary producers and pillagers, freshwater mussels are essential to the ecosystem (Lewandowski, Gardner, and Malczyk, 1991). The cerebral, visceral, and pedal ganglions are the three ganglia that comprise the primordial brain system of bivalves. These ganglia regulate growth, reproduction, and all aspects of their metabolic activities (Sokolove et al., 1984; Flari and Edwards, 2003 and Joosse and Gerearts, 1983). One substance that bivalves store for energy is called glycogen. Temperature, hunger, and pollution were among the variables that affected the quantity of glycogen (Dongre S. B. 2016 and De Zawan and Zandlee, 1972). Lipids are essential to the process of egg production, play a major part in are a primary source of metabolic energy and are involved in the synthesis of tissue and cell membranes. There has been a lot of research done on the lipid content and metabolism of marine mollusks, but not much on freshwater forms or the Seasonal variations in the makeup of fatty acids of freshwater bivalve species.

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Additionally, in low-carbohydrate environments, they give the energy needed for development. A comprehensive report on the fatty acid makeup of Russian freshwater prosobranch mollusks, India, and the United States has been released. Mollusks' lipid content can be influenced by both external (exogenous) and internal (endogenous) influences, such as changes in temperature and food supply, as well as physiological and metabolic activities. Studies on lipids content of Indian gastropods had conducted. The fundamental components of the organism, proteins are essential for the growth and development of bivalves. Proteins are the most common macromolecule found inside cells and account for over half of the dry weight of most organisms. They are essential to the composition and functionality of living organisms. Every phase of the chemical and physical activity that constitutes a cell's existence is intimately related to them. They are therefore essential to the composition and functionality of cells. Proteins that are both non-enzymatic and enzymatic interact to regulate balanced of metabolism. Also they are necessary for vital metabolic and physiological functions that maintain cellular homeostasis. Therefore, one way to think of assessing the protein level is as a diagnostic technique to explain the physiological function of the cell was determined. Determination amount of protein, glycogen, and lipids in the midsummer of freshwater mussels gills (*Lamellidens corrianus*) collected from Nandrabad Pond in Aurangabad was the primary goal of this study. In the present study, the consequences of unilateral and bilateral cerebral ganglia removal over the summer are being studied in the freshwater bivalve mussel *Lamellidens corrianus*. Merely a small number of freshwater bivalves have been the subject of studies; these include *Unio* sp. (Dembitsky et al., 1992); *Diplodon delodontus* (Pollero et al., 1983); *Dreissena siouffi* (Ekin et al., 2008); *Diplodom patagonicus* (Pollero et al., 1981); *Carunculina texasensis* (Hagar and Dietz, 1986), *Ligumia subrostrata* (Dietz and Graves, 1981), , *Dreissena polymorpha* and Dongre S.B. (2016). Nevertheless, very little is understood about how the cerebral ganglia control the metabolism of macronutrients such as proteins, lipids, and glycogen.

Material Method:

Located 19 miles from Aurangabad in Khultabad Taluka, the freshwater molluscan bivalve, *Lamellidens corrianus* may be found in the Nandrabad Pond. Over the course of the summer, a group of fifteen animals with shell lengths varying from 95 to 110 mm were selected, and they were given seven days to acclimate to the laboratory setting. Bilateral and unilateral brain ganglia excisions were performed in 30 seconds each following two to three hours in the lab. Two animal groups were employed for experiments, while one group was used for non-operational control. Following a seven-day period, five animals were selected from each group and slaughtered. After that, the gills were dissected and baked to create a powder that could be used to calculate the gills' contents of proteins, lipids, and glycogen using standard methods such Barnes et al.'s vanillin reagent method (1973), the Anthrone reagent from Zwann and Zandele (1972), and protein analysis was estimated Lowey's method, 1955 for protein analysis. The estimate's value was the subject of a statistical analysis.

Results and Discussion:

Few research have been done on seasonal fluctuation, despite the fact that many have been done on the pesticide toxicity, organ insecticides toxicity, heavy metals toxicity and other compounds to aquatic different species and their impact on the levels of biochemical components in different animal tissues. The aim of the present study is to evaluate the effects of summertime cerebralectomy on the nutritional value of proteins, lipids, and glycogen—the macronutrients found in the gills of *L. corrianus*. Due to ideal environmental circumstances, the current study also showed that these bivalves had maximum amounts of the macronutrient lipids in all three animal groups. Additionally, these bivalves compare total protein, Lipids and glycogen with the thrice. The control group's gill glycogen content rose significantly to 2.5175 ± 0.0296 , 1.08425 ± 0.0084 , and 2.040 ± 0.0120 , respectively, in contrast to the experimental group. Lipids: The summertime examination of the control mussel's gills revealed a lipid content of 7.75 ± 0.04 , substantially more than that of the mussels in experimental tissues. In the unilateral group mussel, the gill content was 5.68 ± 0.14 , while in the cerebralectomized mussel as bilaterally, it was 5.03 ± 0.04 . Protein levels in the gills were lowest in the control group (0.05783 ± 0.0110), lowest in the unilateral group (0.46445 ± 0.0222), and lowest in the bilateral cerebralectomized group (0.5471 ± 0.0110) during the summer. The test results of the experiments were shown in Table 1. Furthermore, the physico-chemical properties of the water used in the summer's trials were investigated. The parameters that were measured were chlorides (17.89 mg/l), length (13.07), pH (7.7), temperature (33°C), per day and dissolved

oxygen content (4.00-mg/L/h). The study examined the impact of cerebralectomy to determine the levels of biochemical macronutrients, including proteins, lipids, and glycogen, in the gills of *Lamellidens corrianus*, a freshwater bivalve mussel. The analysis's goal was to determine the effects of unilateral and bilateral cerebralectomy on the mussels' gills. The data was the focus of much statistical analysis. The students decided if the test was relevant. The significance criteria of $p < 0.001$, $p < 0.01$, and $p < 0.05$ were used in this inquiry. Lipids are a necessary part of diets because they store energy during periods of food scarcity. Under extreme climatic conditions, fat and glycogen are employed as energy sources (Shigmates and Takeshita, 1959). Studies on the lipid composition and storage methods of mollusks, particularly bivalves and gastropods, have been conducted since lipids comprise a significant fraction of their tissues (Voogt, 1983). There is very few research on the distribution of fatty acids in tissues, and almost all of them discuss the entire body (Wenne and Polak, 1989 and Hagar and Dietz, 1986). For several marine bivalve mollusks, including *Tapes decussatus*, *Pecten maximus*, *Crassostrea gigas*, *Scaphareinae quivalvis*, and *Tapes philippinarum*, seasonal variations in the fatty acid and lipid compositions have been reported (Pazos, et al., 1996 and 2003). A number of previous studies examined entire animals in connection to bivalve fatty acids (Ekin et al., 2008; Trider and Castell, 1980; Watanabe and Ackman, 1974; Misra et al., 1985; Alkanani et al., 2007;). Additionally, changes in growth metabolism, sexual development, and seasonal fluctuations in marine bivalves were often linked to investigate the tissues for fatty acid content. Studies on freshwater forms are scarce (Ekin et al., 2008; Pollero et al., 1981, and Dembitsky et al., 1992, 1993), and even fewer have been done on the tissues and organs of freshwater species. Proteins are the most common macromolecule found inside cells and account for over half of the dry weight of most organisms. They are essential to the composition and functionality of living organisms. Every phase of the chemical and physical activity that constitutes a cell's existence is intimately related to them. They are therefore essential to the composition and functionality of cells. Proteins that are both enzymatic and non-enzymatic interact to regulate balanced in metabolic activity. They are also necessary for vital physiological functions that maintain cellular homeostasis. Therefore, one may consider measuring the protein content to be a diagnostic tool to determine the physiological process of the cell; nonetheless, the study was carried out since there is a lack of research on the impacts of cerebralectomy.

Conclusion:

Therefore, it is reasonable to conclude that the metabolism of macronutrient content is inhibited by the unilateral and bilateral ablation of cerebral ganglia. Thus, it may be concluded that brain ganglia, mostly through inhibitory actions, may major role played in controlling the pace metabolism and organic reserve from the bivalve gills. An overall trial revealed that the impact was more pronounced in the animals in the group that had their brains removed unilaterally. With the help of these biochemical components, freshwater aquaculture may be developed for profit, feeding the growing population.

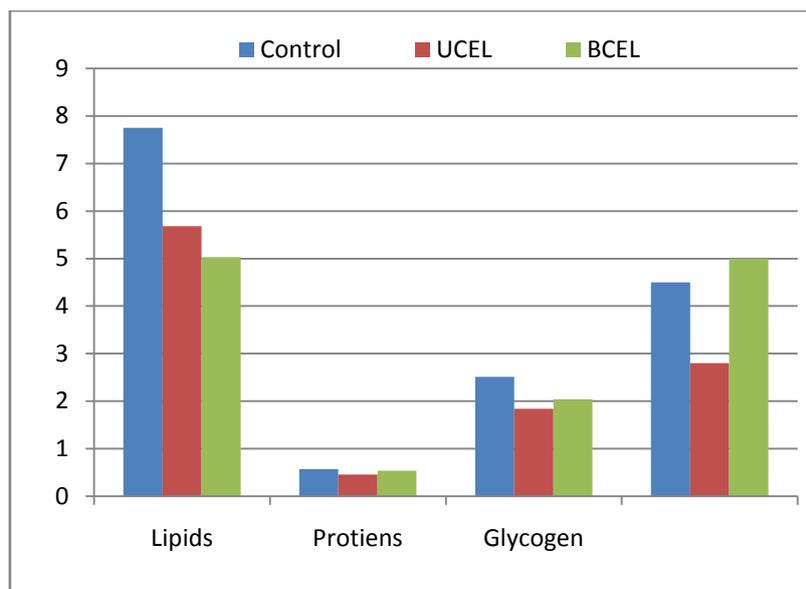
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Table.1. The Macronutrient content, in gills, of freshwater bivalve mussel, *Lamellidens corrianus*, during summer Season when subjected to cerebralectomy.

Summer Season	Control group mussel	Unilaterally cerebralectomized group mussel	Bilaterally cerebralectomized mussel.
Lipids	7.75 ± 0.04	5.68 ± 0.14	5.03± 0.04
Proteins	0.5783±0.0110	0.4645±0.0029	0.5471±0.0110
Glycogen	2.5175±0.0296	1.8425±0.0842	2.040±0.0120



UCEL Unilateral Cerebralectomized animal group., BCEL –Bilateral Cerebralectomized animal group
Figure 1. The Macronutrient, contents in gills, of freshwater bivalve mussel, *Lamellidens corrianus*, during summer Season when subjected to cerebralectomy.