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Protein content measurements in the various tissues of the freshwater mollusc *Lamellidens corrianus* (Lea) from Godavari river

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Abstract

In the present investigation, effect of cerebral ganglia, injection of ganglionic extracts and exposure to rise in temperature on protein content in soft body tissues of *Lamellidens corrianus* (Lea) collected from Godavari river at Kaigaon near Chhatrapati Sambhaji Nagar was observed during winter season. As changes in the environmental conditions, it showed an effect on protein contents in the tissues like, mantle, hepatopancreas, gonad and foot. On 12th day, the protein content from mantle showed significant decrease in cerebral ganglia ablated group. The content from hepatopancreas was decreased in ablated and exposure of ablated animals to rise in temperature groups respectively. While the content showed significant increase in extract injected group. The protein content from foot was significantly decreased in ganglionic injected group.

Key words : Ablation of cerebral ganglia, ganglionic extracts, Protein.

The demand for protein rich food is increasing, especially in developing countries, stimulating the exploration of unexploited or non-traditional resources. Protein is the essential substance of life and accordingly exists in the largest quantity of all nutrients as a component of the living beings. The ratio of carbohydrate was less when compare to the other nutrients such as proteins and lipids in animal tissues, especially in aquatic animals[1]. The proteins are among the most abundant biological macromolecules and are extremely versatile in their function and interaction during metabolism of proteins, amino acids, enzymes and co-enzymes[5]. Protein is the most important organic compound of animal tissue. Protein occurs in the body in the form of amino acids and other metabolites, which serve as building blocks of the body[14]. Proteins are the major biochemical component, which act as source of energy for various physiological functions including reproduction[4]. Jaiswal *et al.*[7]

observed changes in biochemical constituents such as protein, lipid and glycogen when exposed to naphthalene to freshwater prawn, *M. kistnensis*. Machale *et al*.[11] reported depletion in protein, lipid, and glycogen due to cuprous oxide stress in various tissues of freshwater crab, *B. guerini*. Khan *et al*.[9] observed changes in levels of protein, lipid and glycogen in the muscle of freshwater crab, *B. guerini* exposed to copper sulphate. Zambare[15] studied the reflections in protein content of freshwater bivalve, *C. striatella* due to heavy metal exposure. Muley[12] observed the alteration in protein content after exposure to monocrotophos, cypermethrin and some heavy metals. Patil and Mane[13] observed the biochemical levels in different body parts of freshwater bivalve, *L. marginalis* exposed to mercury in monsoon season. Bhavani[2] observed the absorption of metals, biochemical components like Proteins, Carbohydrate and Lipids were, the decrease of proteins, carbohydrates and lipids in the body tissue of *Perna viridis*, due to metal toxicity.

In the present investigation, effect of ablation of cerebral ganglia, injection of their extracts into foot and exposure of ablated bivalves to rise in temperature on protein content during winter season studied.

The fresh water bivalve molluscs, *Lamellidens corrianus* were collected during winter season, from the fixed location on the left bank of downstream of Godavari river at Kaigaon 50, km away from the city Chhatrapati Sambhaji Nagar. After bringing to the laboratory the shells were cleaned to remove faulling algal biomass and mud. The animals of 85-90 mm in shell length were selected and stocked in well aerated reservoir water for 24 hrs in the laboratory condition. The water was changed at approximate interval of 12-13 hrs.

After 24 hrs laboratory acclimatization the animals were grouped in four sets, each containing 30 animals. The first served as control with intact cerebral ganglia (intact control) and others three as experiments *i.e.* ablation of both cerebral ganglia, injection of cerebral ganglionic extract to ablated animals and exposure of ablated animals rise in temperature. Ablation of cerebral ganglia was done by inserting a wedge of 3-4 mm thickness between the shell valves near the anterior adductor muscle. For injection of cerebral ganglionic extract, the extract was prepared in mixture of ice-cold distilled water and absolute alcohol (1:1) (10 ganglia in 1.00ml mixture) was centrifuged and supernatant (0.2ml/animal *i.e.* equivalent to 2ganglia/ animal) was injected into foot of cerebral ganglioctomized bivalves. To study the effect of rise in temperature, 30 animals are ablated by removing both cerebral ganglia. After the ablation of both cerebral ganglia, animals are kept in another aquarium with constant rise in temperature *i.e.* 28°C in winter. Experiment was run for 12 days during winter (December-January). Animals from control, ablation of both cerebral ganglia, injection of cerebral ganglionic extract and exposure of rise in temperature to ablated animals groups, were also scarified for estimation of total protein from different soft body parts. The pooled body parts of 4 animals from each group were used and mantle, hepatopancreas, gonad and foot were separated quickly. The total protein was estimated according to Lowry *et al*.,[10]. The estimations were done after the 7th and

12th day of experiments. The estimation of organic constituents from different body parts were done within a day after pooling samples. All the values of protein contents of each tissue was subjected to statistical analysis using analysis of variance multiway with replicate, student's 't' test used for find out significant differences among the control, ablation of cerebral ganglia, injection of their extract and exposure of ablated animals to rise in temperature groups.

The freshwater bivalve mollusc, *Lamellidens corrianus* showed abundant growth of algae and algal biomass, near posterior siphonal region on the shell indicating commensal habitat. The occurrence, distribution and biology of this is bivalve is influenced by local ecological factors (temperature, pH, inorganic salts, type of soil etc.), flow of water, presence of microorganism, Teleost fishes and seasonal variations in these parameters. Some of these parameters have been investigated at Warangal region in Andhra Pradesh by Chari *et al*[3]. Along the banks of Godavari river at Kaigaon Tq. Gangapur near Chhatrapati Sambhaji Nagar *i.e.* on the habitat of *Lamellidens corrianus*, it has been noticed that the input of organic matter into river concern the fate of late winter to summer shed leaves. This period, having comparatively high temperature for different time intervals along the banks of river, which enrich either with the nitrogen source only, or with both nitrogen and phosphorous sources. Microorganisms at this time may enrich the water. The importance of leaf litter as food for aquatic organism probably lies in providing energy source for microbial growth, and through the preference of animals for leaves that support microorganism and vast resource of energy is profitably exploited[6]. In stream and shallow water of rivers like Godavari leading to secondary and tertiary production. Thus, the particulate organic matter is likely to rise during the late winter to summer, and likely under flood

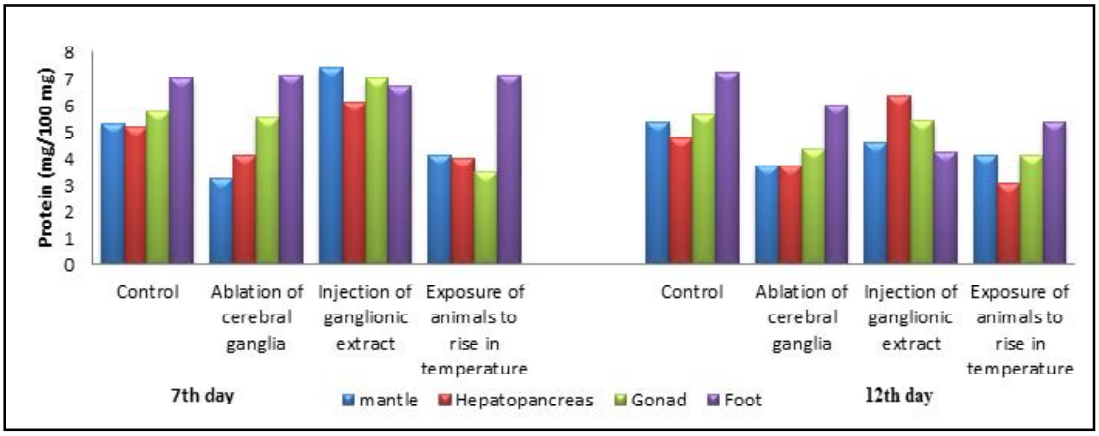

Fig. 1. Effects of ablation of cerebral ganglia, injection of ganglionic extract and exposure of ablated animals to rise in temperature on protein content of *Lamellidens corrianus* during winter season.

Table-1. Effect of ablation of cerebral ganglia, injection of ganglionic extracts and exposure of ablated animals to rise in temperature on Protein content of *Lamellidens corrianus* on 7th day, during winter season (Values in brackets represent percentage difference)
●=P<0.001,●●=P<0.01,●●●=P<0.05

Sr. no.	Tissue	Control	Ablation of cerebral ganglia	Injection of ganglionic extract	Exposure of rise temperature
1	Mantle	5.3040 ±0.1168	3.2123 ●●● ±0.2337 (39.43)	7.4331 ●●● ±0.3092 (40.14)	4.1272 ±0.5094 (22.18)
2	Hepatopancreas	5.1691 ±0.3092	4.1220 ±0.4674 (20.25)	6.1462 ±0.4048 (18.90)	3.9810 ●●● ±0.5355 (22.98)
3	Gonad	5.7763 ±0.2337	5.5497 ±0.3092 (3.92)	6.9909 ±0.2024 (21.02)	3.4718 ●●● ±0.1168 (39.89)
4	Foot	6.9909 ±0.4048	7.1332 ±0.1168 (2.89)	6.7210 ±0.7663 (3.86)	7.1058 ±0.2024 (1.64)

Table-2. Effect of ablation of cerebral ganglia, injection of ganglionic extracts and exposure of ablated animals to rise in temperature on Protein content of *Lamellidens corrianus* on 12th day, during winter season (Bracket values represents percentage difference)
●=P<0.001,●●=P<0.01,●●●=P<0.05

Sr. no.	Tissue	Control	Ablation of cerebral ganglia	Injection of ganglionic extract	Exposure of animals to rise in temperature
1	Mantle	5.3240 ±0.2337	3.7050 ●●● ±0.1168 (30.41)	4.5620 ±0.2024 (14.31)	4.1168 ±0.2337 (22.67)
2	Hepatopancreas	4.7842 ±0.4048	3.7147 ●● ±0.2024 (22.35)	6.3271 ●●● ±0.4048 (32.24)	3.0453 ●● ±0.3506 (36.35)
3	Gonad	5.6614 ±0.1168	4.3742 ±0.2337 (22.74)	5.3852 ±0.1168 (4.88)	4.1243 ±0.5094 (27.15)
4	Foot	7.2197 ±0.6184	6.0010 ±0.5054 (16.88)	4.2413 ●● ±0.6184 (41.25)	5.3754 ±0.3506 (25.54)

condition during rainy season large quantity of organic matter resulting from terrestrial breakdown will find their way into the river system. These processes, coupled with the data as the role of faeces, the micro flora and fauna, and winter chemistry are leading us to a point where the detritus concept and production can be investigate to understand the pace kept by bivalve mollusc to maturation of gonad and release of gametes. Fluctuation in the average environmental parameters of Godavari river, flowing throughout Maharashtra and Andhra, have been reported by Jhingran[8].

In present investigation, the changes in the organic constituents from different tissues in control, ablation of cerebral ganglia group, ganglionic extract injection groups and exposure of ablated animals to rise in temperature on 7th and 12th day during winter season were given in Tables-1 & 2 and fig. 1 during winter season, on 7th day, protein content from mantle was significantly decreased, (3.2123±0.2337, 39.43%, P<0.05) and significantly increased (7.4331±0.3092, 40.14%, P<0.05) in cerebral ganglia ablated and ganglionic extract injected group respectively. The content was significantly decreased (3.9810±0.5355, 22.98%, P<0.05) from hepatopancreas and (3.4718±0.1168, 39.89%, P<0.05) from gonad in exposure of rise in temperature groups respectively. On 12th day, the protein content from mantle showed significant decrease (3.7050±0.1168, 30.41%, P<0.05) in cerebral ganglia ablated group. The content from hepatopancreas was decreased (3.7147±0.2024, 22.35%, P<0.01) and (3.0453±0.3506, 36.35%, P<0.01) in ablated and exposure of ablated animals to rise in temperature groups respectively while the content showed significant increase (6.3271± 0.4048, 32.24%, P<0.05) in extract injected group. The protein content from foot was significantly decreased (4.2413±0.6184, 41.25, P<0.01) in ganglionic injected group.

Due to ablation of cerebral ganglia and exposure of ablated animals to rise in temperature, protein content from most of the tissues decreased in winter. In general, protein contents are mostly affected due to cerebral ganglia removal. It was observed that protein contents in hepatopancreas and gonad decreased in winter due to cerebral ganglia removal suggesting that these reserves are utilized during maturation of gametes. The analysis of variance revealed that in all the tissues seasonal variations in environmental parameters *i.e.* rise in temperatures were mostly responsible for changes in biochemical constituents from different tissues rather than the removal of cerebral ganglia. However, combined effects of changes in environmental parameters and removal of cerebral ganglia caused significant changes in the organic reserves from different tissues. Based on the present findings it has been concluded that the cerebral ganglia possess some factor in regulating the metabolites and different tissues during reproduction.

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