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Seasonal Variation of Carbohydrate, Protein and Lipid of Common Freshwater Edible Gastropod (*Bellamya bengalensis*) of Medinipur District, West Bengal

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Abstract

This proximate study was carried out to determine the seasonal variation of carbohydrate, protein & lipid of common fresh water gastropod *Bellamya bengalensis* in nine selected study sites of Medinipur. For biochemical analysis, shell of the gastropods were removed, flesh were dried with filter paper to avoid the outer water content. The study revealed that protein was much higher than carbohydrate & lipid (mg %) in all nine study sites in all seasons. Protein (17.20 ± 1.78) carbohydrate (13.12 ± 0.74) and lipid (4.83 ± 0.017) were the maximum during Pre-monsoon period than to Monsoon & Post Monsoon period. Protein, carbohydrate, lipid were the maximum during Pre-monsoon period than monsoon & post-monsoon period.

Key Words: *Bellamya bengalensis*, Medinipur, Monsoon, Nutritional value, Seasonal variation.
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Introduction

Molluscs constitute the second largest invertebrates& most successful group next to insects (Abbot, 1989; Rao, 1989; Bouchet, 1991). The estimate of number of species of mollusca today varies from 80,000 species (Boss, 1973) to 135,000 (Van Bruggen, 1995) of these about 5000 species are fresh water (Abbott, 1989; Seddon 2000). Many fresh water molluscs are important food source for humans such as calms and snails. Not only that freshwater molluscs have been known to play a significant roles in the public and veterinary health and thus need to be significantly exploring more extensively (Supian and Ikhwanuddin, 2002). Molluscs are also one of the larger invertebrate groups in the fresh water habitat of Bangladesh (Baby et al., 2010). Fresh water molluscs play a vital role in the economy and tradition of west Bengal in India serving as a food of more than 80% families. The use of fresh water mollusca as protein-rich food is very much in practice in a number of countries viz-India (Rao and Dey, 1989), Mexico (Garcia-Cabus 1989) Taiwan ,Formosa, The Philippines and Thailand (Baby et al., 2010). Some workers in Bangladesh (Jaman and Jahan, 2003; Mallick 1996) investigated in the role of snails as supplementary feed of prawns.

Seasonal changes in bio-chemical composition of Mercenaria and Mytilus have been reported by many workers (Ansell et al., 1964; De Zwann and Zandee 1972). Several works have been done on littoral molluscs of West Bengal costal belt (Chakraborty and Chowdhury, 1993) and the diversity of freshwater and marine molluscs of Medinipur District (Khalua et al., 2003; Khalua et al., 2008); but nutritional perspective is still not well studied.

The present study was carried out to understand the change in bio-chemical composition (Carbohydrate, Protein, and Lipid) of *Bellamya bengalensis* through regular collection of this animal from different freshwater ponds of Medinipur district.

Materials and methods

Study area

The freshwater gastropod , *Bellamya bengalensis* were collected from different ponds and wetlands of Burigeria (P1) , Sattamali (P2) , Golgram (P3), Srikrishnapur (P4), Harinarayanapur (P5), Chandanpur (P6), Chalkanananta (P7), Kolaghat (P8) and Haldia (P9). [Lat 21˚ 30′ - 22^0 2′ N long. 87˚ 20′- 88˚5′ E] (figure 1). The collections are made randomly during the period January-2013 to December 2013. Adult *Bellamya species* (*Bellamya sp.*) are selected for laboratory experiments. Immediately after bringing to laboratory, the shells of these gastropods are brushed and washed with fresh and clean water to remove algal biomass, mud and other waste material.

Sample preparation and biochemical analysis

For biochemical analysis, shell of the *Bellamya sp.* was removed and flesh was dried with filter paper to avoid the outer water content. The wet weights of all the tissues were taken to the nearest milligram (mg) and they were immediately transferred to the hot air oven maintained at 90°-100° C. The samples were dried for 3 to 4 days for the complete removal of their water content (Ahirrao and Kulkarni, 2011). Dry weight of all the tissues were taken

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when all the moisture was removed and no further change in the weight of the dried tissue was noticed. The dried material was powdered and used for analysis.

For biochemical estimations, dry powder was used and its weight was kept practically constant through the experimental work. Carbohydrate was estimated by Kemp et.al. (1954) method, protein was estimated by Lowry et.al. (1951) method and lipid were evaluated by Barns and Blackstock (1975) method.

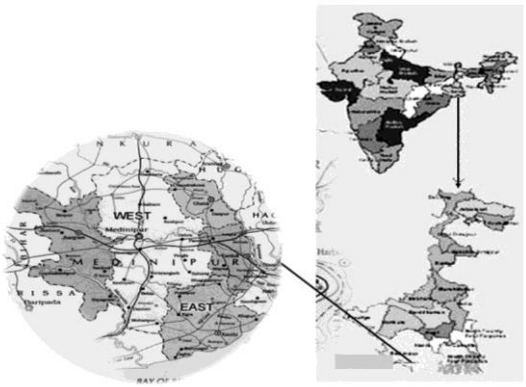

Figure 1. Map of Study area, Medinipur, West Bengal, India.

Statistical analysis

The data were expressed as mean ± SEM, n=6. The analysis was performed (using a statistical package, Origin 6.1, Northampton, MA 01060 USA) with One-way ANOVA tests, $p< 0.05$ as a limit of significance.

Results

Protein

The estimated protein of *Bellamya sp.* has been shown in figure 2. Among the nine selected study sites the protein content in the flesh of *Bellamya sp.* ranging (8.79±0.15) to (17.20 ±a 1.78). It was observed that protein was maximum (17.20 ± 1.78) during pre-monsoon (March – June). It was further noted that the protein content in remained maximum in study site P_3 respectively. The present study revealed that in monsoon protein ranged from (10.23 ± 0.27) to (16.98 ± 1.07); during post-monsoon it varied from (8.79 ± 0.15) to (15.55 ± 0.99) and pre-monsoon the P_3 due to presence of large number of small Nymphea.

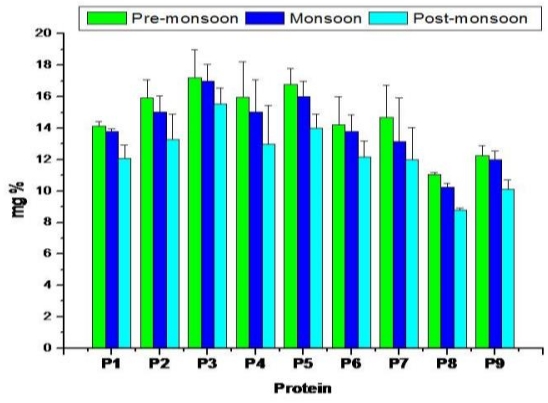

Figure 2. The graphical presentation represents the protein value of *Bellamya bengalensis* of different study areas of Medinipur, West Bengal. The data has been expressed as Mean±SEM ; N=6 of each study area.

Carbohydrate

The analysis of nutrients from the flesh of *Bellamya sp.* results that molluscs are cheap source of protein and as a source of carbohydrate also. Flesh of *Bellamya sp.* contains moderate amount of carbohydrate. The present study revealed that during pre-monsoon period carbohydrate was maximum (13.12 ± 0.74) and during post-monsoon it was minimum (5.034 ± 0.57). There was very little variation of carbohydrate content between monsoons, and post-monsoon. In pre-monsoon the carbohydrate was maximum (13.12 ± 0.74) in study site P_2 and minimum in study site P_8 (7.09 ± 0.54) (figure 3).

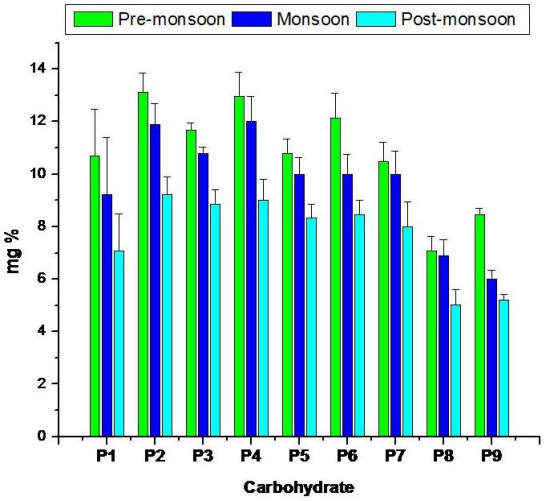

Figure 3. The graphical presentation represents the carbohydrate value of *Bellamya bengalensis* of different study areas of Medinipur, West Bengal. The data has been expressed as Mean±SEM ; N=6 of each study area.

Lipid

The flesh of *Bellamya bengalensis* contain very little amount of lipid. The present study indicated that the lipid content of flesh showed the very small seasonal variation. Lipid was maximum during pre-monsoon and minimum during post-monsoon and moderate amount during monsoon. During pre-monsoon, the lipid was maximum in study site P_2 (4.83±0.01) and P_1 (4.57±0.57) and minimum in study size P_5 (2.14±0.07). During post-monsoon it was maximum in study site P_3 (2.00±0.06) probably due to the presence of large number of Nymphea and very low in study size P_8 (0.89±0.06) due to thermal pollution. During monsoon lipid was the maximum in study site P_9 (1.67±0.26) (figure 4).

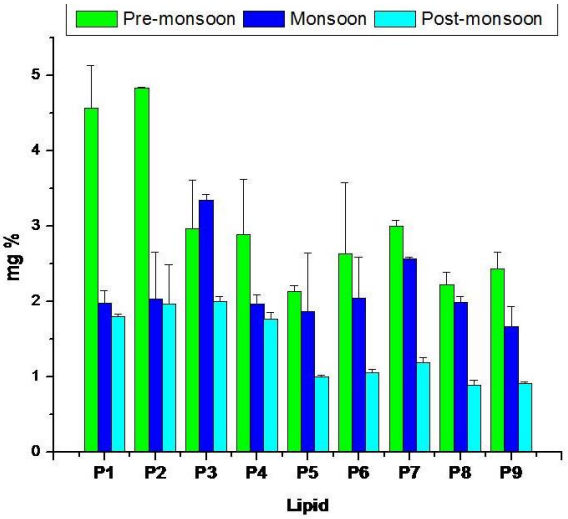

Figure 4. The graphical presentation represents the lipid value of *Bellamya bengalensis* of different study areas of Medinipur, West Bengal. The data has been expressed as Mean±SEM ; N=6 of each study area.

Discussions

Enormous literature is accessible on the toxicity of heavy metals, organ pesticides and insecticides etc. in different aquatic animals related to effect on biochemical constituent levels in different tissues of animals but not so far on seasonal variation. Hence the present study was carried out to evaluate the changes during the seasonal variation on nutritional value of *Bellamya bengalensis* in different area. The present investigation also showed that these gastropods exhibit total protein, carbohydrate and lipid in pre-monsoon period were maximum due to favorable environmental condition in summer.

It was observed that in study site $P_{8,}$ the protein was lower due to the effect of thermal and fly as pollution of Kolaghat Thermal Power Station as well as it was indicated that study site P_9 the protein was comparatively less than rest study areas' due to environmental pollution of Haldia Petrochemicals, Indian Oil Corporation, Mitsubishi etc. and other industries. Other study sites i.e. P_1 - $P_{7,}$ the protein content is comparatively high due to less environmental pollution and stress. During pre-monsoon the protein was the maximum as the water level of pond decreased and less activity of the snail and also the effect of environmental temperature.

During monsoon carbohydrate was maximum in study site P_4 (12.02 ± 0.94) probably due to the presence of large number of *Pisita*, and minimum in study site P_9 (6.01 ± 0.32) and P_8 probably due to the industrial pollution of Haldia and environmental Pollution by Kolaghat Thermal Power Station. In post-monsoon study site P_2 carbohydrate was maximum (9.23 ± 0.65) and minimum in study site P_8 (5.03 ± 0.57). At a glance carbohydrate showed small variation in the entire study site during monsoon and post-monsoon season.

The present study revealed that there was a significant variation in the bio-chemical composition in the flesh of *Bellamya* according to seasonal change. The organic substances like carbohydrate, protein and lipid play a key role in different metabolic activities. Protein is the main organic nutrient that serves as the structural part of different body tissues. The present study showed that protein was maximum during summer season i.e. in the pre-monsoon and very minimum during post-monsoon, probably due to the variation of environmental temperature. It was observed that protein, lipid and carbohydrate were low in post-monsoon probably due to sedentary life without much activity. Similar results were observed by Pandit (2005) in *Lamellidens marginalis* of Godavari River. The lipid was found to be more during summer season as due to exposure of mantle and foot to high temperature in summer season .Similar results was observed by Shaikh (2011). The present study revealed that in energy conservation the organism would be expected to make compensatory adjustment to both the components of energy gain and energy loss in the fate of changes in the environmental conditions (Vedpathak, 1989).

Conclusion

The present study may conclude that the nutrient i.e. protein, carbohydrate and lipid content in the flesh of *Bellamya bengalensis* showed the great seasonal variation and were correlated with the changes in environmental factors and aquatic macrophytes also. However, further study is necessary for evaluation of such variation by molecular study.

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References

Abbott TR. 1989. Compendium of land shells. A full-color guide to more than 2,000 of the World's terrestrial shells. American Malacologists, Inc., Melbourne, FL and Burlington, MA. p. 240.

Ahirrao DV and Kulkarni AB. 2011. Sublethal Stress of Pyrethroids on Biochemical Contents in Prostate Gland of a Freshwater Snail, Bellamya bengalensis. Journal of Experimental Sciences, **2**(3) 01-03.

Ansell AD, Loosmore FA, Lander KF. 1964. Studies on the hard shell calm, Mercenaria mercenaria , in British waters: Seasonal cycle in condition and biochemical composition. J. Appl. Ecol. **1**:83-95.

Baby RL, Hasan I, Kabir KA, Naser MN. 2010. Nutrient analysis of some commercially important mollusks of Bangladesh. Journal of Scientific Research, **2**(2): 390-396.

Barns H and Blackstock J. 1973. Estimation of lipids in marine animals and tissues. Detailed investigation of the sulphovanilline method for total lipids. Journal of Experimental Marine Biology and Ecology, **12**: 103-115.

Boss KJ. 1973. Critical estimate of the number of recent Mollusca. Occas Pap.Molluscs, **3**:81-135.

Bouchet P. 1991. Extinction and preservation of species in tropical world. What future for Molluscs? American Malacologists. **20**: 20-24.

Chakraborty SK and Choudhury A. 1993. Community organisation of macrobenthic molluscs of Sagar Island, Sundarbans, India Indian Biologist. **25**(1): 33-37.

De Zwann A, Zandee B. 1972. Body distribution and seasonal changes in glycogen content of the common sea mussel, Mytilus edulis. Comp. Biochem. Physiol., **43**(A):53-58.

Kemp A, Van Kits, Haijnilngen AJM. 1954. A calorimetric method for the determination of glycogen in tissues. Biochemical Journal, **56**:646.

Khalua RK, Chakravarty G, Chakraborty SK. 2003. Annotated list of mollusks from the coastal tract of Midnapur District , West Bangal, India . J. mar. boil. India, **45** (2): 245- 249.

Khalua RK, Chakravorty G, Chakraborty SK. 2008. Community Structure of macrobenthic molluscs of three contrasting intertidal belts of Midnapore Coastal belt, West Bengal. Zoological Research in Human Welfare, **6**: 47-55.

Lowry OH, Rosenbrough NJ, Fare AL. and Rendall RJ. 1953. Protein measurement with the Folin phenol reagent. Journal of Biological Chemistry, **193**:265-275.

Mallick R.1996. Biochemical Ecology of Stenothyra sp. (Gastropoda:mollusca) in relation to Penaeus monodon (Crustacea: Arthropoda)Culture of Bangladesh,M, Sc.Mcrothesis, University of Rajshahi,pp.1-31.

Pandit SV. 2005. Seasonal variations in the biochemicals of the freshwater bivalve molluscs, Lammellidens marginalis (L.) from Godavari River at Kiagaon, near Aurangabad. Ph.D. Thesis, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India. PP. 1-213

Rao Subba NV and Dey A. 1989. Freshwater Molluscs of India. Zoological Survey of India. Calcutta. p. 225-232

Seddon BM. 2000. Molluscan diversity and impact of large dams. Prepared for thematic review II.1: Dams, ecosystem functions and environmental restoration. IUCN Report.

Shaikh MJ. 2011. Seasonal VariationsIn BiochemicalConstituents in different body tissues of freshwater Bivalve mollusk, Lamellidens marginalis (Lamark) from Pravara river in Maharashtra. The Bioscan, **6** (2): 297-299.

Supian Z. and Ikhwanuddin AM. 2002. Population dynamics of fresh water molluscs (Gastropod: Melanoides tuberculata) in Crocker Range Park, Sabah. ASEAN Review of Biodiversity and Environmental Conservation (ARBEC)

Vedpathak AN.1989. Reprroductive endocrinology of some Lamellibranch mollusks with special reference to environmental stress. Ph. D Thesis, Marathwada University, Aurangabad (M. S), India, pp. 1- 280.

Zaman MB and Jahan MS. 2003. The efficacy of Molluscan flesh in the production of prawn in Bangladesh. Pakistan Journal of Biological Science, **6** (6), 571-574.