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Biochemical changes in various Organs of Lamellidens Consobrinus due to Toxicity stress

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Abstract

The present study describes the biochemical changes particularly the variations of protein in various Organs of Lamellidens Consobrinus. The variation in protein content in different tissues i.e. gills, digestive glands and whole soft body tissues after chronic exposure of heavy metals like $NiCl_2$, CrO_3 to fresh water mussels Lamellidens consobrinus was studied. The mussels were exposed to $LC_{50/10}$ concentration of 1.65ppm of CrO_3, and 0.34 ppm $NiCl_2$ for 21 days. The protein content from the three groups were estimated after 7, 14, and 21 days. It was observed that after chronic treatment of above heavy metals, the depletion of protein content in whole body, digestive gland and gills was observed with increased exposure period. The more amount of protein content decreased in whole body as compared to digestive gland and gills.

Keywords: Nickel chloride, chromium trioxide, protein content, Lamellidens consobrinus, toxicant stress.

Introduction

Indiscriminate use of chemicals, fertilizers resulted in the contamination of aquatic environments and affecting the non target organisms. These harmful substances accumulate in the body of non target organisms and damages the organs and systems of the body and disturb the physiological and biochemical processes of the organisms. Mollusca are very important food stuff. Apart from their commercial value as human food stuff and in feeding of several crustaceans fresh water mussels are phytoplankton eater[1]. They suck the water through siphon and remove the other particles and toxic metals up to certain extent therefore freshwater mussels are used as biological indicator (EPA, 2009). The aquatic environment has always subjected to different types of pollutants of industrial, domestic and agricultural wastes which severely affect the aquatic organisms[2]. Rrapid industrialization in India has resulted into substantial increase in the effluent, which traditionally discharged into nearby natural water and causing threats to animal lives[3,4]. Water pollution causes changing the physical, chemical and biological properties of water bodies, ultimately polluting environment[5]. Due to mercury pollution, biochemical content in different parts of the body is decreased in freshwater bivalve, *Lamellidens marginalis*[6]. Satyaparmeshwar studied and reported that, decrease in protein content of different tissues in freshwater mussel, *L. marginalis* after expose to heavy metal chromium[7], Emission of Cr, chemicals, paints are added in freshwater body due to washed road near the industries, errosion of bushings[8].

Nickel is a widespread pollution contaminant in most of the freshwater bodies. Majority industrial effluents, play a major role to increase the nickel content in surface water. Due to agricultural practice contribute to increase the heavy metals level in freshwater body[9].

As the freshwater bivalve are the richest source of vitamin B_{12} and it is used in food stuff as a delicious dish. So the knowledge of effect of various heavy metals like Cr and Ni on biochemical composition i.e. protein content of different tissues of freshwater mussel, *Lamellidens consobrinus*. The vital organs like gills, digestive gland and whole body are used to determine the protein content of their tissues after chronic treatment to heavy metals like nickel, chromium in freshwater mussel *Lamellidens consobrinus*. Many workers have reported the effect of pesticides and other chemicals and biochemical composition but less information is available on this topic.

Material and Methods

The fresh water mussels Lamellidens consobrinus were collected from Hartala lake near Muktainagar, Dist.: Jalgoan, M.S. Bivalves of similar size were collected and washed in order to remove the algal biomass and other waste. The mussels were acclimatized for 4-5 days in laboratory conditions. Healthy and medium sized mussels were selected for experiment. They are divided into two groups such as group A and B. The groups A of acclimatized mussels are kept as control set. The group B of acclimatized was exposed to chronic concentration (LC 50 value of 96hrs/10) of heavy metal salt $Nicl_2$ (0.34ppm), CrO_3 (1.65ppm) up to 21 days. During experimentation mussels were fed on fresh water algae. In each group, 10 animals were selected after 7th, 14th and 21st days of interval. Ten animals from each set were taken out, dissected and tissues such as the whole body mass, digestive gland and gill was removed and dried at 70^0-80^0C in an oven till constant weight was obtained.

The tissues of control group and experimental group were used for protein estimation by Lowry's method[10].

Observation: The changes in the protein content in whole body and selected tissues, digestive gland and gills of freshwater mussel, *L.Consobrinus* was decreased after exposed to $LC_{50/10}$ concentration of heavy metal salts CrO_3. The data is calculated by statistical analysis method.

Results and Discussion

The control group of mussels, the protein content in gills, digestive gland and whole body is 44.55± 0.0165, 43.50 ± 0.0169 and 42.35 ± 0.0167 respectively shown in table-1.

The bivalve exposed to 1.65ppm ($LC_{50/10}$) of heavy metal salt of CrO_3, the protein content of the gills after 7th, 14th and 21st day was 47.35 ± 0.0175, 46.75 ± 0.0170 and 45.70 ± 0.0162 respectively. The protein content from the digestive gland of bivalve exposed to 0.34ppm ($LC_{50/10}$) of heavy metal salt $NiCl_2$ is 41.15 ± 0.0164, 39.55 ± 0.0168, 38.75 ± 0.0160 after 7th, 14th and 21st day respectively. As well as the protein content from the digestive gland exposed to $LC_{50/10}$ concentration of heavy metal salt CrO_3 i.e. 1.65 ppm was after 7th, 14th and 21st days are 43.55 ± 0.0156, 41070 ± 0.0162, 41.15 ± 0.0143 respectively.

The protein content from the whole body exposed to $LC_{50/10}$ of heavy metal salt $NiCl_2$ (0.34ppm) was found 56.65 ± 0.0170, 53.45 ± 0.0164, 51.70 ± 0.0167 after 7th, 14th and 21st days respectively. As well as the protein content from the whole body exposed to $LC_{50/10}$ of heavy metal salt CrO_3 (1.65ppm) was found to be 57.45 ± 0.0174, 56.20 ± 0.0153, 53.20 ± 0.0155 after 7th, 14th and 21st day respectively.

Table-1
Showing biochemical composition i.e. protein content when the bivalves are exposed to $Lc_{50/10}$ concentration of Nickel chloride

Day	Tissue	7 days	14 days	21 days
A (Control)	Gills	52.80 ±0.0154	51.75 ± 0.0178	51.45 ± 0.0152
	D.G.	49.25 ±0.0162	48.55 ± 0.0162	47.40 ± 0.0166
	W.B.	61.90 ±0.0162	59.20 ± 0.0158	59.05 ± 0.0175
B (Treated with $LC_{50/10}$ of $Nicl_2$ 0.34 ppm)	Gills	44.55 ±0.0165 (-15.63%)	43.50 ± 00.0169 (-15.94%)	42.35 ± 0.0167 (-17.69%)
	D.G.	41.15 ±0.0164 (-16.78%)	39.55 ± 0.0168 (-18.54%)	38.75 ± 0.0160 (-18.25%)
	W.B.	56.65 ±0.0170 (-10.10%)	53.45 ± 0.0164 (-9.71%)	51.70 ± 0.0167 (-12.45%)

Table–2
Showing biochemical composition i.e. protein content when the bivalves are exposed to $Lc_{50/10}$ concentration of chromium trioxide

Day	Tissue	7 days	14 days	21 days
A (Control)	Gills	52.85 ± 0.0163	51.80 ± 0.0165	51.50 ± 0.0171
	D.G.	49.50 ± 0.0170	48.60 ± 0.0168	47.45 ± 0.0164
	W.B.	61.95 ± 0.0168	59.25 ± 0.0161	59.05 ± 0.0164
B (Treated with $LC_{50/10}$ of CrO_3 1.65 ppm)	Gills	47.35 ± 0.0175 (-10.41%)	46.75 ± 0.0170 (-9.75%)	45.70 ± 0.0162 (-11.26%)
	D.G.	43.55 ± 0.0156 (-12.02%)	41.70 ± 0.0162 (-14.20%)	41.15 ± 0.0143 (-13.28%)
	W.B.	57.45 ± 0.0174 (-7.26%)	56.20 ± 0.00153 (-5.15%)	53.20 ± 0.0155 (-9.91%)

Discussion: The result of present studies clearly indicates the protein content gradually decreases with increase in exposure time and regular mode of action of toxicants, due to accumulation of substances up to dangerous level. Toxic stress of any kind leads to change in biochemical and physiological mechanism in the body of organisms. The decrease in the amount of protein content in different body parts after chronic exposure to heavy metal salts shows that, these metals inhibit the synthesis of protein which ultimately results in increase in free amino and protein in the cell or due to enhancement of proteolysis to adjust with high energy demand under the toxic exposure[11]. The decrease of protein content in tissues due to toxic stress and present fatigue due to pesticidal toxicity[12]. The depletion in protein content in various tissues of fish after exposure to nickel[13]. The same observations were noted by David[14]. In snail exposed to Nickel Satyaparmeshwar observed that decrease in protein level, glutamate dehydrogenize activity is decreased in the tissues like adductor muscle, gills and mantle exposed to chromium[15]. In bivalve *Lamellidens marginalis* Kharat et al suggested that the depletion in protein content in the ovary, hepatopancreas, gills and muscles of microbranchium kistenensis due to heavy metal stress[16]. Similar findings are reported by Jagtap et al, in disturbances of protein metabolism of bivalve Lamellidens marginalis exposed to tributylin chloride[17].

According to Soto et.al, these is relationship between effects of heavy metals with change in the levels of proteins in different organisms as the review on protein metabolism[18]. Jagtap et.al, reported the depletion in protein content of all tissues was shown with an increased exposure period[17]. The more change in protein content occurred in digestive gland as compared to gills, mantle, soft body and foot. Ahmed Datan kumia et.al, noted the Cu levels in the body have a positive correlation with levels of protein in the body of fresh water mussel Arodanta woodiana[19]. Tambe R.S. showed that the more decrease of protein content in digestive gland, gonad and gills[20]. They show the higher depletion of protein in the digestive gland due to pollution stress.

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References

1. Ekin I and Bashan M., Fatty aid composition of selected tissues of Unio elonggatulus (Boourguignat, 1860) (Mollusca:Balrvaria) collected from Tigris River, Turkey, *Turk. J. Fish Aquat. Sci.,* **10**, 445-451 **(2010)**.

2. Kalay M. and Canli M., Elimination of essential (Cu, Zn) and non essential (Cd, Pb) metals from tissues of a fresh water fish Tilapia zillii following and uptake protocol, *Turk. J. Zool.,* **24**, 429-436 **(2000)**

3. Almeida J, Novelli, M.E. Pal, Pai S. and Junior R., Environmental cadmium explosure and metabolic responces of Nile Tilapia, *Oreo. Chromis. niloticus, Environ. Pollut*., **114**, 169-175 **(2001)**

4. Ramona A., Biswas A.K., Kundu S., Saha J.K. and Yadav R.B., Efficancy of distillery effluent on seed germination and seedling growth in mustard, cauliflower and raddish proc., *Nat. Acad. Sci. India*, **71**, 129-135 **(2001)**

5. Indra V. and Shivaji S., Metals and organic compounds of sewage and sludges, *J. Environ. Biol.*, **27**, 723-725 **(2006)**

6. Patil S.S. and Mane U.H., Tissue biochemical levels in different body parts of fresh water bivalve, Lamellidens marginalis exposed to mercury in mansoon season, *Ind. Joun. Comp. Animal Physio.,* **22**, 56-61 **(2004)**

7. Satyaparmeshwar K.T., Ravinder Reddy and Vijaya Kumar N., Study of carbohydrate metabolism in selected tissues of freshwater mussel, Lamellidens marginalis under copper sulphate toxicit, *J.Environ.Biol.*, **27(i)**, 9-41 **(2006)**

8. Dixit S. and Tiwari S., Impact assessment of heavy metal pollution of Shahpura lake, Bhopal, India, *International Journal of Environmental Researchm*, **2(1)**, 37-42 **(2008)**

9. WHO, World Heath Organization standard for drinking water guidelines for drinking water quality, Recommendation, france, WHO, **1**, 181 **(2004)**

10. Lawri O.H., Rosebrough N.J., Farr. A.L. and Randall R.J., Protein measurement with folin phenol reagent, *J.Biol. chem.,* **193**, 265-275 **(1951)**

11. Waykar bhalchandra, Lomte V.S. and Zambre S.P., Effect of cypermethrin on the ascorbic acid content in the mantle foot,gill,digestive gland and whole body tissues of fresh water bivalve, Parreysia Cylindrica, *J. Aqua.Biol.*, **16(2)**, 57-61 **(2001)**

12. Parate S.K. and Kulkarni K.M., Toxic influence on the total protein content in the mussels and gills of the freshwater crab, paratephusa jacqimontii exposed to cypermethrin, *J. Aqua. Biol.*, **18(1)**, 111-113 **(2003)**.

13. Desai M.S., Nanda B. and Panigratil J., Toxicological effects on some biochemical parameters of fresh water fish (Channa punctantus (Bloch under the stress of nickel, *J. Environ. Biol.*, **23(3)**, 275-277 **(2002)**

14. David M., Mushigeri S.B. and Prashant M.S., Nickel induced changes in some aspects of ptotein metabolism in the tissues of pila globosa, *J. Environ. Biol.,* **24(1)**, 69-75 **(2003)**

15. Satyaparmeshwar KT, Ravinder Reddy and Vijaykumar N., Effect of chromium on protein metabolism of fresh water mussel, Lamellidens marginalis, *J. Environ. Biol.*, **27(2)** 401-403 **(2006)**

16. Kharat P.S., Laxmi B., Ghoble K.B. and Shejule Kale R.S., Impact of TBTCL on total protein content in fresh water prawn, Macrobranchium kistenensis middle- East., *Journal of Scientific Research*, **4(3)**, 180-184 **(2009)**

17. Jagtap JT, Shejule K.B. and Ubarhande S.B., Acute effect of TBTCL on protein alteration in fresh water bivalve lamellidens marginalis, *Internat. Multidisciplinary J.*, **1(8)**, 13-16 **(2011)**

18. Suto M., Marigomez J and Cancio I., Biological Aspects of metal accumulation and storage, Universaity of the Basque Coventry Bilbo, Basque Country, Spain **(2008)**

19. Kurnia I.A., Purwanto E. and Mahajoeno Edwi, Exposure copper heavy metal(cu) on fresh water mussel (Anodonta Woodiana) and its relation to cu and protein content in the body shell, *Bioscience*, **2(1)**, 48-53 **(2010)**

20. Tambe R.S., Total protein alteration in different tissues of fresh water bivalve, Parreysia Cylindrica after dichloros. Exposure, *Ind. J. of Applied Research*, **4(10) (2014)**