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To Study Toxic Effects of Heavy Metals Mercuric Chloride on Glycogen Composition on Fresh Water Molluscs *Bellamya Bengalensis*

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Abstract

Impact of heavy metal show serious effect on Aquatic creature when it enters in aquatic life. Heavy metals are naturally present in the environment. They are easily accumulated in food chains and some of them are essential to the proper functioning of many biological processes but most of them non-essential for biological processes They are also potentially accumulated in the fresh water environment as well as in organisms. Mercuric chloride (HgCl2) is a heavymetal one of them. Heavy-metal released as wastage through industries but its excessive use and uncontrolled discharge have caused harmful effect on aquatic life Heavy metals that arrival into the aquatic environment create hazardous problem to the biota due to their toxicological effect. in present study was glycogen content in different body parts i.e. Mantle, digestive gland, hepatopancreas, foot, of freshwater Bellamya bengalensis exposed to lethal concentrations of mercury chloride for 24,48,72 and 96 hrs. . Change in the levels of biochemical constituents and suggest that to meet high energy need molluscs was under metal stress. Glycogen content in freshwater mollusca Bellamya bengalensis was altered indicating the effects of HgCl2. hepatopancreas is the most sensitive tissue to cd exposure and that tissue is more suitable for monitoring metal pollution.

Keywords: *Bellamya bengalensis, glycogen, hepatopancreas, Heavy metal, Molluscs, Mercuric chloride (HgCl2)*

Introduction

The snail, *Bellamya bengalensis* is the largest freshwater prosobranch animal.It is included under family Viviparidae which has a worldwide distribution. The snail is usually found near in rivers and ponds. Deu to over release of Mercuric chloride into water bodies it can affect human as well as aquatic creature's. High levels of non-essential heavy metal toxic for aquatic organisms. This is the case for lead and cadmium are this type of heavy metals. (Raghava Kumari, 2013). Higher concentrations of toxicant in aquatic environment cause adverse effect on aquatic organism at cellular or molecular level and ultimately it leads to disorder in biochemical composition The changes in biochemical composition of foot, mantle and digestive gland of freshwater gastropod, Bellamya bengalensis exposed to acute concentrations of detergent (Tide) was studied along with control animals. (Roshani Patel and Anil Kurhe 2023) studied various concentrations of copper and mercury at varying lengths of exposure alter the levels of protein, carbohydrate, lipid, phosphatase, and aminotransferase significantly in the different soft tissues and hemolymph of molluscs. Cu and Hg have adverse effects on the biochemical composition and enzymes of molluscs. (Sandhya M. Sonawane, Mayur Sonawane 2019) studied the effect of mercuric chloride on glycogen of fresh water bivalve L.marginalis they observed that in acute treatment of "Asignificant change in glycogen content was found in mercuric choride treated freshwater mussels, maximum depletion occurred in digestive gland. according to (shaikh Yasmeen 2019) in her study impact of heavy metal,cadmium (II)on glycogen content of freshwater bivalve ,Lamelliden marginalis in monsoon season it was observed that "Lamellidens marginalis when treated with cadmium chloride. Cadmium tion in the different organ of test bivalve molluscs Lamelliden marginalis" (D. V. Ahirrao and A. J. Patil 2019) studied the freshwater snail, Bellamya bengalensis show various histochemical changes after 1, 7 and 15 days of exposure during pre-reproductive, reproductive and post-reproductive periods. according to him "The biochemical estimation of glycogen in the ovary after 1 day exposure a considerable depletion in glycogen content was observed during ore and post-reproductive period where as in reproductive period significant increased was observed. After 7 and 15 days of exposure, significant decrease was found to be noticed".

(Esoka and Umaru, 2006; Adebayo et al., 2007; Jaji et al., 2007; Mashi and Alhassan, 2007; Solomon, 2009) due to increase population, industrialization and urbanization. Households waste and industrial waste directly discharged into water bodies without any treatment. This has led to pollution of inland water bodies and coastal water and subsequently increased water quality parameters such as heavy metal, nutrients and organic matter, soluble ions, oil and grease, and organic chemicals such as pesticides and Polynuclear Aromatic Hydrocarbons (PAHs).(Coetzee et al., 2002; Ursinyova & Hladikova, 2000; Weis & Weis, 1977). due to arrival of Heavy metals to the freshwater that create serious problem biota due to their general toxicity, highly persistent nature, tendency to bioconcentrate and bioaccumulate in an organism, and food chain amplification.(Reddy et al. 1986) concluded that the changes in the levels of glycogen in the foot, mantle, and gills of a freshwater mussel, Parreysia rugosa, under sublethal concentrations of mercury chloride indicate a decrease in energy supply metabolism through oxidative pathways. Exposure to heavy metals is a common phenomenon due to their environmental pervasiveness. Metal intoxication particularly neurotoxicity, genotoxicity, or carcinogenicity heavy metals (particularly arsenic, lead, cadmium and mercury) induce their toxic effects (Mehta et.al 2008). (S. Londhea S. Patilb and N.Kamble 2015) toxic effects of HgCl2 as evidenced by the bioaccumulation and histopathological alterations in slug S. maculata. Animal showed hyper accumulation and rapid behavioral changes to counteract HgCl effects which will be hazardous for the survival of the terrestrial as well as aquatic fauna.

The major contaminations provide an imbalance to the ecological diversity in the region. Hence, this study was designed to create awareness to protect these animals against severe toxic pollution and to maintain Eco balance through food chain (Tilak, K.S et.al2002) Biochemical changes, total proteins, glycogen, aspartate and alanine (AAT and ALAT) amino transferases were studied with exposure of sublethal concentrations of NH3-N, NO2-N and NO3-N Depletion in the food reserves and enzyme activity was observed in all the three fish species exposed to these toxicants (Tesán-Onrubia J. A et.al 2023) mercury bio accumulates in aquatic organisms as they take up Me Hg from the water or ingest prey containing MeHg. in organism deu biomagnification large amount of mercury occupied higher trophic levels. As a result, predatory fish and marine mammals can accumulate significant levels of mercury.(Martinez-Finley E. J and Aschner M. 2014) the Hg0 is available in the liquid form (i.e., silver-colored liquid) under ambient conditions; it may form Hg vapors under the same environmental conditions (i.e., room temperature), attributing to its high vapor pressure.(Park J.-D and Zheng W 2012) toxicity of elemental mercury and inorganic mercury compounds. Inorganic mercury compounds are water soluble with a bioavailability of 7% to 15% after ingestion; they are also irritants and cause gastrointestinal symptoms.. (Clarkson T.W et.al 2007) studided on Mechanisms of mercury disposition in the body according to him "The mercurous mercury in the form of mercurous chloride (Hg2Cl2) is little absorbed in the body".

Materials and Methods:

100 mg of HgCl2 powder was mixed with 100 mL of water. And the solution was formed into volumetric flask and the volume was adjusted to obtain a 1 g/L stock solution of HgCl2.

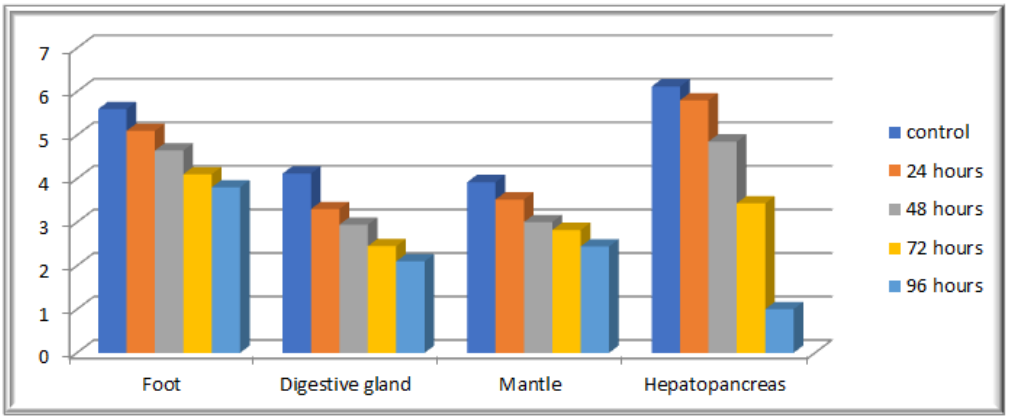
The snail Bellamya bengalensis were collected from the malvadi lake near nimbalak ahmednagar. They were brought to the laboratory and. The snail were acclimatized to laboratory conditions for four-five days. During this experiment the animals were fed on algae.The water in the troughs was changed every day. For this experiment. The adult snail were selected. To study the effects of heavy metals set of animal exposed to sub lithal dose of (mercuric chloride and) on the biochemical composition of Bellamya bengalensis such as carbohydrates (glycogen) was studied in the normal (control) and pollutant (HgCl2) treated, the biochemical constituent was estimated from different body parts i.e., Digestive gland, mantle, hepatopancreas, foot, the results are summarized in Table snail were divided into two group control N=10 for control and N = 10 treated with mercury chloride 100 mg Bellamya bengalensis was exposed for mercury chloride 24,48,72 and 96 hrs. Each body part of animal of each set was pooled separately and three sample were used for biochemical analysis.

Glycogen estimation of the tissue was done by anthrone reagent method (Dezwaan and Zandee, 1972). (Sandhya M. Sonawane, Mayur Sonawane 2018)1 ml of 30% KOH solution was prepaired by mixing 100 mg of. The supernatant was discarded and the residue cake was dissolved in 10 ml of distilled water 0.1 ml of this solution was taken and to it 0.9 ml of distilled water were added. The solution was heated in boiling water bath for 5 minutes and then cooled. Anthrone,reagent was prepared by dissolving 50 mg anthrone powder and 1 gm Thiourea in 100 ml prepaired by using 72% H2SO4. By using spectrophotometer 625 nm change occure in glycogen was calculated referring to a standard graph value, where glucose was used as a standard. each sample three value mean taken for result reported and expressed as mg biochemical content per 100 mg wet weight of tissue.

Results and Discussion

Table – 1 Glycogen percentage in selected Body part of Bellamya bengalensis, control and Treated with HgCl2 as a function of exposure period

Sr.no	Bellamya bengalensis Body part	Control	Change in glycogen content.				Total glycogen change in (%)
			24 hours	48 hours	72 hours	96 hours	
1	Foot	5.601	4.904 ± 0.0200	4.649 ± 0.0376	4.104 ± 0.0270	3.804± 0.0850	32.08
2	Digestive gland	4.122	3.304 ± 0.0036	2.945 ± 0.0036	2.451 ± 0.0036	2.102 ± 0.0058	49.02
3	Mantle	3.922	3.522 ± 0.0194	3.004 ± 0.0197	2.822 ± 0.0197	2.445 ± 0.0036	37.62
4	Hepatopancreas	6.120	5.802 ± 0.0154	3.854 ± 0.0197	2.004 ± 0.0197	1.004 ± 0.0197	83.59



In present study that *Bellamya bengalensis* treated with mercury chloride at varying lengths of exposure alter the levels of carbohydrate the different soft tissues of *Bellamya bengalensis*. Hg have adverse effects on the biochemical composition that cause a lowering of the nutritional reserves of molluscs via the degradation of biomolecules like glycogen. Table In control group hepatopancreas tissue stores highest amount glycogen (6.120±0.094), followed by foot (5.601±0.054), mantle (3.922±0.057), Digestive gland (4.122±0.094), it was observed to Author change glycogen in level of the foot , digestive gland ,whole body, and mantle decreased slightly after exposed to heavy metals. in 96 hours acute treatment of mercuric chloride rapidly the glycogen depletion occured in the digestive gland (49.02 %), foot (32.08 %), mantle (37.62 %)and hepatopancreas (83.59 %).The maximum depletion occurred in the hepatopancreas of *Balmeya bengalnesis*. (Dezwan & Zandee, 1972; Javed & Usmani, 2015) studied depletion of carbohydeate can be correlated to the increased consumption of carbohydrates because of presence of heavy metal stress in the environment responsible for condition like anoxia, hypoxia, or anaerobic metabolism during stress carbohydrates used as available energy source the depletion of glycogen level in hepatopancreas (1.004 ± 0.0197), followed by foot (3.804± 0.0850), mantle (2.445 ± 0.0036), Digestive gland (2.102 ± 0.0058)(Shaffi, 1978). Maximum glycogen level decrease is into fish more Decrease in glycogen level was also due to copper intoxication (Patil, 2011) fresh water bivalves required high amount energy for the metabolic process. When animal under heavy metal stress to fulfill this energy need protein level of organism decreases (G. D. Suryawanshi 2021) observed in their study change in protein level when animal expose to mercury.

Conclusion

The present study is help to detect pollution which occur due to metal released by industries and agricultural field. Further detailed for research in the field of molluscan toxicology, it can provide information about any changes occur the aquatic ecosystem. It help to protect and give information how to restore ecosystem structures, functions of ecosystems that affected by pollution and make important participate to saving food chain reduced environmental impact this study help if any pollution occurs in malvadi lake due to mercury the release of toxic substances and pollutants.

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Conflicts of Interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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