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Effects of Sub Lethal Concentrations of Potassium Permanganate on Protein Content of Freshwater Crab: *Barytelphusa Guerini*

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ABSTRACT: The effect of potassium permanganate on protein content in different tissues of fresh water crab, *Barytelphusa guerini* was studied by using Lowry's Method (1951). The animals were exposed on acute exposure of the potassium permanganate for the present study. The protein content in tissues such as gills, hepatopancreas and muscles were observed. The protein levels in all the tissues were found to be decreased on exposure to potassium permanganate ($KMnO_4$). Under normal physiological condition excess of protein is stored in the tissues like hepatopancreas and muscles in tissues of crab for common metabolic pathways. As per the need of animals it is utilized. On exposure to potassium permanganate the magnitude of protein content was found to be directly linked to the duration of exposure.

KEYWORDS: *Barytelphusa guerini*, Protein, Potassium Permanganate.

I. INTRODUCTION

Now – a – days aquatic pollution due to toxicants on ecosystem show levels above the expected background. The chemical nature of most pesticides and fertilizers results in their accumulation and retention in nature. This will occur in the plants and animals as well as environment itself (Mali, R.P. et.al, 2009).

Metabolism is the term given to the sequence of chemical process that take place in the living animals. The process includes the degradation of complex substances into simpler substances, is the term catabolism. The reverse process of synthesis of complex compounds from simpler substances is anabolism. In the various metabolic processes energy is made available to carry out mechanical work and chemical work such as synthesis of carbohydrates, proteins and lipids (McDonald et.al, 1989). Biochemical analysis is an index of nutritive value only because the fractions it isolates correlated with some of the properties of organisms possesses nutritionally significant value (Kamal et. al, 2007).

Proteins are "building blocks of life" which acquires vital importance to the survival of living things. They are produced without any defects organization in the cell, whose complexity and regularity cannot be compared with any other production system. They constitute a large part of the structure of cells and are present in all tissues. They are composed from chain of amino acids and are vital components of every cell in the living organism. They play an important role in physiological functions like structural components of cell membranes enzymes, proteins, hormones, nucleoproteins and antibodies (Albert Lehninger *et al.*).

II. MATERIAL AND METHODS

The animals used for experimentation were the fresh water crab, *Barytelphusa guerini*. The species is available abundantly in the paddy fields of Nanded District, Maharashtra. They were acclimated to the laboratory conditions for a week prior the bioassay tests during which they were maintained in large aquaria. The crabs were maintained in the glass aquarium jars, fed with goat meat and acclimatized to the laboratory conditions. Dead animals were discarded.

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Only healthy, active and moderate size animals weighed between 35-40 gm were selected for the present experimentation. Experimental crabs were not fed one day before the commencement of experiment in order to avoid the difference, if any, due to differential feeding.

To determine the LC_{50} value, the crabs were exposed to (0.1 gm/L) concentration of potassium permanganate for 24, 48 72 and 96 period of exposure. The static method is used to run the experiment of toxicity evaluation upon 96 hrs as described by Finney, 1971. The bioassay experiment was repeated with control group of animals and mortality was recorded at the end of 96 hrs. No mortality was observed in control group of animals. Similarly crabs were exposed to sub lethal concentration (0.05 gm/L) of potassium permanganate exposed up the period of 96 hours. The protein contents were estimated in the various tissues of fresh water crab, *Barytelphusa guerini i.e.* hepatopancreas, muscle, and gill. The estimation of protein content was done by the method of Lowry et.al, (1951) using crystalline bovine serum albumin (BSA) as the standard. The values for total protein content in crab, *Barytelphusa guerini* expressed as mg protein/gm wet weight of the tissue. The obtained data were statistically analyzed and plotted in the table1 and graphically (A,B,C) given below.

III. RESULTS

The freshwater crab, *Barytelphusa guerini* exposed to sub-lethal concentration of potassium permanganate as a toxicant showed remarkable changes in protein contents in various tissues. The values obtained for protein content for experimental crabs for 24 hrs, 48 hrs, 72 hrs and 96 hrs period of exposure were found to be 16.96, 12.72, 7.87 and 4.54 mg/gm wet wt. of muscle respectively. The protein contents in muscle of fresh water crab, *Barytelphusa guerini* was found to be suddenly decreased up to 96 hrs period of exposure as compared to control set. The total protein content in muscle of freshwater crab, Barytelphusa guerini for control set were found to be 25.75, 25.15, 24.84 & 24.54 mg/gm wet wt. of tissue for 24, 48, 72 & 96 hours period of exposure respectively.

The amount of total protein contents in fresh water crab, Barytelphusa guerini exposed to under stress of potassium permanganate were found to be 13.63, 10.90, 07.96 & 08.03 mg/gm wet wt. of tissue for 24, 48, 72 & 96 hours period of exposure respectively. The obtained values were compared with control set values and the decreasing trend was observed up to 96 period of exposure. The total protein content in gills of crab for control set for 24, 48, 72 & 96 hours period of exposure were 13.63, 13.30, 12.72 & 13.33 mg/gm wet wt. of tissue respectively.

The declining trend was also found in the hepatopancreas as compared to control set. The obtained values for experimental set were found to be 35.48, 30.30, 24.84 and 20.00 mg/gm wet wt. of hepatopancreas respectively. The obtained values were for controls set for 24, 48, 72 & 96 hrs period of exposure were found to be 44.84, 44.24, 44.54 and 43.93 mg/gm wet wt. of tissue respectively.

Table: Effect of Potassium Permanganate on Total Protein Content of Fresh Water Crab, *Barytelphusa guerini* in Control and Experimental Set for 24, 48, 72 & 96 hours period of exposure

Sr. No	Name of Tissue	Exposure Period	Total Protein Content (mg/gm wet wt of tissue) (Control Set)	Total Protein Content (mg/gm wet wt of tissue) (Experimental Set)
1	Muscle	24 hrs	25.75 ± 1.65	16.96 ± 0.74
		48 hrs	25.15 ± 0.86	12.72 ± 0.16
		72 hrs	24.84 ± 0.04	07.87 ± 0.45
		96 hrs	24.54 ± 0.54	04.54 ± 0.15
2	Gills	24 hrs	13.63 ± 0.48	13.63 ± 0.76
		48 hrs	13.30 ± 0.91	10.90 ± 0.66
		72 hrs	12.72 ± 0.82	07.96 ± 0.25
		96 hrs	13.33 ± 0.33	08.03 ± 0.22
3	Hepatopancreas	24 hrs	44.84 ± 0.25	35.48 ± 0.72
		48 hrs	44.24 ± 0.18	30.30 ± 0.68

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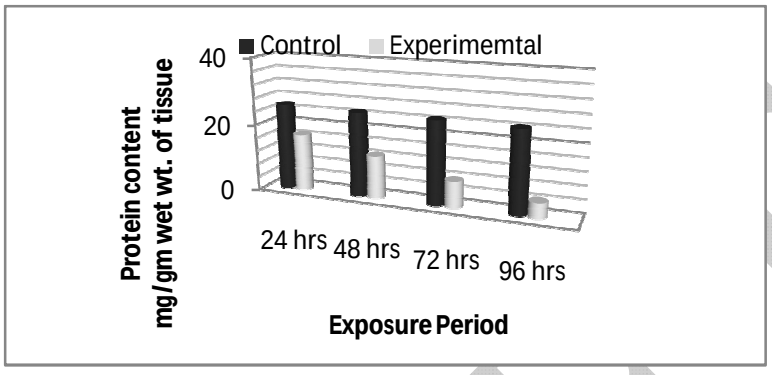
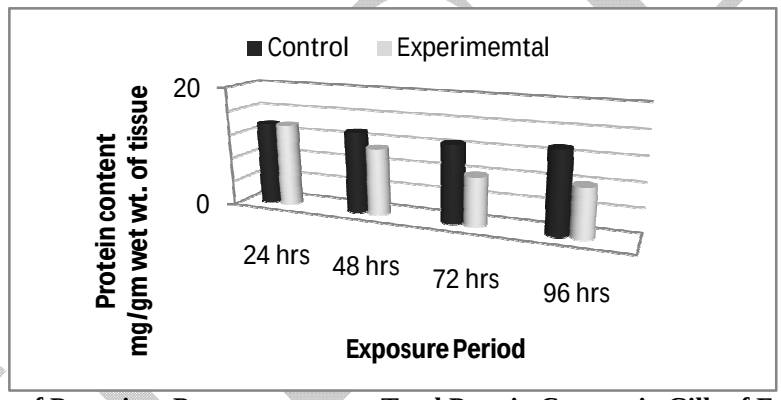
		72 hrs	44.54 ± 0.26	24.84 ± 0.66
		96 hrs	43.93 ± 0.33	20.00 ± 0.54

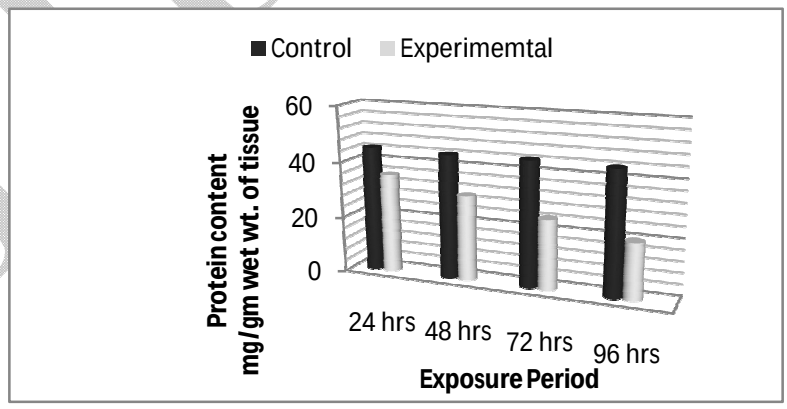
(Each Value is Mean of Five Observations ± S. D.)



Graph A: Effect of Potassium Permanganate on Total Protein Content in Muscle of Fresh Water Crab, *Barytelphusa guerini* in Control and Experimental Set for 24, 48, 72 & 96 hours period of exposure



Graph B: Effect of Potassium Permanganate on Total Protein Content in Gills of Fresh Water Crab, *Barytelphusa guerini* in Control and Experimental Set for 24, 48, 72 & 96 hours period of exposure



Graph C: Effect of Potassium Permanganate on Total Protein Content in Hepatopancreas of Fresh Water Crab, *Barytelphusa guerini* in Control and Experimental Set for 24, 48, 72 & 96 hours period of exposure

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IV. DISCUSSION

Protein metabolism takes place in many organs of the body, most importantly the liver and muscles. So many catabolic pathways for amino acids are localized in the liver which is a major catabolic site for the body and also most plasma proteins are synthesized in the liver. Although the rate of protein metabolism in muscle may be slower than in the liver, the mass of muscles so much exceeds that of other tissues that it makes this tissue also quantitatively the most important site of protein synthesis. Also, much of the degradation and catabolism of amino acids take place in the muscle (Hepher, 1988).

The contaminants in the form of industrial wastes directly mix in the water of streams and rivers. There by polluting the water in different ways. These wastes are very hazardous to the life of aquatic fauna. These non biodegradable substances accumulate in the biosystem. These toxicants cause pollution which cannot be easily removed by oxidation, precipitation or other processes and affects the activity of the animals (Mukke et.al, 2012 ;Bharathi et.al, 2002).

Under stress condition the changes in biochemical parameters occurs where extra energy is needed. The loss of energy in the animal body fulfilled from the stored depots in the form of protein, glycogen and fat in various tissues. The biochemical composition in treated animals changes according to situation like environmental factors, starvation, toxicants etc. The crustaceans resist against stress condition by their own way and try to minimize the effect of this altered situation by removing the toxicant. The level of carbohydrate, protein and fat gives proper idea of the stress. To overcome form this problem the present investigation tries to fulfill the gap on the study on effect of potassium permanganate on biochemical composition of fresh water crab, Barytelphusa guerini. Therefore the assessment of protein can be considered as a diagnostic tool to determine physical phases of organism.

Proteins play an important role in cell metabolism. All enzymes and hormones are made up of protein and involved in the metabolic activities. The total protein content in the hepatopancreas, muscle and gill were found to decline in the sub-lethal concentration of potassium permanganate. Kumar *et al.* (2012) reported that sodium arsenide decreased in the concentration of protein in catfish *Clarius batractus.* Mahajan and Zambare, (2001) reported decrease in protein contents in the fresh water bivalve *Corbicula striatella* after heavy metal stress most of the time. To elevate the level of repair, the proteolytic action increase, resulting decreased of protein contents (Kabeer *et al.*, 1977). More, (2012) and Sawant et.al, 2012 observed similar results in fresh water crab, *Barytelphusa guerini* in blood, gill, hepatopancreas, and muscle exposed to cadmium sulphate and copper sulphate. From the present investigation it can be concluded that potassium permanganate at sub-lethal concentration induced energy demand in the whole body tissue and the crab try to withstand the toxic stress imposed at the cellular level by operating some sort of regulatory pathway.

The protein content in foot, mantle hepatopancreas and whole body of snail *Viviparus bengalensis* shows significant decrease after pesticidal exposure. The impairment in protein synthesis, the decrease in total average protein content of tissue alter treatment suggest enhancement of proteolysis to meet the high energy demand under pesticidal stress (Kabeer, 1978). The fall in protein level during pollutant exposure may be due to increased in protein catabolism and decreased anabolism of protein. Shariff (1987) studied the effect of detergent on biochemical constituent and found decline of protein content and concluded that the decline may be due to increased activity of proteolytic enzymes.

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