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Effect of Copper Sulphate on Protein Content of *Lamellidens marginalis*

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ABSTRACT

The freshwater bivalve Lamellidens marginalis from the river Godavari at Paithan near Aurangabad were exposed to lethal and sublethal concentration (1.6 ppm and 0.82 ppm) of copper sulphate as acute and chronic treatment. Biochemical study shown the alteration of protein content in exponed tissues. In acute treatment by copper sulphate the protein content of whole body decreased significantly ($P < 0.01$). In digestive gland most significant ($P < 0.001$) decrease of protein content was found after acute and chronic treatment. The decrease of protein after treatment was maximum in digestive gland followed by foot and mantle.

Key word's : Copper sulphate, Lamellidens Marginalis, heavy metals.

Introduction

Copper is an essential metal in a number of enzymes. Excessive intake of copper results in its accumulation in the body tissue. Protein content in the tissue of animal is an important organic constituent which plays a vital role in cellular metabolism. RamanaRao and Ramamurthi (1978) studied the protein content in the tissue of *Pila globosa* after exposing to sumethion. SivaprasadRao and RamanoRao (1979) studied the protein metabolism in the fish *Tilapia mossambica*. Yagana Bano *et al.* (1981) studied the protein content in the muscle of *Clarias batrachua* after treatment with DDT. Effect of mercuric chloride on protein content of *Thiara lineata* was studied by Lomte and Sontakkc (1992), Patil (1987) studied changes in protein and free amino acid levels of *Mythimna separata* on pesticidal stress.

Materials And Methods

The freshwater bivalve *L. marginalis* were acclimatized to laboratory condition (pH of water 7.5 to 7.7, oxygen content = 5.4 to 5.8 and$_2$/ and temperature = 27°C) up to two-three days. The healthy active bivalve of medium size were selected for experiment. The bivalves were divided into two groups, one kept as control and other experimental. The experimental bivalves were exposed 1.6 ppm $CuSO_4$, upto 72 hrs as acute treatment. At the interval of 24 hrs. control and treated bivalves were dissected to analyse the protein content. In chronic treatment experimental bivalves were exposed to 0.82 ppm $CuSO_4$ up to 20 days. The control and treated bivalve were fed by algae during treatment. At the interval of 5 days the living bivalves were dissected to analyse the protein content of whole body, foot, digestive gland and mantle. The protein content from wet tissue was estimated by Lowry's method (Lowry et al., 1951) .The protein content of control and treated bivalves were compared.

Results and Discussion

Protein is a major biochemical constituent of body organ. For studying the effect of heavy metal copper

sulphate on protein content of whole body, foot, digestive gland and mantle the bivalves were treated as acute and chronic treatment. The amount of protein is declined vigorously periodically in experimental bivalve. The alteration of protein content in tissue, after acute treatment by $CuSO_4$,was summarised in Table 1. The protein of whole body decreased from 11.84 to 8.50 in acute treatment. In digestive gland it decreased from 4.23 to 3.13 in 72 hrs. exposure. In foot it decreased from 16.81 to 12.25 and in mantle it decreased from 6.00 to 3.00.

In chronic treatment the average protein content of tissue of *L.marginalia* was decreased. The results of chronic treatment were summarised in Table II. The protein content in whole body decreased from 11.42 to 8.08 , in foot 16.11 to 12.82 , in digestive gland 5.08 to 3.82 , and in mantle 6.43 to 3.31.

In the present investigation the protein level after treatment was decreased, the higher depletion of protein in the digestive gland might be due to high metabolic potency and efficiency of the gland when compared to toher tissue like foot and mantle of bivalve, the loss of protein under copper sulphate stress was observed in present study and which may be due to utilization of amino acids in various metabolic processes. Jha (1988) support the idea of consumption at amino acids for metabolic processes as energy source. Another probability was that pollutant might block protein synthesis (Passow et a l., 1961). According to Sivaprasad Rao *et al.* (1980) depletion of protein in pollutant treated animal might be due to enhanced proteolytic activity. The products formed after proteolysis (amino acids) which may fed on TCA cycle through amino transfarage system (Kabocr *et al.*, 1978). Depletion of protein content in animal tissue after exposure to various pollutants was reported by some workers. Grant and Mehrie (1973) have observed the change in serum protein and glycogen content of rainbow trout when exposed to endrin. Ramana Rao and Ramamurthi (1978) observed the protein content in the tissue of Pila (1982) in *Belamid (viviparus) bongalenaia;* Shah and Dubale (1983) in Channa punctatus; and Khalid Shareef et al. (1986) in fishes have reported alteration of protein content in body tissue after pollutant exposure. Palanichamy *et al.* (1986) have observed the effect of pesticides on biochemical component of *0. mossambicus* and reported decrease in protein content. Sambasiva Rao and Nagabhushanam (1987) have reported decreased protein in marine crab after pesticides impact. Tilak eb al. (1991) have studied the pesticide impact on fish *Labeo rohita* and cited decreased protein content after treatment. Sambath and Duralraju (1991) have studied impact of pollutant on protein content and demonstrated protein content altered during stress.

The most alteration of protein after treatment occur in digestive gland and which may be the site of action of pollutant in body of bivalve *L. marginalls.* Singaraju et al. (1991) supported that most alteration of protein in hepatopancreas, altering protein content.

Table 1. Protein content in selected tissue of the control and $CuSO_4$ exposed to *Lamellidens marginalis* as a function of exposure period.

Treatment	Sr.No.	Body weight organ	Total Protein content ± S.D.		
			24 hours	48 hours	72 hours
Control	1	Whole body	15.34 ± 0.2766	13.31 ± 0.3523	15.20 ± 0.3850
	2	Foot	17.81 ± 0.5880	18.71 ± 0.7258	16.78 ± 0.6776
	3	Digestive glant	09.41 ± 0.1715	08.09 ± 0.0754	07.78 ± 0.7203
	4	Mantle	07.77 ± 0.0448	06.17 ± 0.5245	06.07 ± 0.0232
Acute treatment by $CuSO_4$	1	Whole body	11.84 ± 0.8658	8.16 ± 0.4325	8.50 ± 0.4309
			P < 0.05	P < 0.001	P < 0.001
	2	Foot	16.81 ± 0.6631	14.00 ± 0.7146	12.25 ± 1.0306
			P < 0.05	P < 0.01	P < 0.01
	3	Digestive gland	4.23 ± 0.2721	3.14 ± 0.3247	3.13 ± 0.1724
			P < 0.001	P < 0.001	P < 0.001
	4	Mantle	6.00 ± 0.4928	4.72 ± 0.3578	3.00 ± 0.4037
			P < 0.05	P < 0.05	P < 0.05

Table 2. Protein content in selected tissue of the control and $CuSO_4$ exposed to *Lamellidens marginalis* as a function of exposure period.

Treatment	Sr.No.	Body weight organ	Total Protein content ± S.D. 5 Days	10 Days	15 Days	20 Days
Control	1	Whole body	12.61 ± 49.08	12.31 ± 0.2513	11.16 ± 0.4890	11.01 ± 0.8334
	2	Foot	17.91 ± 0.9761	16.39 ± 0.6345	16.22 ± 0.1432	15.11 ± 0.9063
	3	Digestive glant	09.71 ± 0.5779	08.99 ± 0.8038	07.42 ± 0.3294	06.09 ± 0.0732
	4	Mantle	07.01 ± 0.0989	06.81 ± 0.6136	06.12 ± 0.0979	05.21 ± 0.1417
Acute treatment by $CuSO_4$	1	Whole body	11.42 ± 0.7511 NS	10.21 ± 0.1714 P < 0.01	9.35 ± 0.2527 P < 0.01	08.08 ± 0.0635 P < 00.01
	2	Foot	16.11 ± 0.9036 NS	14.80 ± 0.6513 P < 0.05	13.31 ± 0.2351 P < 00.01	12.82 ± 6965 P < 0.05
	3	Digestive gland	5.08 ± 0.6345 P < 0.01	04.42 ± 0.3252 P < 0.001	04.00 ± 0.1347 P < 0.01	03.82 ± 0.2432 P < 0.001
	4	Mantle	6.43 ± 0.3243 P < 0.05	5.00 ± 0.1248 P < 0.05	3.00 ± 0.3447 P < 0.01	03.31 ± 0.2513 P < 0.001

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