

TOTAL PROTEIN ALTERATION IN TISSUE OF FRESHWATER SNAIL, *THIARA TUBERCULATA* DURING CYPERKILL EXPOSURE

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The freshwater gastropod *Thiarsa tuberculata* from Kham river at Aurangabad were exposed to lethal and sublethal concentrations (2.82 ppm and 0.69 ppm) of cyperkill as acute and chronic treatment. Biochemical study shows the alteration of protein content in exposed tissues. In acute treatment by cyperkill the protein content of whole body decreased significantly ($p < 0.01$), but after chronic treatment protein change was not significant. The protein content of foot and mantle remained stable in treatment. 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.

INTRODUCTION

Among the pesticidal pollutants insecticides are considered hazardous because of their ability to kill or immobilize organism at extremely low concentration (Eisler, 1969). Cypermethrin (Synthetic pyrethroid) pesticides is widely used as insecticide because it has high potency to kill insects and have relatively low mammalian toxicity (Elliott, 1977). Consequently the environmental occurrence of synthetic pyrethroid became worldwide (Casida, 1980). Higher concentrations of toxicants in aquatic environment cause adverse effect on aquatic organism at cellular or molecular level and ultimately it leads to disorder in biochemical composition. The pollutant affect the activity of biologically active molecules such as amino acids, co-enzymes, and other proteins containing sulphur, phosphorous and affect physiological processes in tissues (Ghosh & Chatterjee, 1985). Biochemical changes induced by pesticide stress lead to disturb the metabolism, inhibition of important enzymes, retardation of growth and reduction of fecundity and longevity of organism (Murty, 1986). Reports are available regarding the toxic effects of pesticides on protein content of some aquatic animal (Rao & Rao, 1976; Lomte & Alam, 1982; Sambasiva Rao & Nagabhushanam, 1987). Arunachalam *et al.* (1990) have studied the effect of pesticides on protein metabolism of fishes. Sambath & Duriraju (1991) have studied the effect of pollutant on blood protein in frog. Tilak *et al.* (1991) studied the effect of pesticides on biochemical components. Singaraju *et al.* (1991) have observed the effect of malathion on protein metabolism of *Paratelphusa hydrodromous*. The present work was designed to find out the effect of synthetic pyrethroid pesticide (cyperkill) on protein content of whole body, foot, digestive gland and mantle of freshwater snail, *Thiara tuberculata* after acute and chronic treatment.

MATERIAL AND METHODS

The freshwater snail *T. tuberculata* were procured from local freshwater body (Kham river at Aurangabad). They were acclimatized to laboratory conditions (pH of

water 7.5 to 7.7, O₂ content = 5.4 to 5.8 ml O₂/lit. and temp = 27°C) upto two-three days. The healthy active snails of medium size were selected for experiment. The snails were divided into two groups, one kept as control and other experimental. The experimental snails were exposed 2.82 ppm cyperkill upto 72 hours as acute treatment. At the interval of 24 hours control and treated snails were dissected to analyse the protein content. In chronic treatment experimental snails were exposed to 0.69 ppm cyperkill up to twenty days. The control and treated snails were fed by algae during treatment. At the interval of 5 days the living snails 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 snails were compared.

RESULTS AND DISCUSSION

Protein is a major biochemical constituent of body organ. For studying the effect of pesticide cyperkill on protein content of whole body, foot, digestive gland and mantle the snails were treated as acute and chronic treatment. The amount of protein is declined vigorously periodically in experimental snail. The alteration of protein content in tissues, after acute treatment by cyperkill was summarised in Table I. The protein of whole body decreased from 13.8 to 9.8 in acute treatment. In digestive gland it decreased from 9.2 to 4.6 in 72 hours exposure. The protein content of foot and mantle was not changed significantly.

In chronic treatment the average protein content of tissue of *T. tuberculata* was decreased. The results of chronic treatment were summarised in Table II. The protein content in whole body decreased from 12.61 to 8.35, in 20 days treatment. In the foot, digestive gland and mantle protein content decrease from 17.19 to 13.52, 9.71 to 5.52 and 7.11 to 5.31 respectively after cypermethrin chronic treatment. The results of total protein clearly indicate that digestive gland was the most affected organ followed by foot and mantle.

In 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 other tissue like foot and mantle of snail. The loss of protein under cyperkill 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 of amino acids for metabolic processes as energy source. Another probability was that pollutant might block protein synthesis (Passow *et al.*, 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 in TCA cycle through amino transference system (Kabeer *et al.* 1978). Depletion of protein content in animal tissue after exposure to various pollutants was reported by some workers. Grant & Mehrle (1973) have observed the change in serum protein and glycogen content of rainbow trout when exposed to endrin. Ramana Rao & Ramamurthi (1978) observed the protein content in the tissue of *Pila globosa* after sumithion exposure. Yagana bano *et al.* (1981) in cat fish; Lomte & Alam (1982) in *Belamia (Viviparus) bengalensis*; Shah & 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 *O. mossambicus* and reported decrease in protein content. Sambasiva Rao & Nagabhushanam (1987) have reported decreased protein in marine crab after pesticides impact. Tilak *et al.* (1991) have studied the pesticide impact on fish *Labeo rohita* and cited decreased protein content after treatment. Sambath & Durairaju (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 snail *T. tuberculata*. Singaraju *et al.* (1991)

Table I. Protein content in tissue of the control and cyperkill exposed *Thiara tuberculata*.

Treatment	Sr. No.	Body organ	Total protein content mg/100 mg WW \pm S.D.		
			24 hrs	48 hrs	72 hrs
Control	1.	Whole body	13.89 \pm 0.7266	12.31 \pm 0.2531	13.46 \pm 0.3755
	2.	Foot	18.61 \pm 0.4980	18.88 \pm 0.7185	17.83 \pm 0.6776
	3.	Digestive gland	9.21 \pm 0.1714	8.08 \pm 0.0653	7.87 \pm 0.7103
	4.	Mantle	7.06 \pm 0.0489	6.71 \pm 0.5797	6.03 \pm 0.0244
Acute treatment by cyperkill	1.	Whole body	11.75 \pm 0.6123	10.42 \pm 0.3429	9.82 \pm 0.6595
	2.	Foot	18.11 \pm 0.9063	16.62 \pm 0.3429	16.21 \pm 0.1714
	3.	Digestive gland	6.22 \pm 0.5878	4.42 \pm 0.3429	4.61 \pm 0.4980
	4.	Mantle	7.51 \pm 0.4264	5.78 \pm 0.6368	4.52 \pm 0.4245
			NS	NS	P < 0.01
			P < 0.05	P < 0.01	P < 0.01
			NS	NS	P < 0.05
			P < 0.01	P < 0.001	P < 0.01
			NS	NS	P < 0.01

NS = Not significant.

Table II. Protein content in tissues of the control and cyparkill exposed *Thiara tuberculata*.

Treatment	Sr. No.	Body organ	Total protein content mg/100 mg WW \pm S.D.			
			5 days	10 days	15 days	20 days
Control	1.	Whole body	12.61 \pm 0.4980	12.31 \pm 0.2531	11.61 \pm 0.4980	11.01 \pm 0.8246
	2.	Foot	17.19 \pm 0.9716	16.80 \pm 0.6531	16.22 \pm 0.1796	15.11 \pm 0.9063
	3.	Digestive gland	9.71 \pm 0.5797	8.99 \pm 0.8083	7.42 \pm 0.3429	6.09 \pm 0.0734
	4.	Mantle	7.11 \pm 0.0898	6.81 \pm 0.6613	6.12 \pm 0.0979	5.21 \pm 0.1714
Chronic treatment 1. by cyparkill	1.	Whole body	12.81 \pm 1.4778	12.26 \pm 1.0206	10.08 \pm 0.0653	8.35 \pm 0.2857
	2.	Foot	18.21 \pm 0.1714	17.42 \pm 1.1594	16.52 \pm 0.4245	13.52 \pm 0.4092
	3.	Digestive gland	6.32 \pm 0.2612	5.41 \pm 0.3347	5.31 \pm 0.2531	5.52 \pm 0.4245
	4.	Mantle	7.03 \pm 0.244	6.62 \pm 0.5062	5.41 \pm 0.3347	5.31 \pm 0.2541
			NS	NS	P < 0.05	P < 0.05
			NS	NS	NS	NS
			P < 0.01	P < 0.01	P < 0.01	P < 0.01
			NS	NS	P < 0.05	P < 0.05

NS = Not significant.

supported that most alteration of proteins in haepatopancreas, altering protein content.

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