

## IMPACT OF PESTICIDE METHOXYCHLOR ON PROTEIN CONTENT IN THE FRESH WATER FISH, *CYPRINUS CARPIO*

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### ABSTRACT

Fishes are very sensitive to a wide variety of toxicants in water, various species of fish show uptake and accumulation of many contaminants or toxicants such as pesticides. The fresh water fish, *Cyprinus carpio* was exposed to methoxychlor and the median lethal concentration was found to be 0.42 ppm. After sublethal exposure tissues such as gill, liver, kidney, muscle and brain were sacrificed and analysed for protein content.

**Key words:** *Cyprinus carpio*, pesticide, fresh water fish.

### 1. INTRODUCTION

Pesticides have brought tremendous benefits to mankind by increasing food production and controlling the vectors of man and animal diseases. At the same time use of these pollutants has posed potential health hazards to the life of fishes. Pesticides are major cause of concern for aquatic environment because of their toxicity, persistency and tendency to accumulate in the organisms (Joseph and Raj, 2010). Pesticides are mostly non-selective, widespread applied, possess toxic properties and in some cases are very refractory. These features entitle pesticides to be one of the most fearful group substances as far as biological communities and humans are concerned.

Most of the pesticides of both plant origin and chemical applied in agricultural field reach water bodies through runoff affecting aquatic flora and fauna specially fishes. The lipophilicity of synthetic pesticides indicates that these chemicals will be absorbed by fish even from very low concentrations in water (Hill, 1989). Persistent chemical molecules with long half-life periods found in chemicals pose a threat to fish and also to the human population consuming the affected fish (Bouregois *et al.*, 1993; Nayak *et al.*, 1995; Kalavathy *et al.*, 2001; Saravanan *et al.*, 2003; Selvarani and Rajamanickam, 2003 and Park *et al.*, 2004).

### 2. MATERIALS AND METHODS

They were collected from the Mettur fish farm stocked and acclimatized for a time period of 10-15 days in the laboratory conditions in glass aquaria containing dechlorinated water. The water of the aquarium was aerated continuously through stone diffusers connected to a mechanical air compressor. Water temperature ranged between 22

± 6°C and the pH was maintained between 6.1 and 8.4. Fish were fed twice daily alternately with rice bran and oil cakes. For the present study, matured adult fishes were exposed to different concentrations viz LC<sub>50</sub> of Methoxychlor for short term (24, 48, 72 and 96 hours) and long term (10, 20 and 30 days) continuously. Seven groups of ten fishes for each concentration of the pesticides were used. In these aquaria water was replaced daily with fresh treatment of pesticides. Each experiment was accompanied by its respective control.

Methoxychlor is an organochlorine pesticide that was developed as a substitute for DDT. Methoxychlor has been used as a pesticide on pets, livestock, crops, gardens and in animal feed (Palanza *et al.*, 2001; Magliulo *et al.*, 2002). Appropriate narrow range of concentration was used to find the median lethal concentration, using a minimum of 10 fishes for each concentration and the mortality was recorded for every 24hrs upto 96hrs. It was found as 0.42 ppm for 96 hrs, using probit analysis method (Finney, 1971). From the stock solution various sublethal concentrations were prepared for bioassay studies.

At the end of each exposure period, fishes were sacrificed and tissues such as gill, liver, kidney, muscle and brain and were dissected and removed. The tissues (10 mg) were homogenized in 80% methanol, centrifuged at 3500 rpm for 15 minutes and the clear supernatant was used for the analysis of protein content. Total protein concentration was estimated by the method of Lowry *et al.* (1951).

### 3. RESULTS AND DISCUSSION

Proteins occur in the body in the form of amino acids and other metabolites, which serve as building blocks of the body. Hence, protein content of the cell is considered to be an important tools for

evaluation of the physiological standards. Several authors have reported alterations in total proteins and their metabolites in aquatic organisms exposed to toxicants (Ahmed *et al.*, 1997).

The reduction in protein content under effluent stress noticed in the present study may be attributed

to the utilization of amino acids in various catabolic reactions. The reduction in protein content might be due to the blocking of protein synthesis or protein denaturation or interruption in the amino acid synthesis by metals (Jha, 1991).

**Table 1. Changes in the protein content in the tissues of *Cyprinus carpio* on short term exposure due to methoxychlor.**

Sample (mg/g wet tissue)	Exposure Periods				
	Control	24 hrs	48 hrs	72 hrs	96 hrs
Gill	23.50±0.09	21.36±0.10	19.11±0.02	18.36±0.06	15.77±0.05
% change		9.10↓	18.68↓	21.87↓	32.89↓
Liver	25.61±0.06	25.35±0.05	24.87±0.10	22.90±0.05	22.76±0.07
% change		1.01↓	2.88↓	10.58↓	11.12↓
Kidney	19.38±0.03	19.06±0.04	18.32±0.30	17.45±0.06	17.20±0.05
% change		1.65↓	5.46↓	9.95↓	11.24↓
Muscle	29.80±0.03	29.31±0.09	28.54±0.14	28.09±0.09	27.35±0.04
% change		1.64↓	4.22↓	5.73↓	8.22↓
Brain	14.59±0.05	13.97±0.11	13.45±0.08	12.93±0.01	12.66±0.18
% change		4.24↓	7.81↓	11.37↓	13.22↓

Values are mean ± SD, n=5, Figures in Parenthesis are percentage decrease over control.

\* - Significant at 5% (t<0.05) \*\* - Significant at 1% (t<0.01) NS - Non Significant

**Table 2. Changes in the protein content in the tissues of *Cyprinus carpio* on long term exposure due to methoxychlor.**

Sample (mg/g wet tissue)	Exposure Periods			
	Control	10 days	20 days	30 days
Gill	23.50±0.09	13.98±0.01	10.45±0.07	9.78±0.13
% change		40.51↓	55.53↓	58.38↓
Liver	25.61±0.07	20.76±0.04	20.07±0.03	18.32±0.16
% change		18.93↓	21.63↓	28.46↓
Kidney	19.38±0.11	16.54±0.05	16.11±0.01	15.08±0.08
% change		14.65↓	16.87↓	22.18↓
Muscle	29.80±0.12	25.89±0.03	25.20±0.04	24.56±0.04
% change		13.12↓	15.43↓	17.58↓
Brain	14.59±0.05	12.08±0.02	11.75±0.06	11.00±0.03
% change		17.20↓	19.46↓	24.60↓

Values are mean ± SD, n=5, Figures in Parenthesis are percentage decrease over control.

\* - Significant at 5% (t<0.05) \*\* - Significant at 1% (t<0.01) NS - Non Significant

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