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Effect of an insecticide (monocrotophos) on biochemical constituents *Mystus vittatus*

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ABSTRACT

The effects of an insecticide monocrotophos on some biochemical parameters of the fish, *Mystus vittatus* at 24, 48, 72 and 96 hrs of exposures were studied. Median lethal concentration (LC50) of monocrotophos to the fish for 24 hour exposure was determined during bioassay study. The protein contents were found to be declined in all the samples analyzed during all the exposure periods. The reduction of protein may be due to proteolysis and increased metabolism under toxicant stress. The carbohydrate levels were found to be elevated in the samples of gill, muscle and kidney in all the exposure periods. This may be due to the stress induced by the insecticide as physiology of organism with the help of corticosteroids. The cholesterol contents of gill, muscle and kidney were found to be declined in all the treatment periods of experimental fish compared to control. This may be due to utilization of fatty deposits instead of glucose for energy purpose.

KEY WORDS: Water pollution, Biochemical parameters, *Mystus vittatus* .

INTRODUCTION

Pesticides leave residues in water and soil even after several days of the spray in the crop fields. The uses of organ phosphorus pesticide in crop filed are highly toxic to the aquatic organisms including fish (Sreenivasan and Swaminathan, 1967). Extensive use of pesticides pollutes the aquatic environment. Such pollution disorders the metabolic activities and alters physiological state thereby changing the biochemical constituents of fishes (Anon, 1975). In aquatic toxicology the traditional LC_{50} test is often used to measure the protential risk of a chemical (Jach de Bruijin et al., the sublethal effects of malathion, thiodon and ekalux on protein, carbohydrate and lipid content of muscle and liver of *Mystus vittatus* .

Khanee et al. (1992) observed depletion in protein contents of various tissues of fish *Oreochromis mossambicus* during the exposure of deltamethrin. Begum and Vijayaraghavan (1995) have recorded an increase of glucose level in branchial tissue of an air breathing fish, *Clarias batrachus* treated with rogon. Anusha *et al.* (1996) studied the sublethal effects of organ phosphorous pesticides quinalphos in the tissues of the fish *Cirrhinus mrigala.*

Tilak et al. (2003) have studied the biochemical changes induced by fenvalerate in the freshwater fish *Channa punctatus.* Proteins are important organic substance required by organisms in tissue building and play an important role in energy metabolism (Yeragi *et al.,* 2003). Mishra *et al.* (2004) studied the effect of malathion on lipid content of liver and muscles of *Anabas testudineus.* The present study has been aimed to know the effect of monocrotophos on some biochemical constituents in certain tissues of the fish *Mystus vittatus* .

MATERIALS AND METHODS

In the present study, fish *Mystus vittatus* were exposed to different concentrations of the fish were studied. Technical grade insecticide, monocrotophos manufactured and supplied by TUCAS limited, Tamil Nadu, India, was taken for the present study.

The bulk sample of the freshwater fish, *Mystus vittatus* (Ranging in weight 14 gm to 17 gm and in length from 7 cm to 10 com) was procured from thelocal market of Madhepura and transported to the laboratory in well aerated polythene bag and acclimated to the ambient laboratory temperature (28 ± 0.2) in large glass aquarium. During the period of acclimation, they were fed every day with oil cake lasted for 2 weeks. After acclimation healthy fish were selected from stock and transferred to another glass tank Feeding was stopped one day before the commencement of the experiment.

The median lethal concentration (LC_{50}) of monocrotophos to the freshwater fish *Mystus vittatus* for 24 hr. exposure was determined. The effect of monocrotophos on the biochemical constituents like protein, carbohydrate and cholesterol under sublethal toxicity were analysed in the tissues gill, muscle and kidney by using the following standard procedures.

The total protein concentration was estimated by the method of Lowry *et al.* (1951) and the quantitative estimation of carbonhydrate in the tissue was done by the method described by Hedges and Hofreiter (1962). The cholesterol level was estimated based on enzymatic method using cholesterol esterase, cholesterol oxidase and peroxidase (Richmond, 1973).

RESULTS AND DISCUSSION

The changes in the biochemical constituents in the gill, muscle and kidney of the fish *Mystus vittatus* exposed to sublethal concentration of monocrotophos at different exposure periods were observed in the present study. The physical and chemical characteristics of the water used for the study showed the permissible values which were always within the admissible limit of APHA (1998).

. The median lethal concentration (LC_{50})of monocrotophos for 24 hr exposure of the fish *Tilapia mossambica* was 2 ppm. The mortality of the fish *Tilapia mossambica* exposed to different concentrations of monocrotophos was observed and it showed that the monocrotophos is very toxic to fish even at very low concentration. Maheswari *et al.* (2001) have observed the median lethal concentration of Triazophos to the fish, *Clarias batrachus* and reported that organophosphate was more toxic among other insecticides. In the present study protein content of gill, muscle and kidney were found to be declined during all the exposure periods of 24 hr, 48 hr, 76 hr and 96 hr (Table 1) as observed by Venkataraman *et al.* (2006) who studied for metabolic dysfunction to malathion toxicity in fish *Glossogobius giuris.*

Table 1: Showing the protein, carbohydrate and cholesterol level (mg/gm) of various tissues of *Mystus vittatus* exposed to varying periods of sublethal monocrotophos toxicity.

Tissues	Exposure periods (hrs.)	Protein		Carbohydrate		Cholesterol	
		Control	Experiment	Control	Experiment	Control	Experiment
Gill	24 hr	14.40	14.00	3.442	8.210	41.032	30.716
		±0.14	±0.15	±0.287	±0.332	±1.117	±1.247
	48 hr	14.41	12.72	3.306	8.720	40.342	26.846
		±0.14	±0.19	±0.217	±0.781	±0.899	±1.170
	72 hr	14.25	11.66	3.204	8.968	39.470	23.604
		±0.27	±0.11	±0.222	±0.348	±0.764	±1.402
	96 hr	13.81	11.32	3.084	11.336	38.058	23.268
		±0.41	±0.24	±0.082	±0.835	±1.278	±2.111
Muscle	24 hr	14.269	11.912	4.350	17.160	48.970	29.736
		±0.842	±1.226	±0.349	±0.896	±0.381	±0.409
	48 hr	14.120	10.892	4.248	15.886	47.618	29.292
		±0.523	±0.815	±0.329	±0.831	±0.734	±0.565
	72 hr	12.860	6.932	4.000	26.452	46.934	29.956
		±1.303	±0.473	±0.158	±0.841	±0.540	±0.305
	96 hr	12.740	6.228	4.020	24.572	45.668	23.720
		±1.574	±0.255	±0.357	±1.771	±1.412	±0.541
Kidney	24 hr	35.460	17.376	15.812	45.150	65.71	39.998
		±0.523	±0.948	±0.337	±2.407	±0.197	±0.858
	48 hr	35.320	15.980	15.912	46.466	67.515	39.080
		±0.682	±0.845	±0.231	±1.512	±0.446	±0.843
	72 hr	33.164	14.480	14.192	50.684	67.265	37.793
		±0.751	±1.214	±1.390	±1.382	±0.415	±0.482
	96 hr	33.140	11.376	13.652	61.670	65.498	30.818
		±0.847	±0.783	±0.788	±1.739	±1.193	±1.123

Lynch *et al.* (1969) and Dalela *et al.* (1981) observed a decrease in protein content in *Mystus vittatus* under pesticide exposure and reported that the depletion of protein may be due to the excretion of proteins by kidney due to kidney failure or impaired protein synthesis as a result of liver disorders. Dubhat and Bapat (1984) and Patel and Parmer (1993) observed maximum decrease in protein contents in the liver of *Channa orientalis* and *Baleopthalmus dussumieri.*

The carbohydrate level was found to be increased in the present investigation as observed by Srivastava and Srivastava (1995) in liver and muscle tissue of *Heteropneustes fossilis* and *Barcus ticto* exposed to Chlordecone. Koundinya and Ramamurthi (1979) and Srivastava and Singh (1981) reported that sublethal concentration of certain organophosphate pesticides caused glycogenolysis which produced hyperglycemia in the African food fish *Tilapia mossambica* and the Indian catfish, *Heteropneustes fossils* respectively. Elevated carbohydrate level in the liver or the fish *Heteropneustes fossilis* was observed by Narendra Singh and Anil Srivastava (1982) during the exposure of formathion toxicity.

The cholesterol level was found to be decreased in the exposure periods. Such a trend has also been reported by Palanichamy *et al.* (1986) in *Oreochromis mossambicus* on exposure to 3 different period. The

reduced cholesterol level may be due to the inhibition of cholesterol biosynthesis in the liver or due to reduced absorption of dietry cholesterol as reported by Jayantha Rao *et al.* (1984) and Kanagaraj *et al.* (1993). Shakoori *et al.* (1996) reported that the cholesterol decrease may be due to utilization of fatty deposits instead of glucose for energy purpose.

A toxicant induce its effects at cellular or even at molecular level, but ultimately cause physiological, pathological and biochemical alterations. It is therefore necessary to focus attention on changes in biochemical composition of marine organisms, which are under pollutant threat.

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