The Scientific Temper
July, 2010; No.1: pp131-134

Academy of Innovative Research
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TOXICITY OF PAPER MILL EFFLUENTS EFFECTS LIVER PROTEIN AND AMINO ACID DURING ANNUAL BREEDING CYCLE OF *HETEROPNEUSTES FOSSILIS* (BLOCH)

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ABSTRACT

The toxicity of paper mill effluent in liver of *Heteropneustes fossilis* was studied. Fishes exposed to 0.5 and 0.8 of 96 hrs LC_{50} of effluents showed significant alteration in biochemical parameters of liver protein and amino acid contents of liver. Protein and amino acid contents of liver are maximum in spawning phases but the protein and amino acid content of liver are measured to be decreased and increased respectively in experimental fishes in all the three phases of the breeding cycle. The changes were observed to be statistically very significant ($P < 0.05$, $P < 0.001$)

Keywords – Catfish, Effluents, liver

INTRODUCTION

With rapid growth of industrial activities there has been tremendous increase in the production of harmful concentration of the various types of contaminants, affecting the aquatic life in different ways. Biochemical studies have been accepted progressive importance in toxicological research. The biochemical changes are closely associated with all the physiological faults. Liver has been considered the main metabolic centre as well as the major detoxifying organ of the body. The fishes are the most sensitive of all the aquatic animals towards such pollutants, and fish easily, gets it tissues damaged due to water pollutants. Although pollution of the fresh water bodies by industrial effluents is known to damage the aquatic species. The effects of industrial effluents on the liver of cat fish have been well described by many workers (Davies *et, al,* 1976, Joshi and Desai 1988) The present study is an attempt to deal with the effect of sub-lethal concentration of industrial effluents and to evaluate the alteration in the level of protein and amino acid contents in the liver of fresh water cat fish *Heteropneustes fossilis* in relation to annual breeding cycle.

Materials and methods

Live specimens of fish were collected from the local fish market they were acclimatised to the laboratory condition for 3 to 5 weeks under natural photoperiod and temperature (21 to 30^0c) in a 125 litter aquarium and fed on small pieces of liver and commercially available fish food. Mill effluents of Sanjay paper mill, Maghar, Santkabir Nagar (U.P.) India was selected as test toxicants for biochemical studies. Fishes were put in the group of 50 animals.

Group A- Control, were placed in tap water.

Group B- Experimental, were exposed to 0.5 and 0.8 sub-lethal concentration of effluents.

For the estimation of protein and amino acid in the fish liver, the standard methods of

Lowery *et, al* (1957) and standard methods of Spies (1957) were used respectively. In the present study SD, SE, confidence limits and regression co-relation coefficient were calculated and tested properly by statistical methods of Sn edecor (1961).

RESULTS AND DISCUSSION

Control group of test fish showed the maximum value of protein and amino acid in the spawning phase. The protein contents measured during spawning phase was 1.32 and 1.6 times greater from pre spawning and post spawning phases respectively in the liver while the amino acid contents measured during the spawning phase was 1.12 and 1.09 times greater from pre spawning and post spawning phases respectively in liver of control fish. But in experimental group of test fish, the estimation of protein and amino acid contents in liver were observed to be decreased and increased respectively in all the phases of breeding cycle.

The spawning phase is the most active phase of the life cycle. Liver is the main metabolic centre, particularly during the spawning phases of the fish, the rate of protein synthesis is many fold increase in liver, because protein material is also needed as main nutrients reserve in eggs of spawning fishes. The similar result also reported in gonadial tissue by various workers. (Narayan *et,al,* 1985, Sindhe *et,al,* 2002, Upadhyaya *et,al,* 2005)

Stressed fishes required additional energy, for this purpose gluconeogenesis were induced as a supplementary physiological response toward this requirements and as a result the protein content of the tissue were degraded and rise amino acid pool generated for its conversion to glucose molecules to meet out the energy demand. The reduction of protein and rise in free amino materials could also be related to stressed induced gluco neogenetic protein breakdown under the effect of pituitary inter renal hormonal axis and its toxic constituents of industrial effluents are also reported to decrease protein and increase amino acid level in ovary tissue of cat fish, *Clarias batrachus* exposed to sugar mill effluents (Upadhyay *et,al,* 2005).

Reduction in protein contents and glycogenolysis in liver tissue in different fishes under industrial effluents has already been reported by various workers. (Mishra *et,al,* 2003, Narayan *et,al,* 1985, Pandey *et,al,* 2003, Shukla *et,al,* 1985, Sindhe *et,al,* 2002) Achyutha Devi *et al*, 2006.

Acknowledgements

The authors are very thankful to the Principal, K S Saket P G College, Ayodhya, Faizabad for providing research facilities during the entire course of the present study.

Table :- Data showing changes in protein and amino acid content (mg % and μg/mg) in liver of *Heteropneustes fossilis* along with percent changes from control due to exposure of sub-lethal concentration effluents for 96 hrs.

Tissue	Biochemical Constituents	Phases of Breeding Cycle	Group A Control	Group B Experimental (Mill Effluents)			
				0.5 of 96 hrs LC_{50}	% change from control	0.8 of 96 hrs LC_{50}	% change from control
Liver	Protein	Pre Spawning	2.437±0.232	1.852±0.099	-24.08	0.760±0.237	-68.81
		Spawning	3.22±0.165	1.936±0.075	-40.09	1.76±0.104	-45.47
		Post Spawning	2.04±0.155	1.646±0.071	-28.23	0.835±0.037	-59.06
	Amino acid	Pre Spawning	40.64±0.256	49.68±0.177	+22.24	54.57±0.466	+34.77
		Spawning	45.53±0.325	53.82±0.538	+18.20	58.16±0.438	+27.73
		Post Spawning	41.77±0.798	47.47±0.550	+13.64	50.79±0.694	+21.59

(Values are of mean ± SE, n=10)

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