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Effect of Endosulfan on the Protein contents of Liver, Kidney and Gonads of the fish *Channa punctatus* (Bloch.)

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ABSTRACT

This study includes the alterations induced by chronic (30 days) exposure of the fish *Channa punctatus* to a sublethal concentrations (1.0 ppm) of endosulfan on the profile of total protein in the liver, kidney and gonads. The kidney showed maximum depletion of total protein content amounting 31% ($p < 0.001$), followed by liver 30% ($p < 0.001$), kidney 19% ($p < 0.05$) and gonads 17% ($p < 0.01$). The present study therefore points towards a severe metabolites dysfunction n response to endosulfan toxicity in the fish *C. punctatus* (Bloch.).

Keywords: *Endosulfan, C. punctatus (Bloch.), Toxicity, Metabolites.*

INTRODUCTION

Pesticide endosulfan is biological toxicant that are required by man to kill insect and their pest that destroy the crops. A pesticide belongs to an important class of chemical compounds, which pose as a continuous liability to the stability of aquatic ecosystem. Various workers on pesticides effect studied are Tripathi and Verma (2004), Rita and Milton (2006), Nwamba and Ajima (2011) and Arti and Rishikesh (2016).

MATERIALS AND METHODS

The fish *Channa punctatus* procured live from the local fish market of district Darbhanga, India, were washed with 0.1% KMn04 solution to remove dermal infection if any. Healthy fishes of average length (9-12cm) and weight (21-25 g) were acclimated for 15 days to laboratory conditions. The fishes were fed with chopped goat liver every day ad libitum. Running tapwater was used in all the experiments and the fish were adjusted to natural photoperiod and ambient temperature. No aeration was done.

Static acute bioassays were performed to determine LC5o values of endosulfan for 24, 48, 72 and 96 hours following the methods of APHA, AWWA & WPCF (1985). The LCso values for these periods were 8.25 ppm, 6.25 ppm, · 4.25 ppm and 3.25 ppm respectively. The sublethal concentration was determined following the formula of Hart *et al.* (1945). Twenty acclimated fish were exposed to a sub-lethal concentration (1.8 ppm) of endosulfan for 30 days. Side by side same number of fish as that of experimental one was maintained as the control group. At the end of exposure period the fish were anaesthetized with 1:4000 MS 222 (tricane, methane, sulfonate, sandoz) for two minutes. The liver, muscle, testis and ovary were quickly dissected out, weighed to nearest mg and processed for the quantitative estimation of protein by the methods of Varley *et al.* (1980).

RESULTS AND DISCUSSION

The protein profiles of liver, kidney, (gonads) testis and ovary in response to endosulfan exposure showed a significant decline. The liver and kidney showed statistically more significant decline. The liver and kidney showed statistically more significant ($P < 0.001$) decline *i.e.* 31% in kidney, while 30% in liver. The testis showed significant ($P < 0.05$) while ovary showed significant at ($P < 0.01$). The testis showed decline 19% while ovary 17%. Total protein in the control liver, kidney, testis and ovary was estimated to be 102.19±1.81, 75.006±1.04, 80.48±1.41, and 121.01±1.89 respectively. As against there, the total protein profiles in the experimental lots were 50.08±1.96, 45.08±0.01, 60.08±0.01 and 70.08±0. 01 respectively (Table 1).

Table 1

Profiles of total protein (mg/g wet tissue) content of liver, kidney, testis and ovary of *Channa punctatus* chronically exposed to endosulfan after 30 days treatment.

Tissue	Control	Endosulfan
Liver	102.19±1.81	50.08±1.96
Kidney	75.006±1.04	45.08±0.01
Testis	80.48±1.41	60.08±0.01
Ovary	121.01±1.89	70.08±0.01

Values are mean ± SE of 5 observations.
Significant level $p < 0.05$

The level of tissue protein in control fish recorded in the present study indicates that proteins are the largest contributors to the wet weight of the tissues after water. Previous workers have also reported decline in tissue protein profiles in a number of fish species exposed to various pesticides and pyrethroids. Deshmukh (2017) found a reduced protein content in liver of *Channa gachua* exposed to endosulfan and associated the same with degradation as also the detoxification of endosulfan. . Again Deshmukh (2015) noted a steady decline in the total protein of liver and muscle after 7 and 15 days exposure of the fish, *Wallago attu* to endosulfan and correlated it. Similarly, a significant decrease in the protein content was recorded by Saravanam and Echuliath (2011) in the *Labeo fimbriatus* exposed to endosulfan and suggested inhibition of protein synthesis by the toxicant.

The present findings on tissue proteins are in conformity with those of Deshmukh (2016); Reddy and Bhagyalakshmi (1994) and Banaee and Amadi (2011). A steep decline in protein content was noted by Tripathi and Verma (2004) in liver, kidney, gill and gonads of the endosulfan exposed *Clarias batrachus* and suggested increased proteolysis and possible utilization of the products of their degradation for metabolic purposes. Similar decline in protein content of hepatopancreas and muscle tissue of fresh water crab *B. cunicularis* and *Anabas testudineus* exposed to sublethal . concentration of endosulfan was reported by Venkateshwarlu and Shannaugan (2005) and Nordin *et al.* (2018) who have also pointed out an acceleration of protein catabolism during endosulfan intoxication. Similarly, in an earlier study, Deshmukh (2015) observed that when *Wallago attu* was exposed to sublethal concentration of endosulfan, a decreased protein level was evident from first day onwards.

Proteins being involved in the architecture and physiology of the cell seem to occupy a key role in the cell metabolism. The observed significant depletion of tissue protein in the present case denotes high catabolic potency of those organs and may be attributed to the intensive proteolysis and utilization of their degradation products for metabolism under the

toxic influence of endosulfan (Saravanam and Echuliath, 2011). The observations of Saleem and Shakoori (1985) on the loss of tissue proteins during permethrin intoxication offer support for the observed decrease of protein level in tissues. Moreover, the decreased protein contents might also be attributed to the tissue destruction, necrosis, or disturbance of cellular function and consequent impairment in protein synthetic machinery (Nwamba and Ajima, 2011). Further, the loss of gonadal proteins may also be associated to the direct action of pyrethroids leading to arrest of vitellogenesis in ovary and loss of germ cells in testis Rita and Milton (2006), Singh *et al.* (2007) and Muthulakshrni *et al.* (2008). Thus we see that protein metabolism is also impaired under the sublethal chronic stress of pyrethroids which induced compensatory mechanism in the tissues resulting in proteo1ysis.

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