

Cypermethrin Impact on Total Protein in Muscle and Liver of the Freshwater Fish *Channa Punctatus*

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Abstract---Cypermethrin, a synthetic pyrethroid pesticide and potential toxic pollutant, accumulated in aquatic ecosystems was investigated in present study for acute toxicity. Freshwater fish *Channa punctatus* was selected for bioassay experiments. The effect of cypermethrin (synthetic pyrethroid) on total protein in muscle and liver tissues were estimated in freshwater fish *Channa punctatus*. Fishes were exposed to sublethal concentration of cypermethrin (0.00078µg/lit) for 24, 48, 72, and 96 hours of different time intervals. The total protein level was found to decrease 58.99, 41.12, 38.11, 21.81mg/lit in muscle and 23.62, 20.77, 19.17, 12.67 mg/lit in liver tissues at different exposure period.

Keywords---Cypermethrin, liver, muscle, protein.

I. INTRODUCTION

Cypermethrin is widely used as pesticide in agricultural field based on pyrethroids and these are extensively used to control the pest today to increase agricultural production. It is among the most effective pyrethroid preparations and its effectiveness in the case of fish is same as that of other pyrethroids containing cyano-3-phenoxybenzyl groups [1]. They block the sodium channels of nerve filaments, thereby lengthening their depolarization phase; moreover, they affect the GABA receptors in the nerve filaments [2]. Agricultural chemicals including nitrogen compounds, pesticides and broke down products are commonly present in water bodies [3]. The extensive and uncontrolled use of pesticides has caused serious environmental problems, influencing structure and function of the ecosystem [4]. Pesticides represent a relevant stressor for many aquatic and terrestrial species [5]. The contamination affects all group of organisms in aquatic ecosystem like invertebrate [6] and non target aquatic biota like fishes [7]. In addition to their acute toxicity, many pyrethroids may have potentially deleterious effect at sublethal levels [8]-[10].

Common use of these pesticides by methods like crop dusting, orchard and forest spraying or mosquito control means that some inevitable enter aquatic ecosystems. It is necessary to know the effects of these broad spectrum pesticides on aquatic organisms [11]. Synthetic pyrethroids came after organochlorines and carbamates and organophosphates became popular not only because of their efficacy but also due to their relatively faster biodegradability and low mammalian toxicity [12]. Pyrethroids are found to cause significant morphological and behavioral stress in freshwater fishes. Scientist has shown that insecticides mainly affect liver of fishes.

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Notable alteration that is declined trend in liver and intestine glycogen of *Ophiocephalus punctatus* exposed to sublethal concentration of cypermethrin, these declined values of glycogen showed disturb carbohydrate metabolism due to toxic stress [13]. In fishes, proteins are one of the main sources of energy which also plays an important role in tissue building. The fresh water fish *channa punctatus* is mostly used as a food item; hence an attempt has been made to study the changes, in the total protein of the freshwater fish *Channa Punctatus* exposed to sublethal concentration of Cypermethrin.

II. MATERIALS AND METHODS

The freshwater fishes were collected from different ponds or local market of Meerut District. Fishes were acclimatized in laboratory condition, for 10 days fed with artificial food and procedure for toxicity was done. After that fishes were exposed to sublethal concentration of cypermethrin (0.00078 µg/lit) at 24, 48, 72, and 96 hours. The fishes were sacrificed and fresh(wet) tissues liver and muscle were isolated then total protein was estimated by *Lowry et al.* (1951) method.

III. RESULT AND DISCUSSION

In the present study observed that there was significant decrease in total protein of muscle and liver tissues of tested fishes at different exposure period. The value were found to be 58.99, 41.12, 38.11, 21.81 mg/lit in muscle and 23.62, 20.77, 19.17, 12.67 in liver respectively compared to control values (see Table 1). As significant decrease was observed in muscle and liver tissues may be because these organs are more active and require large amount of energy. It also appears that vigorous struggling may enhance muscle activity which may probably contribute to protein degradation that is proteolysis.

TABLE 1: CHANGED TOTAL PROTEIN IN MUSCLE AND LIVER (WET TISSUES) OF FRESHWATER FISH CHANNA PUNCTATUS EXPOSED TO SUB LETHAL CONCENTRATION OF CYPERMETHRIN (0.00078 µg/LIT).

Tissues	Exposure period (hrs)				
	Control	24	48	72	96
Muscle (mg/lit)	56.89±0.0217	58.99±0.021	41.12±0.013	38.11±0.022	21.81±0.021
Liver (mg/lit)	32.12±0.019	23.62±0.021	20.77±0.020	19.17±0.018	12.67±0.017

Few earlier reports also gave indication of strong stress inducing potential of pyrethroids. It was found that cypermethrin to be potential toxicant as it resulted in

significant changes such as hyperplasia, disintegration of hepatic mass and focal coagulative necrosis in *Labeo rohita* [14]. There was also reported severe histopathological lesions and marked decline in protein level and glycogen level in different organs of Nile tilapia (*Oreochromis niloticus*) in response to the treatment of cypermethrin for 10 days [15]. The freshwater fish, *Clarias batrachus*, has been reported to exhibit significant decrease in the activity of Na⁺-K⁺ ATPase and the level of glycogen content along with simultaneous elevation in the level of glycogen phosphorylase in response to cypermethrin intoxication indicating its strong capacity of inducing strong stress in fish. λ -cyhalothrin was found to exert profound effects on serum glucose, protein, cholesterol, triglycerides, alkaline phosphatase, glutamic pyruvic acid transaminase and glutamic oxaloacetic acid transaminase in African catfish, *Clarias gariepinus* [16].

Similar findings shown that proteins are the main source of energy there degradation is to cope with high energy demand augmented during malathion stress in *Cyprinus carpio* [17]-[18]. Also the total protein level showed decreased trend in Nile Tilapia (*Oreochromis niloticus*) in response to the treatment of cypermethrin [15]. In *Clarius gariepinus* exposed to cyhalothrin decreased protein observed [19]. Decreased in protein level may be attributed to impaired synthetic machinery due to cypermethrin effect [20]. Similarly, significantly decrease in protein content in rainbow trout (*Oncorhynchus mykiss*) due to contaminated environment condition was found [22]-[23]. The depletion of protein fraction in liver, brain and kidney may have been due to their degradation towards toxicity of cypermethrin and possible utilization for metabolic purposes [24]-[26].

IV. CONCLUSION

In present study it is concluded that toxic nature of cypermethrin affected total protein in muscles and liver tissues of *Channa punctatus* therefore proteins are mainly involved in energy and metabolic process. The physiological and metabolic status of fishes disturbed due to toxic stress.

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