



ORIGINAL ARTICLE

Assessment of Liver Biochemical Alterations in Fresh Water Fish *Channa punctatus* (Bloch.) Under Stress of Monocrotophos

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ABSTRACT

Although ecotoxicological manifestations of organophosphorous intoxication have been documented by several workers in various organs of fishes but despite our best efforts, we could not gather any information regarding the adverse effect of organophosphorous on the some system deeply viz. health profile of fishes. As healthy organs of fish are an important determinant of its breeding potential, and thus any toxicological factor adversely affecting the histoanatomy of liver will definitely hamper the gross production of fishes. The freshwater is polluted due to entry of excess sewage water, industrial effluents and large number of pesticides in natural and agricultural pest management. The pesticides like organophosphates are regularly used in agricultural pest management for food production but through their excessive and indiscriminate use in agriculture pest management and public health operations. The rapidly increasing use of insecticides in agriculture possess serious hazards to aquatic animals. In the present investigation, liver acid and alkaline phosphatase have been observed to study the toxic effects spectrum of monocrotophos in *Channa punctatus*.

Key words: Liver, Biochemical Alterations, Fish *Channa punctatus*, Monocrotophos

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INTRODUCTION

Pesticides are one of the most potentially harmful chemicals liberated into the environment in an unplanned manner. Though they have contributed considerably to the welfare of humans and thy adverse effect on non-target organisms very serious. The major sources of environmental contamination by these chemicals are agricultural practices, usage in public health programmes and industrial discharges. Indiscriminate use of pesticides has elevated the risk of contamination of environment and aquatic habitat. Considering the above facts, the present work has been undertaken to study the alteration of some biochemical parameters of fish *Channa punctatus* treated with sublethal concentrations of monocrotophos pesticide. Liver play an important role in the body metabolism because all substances absorbed by the gastrointestinal tract pass through it before entering into the general blood circulation. Some toxicants cause direct injury to the liver while others are metabolized. Liver is the organ like largest gland of the body performing several functions. It has no direct contact with the pollutants dissolved in water but once they are in the body they are metabolized in liver. In the present investigation, alterations in liver biochemistry have been noted after monocrotophos intoxication.

MATERIALS AND METHODS**Selection, Rearing and Maintenance of Fish:**

The fresh water air breathing fish *Channa punctatus* (Bloch.) which is also known as *Ophiocephalus punctatus* of Day, ranging from 8 to 15 cm in length and 20 to 65 gm in weight were collected from the local fish market. The fishes were collected during September to April when the room temperature ranged from 25 to 36°C and water temperature from 20 to 25°C. They were carefully examined for any injury and then kept in one percent solution of potassium permagnate for few minutes to get rid off any dermal infection. Finally they were stored in large glass aquaria in measuring 75 cm X 37.5 X 37.5 cm and fed on boiled egg yolk and fish food. Tap water stored in large aquarium for dechlorination and was used as a diluent medium. The water of aquarium was changed every two days or even earlier if it give foul smell.

Experimental Protocol:

To assess the effect of monocrotophos the fish, *Channa punctatus* (Bloch.) were grouped in to five sets, four acute and one control sets. The *Channa punctatus* were killed under light chloroform anaesthesia. They were dissected carefully and the liver was taken out and weighted for the biochemical estimations.

Experimental Compound:

Monocrotophos has been selected for present study. Trade names for products containing monocrotophos include Azodrin, Bilobran, Crisodrin, Monocil 40, Monocron, Nuvacron, Pillardrin, and Plantdrin.. Use of monocrotophos on potatoes and tomatoes was withdrawn in 1985. All applications of monocrotophos were discontinued in the United States in 1988. Before its withdrawal, monocrotophos was a Restricted Use Pesticide (RUP). Monocrotophos is an organophosphorus insecticide and acaricide which works systemically and on contact. It is extremely toxic to birds and is used as a bird poison. It is also very poisonous to mammals. It is used to control a variety of sucking, chewing and boring insects and spider mites on cotton, sugarcane, peanuts, ornamentals, and tobacco. The Environmental Protection Agency (EPA) classifies monocrotophos as a class I toxicity- highly toxic. Products containing monocrotophos bear the Signal Word 'Danger'. Monocrotophos is available in other countries as a soluble concentrate or an ultra-low volume spray.

Biochemical Estimations:

The acid and alkaline phosphatases were estimated by y the Kind and King Kit method (1954).

Statistical Calculations:

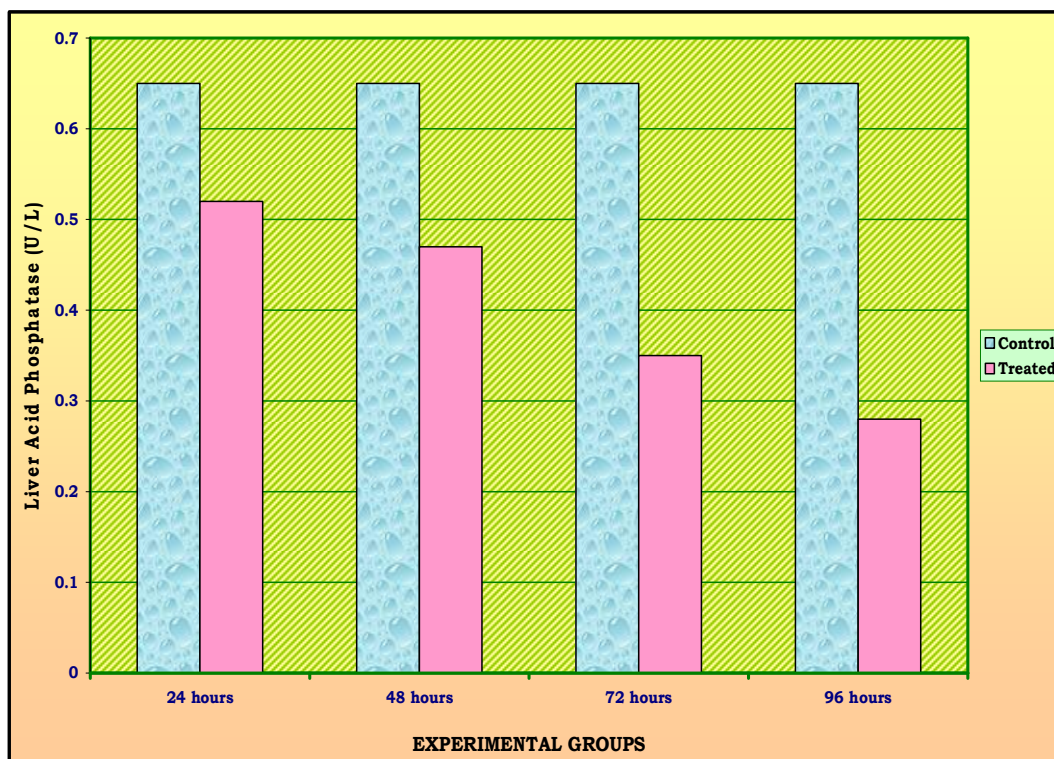
In the present study, the software KpKy plot was used for different statistical calculations based on Fischer and Yates (1950).

Table 1: Acid phosphatase (U/L) in liver of *Channa punctatus* after monocrotophos treatment

S.No.	Duration	No. of fishes	Control	Treatment
			Mean±S.Em.	Mean±S.Em.
1.	24hrs	6	0.65±0.08	0.52±0.04*
2.	48hrs	6	0.65±0.08	0.47±0.09**
3.	72hrs	6	0.65±0.08	0.35±0.05****
4.	96hrs	6	0.65±0.08	0.28±0.02****

* Non-significant, **Significant, *** Highly significant, **** Very highly significant

Fig. 1: Acid phosphatase (U/L) in liver of *Channa punctatus* after monocrotophos treatment



RESULTS AND DISCUSSION

The acid phosphatase in *Channa punctatus* was 0.65 ± 0.08 U/L for 24, 48, 72 and 96 hours. The acid phosphatase in *Channa punctatus* was 0.52 ± 0.04 U/L for 24 hours, 0.47 ± 0.09 U/L for 48 hours, while 0.35 ± 0.05 U/L for 72 hours and 0.28 ± 0.02 U/L for 96 hours respectively. The acid phosphatase shows a decreasing trend with treatment. The decrease in acid phosphatase following serial treatment with monocrotophos was non-significant after 24 hours, significant after 48 hours and very highly significant after 72 hours and 96 hours (Table 1, Fig. 1).

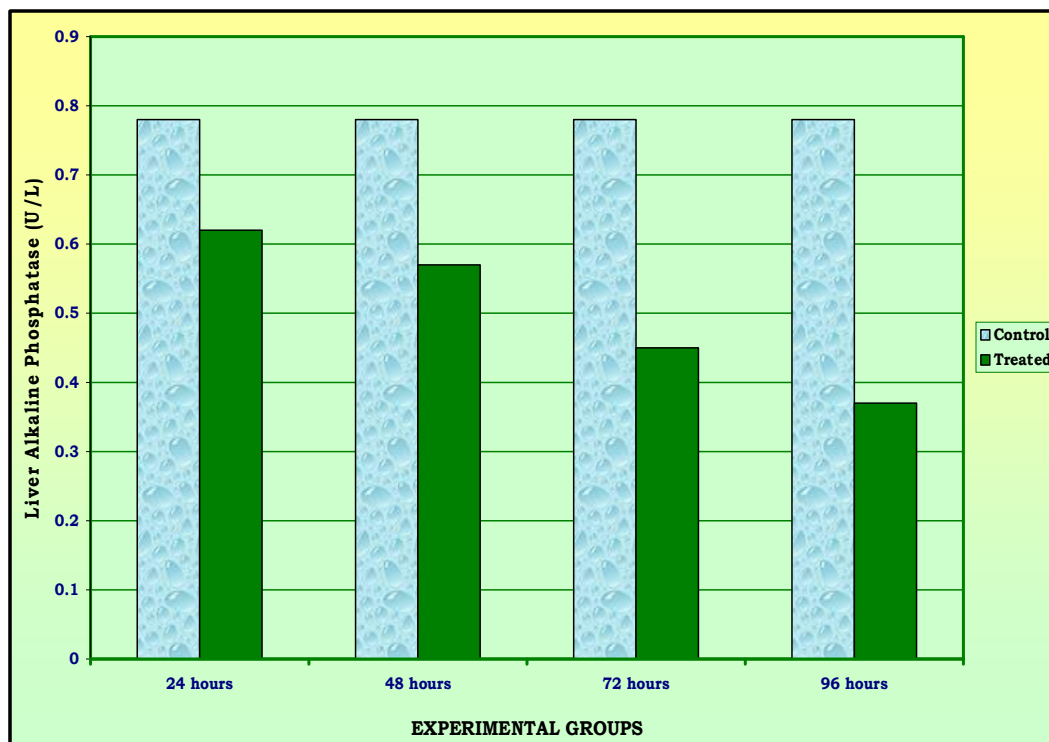
The alkaline phosphatase in *Channa punctatus* was 0.78 ± 0.06 U/L for 24, 48, 72 and 96 hours. The alkaline phosphatase in *Channa punctatus* was 0.62 ± 0.03 U/L for 24 hours, 0.57 ± 0.08 U/L for 48 hours, while 0.45 ± 0.04 U/L for 72 hours and 0.37 ± 0.03 U/L for 96 hours respectively. The alkaline phosphatase shows a decreasing trend with treatment. The decrease in alkaline phosphatase following serial treatment with monocrotophos was non-significant after 24 hours, significant after 48 hours and very highly significant after 72 hours and 96 hours (Table 2, Fig. 2).

Table 2: Alkaline phosphatase (U/L) in liver of *Channa punctatus* after monocrotophos treatment

S.No.	Duration	No. of fishes	Control	Treatment
			Mean±S.Em.	Mean±S.Em.
1.	24hrs	6	0.78 ± 0.06	$0.62 \pm 0.03^*$
2.	48hrs	6	0.78 ± 0.06	$0.57 \pm 0.08^{**}$
3.	72hrs	6	0.78 ± 0.06	$0.45 \pm 0.04^{***}$
4.	96hrs	6	0.78 ± 0.06	$0.37 \pm 0.03^{****}$

* Non-significant, **Significant, *** Highly significant, **** Very highly significant

Fig. 2: Alkaline phosphatase (U/L) in liver of *Channa punctatus* after monocrotophos treatment



Decreased activity of acid and alkaline phosphate indicate disturbance in the structure and integrity of cell organelles like membrane transport system and endoplasmic reticulum. Such damage too cell organelles has been reported in various studies. *Oreochromis mossambicus* treated with organophosphorus insecticide. Velisek, *et al.*, (2006) in rainbow trout treated with monocrotophos. The decrease in ALP probably indicates an altered transport of phosphate and an inhibitory effect on cell growth and proliferation. The inhibitions of liver ALP activities were demonstrated in animals exposed to different heavy metal, pesticides and sewage. Das and Mukherjee (2000) also noted depletion of ALP in liver and muscle tissue of *Labeo rohita* on the exposure of quinalphos. Toxicant other than insecticide such as heavy metal also reduce that activity levels of acid and alkaline phosphate in muscle and liver tissue of the fish *Labeo rohita*. Kumar, *et al.*, (2010) observed λ -cyhalothrin and monocrotophos induced *in vivo* alterations in the activity of acetylcholinesterase in a freshwater fish, *Channa punctatus* (Bloch). These findings indicated that apart from the established mechanism of delayed closure of sodium ion channels, these pyrethroids inhibit the activity of AChE in *C. punctatus* which could further aggravate their neurotoxic effects. Iwatsuki (2013) examined review of the *Acanthopagrus latus* Complex (Perciformes: Sparidae) with Descriptions of Three New Species from the Indo-West Pacific Ocean; Akbary (2014) evaluated consideration of Blood Serum Biochemical Parameters of Yellow Fin Sea Bream (*Acanthopagrus latus* Houttuyn, 1782) and Orange-Spotted Grouper (*Epinephelus coioides* Hamilton, 1822) and Hamed, *et al.*, (2015) worked on Histopathology and Biochemical Analysis of Common Carp (*Cyprinus carpio*) Exposed to Sublethal Concentrations of Carboxin-thiram (Vitavax Thiram). These findings are in accordance with our findings and validate our findings with their results and indicate decrement in ALP activity. However, there are some alterations with their values but almost similar change has been observed.

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