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### Research Article

### Zoology

#### IMPACT OF INSECTICIDE AS ALLETHRIN ON BIOCHEMICAL, HAEMATOLOGICAL AND HISTOPATHOLOGICAL CHANGES IN *Cyprinus Carpio*

Dr. K. PAZHANISAMY

Department of Zoology, Government Arts College,  
(Affiliated to Bharathidasan University), Ariyalur -621713, Tamil Nadu, India

#### ABSTRACT

In the present study was to investigate the Allethrins exposure *Cyprinus carpio* fish. Oxidative stress marker on MDA significant difference in Control fish and Allethrins exposed fish were observed. The MDA content was higher in Group II as compared with Group I fish of *Cyprinus carpio*. Liver marker on SGOT and SGPT was higher in Group II as compared with Group I fish of *Cyprinus carpio*. Hematological parameters was significant difference in Control fish and Allethrins exposed fish were observed. The WBC content was higher in Group II as compared with Group I fish of *Cyprinus carpio*. The Hb and RBC content was higher in Group I as compared with Group II fish of *Cyprinus carpio*. To Carbohydrate, protein and lipids were significant difference in Control fish and Allethrins exposed fish were observed. The Carbohydrate, protein and lipids content was higher in Group I as compared with Group II fish of *Cyprinus carpio*. Histopathological observation also confirmed the toxicity of pesticide as Allethrins.

**Keywords:** Allethrins, *Cyprinus carpio*, Hematological parameters, Liver marker

#### INTRODUCTION

In developing countries like India with agriculture based economy there is increasing trend of cash crop cultivation. Agricultural development continues to remain the most important objective of Indian planning and policy. In the process of development of agriculture, pesticides have become an important tool as a plant protection agent for boosting food production (Dave *et al.*, 1998). Pesticides are economically important chemicals and their use in agriculture has increased crop yields leading to a decrease in food costs. A pesticide is defined as a chemical agent used to destroy or control pests. The root word is the Latin word "cida" which means to kill. The generic term "pesticides" can apply to a wide spectrum of chemicals, including insecticides,

rodenticides, herbicides, fungicides, biocides, and similar chemicals (Wolf, *et al.* 1967). In the present study to investigate the impact of insecticide as allethrin on biochemical, hematological and histopathological changes in *Cyprinus carpio*

#### MATERIALS AND METHODS

##### Collections and Acclimatization of Experimental Animal

*Cyprinus carpio* of average weights of 4.50gm were collected from fish farm, Thanjavur district, Tamil Nadu. Fish were fed with pelleted feed and water was renewed every day.

##### Experimental design

Group I : Control fish

Group II: Fish were treated with Allethrins (100µg/l).

The experiments were carried out with the help of small square type glass troughs of 10-liter capacity, which were covered with in iron wire gauge to avoid the jumping of the fish from the trough. To provide proper supply of oxygen an aerator was used. The test media was changed daily with fresh addition of the toxicant. The test media was changed daily with fresh addition of the toxicant. Fish were treated with Allethrins (100µg/l) for 3 days in static tank containing water. At the end of the experimental period (After 24 hours), the fishes were sacrificed by decapitation. Blood was collected with and without EDTA and allowed to clot at room temperature and then centrifuged at 3000 rpm at 4°C for 20 min to obtain serum.

**Haematological analysis**

Haemoglobin, WBC and RBC were estimated by Cyanmethemoglobin method (Dacie and Lewis, 1968). Malondialdehyde was estimated by the thiobarbituric acid assay method of Beuge and Aust (1978). The SGOT and SGPT activity were estimated by the method of Reitman and Frankel (1957). Protein was estimated by the method of Lowry *et al.* (1951). Total lipids in tissues were estimated by the method of Folch *et al* (1957). To estimate the amount of carbohydrate

present in the given sample by using Anthrone method

**Statistical analysis**

Values are expressed as Mean ± SD for 10 fish. Data was calculated by student t-Test (Independent sample, P value two tail) using MS-excel ver. 2013. Statistically significant level 0.05.

**RESULTS AND DISCUSSION**

The present study was carried out to analyze the various biochemical parameters in normal and pesticide exposure fish the observation made on different fish of normal and pesticide exposure fish were compared. Agricultural pesticide are widely used in aquaculture to enhance the natural productivity of a pond by stimulating the production of phytoplankton which serve as feed for fishes.

**Oxidative stress markers**

Present study was compared on control fish and Allethrins exposed fish of Oxidative stress marker on MDA was control fish estimate on 4.70±0.32 and Allethrins exposed fish 15.51±1.08 were reported on following table 1. Significant difference in Control fish and Allethrins exposed fish were observed. The MDA content was higher in Group II as compared with Group I fish of *Cyprinus carpio*.

**Table.1: Oxidative stress marker in *Cyprinus carpio* of control and Allethrins exposed fish**

Parameters	Result	
	Group I (Control fish)	Group II (Allethrins exposed fish)
MDA (nmol/L)	4.70±0.32	15.51±1.08
AST (SGOT) (IU/l)	20.79±1.45	63.42±4.43
ALT (SGPT) (IU/l)	46.54±3.25	73.05±5.11
Hb (g/dl)	1.59±0.11	0.56±0.03
RBC x 10 <sup>6</sup> (Million/cu.mm)	2.47±0.172	1.40±0.98
WBC x 10 <sup>3</sup> (Cu. mm)	7.01±0.49	8.50±0.59

Value were expressed as Mean ± SD for triplicates

Malondialdehyde (MDA) is the major aldehyde resulting from the peroxidation of biological membrane polyunsaturated fatty acid. MDA, a secondary product of lipid peroxidation is used as an indicator of tissue damage by series of chain reactions (Ray and Husain, 2002). The study of lipid peroxidation is attracting much attention in recent years due to its role in diseases process membrane lipids are particularly susceptible to lipid peroxidation due to the presence of polyunsaturated fatty

acids. It has been implicated in the pathogenesis of a number of diseases and clinical conditions. These include atherosclerosis, cancer etc., Experimental and clinical evidence suggests that aldehyde products of lipid peroxidation can also act as bioactive molecule in physiological and pathological conditions. It is now generally accepted that lipid peroxidation and its product play an important role in liver, kidney, heart and brain toxicity (Lakshmi *et al.*, 2005). MDA is one of the indicators of oxidative

stress. In the present study, the increased content of MDA in pesticide exposure subjects as compared with normal subjects, indicates that the increase in oxidative stress and lipid peroxidation in pesticide exposure subjects

Oxidative stress is the consequence of an imbalance between oxidative and reductive processes in the cell. Oxidative stress is induced when the physiological antioxidant defence system can no longer counteract the elevated ROS levels (Prieto *et al.*, 2009) or as a result of the cellular incompetency to repair oxidative damage (Dorval and Hontela, 2003). These circumstances are manifested by an increase in lipid hydroperoxides, which are estimated through malondialdehyde (MDA) quantification. Similar to other vertebrates, teleosts have evolved a wide array of antioxidant defence systems to protect themselves from deleterious effect of ROS (Basha and Rani, 2003; Erdogan *et al.*, 2005). The lipid peroxidation process affects biomolecules associated with the membrane such as membrane bound proteins or cholesterol, and may be of importance in fish as their membranes contain a higher degree of polyunsaturated fatty acid (PUFA) (Halliwell and Gutteridge, 1999). Malondialdehyde is well characterized oxidation product of PUFAs and thiobarbituric acid reactive substances (TBARS) method of quantifying lipid peroxides in sample measures this end product. The concentration of MDA is the direct evidence of lipid damage caused by free radicals.

#### **Liver function analysis**

Present study was compared on control fish and Allethrins exposed fish of Liver marker on SGOT and SGPT was control fish estimate on (20.79±1.45 and 46.54±3.25) and Allethrins exposed exposed fish (63.42±4.43 and 73.05±5.11) were reported on following table 1. Significant difference in Control fish and Allethrins exposed fish were observed. The SGOT and SGPT content was higher in Group II as compared with Group I fish of *Cyprinus carpio*.

The liver is responsible for the transformation of foreign substances (xenobiotics), a process that aims to make xenobiotics water soluble and hence amenable to excretion. Fish liver is a vital organ concerned with basic metabolism and is the major organ of accumulation, biotransformation and excretion of contaminants (Figueiredo *et al.*, 2006).

Monitoring of liver enzymes leakage into the blood has proved to be a useful tool in liver toxicological studies (Osman *et al.*, 2010). Thus, liver function tests are surrogates for the assessment of toxicity in animals. The analysis of serum proteins and enzymes viz., aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP) activities of fish liver are important tool for the assessment of metal toxicity.

#### **Haematological changes**

Haematological parameters are closely related to the response of the animal to the environment, an indication that the environment where fishes live could exert some influence on the hematological characteristics (Gabriel *et al.*, 2004).

Present study was compared on control fish and Allethrins exposed fish of Haematological on Hb, RBC and WBC was control fish estimate on (1.59±0.11, 2470000.00±172900.00 and 7016.60±491.16) and Allethrins exposed fish (0.56±0.03, 1403333.30±98233.31 and 8500.00±595.00) were reported on following table 1. Significant difference in Control fish and Allethrins exposed fish were observed. The WBC content was higher in Group II as compared with Group I fish of *Cyprinus carpio*. The Hb and RBC content was higher in Group I as compared with Group II fish of *Cyprinus carpio*.

#### **Estimation of Carbohydrate, protein and lipids**

Carbohydrates are a group of organic compounds including sugars, starches and fiber which is a major source of energy for animals. The protein has a high biological value with its growth promoting capability. Lipids are extremely important in maintaining structural and physiological integrity of cellular and sub-cellular membranes. Lipids are the best source of energy producers of the body through metabolism.

Present study was compared on control fish and Allethrins exposed fish of Carbohydrate, protein and lipids was control fish estimate on (3.94±0.27; 25.08±1.46 and 0.49±0.05) and Allethrins exposed exposed fish (2.50±0.17; 17.53±1.08 and 0.16±0.05) were reported on following table 2. Significant difference in Control fish and Allethrins exposed fish were observed. The Carbohydrate, protein and lipids content was higher in Group I as compared with Group II fish of *Cyprinus carpio*.

**Table.2: Biochemical analysis such carbohydrate, protein and lipids in *Cyprinus carpio* of control and Allethrins exposed fish**

Parameters	Result	
	Group I (Control fish)	Group II (Allethrins exposed fish)
Protein (mg/g)	3.94±0.27	2.50±0.17
Carbohydrate (mg/g)	25.08±1.46	17.53±1.08
Lipids (mg/g)	0.49±0.05	0.16±0.05

Value were expressed as Mean ± SD for triplicates

Nutrients are required in order to build and repair cells and body tissues, maintain the organs and bones in optimum working condition and to provide energy, fuel and warmth. Good nutrition is essential for good health and eating nutritious food can help prevent common ailments, as well as more life threatening illness and diseases (Varadharajan and Soundrapandian, 2014).

Protein is essential for the sustenance of life and accordingly exists as the largest quantity of all nutrients as a component of the human body (Okuzumi and Fujii, 2000). Present study evaluate on protein content was reported on statistically significant difference in group I and group II at significant level 0.05.

Fish and fish products play a great role in the nutritional picture because they are rich source of nutrients and provide a good balance of protein, vitamins and minerals, and a relatively low caloric content. In addition these properties it also excellent sources of Polyunsaturated fatty acids which appear to have beneficial effects. Fish is one of the most

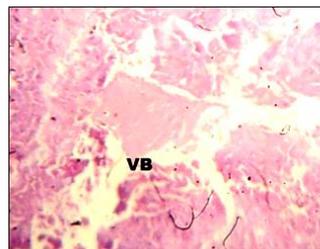
important foods in human diet because of its high nutritional quality. They are the well known source of a group of polyunsaturated fatty acids especially omega-3 and omega-6, which can prevent atherosclerosis and thrombosis. These fatty acids have preventive effects on coronary heart diseases, autoimmune disorders, arrhythmias, lowering plasma triglyceride levels and blood pressure (Jag Pal *et al.*, 2018).

**Histopathological observation**

In control fish of *Cyprinus carpio* hepatic cells were polygonal in shape with distinct nuclei. Large number of blood sinusoids and normal veins were also seen around the hepatocytes. Present investigation observed marked histopathological changes in the liver of *Cyprinus carpio* exposed to Allethrins. In the liver of the fish exposed to sublethal concentrations of Allethrins, hepatic alterations such as vacuolation, vein broken, loose arrangement of hepatic cells, histolysis and disintegration of cell boundries (Figure) were observed.



Normal fish



Allethrins exposed fish

**Figure 1: Histopathological changes in liver of *Cyprinus carpio***

**Conclusion**

Over all it can be concluded that Lead is an environmentally reactive metal that exhibits a high degree of toxicity to living organisms. The results of the present study indicated that Allethrins had lucid deleterious effects on *Cyprinus carpio*. It not only cause histopathological alterations in the vital organs of the fish but also interact with essential trace

elements and may have drastic effects on oxidative stress homeostasis and vital organs architecture. Studies regarding Pb<sup>2+</sup> toxicity may be crucial to understand their toxicological mechanism and its impact on trace metals metabolism in *Cyprinus carpio* fish..

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