EFFECT OF PESTICIDE METHYL PARATHION ON HAEMATOLOGICAL ALTERATIONS IN THE FRESH WATER FISH *Labeo rohita*

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Abstract

Pesticide is common pollutants of fresh water ecosystems where they induce adverse effects on the aquatic biota. Parathion is an organophosphate insecticide and extensively used to control harmful insects of agriculture. Fish, Labeo rohita is an important carp species popularly called rohu in Tamil Nadu region having good nutritional values. Fishes living in close association with may accumulate pesticides. In the present observation, the toxic effects of pesticide methyl parathion LC_{50} 4.5 ppm on the total RBC, WBC and Hb in the fish, Labeo rohita were estimated. The sublethal concentrations of pesticide methyl parathion on (10% sublethal concentration and 30% sublethal concentration) showed a decreasing trend in the RBC and Hb compared to control and the WBC analysis revealed a significant increased compared to control for a period of 4, 8 and 12 days exposures. The results indicated the toxic nature of the sublethal concentrations pesticide cypermethrin.

Key Words: *Fish Labeo rohita, Pesticide, Methyl parathion, Haematology, RBC, WBC, Hb.*

Introduction

Methyl parathion, an organophosphate pesticide, extensively used in agriculture is known to be responsible for a number of physiological and biochemical disturbances to the non-target organisms. It is known to be a neurotoxic and hepatotoxic pesticide. It has been reported that some of the serum enzymes are useful in diagnosing liver diseases (Reichling and Kalpan, 1988; Schmidt and Schmidt, 1990). Agricultural chemicals including nitrogen compounds, pesticides and brokedown products are commonly present in water bodies (Capel *et al.*, 2008).

Blood is a pathophysiological reflector of the whole body. Knowledge of the physiological action of the toxicant helps to predict on important sublethal effects and analysis of biochemistry, hematology and histopathology may be used to determine the mode of action of the toxicant. In recent years, biochemical variables were used more when clinical

diagnosis of the fish physiology was applied to determine the effects of external stressors and toxic substances. Therefore, biochemical evaluations are gradually becoming a routine practice for determining the health status in fish. Blood is a pathological indicator of the whole body, and hence hematological parameters are important for analysis of the functional status of an exposed animal to suspected toxicant (Omitoyin, 2006). Moreover, blood cell profile has been considered as an important indicator of diseases and other toxicants. As pathomorphological changes are indicative of numerous diseases (Yawata, 2003) there is little doubt of the importance of elucidating the mechanism governing erythrocyte shape (Pawloski *et al.*, 2006).

Blood is the indicator of pathological changes induced by the pollutants in fishes. Onset of any environmental toxicity in surrounding water, fish blood shows remarkable pathological changes. Hematological parameters are important for toxicological research and as indicators of environmental stress and disease in fish (Kumar *et al.*, 1999a; Kumar *et al.*, 1999b; Talas and Gulhan, 2009). Fish *Channa striatus* were exposed to endosulfan pesticide alterations in the haematological parameters such as haemoglobin (Hb) and red blood corpuscles (RBC) were decreased whereas WBC was increased in increasing sublethal concenterations of endosulfan respectively (Deshmukh, 2016). Similer worker were reported in haematological alterations in pesticide toxicity effect in different fishes Amitkumar *et al.* (2010) studied in endosulfan on haematology of *clarias batrachus.* In the present study, haematological parameters changes in fish *Labeo rohita* were exposed to pesticide methyl parathion.

Materials and Methods

Fish, *Labeo rohita* was collected from Vanthavasi area Thiruvannamalai district, and were brought to the laboratory in large plastic troughs and acclimatized for one week. Healthy, fish having equal size (length 10 to 12 cm) and weight (50 to 60 g) were used for experimentation. Stock solution of methyl parathion was prepared by dissolving appropriate amount of salt in distilled water. Physico-chemical characteristic of test water have analyzed regularly during the test periods following the standard method describe by APHA (1998). Batches of 10 healthy fishes were exposed to different concentrations of pesticide methyl parathion to calculate the medium lethal concentration LC_{50} value (4.5 ppm) using probit analysis Finney method (1971). The fishes (Four groups) were exposed to the two sublethal concentrations ($1/10^{th}$ and $1/20^{th}$ mg/L) of methyl parathion for 4, 8 and 12 days respectively. Another group was maintained as control. Fish was collected and gently wiped with a dry cloth to remove water. Caudal peduncle was cut with a sharp blade and the blood was collected in a watch glass containing EDTA, an anticoagulant (6% Ethylene diamine tetra acetic acid). The blood was mixed well with the EDTA solution by using a needle and this sample was used for determining the Red Blood Corpuscle Count (RBC), White Blood Corpuscle Count (WBC) and Haemoglobin count (Hb).

Results

Methyl parathion pesticide caused 50% mortality of fish *Labeo rohita* at 96 h was 4.5 ppm. The LC_{50} values of methyl parathion for 24, 48, 72 and 96 hours were 3.0, 3.5, 4.0 and

4.5 ppm respectively. The toxic effects of pesticide methyl parathion is presented on the haematological parameters of fish *Labeo rohita* such as number of red blood corpuscles (RBC), white blood corpuscles (WBC) and haemoglobin content (Hb). The observations were made at the end of exposure periods 4, 8 and 12 days to calculate the percentage of increase and decrease of different haematological parameters.

Red Blood Corpuscles (RBC)

The 10% and 30% sublethal concentrations of methyl parathion showed a decreasing trend in the RBC counts compared to controls (Table 1 and Fig. 1). Mean values of RBC in control fish were estimated to be 1.72, 1.74 and 1.73 (10^6/mm^3). In the 10% sublethal concentration values were recorded to be 1.63, 1.51 and 1.37 and the 30% sublethal concentration values were recorded 1.56, 1.43 and 1.28 (10^6/mm^3) respectively.

White Blood Cells (WBC)

Haematological parameter WBC in the fish *Labeo rohita*, both in control as well as 10% and 30% sublethal concentrations of pesticide methyl parathion exposed for 4, 8, and 12 days (Table 1 and Fig 2). The WBC analysis revealed a significant increase compared to control fish. White Blood Cells (WBC) count from 6.53, 6.52 and 6.55 in control fish. The 10% sublethal concentration values were recorded from 6.66, 7.48, and 7.78 and the 30% sublethal concentration values were recorded from 7.17, 7.67, 7.91 (10^3/mm^3) respectively.

Haemoglobin (Hb)

Haemoglobin alterations in the control and pesticide methyl parathion treated (10% & 30% sublethal concentrations) fish *Labeo rohita* exposure periods for 4, 8 and 12 days (Table 1 and Fig.3). Haemoglobin analysis revealed a significant reduction compared to control fish. Haemoglobin was count from 7.23, 7.25 and 7.26 g/100ml in control fish. The 10% sublethal concentration values were noted from 6.93, 6.69 and 6.31 g/100ml and 30% sublethal concentration values were recorded from 6.75, 6.42 and 6.23 g/100ml respectively.

Table 1. Alteration in the haematological parameters in the fish *Labeo rohita* under sublethal concentrations of pesticide methyl parathion.

Days	Exposure	RBC (10^6/mm^3)	WBC (10^3/mm^3)	Hb (g/100ml)
4 days	Control	1.72 ± 0.06	6.53 ± 0.12	7.23 ± 0.05
	10% SLC	1.63 ± 0.09	6.66 ± 0.17	6.93 ± 0.05
	30% SLC	1.56 ± 0.08	7.17 ± 0.06	6.75 ± 0.07
8 days	Control	1.74 ± 0.11	6.52 ± 0.25	7.25 ± 0.07
	10% SLC	1.51 ± 0.04	7.48 ± 0.12	6.69 ± 0.04

	30% SLC	1.43 ± 0.08	7.67 ± 0.16	6.42 ± 0.08
12 days	**Control**	1.73 ± 0.14	6.55 ± 0.16	7.26 ± 0.08
	10% SLC	1.37 ± 0.07	7.78 ± 0.09	6.31 ± 0.12
	30% SLC	1.28 ± 0.05	7.91 ± 0.17	6.23 ± 0.11

Values are mean ± SD for four observations

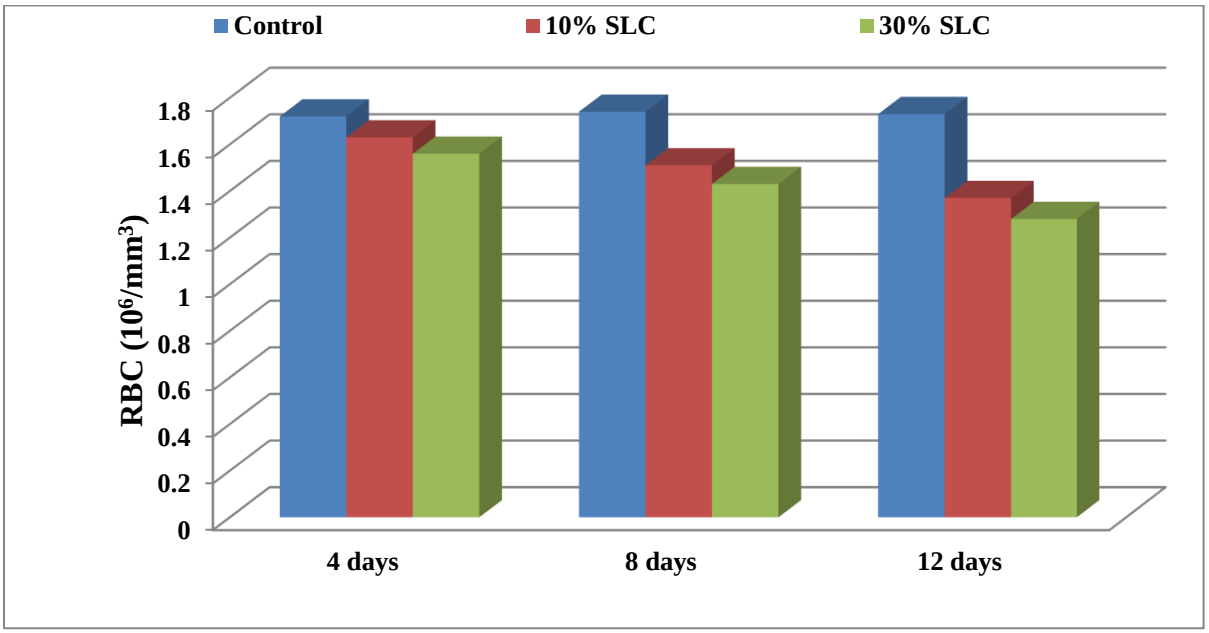

Fig. 1. Alteration in the total RBC of *Labeo rohita* under sublethal concentrations of pesticide methyl parathion.

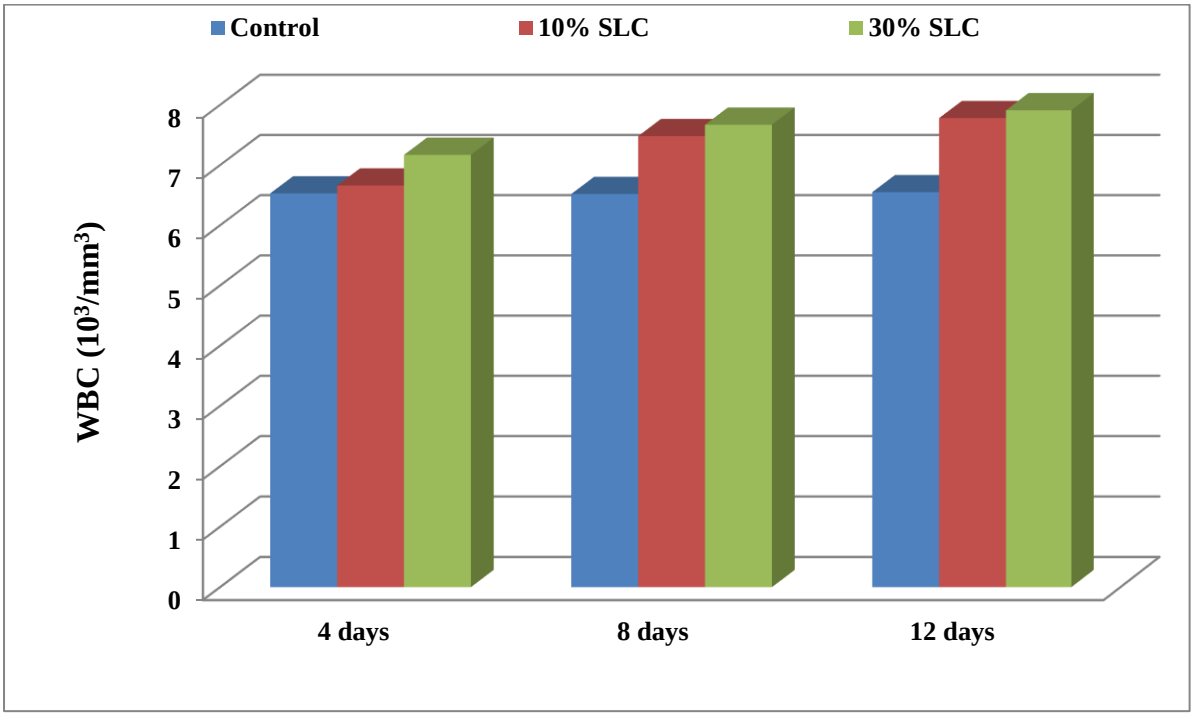

Fig. 2. Alteration in the total WBC of *Labeo rohita* under sublethal concentrations of pesticide methyl parathion.

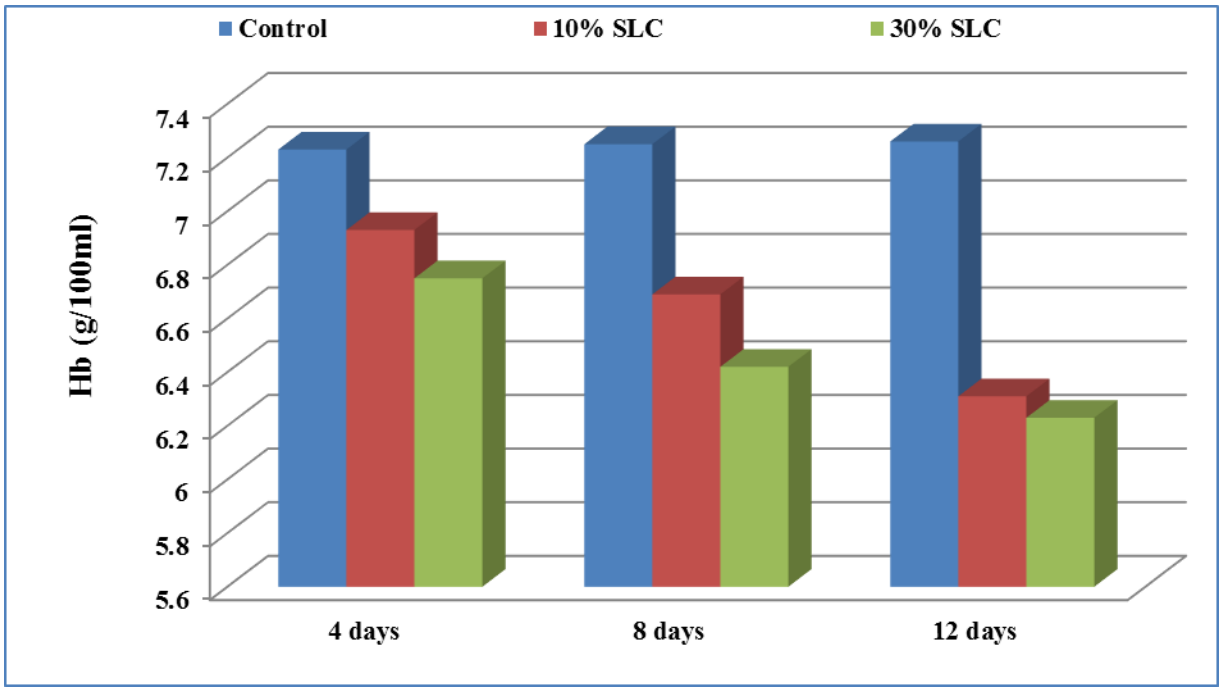

Fig. 3. Alteration in the haemoglobin content of *Labeo rohita* under sublethal concentrations of pesticide methyl parathion.

Discussion

In the present study LC_{50} values of pesticide methyl parathion treated fish *Labeo rohita* at 96 hours was 4.5 ppm and sublethal concentrations namely 10% and 30% values were selected, studying their effects on haematological aspects. During the acute toxicity tests, the fish were seen to exhibit several behavioural responses, such as fast jerking, frequently jumping, erratic swimming, spiraling, convulsions and tendency to escape from the aquaria. Following this state of hyper excitability, the fish became inactive and loss of orientation. There was loss of equilibrium and paralysis which ultimately resolved in death of the fish. These altered behavioral abnormalities were observed only at high concentration ranges (values higher than 96 h LC_{50}). Bhat *et al*. (2012) reported a significant decrease was observed in values of hematological parameters like Hb and RBC throughout the exposure of methyl parathion. The authors reported an increase in leukocyte initially, which later recovered, showing a significant decrease at the end of the experiment. Acute toxicity of pesticides like Endosulfon, Malathion and copper sulphate at different concentrations to fresh water prawns *Macrobrachium rosenbergii* were reported (Natarajan *et al*., 1992)

Haematological parameter RBC and Hb in the fish *Notopterus notopterus*, exposed to sublethal concentrations of pesticide parathion revealed a significant decrease compared to control fish. White Blood Cells (WBC) revealed a significant increase compared to control fish (Manoj Kumar Ahirwar and Qaiser Jahan Shammi. 2014). Pawara *et al*. (2017) noted the fish was exposed to sublethal concentration of imidacloprid to assess the alterations in the level of haematological parameters such as RBC, WBC and Hb of fish, *Channa punctatus* were observed.

Conclusion

Present study indicates that presence of low concentration of pesticide methyl parathion in the water is toxic to fishes and alters the haematological of the fish tissues. Results indicate that the usage of the methyl parathion in the agriculture fields may be a threat to aquatic fauna and flora as well as humans. Finally, concluded that the assured greater significance due to the increasing emphasis on fish culture and greater awareness of the pollution in aquatic ecosystem. Therefore, the information obtained may be useful for management and monitoring of agricultural insecticide contamination in aquatic ecosystem.

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