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Research Article

TOXICITY OF MONOCROTOPHOS AND THEIR EFFECTS ON HAEMATOLOGICAL PARAMETERS OF MARINE FISH *MUGIL CEPHALUS*

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ABSTRACT

The haematological parameters of *Mughil cephalus* were investigated after exposing the fish to the sublethal concentrations of (1/10, 1/30 of 96h LC_{50}) monocrotophos. The 96h LC_{50} value of the monocrotophos during acute exposure was found to be 0.0038 ppm. Exposure of the fish to monocrotophos showed a significant decrease in RBC and haemoglobin (Hb) content at the end of 30th day as compared to control whereas the WBC increased significantly, with the increase in exposure periods.

Keywords: *Mughil cephalus*, Acute toxicity, Monocrotophos, Haematological parameters.

INTRODUCTION

Fishes are one of the most widely distributed organisms in an aquatic environment and being susceptible to environmental contamination may reflect effects of environmental pollution in water (Ramesh *et al*., 2009). Haematological indices are very important diagnostic tools for the evaluation of pathological status or stress due to pollutants and environmental fluctuations in fishes (Vosyliene, 1999). McCay (1931) first demonstrated that alterations in blood and damage to hemopoietic tissues in fish can be associated with pathological conditions related to water borne pollutants. The blood was affected prior to the onset of more striking changes in fish exposed to various contaminants (Halsband & Halsband, 1963). The fact that the changes in fish blood, prior to the onset of more striking morphologic and physiologic changes can be indicative of unfavourable aquatic medium has been demonstrated by Eisler & Gardner (1973). The haemotology of fish is often sensitive to pollution induced stress (Al Asgah *et al*., 2015; Ayoola & Dansu, 2014; James *et al*., 2009) and (Khalesi *et al*., 2017). Hence, the present study was designed to explore the sublethal effects of monocrotophos on the haematological parameters of *Mugil cephalus* under laboratory condition.

MATERIALS AND METHODS

Mugil cephalus were collected from Agniar estuary, southeast coast of Tamilnadu. The fish were exposed to different concentrations of monocrotophos and mortality was observed for 96 hr. A static renewable bioassay method was adopted for the determination of 96 hr median lethal concentration (Sprague, 1973). Probit analysis was followed for the calculations of 96 h LC_{50} (Litchfield & Wilcoxon, 1949).

The fish were removed from each experimental group and blood was collected, by cutting the caudal peduncle, in a test tube containing 6% EDTA as an anticoagulant. Haematological parameters were estimated according to routine clinical method (Branda *et al*., 1978) RBC and WBC were counted by using an improved Neubauer counting chamber. Haemoglobin was used to determine the haemoglobin content of the blood.

RESULTS AND DISCUSSION

Blood plays a decisive role in the regulation of life processes. To function properly, an organism must be capable of keeping its blood composition relatively constant under normal conditions. The blood plays an integrated and inevitable part in all immune system (Zeeman & Brindley, 1981).

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Haematological parameters are related to responses of the organism to the changing environmental conditions and therefore can be used to screen the healthy state of fish submitted to the toxicant (Gill & Pant, 1981). In the present study, *Mugil cephalus* exposed to monocrotophos in RBC, Hb and significant increase in WBC count (Figure 1- 3). The erythrocytes of *Mugil cephalus* were almost oval in shape and their total count of blood showed decreasing trend in the treated fishes compared to the control. The percent decrease in RBC number were -3.91, -9.69,-17.08 and -14.05, -30.04, -49.71 at 10, 20 and 30 days of 10% and 30% sublethal concentrations of exposure respectively. Similar decrease in RBC number was observed by investigators in different species such as *Labeo rohita* fingerlings exposed to sublethal concentration of quinalphos (Das & Mukherjee, 2000), *Tilapia zilli* exposed to aluminium (Alwan *et al.*, 2009), *Mugil cephalus* to copper (James *et al.*, 2009) and *Garra gotyla gotyla* to manganese (Sharma & Langer, 2014).

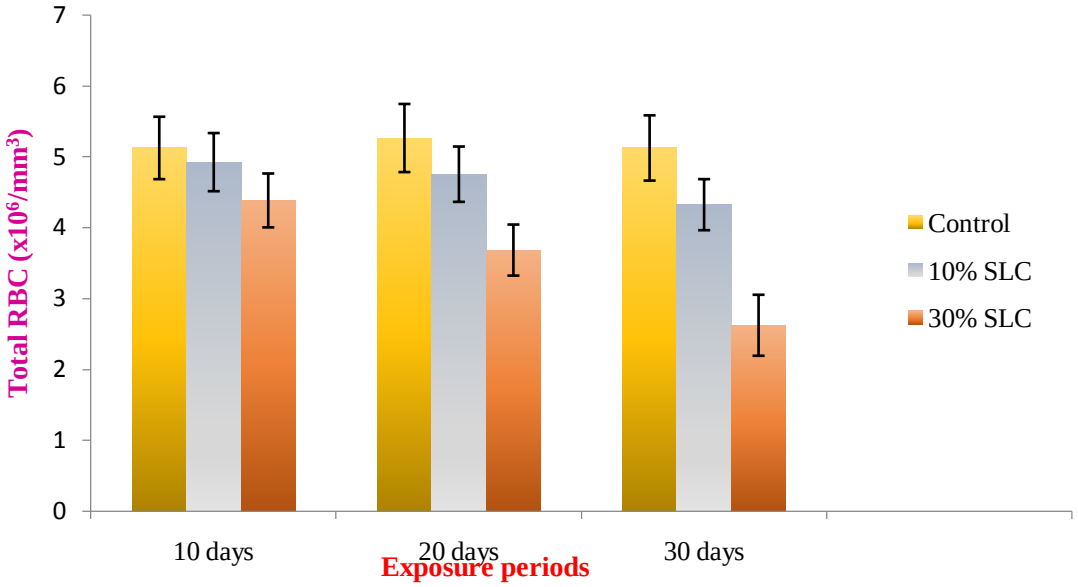

Figure 1. RBC of *Mugil cephalus* under sublethal concentrations of Monocrotophos.

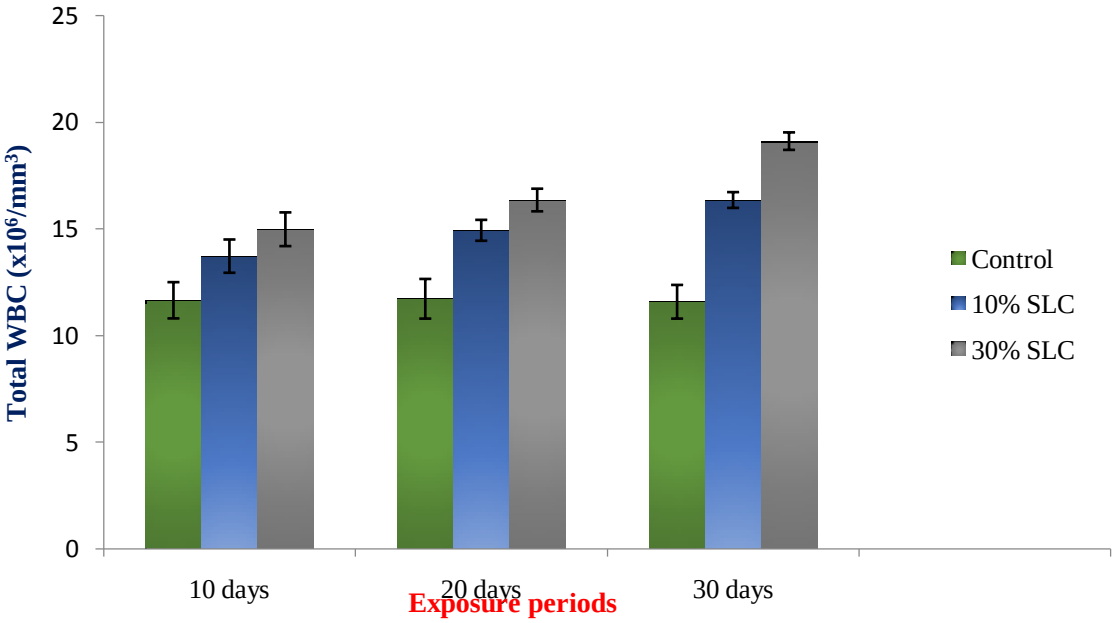

Figure 2. WBC of *Mugil cephalus* under sublethal concentrations of Monocrotophos.

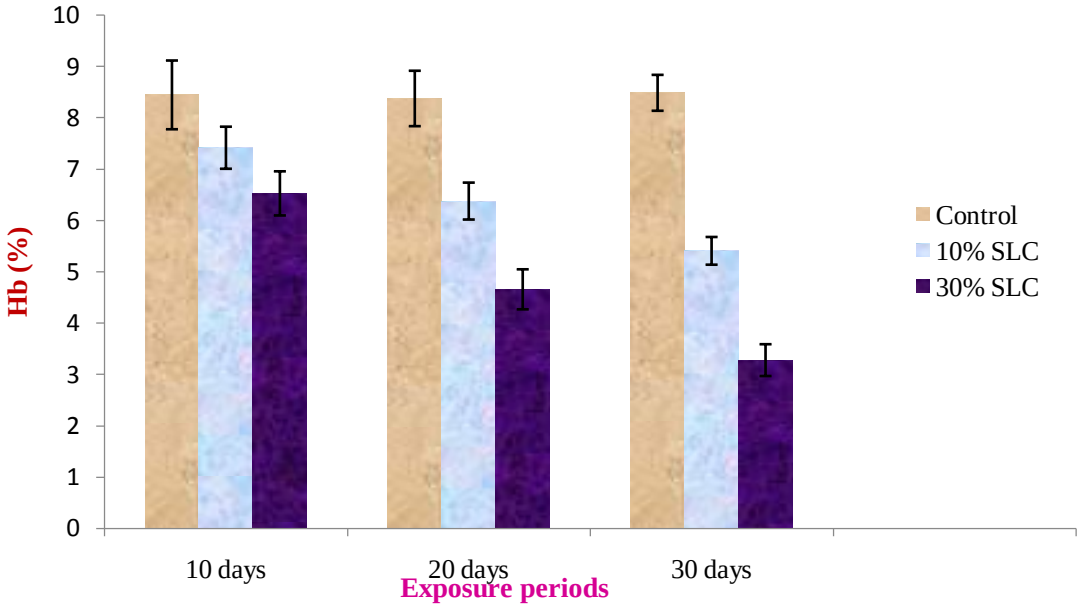

Figure 3. Hb of *Mugil cephalus* under sublethal concentrations of Monocrotophos.

White blood corpuscles donot contain any pigment and are colourless. The most important function of these leukocytes is the defense of the body against infection. If the animal is exposed to infection or to any other foreign antigen, proliferation of the WBC is conspicuous. In the present study, the number of leucocytes found to the increased in treated groups compared to control. The present increases were 17.76, 27.39, 50.69 and 28.58, 39.51, 65.03 at 10, 20 and 30 days of 10% and 30% sublethal concentration exposure respectively. The increase was statistically significant. Goel & Agrawal, (1984) observed an increased leucocytes in alachlor exposed *Clarias batrachus*. Similar observations were also in *Channa punctatus* exposed to thioacetamide (Saxena & Parashari, 1983), *Oreochromis mossambicus* to lindane *Badis bunchanani* to cadmium sulphate (Rao & Sarma, 1982), *Channa punctatus* to acid stress (Dheer *et al*., 1987).

The observation revealed that sublethal concentration of monocrotophos causes decrease in percent were -12.19,-23.87,-36.28 and -22.72,-44.39,-61.37 at 10, 20 and 30 days of 10% and 30% sublethal concentrations exposure. The decreased Hb content was observed in many investigators(Gill & Pant, 1981)found decrease in the Hb content of *Puntius conchonius* exposed to sublethal concentration of mercury. The significant decrease in Hb percentage was also in *Channa striatus* exposed to Metasystox (Natarajan, 1981), *Channa punctatus* exposed to malathion (Pandey *et al*., 1987), *Rasbora daniconius* to sodium lauryl sulphate (Nayak & Madhyastha, 1980), *Sarotherodon mossambicus* to sublethal concentration of sumithion and sevin (Koundinya & Ramamurthi, 1980), *Channa punctatus* to thioacetamide (Saxena & Parashari, 1983), *Oreochromis mossambicus* to copper sulphate (Lalitha *et al*., 1988), *Labeo rohita* to quinalphos (Das & Mukherjee, 2000), *Tilapia zillii* to aluminum (Alwan *et al*., 2009), *Mugil cephalus* to copper (James *et al*., 2009) and *Lates calcarifer* to cadmium and mercury (Chezhian *et al*., 2012).

In the present study the decrease in the total number of RBC and Hb content were observed in the monocrotophos treated fishes. It indicates the anaemia condition of the fish. Anaemia is due to a decreased rate of production or increased loss of red blood cells. This agrees with the results in hypochromic microcytic anaemia which was attributed to deficiency of iron and its decreased utilization of the Hb synthesis (Natarajan, 1981) and (Javed & Usmani, 2015). Contrary to observation of decrease in RBC and Hb, there was an increase in the number of WBC in monocrotophos treated fishes at all periods of exposure than the normal fishes. (Lone & Javaid, 1976) reported the same observations of increase in the number of WBC in *Clarias batrachus*. This increase in the number of WBC may play a part in the immunological defense systems during exposure to monocrotophos and appears to be associated with increased circulatory levels of granulocytes which are known to be responsible for phagocytosis (Britton, 1963). This suggests the development of a certain degree of tolerance during monocrotophos stress condition.

CONCLUSION

From this experiment it can be calculated exposure of fish to sublethal concentration of monocrotophos for 10, 20 and 30 days caused alteration in heamatological parameters. RBC and Hb percentage continuously decrease as numbers of exposure days in monocrotophos were increase. Incontary WBC was increased. Erythrocytes also show many abnormalities in their structure after long period of exposure. Changes are more intense in long period of exposure and no recovery takes place even after long period of exposure in low concentration of monocrotophos, which in turn affects oxygen carrying capacity of blood and

ultimately physiology of fish. These alterations may be due to inhibitory effect of monocrotophos on enzyme system or due to stress. So it concluded that haematological parameters are the most sensitive parameters and can be used as indicator to show intensity of stress in fish exposed to different toxicants or for detecting period of toxic exposure in environment. Therefore it is suggested that use of such types of pesticides, herbicides, fungicide control, agricultural pests and weeds should be judicious and controlled.

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