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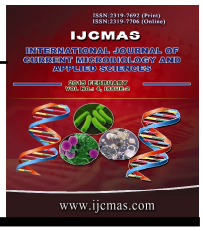

Original Research Article

Impact of the Pesticide Endosulfan 35% EC on the Haematological Parameters of Fresh Water Fish, *Cirrhinus mrigala*

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A B S T R A C T

Pesticidal stress is very common factor today in human health and animal health. Most of the world's population depends upon fish food. Fishes can serve as bio-indicators of environmental pollution since they are directly exposed to chemicals resulting from agricultural production via surface run off or in directly through the food chain of ecosystem. Haematological parameters are considered as index of the total body and therefore they are important for diagnosing structural and functional strategy of fish. However, the diet composition, metabolic adaptation and variation in fish activity are the main factors responsible for the changes in haematological parameters of fish. Appropriate narrow range of concentrations from 0.1 to 0.6ppm was used to find the median lethal concentration, using 10 fishes for each concentration and mortality was recorded for every 24hrs up to 72 hrs. The LC50 value is 0.4 ppm for 72hrs.10 fishes were exposed in each experiment and blood was collected from gills and caudal region. The blood samples were tested for haematological parameters. All the parameters were found to be decreased except WBC, lymphocytes and eosinophils when compared to control.

Introduction

Water pollution problems related to agrochemicals have been taken into consideration and it has been found that use of agrochemicals in the crop fields is liable to change the abiotic and biotic characters of the aquatic media leading hazards to the aquatic flora and fauna.

Fishes belonging to different taxonomic group are adopted variously depending on different prevailing ecological conditions. The blood composition of the fish could be used as one of the indices to indicate their well being.

Fishes are rich in proteins, lipids, minerals and vitamins and form valuable food for growing population and especially for millions of people suffering from malnutrition and under nourishment in India. Fishes are aquatic and poikilothermic animals and perform best under a narrow range of optimum environmental conditions. Pesticides are used to control pests of food crops, livestock and human health. Due to their injudicious and indiscriminate usage, water bodies like ponds, lakes and low lying water filled areas are continuously polluted. The extensive use of pesticides, insecticides,

herbicides and fungicides are being promoted by Government of India to enhance the crop production to meet the demand of the growing population. The rationale behind this is the eradication of undesirable insects, pests, weeds and herbs for increased yield but on the other hand, these lead to large scale mortality of one of the most important aquatic fauna, the fishes forming stable food to the mankind. Haematological indices are considered to be pathophysiological indicators of the whole body and therefore are important in diagnosing the structural and functional status of animals exposed to pollutants. Fish serves as a bioindicator species as it responds with great sensitivity to changes in the aquatic environment and thus, has an important role in the monitoring of water pollution.

Materials and Methods

The toxicant Endosulfan 35% EC has been used for the present study. Endosulfan is an organ chlorine insecticide and acaricide, and acts as a contact poison in a wide variety of insects and mites. Endosulfan is effective against a wide range of insects and certain mites on cereals, coffee, cotton, fruit, oilseeds, potato, tea, vegetable and other crops. It can also be used as a wood preservative. Fishes were maintained in a large tank and acclimatized to laboratory conditions for 21 days. Water was changed daily to maintain the oxygen content and to remove the excreta of fishes. Fishes were maintained at room temperature and fed with wheat bran daily at least one hour prior to the replacement of the tank water. Feeding was stopped two days prior to the experiment in order to keep the animal more or less in the same state of metabolite requirement.

Batches of 10 healthy fishes were exposed to different concentrations of Endosulfan 35 % EC to calculate LC_{50} value. One more set of fishes are maintained as control in tap water. To find the wide range of concentration 1 to 5ml Endosulfan 35 % EC were chosen and the number of dead or affected fish in each set up was noted at regular intervals of 24 hrs. The tanks were aerated with electrically operated aerator. Appropriate narrow range of concentrations 0.1 to 0.6ppm was used to find the median lethal concentration using 10 fishes for each concentration and mortality was recorded for every 24 hrs up to 72 hrs. It was found as 0.4 ppm for 72 hrs.

Three groups of fishes were exposed to 0.4 ppm (sub lethal concentration for 72 hrs) concentration for 24, 48 and 72 hrs respectively. Another group was maintained as control at the end of each exposure period, the blood was collected from gills and tail region using syringe and anticoagulants (ammonium oxalate, EDTA) were added and the haematological parameters such as RBC, WBC, Hb, MCV, MCH, MCHC, PCV, platelets, Lymphocyte, Polymorphs and Eosinophil were analysed.

The haemoglobin content was estimated by acid hematin method (Sahli, 1962). Total RBC count and WBC count were counted using an improved Neubaur haemocytometer (Shah and Altindag, 2004). The mean corpuscular volume was calculated by using values of PCV% and the red blood cell counts expressed in μm-3. The mean corpuscular haemoglobin content was calculated by using the value of haemoglobin content and the red blood cell counts and expressed in pg. The percentage of mean corpuscular haemoglobin concentration was calculated by using the values of haemoglobin content and the PCV%. The PCV percentage was calculated employing standard method and formulae.

Results and Discussion

Lethal concentration (LC_{50}) at 72 hrs was found to be 0.4 ppm. The amount of RBC in the blood of the fishes exposed to 0.4ppm Endosulfan 35% EC for 24, 48 and 72 hrs was found to contain 1.62, 1.59, 1.51 and mean control was found to be 1.89X106mm3. The amount of WBC in the blood of fishes exposed to 0.4 ppm Endosulfan 35% EC for 24, 48 and 72 hrs values were found to contain 5700, 6200, 7900 and mean control was found to be 4300 mm^3. The level of haemoglobin in the fish *Cirrhinus mrigala* on exposed to 24, 48 and 72 hrs was found to contain 2.84, 2.42, 2.12 and mean control was found to be 3.20g%. The value of MCV in fishes exposed to 0.4ppm of Endosulfan 35% EC for 24, 48, 72 hrs are found to contain 32.5, 29.4, 30.2 and mean control was found to be 40.5μm^3.

The amount of MCH in the blood of the fishes exposed to the toxicant found to contain 17.0, 14.2, 12.4 for 24, 48 and 72 hrs respectively and a mean control was found to be 20.1 pg. The amount of MCHC in the blood of the fish exposed to Endosulfan 35% EC was found to contain 18.6, 15.8, 14.5 for 24, 48 and 72 hrs of exposure and a mean control were found to be 20.8 g/dL.

Table.1 Effect of Endosulfan 35% EC On haematological parameters in the blood of the fish *chirrinus mrigila*

Parameters		Exposure Periods			
		control	24Hrs	48Hrs	72 Hrs
RBC (106/mm3)	Mean±SD %	1.89±0.015b	1.62±0.012c 16.00↓	1.59±0.014a 17.00↓	1.51±0.016d 22.00↓
WBC (106mm3)	Mean±SD %	4300±133.99 a	5700±142.89b 22.79↑	6200±152.5 7c 29.20↑	7900±168.72 d 47.15↑
Haemoglobin (gm %)	Mean±SD %	3.20±0.160b	2.84±0.139b 12.60↓	2.42±0.160a 26.80↓	2.12±0.160d 36.48↓
MCV (µm3)	Mean±SD %	40.5±0.158a	32.5±0.152d 21.25↓	30.2±0.142b 27.07↓	29.4±0.167c 29.10↓
MCH (pg)	Mean±SD %	20.1±0.162b	17.0±0.176c 17.20↓	14.2±0.131b 31.89↓	12.4±0.142d 41.31↓
MCHC (g/dL)	Mean±SD %	20.8±0.163b	18.6±0.167c 12.11↓	15.8±0.141a 26.25↓	14.5±0.143d 32.81↓
PCV (%)	Mean±SD %	9.7±0.49b	9.08±0.158c 8.12↓	7.9±0.149a 11.34↓	6.9±0.162d 22.84↓
PLATELETS (mm3)	Mean±SD %	38900±194.4 a	35200±135.76 b 9.86↓	30800±135. 76c 22.37↓	25700±207.3 6d 35.8↓
LYMPHOCYTES (%)	Mean±SD %	29±1.594d	36±1.68c 26.00↑	39±1.43b 36.71↑	48±1.61a 41.42↑
POLYMORPHS (%)	Mean±SD %	70±1.62a	62±1.65b 12.59↓	59±1.62c 16.94↓	50±1.65d 29.98↓
EOSINOPHIL (%)	Mean±SD %	4.0±0.158a	5.0±0.158b 34.30↑	5.0±0.224c 34.30↑	5.0±0.255d 34.30↑

The decreased erythrocyte count and haemoglobin content observed in this study may be due to the disruptive action on the erythropoietic tissue, which in turn affected the cell viability. The increase in WBC count can be correlated with an increase in antibody production, which helps in survival and recovery of the fishes exposed to the toxicant.

A significant increase in WBC count in the present study indicate a hypersensitivity of leucocytes to monocrotophos and these changes may be due to immunological reactions to produce antibodies to cope up with stress induced by Monocrotophos. Under the light of this toxicity study, it is concluded that exposure to sub lethal concentrations of Monocrotophos results in a significant alterations in different haematological parameters and this kind of physiological changes may directly affect the survivability of these fishes in their natural habitat.

All haematological parameters except WBC and differential count of eosinophil and lymphocyte were decreased from the control. The WBC and lymphocytes were increased in all the exposures. Eosinophil increased in 24 hrs and remained same in further exposures. From the above investigation it can be inferred that the aquatic animals will be adversely affected by the pesticide Endosulfan 35% EC. So we should create awareness among people to use biocides instead of synthetic pesticides and herbicides.

The amount of PCV in the blood of the fish exposed to 0.4 ppm of the toxicant found to contain 9.08, 7.9 and 6.9 for 24, 48 and 72hrs of exposure respectively and mean control was found to be 9.7%. The amount of platelets in the fish, *Cirrhinus mrigala* exposed to 0.4 ppm of the toxicant Endosulfan 35% EC found to contain 35,200, 30,800 and 25,700 for 24, 48 and 72 hrs respectively and mean control was found to be 38,900mm-3.The amount of Lymphocyte in the fresh water fish, *Cirrrhinus mrigala* exposed to 0.4 ppm concentration of the toxicant was found to be 36, 39, 48 and 29% for control, 24, 48 and 72hrs of exposure respectively. The amount of Neutrophils in the blood of the fish exposed to 0.4 ppm concentration of the pesticide was found to be 62, 59, 50 for 24, 48 and 72 hrs of exposure respectively and mean control was found to be 70%.The amount of Eosinophils in the blood of the fish, *Chirrinus mrigila* exposed to 0.4 ppm of the toxicant was found to be 5.0, 5.0, 5.0 in 24, 48 and 72 hrs of exposure and mean control was found to be 4.0%.

References

Sahli, T. 1962. In: Textbook of clinical pathological seward. Muller, E., (Ed.). William and Williams, Baltimore.

Shah, S.L., Altindag, A. 2004. Haematological parameters of tench (*Tinca tinca L.*) after acute and chronic exposure to lethal and sublethal mercury treatments. *Bull. Environ. Contam. Toxicol.*, 73: 911–918.