Biospectra : Vol. 12(2), September, 2017, pp.51-54
An International Biannual Refereed Journal of Life Sciences

14(AS).
Animal Science

ISSN : 0973-7057

Acute organophosphate (carbamate) toxicity causing anemia in female *Cirrhinus mrigala* (Ham.)

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Received : 25th June, 2017; Revised : 20th July, 2017

Abstract : Indirect and continuous entry of carbamate (organophosphate) pesticide in the system of *Cirrhinus mrigala* amounts to acute toxicity that hamper the normal profile of haematological counts of the fish. The present article deals with the impact of acute carbamate toxicity especially on the RBC counts & haemoglobin quantitative composition in the experimentally treated female fishes with two concentrations variants (0.47%& 0.94% v/v) for five different durations of exposure. Statistically significant findings have been found on the gradually depleting standard values of the blood parameters considered. The result has been discussed in the light of clinical symptoms of anemia in the female fishes which are responsible for egg production & carrying out future generation of its race. Additionally these fishes also have edible value, so the anemic individuals may not be good for food from nutritional aspect.

Keywords: Organophosphate toxicity, RBC count, haemoglobin%, anemia, *Cirrhinus mrigala*

INTRODUCTION

The existence of different pollutants in the environment and ecosystem due to their extensive use in agricultural and industrial applications are one of the major problems acting as toxicity for all the living organisms, terrestrial as well as aquatic. Majority of these chemicals are present in the form of heavy metals that are non-biodegradable and thus leading to endogenous binding of the molecules as they enter the biological system causing toxic effect both in the terrestrial & aquatic habitat.[1] Pesticides are widely used in modern agriculture to aid in the production of high quality food. However, some pesticides have the potential to cause serious health and environmental damage. Carbamates are a class of insecticides structurally and mechanistically similar to organophosphate (OP) insecticides. Carbamates are N-methyl Carbamates derived from a carbamic acid and cause carbamylation of acetylcholinesterase at neuronal synapses and neuromuscular junctions. Though the pesticides are applied to enhance agricultural production while the indiscriminate and contaminate the biota. Subsequent to the translocation of pesticides to aquatic environment the non-targets such as fish are exposed to low concentration over a long period and affect the efficiency of various life parameters and seem to produce many physiological and Biochemical changes in fish. Fish have been valued for many years as excellent indicators of water quality. High usage of pesticide in the field, it affects both biotic and abiotic environment. The oxygen consumption (biotic) is a very sensitive physiological process and the change in respiratory activity has been used as an indicator of stress in animals exposed to

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toxicants. A number of investigations on the effect of pesticides on the oxygen consumption of fish have been reported. [2-4] Stresses and pollutants generally cause relatively rapid changes in Blood characteristics of fish.[5,6] A reduction in haemoglobin content and erythrocyte population resulting in anaemia have also been suggested as reason for drop in oxygen uptake in fish *Channa punctatus* exposed to lethal concentration of Deltamethrin.[7] Though, the biochemical, Physiological and enzymatic parameters are the common biomarkers of exposed fish to toxicity of pollutant. It can even cause countless abnormalities and reduces the life span of organisms.[8,9] Discontinuous use of these pesticides may also lead to serious environment as well as aquatic & land dwelling animals. Haematological studies on fishes have assumed greater significance due to the increasing emphasis on pisciculture and greater awareness of the pollution of natural freshwater resources in the tropics.

MATERIAL & METHODS

Sample collection

About 30 species of freshwater fish *Cirrhinus mrigala* were bought from the local market having the length 12-14cm and 20-25 g respectively. These species were then kept in laboratory for few days and fed with commercial fish food twice a daily. After acclimation, 30 aquaria each containing 30L water were stocked with ten fish per aquarium. All the fishes were then fed with different carbamate concentration depending on the given exposure of time-1day, 7 days, 14 days and 28 days. After completion of the respective duration these fishes were then examined for their statistical analysis for the presence of RBC and haemoglobin count.

RESULT AND DISCUSSION

Carbamate insecticide entering indirectly into the system of *C.mrigala* in the paddy field may cause continuous depletion of haemoglobin content after breaking the RBC. Day specific treatment of different concentrations of the insecticide with the fish in the laboratory has produced significant decrease in the haemoglobin content causing anemia. The plausible reason of decrease of haemoglobin may be the detachment of peptide chain from the central metal iron by the molecular leaching of carbamate which enters into RBCs by breaking their cell boundary. Therefore, it is recommended that the fish culture personnel concerned with quality fish production must take into consideration the standard & treated profiles of haemoglobin in fishes in general & that in *C.mrigala* in particular in order to protect the fishes from getting pushed into the anemic zone below (Table no. 1)

Table 1- Profile of RBC count and haemoglobin % in male *C. mrigala*

Treatment no.	Exposure time	Variations in RBC counts%			Variations in Haemoglobin %		
		Control	0.47%(v/v) crbm. treated	0.94%(v/v) crbm. treated	Control	0.47%(v/v) crbm. treated	0.94%(v/v) crbm. treated
1	1	5.19± 0.54	5.08±0.33	5.02±21	12.57±0.23	12.23±0.26	12.09±0.57
2	7	5.21±0.29	4.67±0.17	3.88±0.06	12.63±0.25	10.73±0.25	10.27±0.64
3	14	5.20±0.44	3.85±0.11	3.10±0.11	12.50±0.30	10.40±0.75	9.47±0.60
4	21	5.27±0.38	2.40±0.28	2.20±0.08	12.67±0.45	9.13±0.84	8.90±1.37
5	28	5.17±0.28	2.73±0.06	2.14±0.08	12.40±0.56	9.50±0.61	9.23±0.55

ACKNOWLEDGEMENT

The author is very much thankful to Prof. Arun Kumar, Head, University Department of Zoology, B.N.Mandal University, Madhepura & to his guide, Dr. Dinesh Yadav, Associate Professor, Department of Zoology, T.P College, B. N. Mandal University Madhepura for their support in completing this research paper.

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