



STUDY OF HAEMATOLOGICAL PARAMETERS IN FISH.

Jagdish D. Vasait

M.G.V's, M.S.G.Arts, Science and Commerce College Manmad Dist-Nashik (M.S.)
Pin-423104

ABSTRACT:

The effect of monocrotophos at a sublethal concentration of 6.88 ppm for 7 days exposure was studied on some hematological abnormalities of *Nemacheilus botia*. Haemoglobin content and TEC count markedly reduced and TLC count increased.

Key words: - *Monocrotophos, Haemoglobin, TEC, TLC, Nemacheilus botia.*

INTRODUCTION:

During recent years considerable attention has been focused on the fates of pesticides and their derivatives in the aquatic environment. The pesticides came to be used extensively in agriculture and public health programmes. This would lead to continued rise of concentration of insecticides in fresh water reservoirs as result of water runoff, the greatest hazard to fish and another aquatic animals, ultimately to humans by consuming polluted fish. Modern Indian agricultural practice heavily depends on the pesticides for the control of insect pests of different crops. The usefulness of pesticides in agricultural practice is unquestionable. The importance of pesticide in food production and public health neither is underestimated, nor can some of the hazard involved in the use of pesticides as practiced today be ignored. Insecticide, monocrotophos an organophosphate is often used in agriculture caused the maximum health hazard. Monocrotophos is commonly used organophosphate pesticide for the control of agricultural pest in India (Ray, et al 1985). Organophosphates are highly toxic to fish and powerful nerve poisons, since they inhibit AcHE activity (Casida, 1964; Coppage and Mathews, 1974; Klaverkamph and Hobden, 1980; Liske et al, 1980; Rath and Misra.1981.) Organochlorine

and organophosphate pesticides like DDT, thiodane, Malathion, sumithion, have been shown to alter the blood parameters (Toft, 1955; Javaid, 1976; Ramanujam and Mohanty, 1977; Mukhopadhaya and Dehadrai, 1980; Joshi and Pandey, 1988). Aquatic organisms especially the fish, can be used as biomonitors for recording stresses in the environment caused by pollution, and can be utilized as a warning system to prevent the greater damage later. Direct effects of pollution on fish life are either catastrophic or gradual depending on the amount and kind of the undesirable effluents in relation to quantity of the recipient water mass. (Ellis, 1936). In the present study an attempt was made to study the effect of monocrotophos on some haematological parameters of edible fish *Nemacheilus botia*.

MATERIALS AND METHODS:

Nemacheilus botia is an inhabitant of Panzan river flowing near Manmad (Nashik), India. The live fishes were netted from this river, brought to the laboratory and released in glass aquaria (size 3*1*1 ft.) where a continuous and gentle flow of tap water was maintained. The fishes were fed on fish meal procured from market and allowed to acclimatize to laboratory conditions for one week. The physico-chemical characteristics of test water such as temperature (20±2°C); pH (8±0.2) Dissolved oxygen (4.0

mg/L), Carbonates (130 mg/L) were analyzed during experimentation period (APHA, 1989) To conduct the haematological study fishes of uniform size (3 ± 1 cm.) and weight (1 ± 0.2 g) were exposed to sublethal concentrations 6.88 ppm for 7 days exposure.

Blood samples were collected by cutting the caudal vein with a sharp blade or by cardiac puncture in vial containing 2 % EDTA as an anticoagulant. The hemoglobin content RBC and TLC count were performed by using fully automatic blood analyser Model No MEK7300 Make (Nihon Kohden). The experimental data was analysed statistically by adopting statistical method (Pillai and Sinha, 1968).

RESULTS AND OBSERVATIONS:

The results of the haematological alterations are presented in table-I. The results obtained in this study were time dependant, during 7 days and 14 days exposed to sublethal concentrations of monocrotophos.

There was decrease in content of haemoglobin and the total RBCs count was found reduced. The WBCs count was found increased. The percent changes showed the following trend. The details of the results are as follows.

Haemoglobin: +

7 days (-31.13)<14 days (-33.81)

RBCs: 7 days (-40.78)<14 days (-45.51)

WBCs: 7 days (+307)< 14 days (+442)

All the values are statistically significant.

DISCUSSION:

The haematological parameters are studied, as they constitute certain health indices. The measurement of haemoglobin, erythrocyte and leucocyte disclose the possible relations of blood forming tissue to the monocrotophos treatment. The exposure of fish *Nemacheilus botia* to monocrotophos caused significant decrease in number of erythrocytes

and haemoglobin where as significant increase in total leucocytes for both 7 and 14 days Data on Hb concentration, RBCs and WBCs total count of fish registered with varying level of significance (Table-I) of interest is that monocrotophos treatment the blood parameters showed negligible variations between the values of 7 days and 14 days treatment. The number of workers has investigated into toxicity of various chemicals to fishes using haematological parameters. The decrease in RBCs number and Hb content has been reported during exposure to various pesticides in fish. (Bhai *et al* 1971; Pandey *et al*, 1976,79; Koundinya, 1979; Pandey *et al* 1976,79; Madhu, 1983; Rammurthi 1988). Ramanujan and Mohanty (1977) reported, the decrease in RBC, Hb, PCV, MCH and MCHC in *Heteropneustes fossilis* due to thidon. Decrease in RBC, PCV and Hb concentration was observed in *Tilapia mossambica* treated with carbaryl, sumithion and lindane (Koundinya and Ramamurthi 1979, Madhu 1983). Lowe and Niimi (1986) during investigation with rainbow trout, *Salmo gairdneri* observed decline in erythrocyte count and lymphocyte changes might be associated with immune response induced by cadmium. Banerjee and Verma (1987) studied the effect of heavy metals ($HgCl_2$) poisoning on leucocytes of *Anabus testidineus* and observed a marked rise in lymphocyte number, which naturally increase the total leucocyte count, which suggests hypersensitivity of leucocyte for ($HgCl_2$). Several authors have noticed increase in WBCs in animals repeatedly treated with sublethal doses of insecticides. (Vijaykumari, 1988; Philip *et al*, 1989) Mishra S.K., *et al*, (1992) Observed decrease in lymphocyte, neutrophil and basophil number and increase in monocyte and eosinophil number with correspondence to

increase duration of exposure. Nath and Banerjee (1995) observed significant increase in total WBCS count in *Heteropneustes fossilis* due to divithion. Bhargavas *et al*, (1999) observed the BHC and Malathion induced changes in TLC and DLC of *Channa stiatius*. They have reported, a small increase in total leucocyte count caused by Malathion but no significant effect. Dhembare, *et al* (2000) observed decrease in WBCs, RBC, Hb, PCV and MCH on exposure to insecticide in fish *Punctius sopore*. Dhanpakium *et al* (2001) observed the toxic of copper and zinc mixtures on some haematological parameters in common carp, *Cyprinus carpio* (Linn.) They have been reported, significant decrease in total RBC count, haemoglobin and significant increase in WBCs count. Gautam R.K. *et al*, (2002) studied the haematological alterations in *Channa punctatus* reveals immunological response due to toxic effect. Joshi (2002) observed the effect of lindane and malathion exposure to certain blood parameters in fresh water teleost fish, *Clarias batrachus*. He has reported, Malathion and lindane causes small decrease in Hb%, PCV and RBC count however WBCS count in increased and ESR remains unchanged in Malathion treated group. In the present study the Hb was decreased on exposure to monocrotophos in fish *Nemacheilus botia*. It is well established that haemoglobin synthesis occurs in the developing red blood cells (reticulocytes). Accordingly, if there were a decrease in the number of red blood cells, there would also be decrease in Hb concentration. Present study suggests that, sublethal concentration of monocrotophos have induced a decrease in RBC count and this perhaps is responsible for a decrease in Hb concentration. The decrement in RBC count and Hb concentration may also be due to deleterious

effects of monocrotophos on the effects of erythropoietic tissue of fish. A similar suggestion was made by Verama *et al* (1982) in *Myxus striattus*.

The increased in the WBCs count was noticed at both 7 days exposure of monocrotophos (Table-I). Very few attempts have been made to study the WBCs in animals treated with pesticides. During pathological conditions the animal set up their defensive capability through hyperplasic mechanism. Hence, increase in WBCs in the present study, probably, indicate the presence of such mechanism. The rise in WBCs count suggests the increased defense mechanism against probable attach of microbes during *monocrotophos toxicosis*.

In conclusion the alterations in the haematological parameters after meaningful indices to monocrotophos toxicity at 7 days exposures. Further, it is also pointed out that the haematological alterations in the monocrotophos exposed to fishes might be due to physiological dysfunction of hemopoietic stem, which is considered to be the most sensitive indicator towards environmental pollutants.

ACKNOWLEDGEMENT:

Author thanks to Hon'ble Apoorva Hiray and Principal, Arts, Science and Commerce College Manmad (Dist-Nashik)

REFERENCES:

- APHA: American Public Health Association: Standard methods for the examination of waste waters 17th edition, Washington, DC, 1989.
- Coppage D.L. Mathew G, Cook, G.H. and Knight.J.(1975), Brain acetocholesterage inhibition in fish as a diagnosis of environmental poisoning by a malathion O- dimethyl (1,2

- Dicarbetoxyethyl) Phosphoro-diothate, pest *E. Biochem. Physiol.* 5(6).
- Casida, J.E., (1964), Esterage inhibitors as pesticides, *Sci.*, 146.10011
- Dhanapakium P, Ramaswami V.K. (2001): Toxic effects of copper and Zinc mixtures on some haematological and biochemical parameters in common carp, *Cyprinus Carpio (Linn.)*. *J. Environ, Bio*, 22(2); 105-111.
- Dhembare A.J., Pondha G.M. (2000) Haematological changes in fish, *Punctius sophore* expose to some insecticide, *J. Expt. Zoo India*, 3 (1): 41-44.
- Donald Hunter and Bomford, R.R. (1967), Hutchinson's clinical methods. 14th edn. (Publ. Bailier Tindall and Casell), London, P.145.
- Joshi P. (2002): Effect of lindane and malathion exposure to certain blood parameters in freshwater teleost fish, *Clarias batrachus*. *Poll. Res.* 21 (1) 55-57.
- Klaverkamp J.F. and Hobdon B.R. (1980): Brain-acetyl cholinesterase inhibition and hepatic activation of acephote and fenithion in rainbow trout (*Salmo gairdneri*) *Can. J. Fish Aqua. Sci* 31, 1450
- Koundinya P.R. and Ramamurthi, R. (1979): Haematological studies in Sarotherodon *Tilapia Mossambica* (Peters) exposed to lethal conc. of Sumition and Seven, *Curr, Sci.* 48 (19): 877-879.
- Lieske, C.N., Clark, J.H., Meyer, H.G. and Lowe, J.R. (1980), Spontaneous And induced reaction of eel anticholinesterase inhibited by Three organophosphates, *Pestic, Biochem. Physiol.* 13, 205.
- Lowwe Jinde and Nimmi, A.J. (1986): Haematological characterization of rainbow trout *Salmo gairdneri* in response to Cd. Exposure. *Bull. Of Environ. Toxicol*, 37:375.
- Mishra S.K., Behera S.C. (1992): Evaluation of toxic effects of mercuric Chloride on haematological parameters of a freshwater fish *Channa punctatus (Bloch.)* *Env. Eco.* 10 (2): 394-396.
- Nath Ravindra, Banerjee V. (1999): Influence of lethal and sublethal toxicity of Rogor on the blood parameters of fresh water fish, *Heterpneustes fossilis*. *Env. Eco*, 17 (4) 940-944.
- Pandey, B.N., Chanchal, A.K. and Singh, M. P. (1976): Effect of malathion on O2 consumption and blood of *Channa punctatus*, *Indian J. Zoo*; 27:95- 100.
- Patil, V.T. (1987): Some toxicological effects of an organophosphorous Insecticide monocrotophos on the edible mudskipper, *Boleopthalmus dussumieri*, *M. Phil. Dissertation, South Gujrat University, Surat*.
- Philip D.J.H. (1978): The use of biological indicator organism to quantitate chorine pollutants in aquatic environments. – *A Review Environ. Pollu.* 6:197-229.
- Ramanujam, S.N. and Mohanty (1977): Thiodane, lindane sublethal response on haematological parameters of *Heteropneustes fossilis*. *Jour. Of Life sciences.* 8-13.
- Sohn, I.D. and Henry, I.B. (1969), In: Todd-Sunford clinica diagnosis by Laboratory methods, 14th edn., *W. B. Saunders company, Philadelphia, London, Toronto*, 139-143.
- Sahli, T. (1962), In: Textbook of clinical pathological (Ed.), *seward, E., Muller. William and Williams, Baltimore*.
- Verma S.R., Sarita Rani and Dalele, R.C. (1982): Indicators of stress induced by pesticides in *Myustus Vittatus* haematological parameters, *Ind. Jour. Environ.* 24 (1):58-64.
- Vijayakumari, P. (1988): Chronic toxicity of Diuron to *Tilapia mossambica* (Peters): Effects on certain physiological properties of the Blood. *Ph.D. Thesis, S.V. University, Tirupati, India*.

Table-I Effect of Sublethal Concentrations of monocrotophos on the haematological parameters of edible fish *Nemacheilus botia*.

<i>Blood Parameters</i>					
Haemoglobin (gm%)		Total erythrocyte count (millions/cmm.)		Total leucocyte count (thousands /cmm.)	
Control	7 day	Control	7 day	Control	7 day
9.7	6.68*	2.49	1.47*	1.36	5.56
±0.158	±0.1923	±0.057	±0.2931	±0.0391	±0.3646
	(-31.13)		(-40.71)		(+307)

Each value is mean of five observations \pm SD: Value indicated in parenthesis is percent change over control.

Experimental value is significantly different from control with statistically significant; *P<0.05; ** P<0.01; ***P<***0.001.