Impact of Water Quality on Haematological Parameters of *Labeo Rohita*

YOGESH BABU DIXIT
P.G. Deptt. of Zoology, Janta Mahavidyalya Ajitmal, Distt. – Auraiya, (U.P.)

Abstract- Water quality assessment of two water bodies Daryabganj and Rustamgarh in district Etah was made to understand the effect of pollutants on haematological parameters of fresh water fish Labeo rohita. The results revealed, increasing trend in WBC count (TLC), Haemoglobin concentration (Hb%), Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobin concentration (MCHC) and a decreasing trend in RBC count (TEC), Packed cell volume (PCV) and Mean corpuscular volume (MCV). These changes are due to the effect of variations in water quality viz., pH, DO, CO_2, BOD, Hardness, Chloride and Ammonical nitrogen.

Indexed Terms- Haemoglobin, Haematological parameters, Ammonical nitrogen.

I. INTRODUCTION

The aquatic environment plays a fundamental role in the functioning of ecosystems as they are the major recipients of pollutants, which, over time, can have serious consequences for biota that may not become apparent until changes occur at the population or ecosystem level, a point at which it may be too late to take effective counter measures (Bhagde *et al*., 2020). A substantial amount of most of the chemicals employed by human beings in agricultural practices such as fertilizers, organic manure finds its way into rivers, lakes and ponds. Majority of them has been found to be extremely toxic not only to fish but also to the organisms which contribute to the food chain of fishes (Kaur and Mishra, 2019). Fishes are generally exposed to pesticides through dermal uptake, direct absorption through any of the routes, these xenobiotics are potent to cause physiological dysfunctions like haematological changes in fishes (Prakash and Verma, 2020a,b). A major part of the world's food is supplied from fish sources since time immemorial and it is very indispensable to make safe the health of fishes (Verma and Prakash, 2020). Being at the clemency of their surroundings, any change in the quality of their environment is bound to affect their health vis-a-vis the fishery resource of a water body.

Blood forms a unique compartment between the external and internal environment in fishes and therefore any physical or chemical change in the environment induces changes in the nature of blood (Wilson and Taylor, 1993). Pollutants or any other stressor is reported to induce changes in the haematological parameters of fish (Chandrasekhar and Jayabalan, 1993 and Luskova, 1997). Blood parameters of a fish, therefore, provide information not only about the health status of the fish but also the quality of water in which they are living (Sampath *et.al.*, 1998 and Pampatwar, 2007). It is because of this fact that fish haematology is gaining significance (Hickey, 1976 and Joshi *et.al.*, 1980). In the present study attempts have been made to assess the relationship between water quality and the haematological profile Labeo *rohita* in different environments.

II. MATERIAL & METHODS

- Data Analysis

Water samples were collected from both waterbodies and analyzed their Physico-chemical characteristics as per the method described by APHA (1985). The freshwater teleost, *Labeo rohita.*, weighting 500-800g were collected randomly from both lake using gill net and brought to the laboratory alive. For haematological studies, blood was collected in vials by puncturing the heart with the help of glass syringe. Total RBC and WBC count was made using Naubauer's double haemocytometer. While Haemoglobin concentration was determined using Sahli's haemometer, Packed Cell Volume (PCV) or Haematocrit values (Ht) were determined using Wintrobe's tube. All these parameters were

determined using the method described by Wintrobe (1975). From the above values erythrocyte constants were calculated.

Statistical assessment was carried out using the statistical percentage for the social science (Version 16) computer programme. All the data were first tested for normally using Kolmogorov-Smirnov and Shapiro wilk tests to meet statistical demand.

III. RESULTS AND DISCUSSION

The results of the present study provide basic information on the effect of pollutants present in the both lakes on haemotological parameters of *Labeo rohita*.. Haematological values and cell structure of *Labeo rohita* from the two habitats are given in table I. Significant variation between the study areas were detected in all the haematological values.

Similar results have also been obtained by Mcleay (1973) that increase in total RBC count (TEC) in fishes collected from polluted water bodies is because haemopoeisis is stimulated in fishes exposed to toxicants caused by higher demands of oxygen and carbon dioxide transport in the polluted media.

Leucocytosis is also evident in fishes collected from Lake A and B (Table II). Similar findings have also been reported by Hemavathi and Rao (2000) in *Channa punctatus* exposed to lead. Joshi *et.al.* (2002) have reported mercuric chloride to cause increase in TLC in Clarias batrachus which is primarily a defense mechanism to combat pollution.

The haemoglobin content (Hb) was also observed to be higher in fishes collected from Lake A and B. Similar observations have also been made by Hrubec *et.al.*, (2000) that increase in Hb is due to reduction in the erythrocytes and liberation of haemoglobin content into the cell. A significant elevation in haemoglobin has also been reported in *T.mossambica* exposed to sumithion and sevin (Koundinya and Ramamurhti, 1980). *Channa striatus* exposed to metasystox (Natarajan, 1984) and in *Notopterus notopterus* exposed to chlordane (Gupta, 1995). The decline in Hb content of cyprinus carpioz was also observed by Chauhan *et.al.*, (1994) & Ramesh and Sarvanan (2008).

Table 1: Physico-chemical parameters of Daryabganj Lake and Rustamgarh Lake

Parameters	Lake A	Lake B
Water temperature (CC)	20.23	21
pH	7.2	7.4
Conductivity (S)	0.5	1.6
Dissolved Oxygen	5.3	2.4
Biochemical Oxygen Demand	0.25	6.2
Fire Carbon dioxide	55.256	165.55
Alkalinity	102.5	573.75
Hardness	68.25	278.5
Chloride	92.52	276
Ammonical nitrogen	0.38	5.56

N.B.: all the parameters are expressed in mg/L.

Table 2: Haematological parameters of *Labeo rohita* from Daryabganj and Rustamgarh Lake.

Parameters	Lake A	Lake B
TEC (10^6/mm^2)	8.18	7.92
TLC (10^3/mm^3)	35.99	40.37
Hb (%)	4.3	17
Ht (%)	25	9.1
MCH (pg)	5.25	23.32
MCHC (%)	30.56	186.81
MCV (cu.μ)	17.2	12.4

This study, further, revealed reduction in Ht in fishes collected from lake B when compared to those collected from Lake A which may be due to increased rate of erythropoiesis as well as haemolysis; Similar results were also observed in the flounder *Pleuronectes flesus* subjected to cadmium intoxication (Larsson,1975). In addition, an alteration in fish metabolism would have also led to decreased Ht value in *Cyprinus carpio* (Srivastava and Mishra, 1979).

Alterations in erythrocytes constant have been attributed to direct or feedback responses, structural damage, impairment in haemoglobin synthesis, stress related release of RBC from the spleen and hypoxia, and exposure to pollutions (Shah, 2006).

Studies have confirmed pollutants to affect water quality and further also supports the hypothesis that physiological change in the fish are reflected in the values of one or more haematological parameters. Thus one of the major agents responsible for causing

individual variations in fish haematology is water quality.

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