Effect of Chromium on Haematology of *Channa Punctatus*

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Abstract- ***Toxic effects of heavy metal chromium is a matter of worldwide concern in the edible fishes. Present study was aimed to monitor the chromium induced toxicity in freshwater snake headed fish Channa punctatus. To investigate the impact of chromium toxicity on the exposed fish, Channa punctatus, haematological profile of both control and experimental group of fish was done. A sublethal dose (1/10 concentration of 96 hr 10 LC_{50}) of the chromium trioxide were given for 45 days. Fish were fed on commercial feed at the rate of 3% body weight. With help of heparinized needle blood sample was collected from the caudal vein of both control as well as experimental fish. Haemoglobin%, haematocrit (PCV%), RBC and WBC count were made. Significant alterations was observed only after 45 days of exposure periods.***

Indexed Terms- ***Haematology, Chromium, Channa punctata,***

I. INTRODUCTION

The contamination of fresh water with a wide range of pollutants has become a matter of great concern over the last few decades, not only because of the threat to public water supplies, but also with the damage caused to the aquatic life. The metals are of special concern because of their diversified effect and the range of concentration stimulated toxic ill effect to the aquatic life forms. Most of the heavy metal ions are toxic or carcinogenic in nature and pose a threat to human health and the environment (Damien *et al*., 2004; Farombi *et al*., 2007).

Study on whole blood count, micronuclei induction and biochemical changes in fish serves as an effective tool in the diagnosis of stress, mutagenesis, environmental pollution and also the abiotic fish diseases as changes in blood appears first before the onset of any morphological or degenerative changes. Hematology is an index of health status in a number of fish species. Haematological indices of the fish blood provides valuable facts concerning the physiological response of fish to change in its external environment. Haematological variables have a well-known clinical value in prognosis and diagnosis and the comparative convenience of sampling offered by it (Deshmukh, 2016). Fish haematology therefore is used to demonstrate abnormal functioning of physiological mechanism in fish (Adakole, 2012). In spite of being an analytical tool, fish hematology in India is still not in common practice, and is used only when there is some staid epidemiological quandary among fishes or with their environment, leading to mass mortality (Chadha and Sharma, 2015). Work on absolute blood values viz. Mean Corpuscular Volume (MCV), Mean Courpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) has attracted little attention therefore, the present investigation was carried out to assess the impact of chromium on haematological parameters of *Channa punctatus*.

II. MATERIALS AND METHODS

The *Channa punctata* collected from local fresh waterbody and were acclimatized to laboratory conditions in aquaria for seven days. In one aquarium the fish were kept as control specimens given the same food and environment as that of the experimental fish except that they were not given the dose of heavy metal compound. Analytical grade potassium chromate was used as metal toxicant throughout the experiments as toxicant. The test experiment was performed for period of 45 days. To observe the chronic effects of chromium, sublethal dose (1/10 concentration of 96 hr 10 LC_{50}) of the chromium trioxide were given for 45 days. Fish were fed on commercial feed at the rate of 2% body weight. With help of heparinized needles, blood sample of both control and chromium exposed fish were collected

from the caudal vein. Haemoglobin%, haematocrit (PCV), RBC and WBC counts, mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Volume (MCV) and Mean Corpuscular Haemoglobin Concentration (MCHC) were done by following standard method. The total erythrocyte count was made with Neubaur's haemocytometer.

III. RESULTS AND DISCUSSION

The blood of fresh water teleost, *Channa punctata* was used in the present investigation for finding out the effect of heavy metal Chromium on various blood parameters viz. haemoglobin percent (Hb%), Packed Cell Volume (PCV), Erythrocytes Sedimentation Rate (ESR), Total Erythrocyte Count (RBC count), Total Leukocyte Count (WBC count). mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Volume (MCV) and Mean Corpuscular Haemoglobin Concentration (MCHC) exposed to $1/10^{th}$ of lethal concentration of chromium trioxide. These values provide a fairly good index of the physiological condition of the blood viz. eco-biological and physio – pathological condition.

Table 1 summarizes the effect of heavy metal, Chromium on haematological parameters of *Channa punctatus*. WBC, Hb and PCV were decline significantly ($p < 0.001$) as compared to control fish. RBC, Hb% and WBC are often used in the general evaluation of animal's health. Changes in these indices from reference give an indication of disease.

Table 1**:** Alternation of blood profile of *Channa punctate* exposed to chromium for different periods.

Parameters	Period of Exposure		
	Control	30 days	45 days
RBC (× 10^6 /µL)	3.22	5.41* (+60.01%)	6.44** (+100%)
Hb (%)	9.60	8.13 (-15.31%)	7.16* (-25.41%)
PCV (%)	47.66	34.54 (-27.52%)	24.66* (-48.26%)
ESR	9.26	11.60* (+25.26%)	15.62** (+68.68%)
WBC (× 10^6 /µL)	36.75	49.33* (+34.23%)	60.16** (+63.70%)
MCH	33.48	26.81 (-19.92%)	15.11** (-54.85%)
MCV	59.03	75.96 (+28.86%)	81.33** (+37.77%)
MCHC	42.04	34.40* (-18.17%)	24.62** (-41.43%)

*Significant at 0.05% level; ** Significant at 0.01% level

The fishes exposed to sublethal concentrations of heavy metal chromium in the present investigation showed remarkable hematological alterations. Hematology is used as an index of fish health status in number of fish species to detect different stress conditions like diseases, hypoxia, and exposure to metals and pollutants etc. (Blaxhall, 1972).

The results of present investigation reveal that the Red blood corpuscels (RBC), Haemoglobin (Hb), Haematocrit (PCV), MCH, and MCHC values were significantly decreased after 30days and 45days exposure periods when compared to control, being statistically significant. On contrast to this, the White blood cell (WBC), and MCV values were found statistically significant increase (Table No. 1). Haemoglobin, a respiratory pigment present in the erythrocytes. Value of haemoglobin percent depends upon value of total erythrocyte count. After 30 and 45 days of exposure to chromium, haemoglobin % and RBC count were significantly decreased. Similar results were confirmed by Joshi *et al.,* (2002) and Sinha (2017). Ghazaly and Said (1995) found similar results in *Tilapia nilotica* after exposure to sublethal concentration of copper.

The erythrocyte constants MCV, MCH, and MCHC offer relationship on size, form and Hb constants of erythrocytes. They allow the determination of morphological anaemia that whether Normocyte, Macrocyte or Microcytic anaemia. The alterations in the haematological indices *i.e.* increase in MCV and decrease of MCH and MCHC in the present study may be due to a defence against the toxic effect of chromium and in turn due to decrease in RBC's, Hb and PCV and the disturbances occurred both in metabolic and haemopoitic activities in fish. Increase

in MCV and WBC count suggests that the anemia is of macrocytic type (Sheiq, 2009). Thus it is concluded that the present study clearly indicates that chromium, a toxic heavy metal discharge via effluents into aquatic environments caused severe anemia and alterations in hematological indices in the fresh water snake headed fish, *Channa punctatus*.

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