

Physico chemical analysis and Toxicity of cadmium and Chromium on some hematological parameter of Indian major carp (*Catla catla*)

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Abstract- The aim of the study was to assess the effect of different heavy metals agents on hematological. The Indian major Carp *Catla catla* was exposed to Sub lethal concentration of Cadmium and Chromium for various exposure period 10,20 and 30 days .Hematological parameter of RBC ,WBC and Cd, Cr were measure both in control and experimental fish. During The Various exposure period day 10,20 and 30 day of RBC, WBC and Cd, Cr level were <1.20>,<1.30> significantly evaluated in the experimental fish , Over the control and the WBC level was decreased significantly <8.20> and <9.20>in experimental fish.

Keywords: Chirimiri, Cadmium, Chromium hematological parameter, *Catla catla*

1. Introduction

Anthropogenic activities are the basic characters shows by Heavy metals. Generally the heavy metal include Chromium, Cadmium, Arsenic, Zinc ,Lead , Mercury, Nickel and Copper hence their present in the water show highly toxic to fishes and other aquatic animals .Heavy metals are present in the soil and aquatic environment. Heavy metals are contaminated mostly from agriculture ,Mines , domestic and industrial waste product. The increasing level of Heavy metal in fish was indicate has spurred scientists to make research on the dangers caused by the heavy metals resulting to heavy metal accumulation of fish cell .the main aim of the study was to assess the possible sources of heavy metals in the aquatic environment impact.Several detrimental effect of heavy metals are reported in fish . Some of which include poisonous effect in the blood such as anemia ,eosinophillia, lymphocytosis, renal lesions, detachment of gills ,fusion of secondary gills inflammation in filaments ,acute inflammation in the liver. In human some of which include skin disease, irritation of the gastrointestinal mucosa, nephritis lung cancer liver and kidney damage, necrosis, neurological and behavioral disorder and death amongst others. In conclusion the toxic effect of heavy metal in fish and the effect of bioaccumulation and biomagnifications have seen review, it is therefore recommended that the treatment of all forms of wastewaters, agricultural waste, sewage, industrial effluents be carried out before their discharge in to the environment.

Aquaculture productivity constitutes significant portion national income in India. Large scale mortalities of fish after occur in ponds and loss in due to environmental pollution stress followed by microbial infection. Different factor such as physical and chemical properties of water as well as seasonal changes are the reason of significant argumentation of metal in different fish tissue. hence the present study has been carried out the hematological studies are disease induced Indian major carp *Catla catla* fed with groundnut ,soybeans and heavy metals powder Cadmium and Chromium formulated water. [6,7]. A live fish (15± 1g) were collected from Sarbhoka Dam And Morga Dam Nagpur Chirimiri Chhattisgarh India. The fishes were maintained in non-chlorinated water in 15 day. The ground nut oil cake, fish meal and rice bran, groundnut, soybean, were mixed and sterilized and mixed cadmium and chromium in water in different concentrations (0.2ppm, 0.4ppm and 0.6ppm) for experimental fishes and without heavy metal and diet for control fish. In every 10 in days following hematological studies such as,

RBC Count

This methods is followed by (Wintrobe, 1934) [24]

$$\text{Number of RBCs/mm}^3 = \frac{\text{Number of RBC counted} \times 200 \times 10}{\text{Area of chamber counted}}$$

WBC Count

This methods is followed by (Dhayanithi et al., 2007) [7]

$$\text{Number of WBCs/mm}^3 = \frac{\text{Number of WBC} \times \text{Dilution}}{\text{Area counted} \times \text{Depth of the fluid}}$$

Haemoglobin Content

This methods is followed by (Blaxhall and Diasley,1973) [4]

Table 01: Physical parameters of Sarbhoka Dam

Month	Water Temperature C	Transparency cm	TDS gm/litter	PH
Jun	34.2	60.1	2.4	7.2
July	33.2	58	1.11	7.3

Aug	33.4	45.6	0.2	7.5
Sep	29.5	46	0.3	7.6
Oct	30.0	45	0.9	8.0
Nov	29.0	45.2	1.8	8.1
Dec	19.1	52	0.6	8.2
Jan	20.0	43.2	0.37	8.5
Feb	21.5	46.9	0.39	8.8
Mar	27.5	45	0.4	7.9
Apr	28.2	61	0.3	7.7
May	34.5	77.5	0.6	7.0

Table 02: Heavy metal analysis in water of Sarbhoka dam

s.n	Parameters	Unit	Result
1 .	SILICA (sa SiO ₂)	s/mass	51.95
2 .	CALCIUM (as CaO)	s/mass	1.67
3 .	PHOSPHORUS (as P ₂ O ₂)	s/mass	0.19
4 .	MAGNESIUM (as Mgo)	s/mass	2.03
5 .	ALUMINA (as Al ₂ O ₃)	s/mass	7.34
6 .	IRON (as Fe ₂ O ₃)	s/mass	4.61
7 .	CHROMIUM (as Cr ₂ O ₃)	s/mass	2.01
8 .	POTASIUH (as K ₂ O)	s/mass	1.03
9 .	SODIUM (as Na ₂ O)	s/mass	2.33
10.	CADMIUM	s/mass	4.66
10	TITANIUM TiO ₂)	s/mass	0.39
11	MANGANESAE (as MnO)	s/mass	0.74

Table 03: Hematological analysis of Cadmium

Concentration mg/1				
Treatments	Control	10-Days	20-days	30-days
HB	4.90±0.12	4.20± 0.29	4.10± 0.58	3.60±0.29
PCV	14.50±0.29	13.50±0.87	13.00±1.73	12.90±0.29
WBC	5.13±0.10	6.15±0.11	6.20±0.08	8.20±0.35
RBC	1.65-0.03	0.65±0.03	1.43±0.10	1.20±0.06
MCV	87.87±0.21	94.40±0.14	92.86±0.56	99.23±0.64
MCH	29.69-0.18	29.37±0.07	29.29±0.22	28.84±0.28
MCHC	33.79-0.12	31.11±0.02	31.54±0.04	29.07±0.07

Mean in the same row with different superscripts differ significantly.

HCT = Haematocrit. HB = Haemoglobin. WBC = White blood cell counts. RBC = Red blood cell count. PLT= Platelets.

MCH=Mean corpuscular haemoglobin. MCV= Mean corpuscular volume.

sMCHC = Mean corpuscular haemoglobin concentration.

Table 04: Hematological analysis of chromium

Concentration mg/1				
Treatments	Control	10-Days	20-days	30-days
HB	4.90±0.12	4.20± 0.29	4.10± 0.58	3.60±0.29
PCV	14.50±0.29	13.50±0.87	13.00±1.73	12.90±0.29
WBC	6.15±0.14	6.15±0.14	8.00±0.07	9.20±0.35
RBC	1.65-0.03	0.65±0.03	1.43±0.10	1.30±0.04
MCV	87.87±0.21	94.40±0.14	92.86±0.56	99.23±0.64
MCH	29.69-0.18	29.37±0.07	29.29±0.22	28.84±0.28
MCHC	33.79-0.12	31.11±0.02	31.54±0.04	29.07±0.07

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HCT = Haematocrit. HB = Haemoglobin. WBC = White blood cell counts. RBC = Red blood cell count. PLT= Platelets. MCH=Mean corpuscular haemoglobin. MCV= Mean corpuscular volume. MCHC = Mean corpuscular haemoglobin concentration.

In the present study the haemoglobin content, RBCs and WBCs were studied in disease induced *Catla catla* using different concentrations of heavy metal cadmium and chromium powder. The RBCs count in the control groups was found to be $51.6 \pm 1.50 \times 10^6$ cells/ml. The heavy metal treated fishes showed the RBCs $53.0 \pm 1.0 \times 10^6$ cells /ml (0.4ppm) $54.0 \pm 1.00 \times 10^6$ cells /ml (0.6ppm) and $53.0 \pm 1.00 \times 10^6$ cells /ml (2.0g) in the initial day (0 day). The RBCs was increased with increasing concentration of heavy metals chromium and cadmium in different day of treatment (10, 20, and 30). In the present study the WBCs count was varied from both experimental and control fishes. The WBCs count in the control fishes showed $18.3 \pm 1.52 \times 10^6$ cells /ml and the treated fishes showed maximum number of WBCs was observed. In 1.5g cadmium and chromium diet found to be $25.0 \pm 1.00 \times 10^3$ cells /ml in the initial day (0day) and $30.0 \pm 2.0 \times 10^6$ cells /ml (30 day). Haemoglobin content on disease induced India major carp *Catla catla* treated with cadmium and chromium heavy metal formulated water were studied in different days of treatment (0 day to 30 day). In the control fishes showed low level of haemoglobin content (5.30 ± 0.05 g/dl). Different concentrations of cadmium and chromium treated water fishes showed gradual increase in hemoglobin content after different days of treatment.

Discussion

In the present study, the RBC count decreased significantly in the cadmium treated fish. The decreased in RBC count during lethal exposure to cadmium is due to exaggerated disturbance that occurred in both metabolic and haemopoietic activity of fish exposed to the pollutant. In recent years hematological parameters have been used more to assess the effect of sub lethal concentrations of pollutants [10,14]. In this present investigation the significant decreased in the various parameter of blood was observed in Indian major carp *Catla catla* due to the treatment of different toxicant cadmium and chromium for short durations. The hematological parameter in fish can significantly change in response to chemical stressors. However, these alterations are nonspecific to a wide range of substance. [13,15]. The results of the present investigation show that the cadmium and chromium treatment inflicted a drastic reduction in the total count of the RBC which shows a dosage dependent effect [14,17]. Reduction in haemoglobin percentage and RBC count of the fish *catla catla* treated with heavy metal. Decreased level in RBC count and Cd content was observed in fish *catla catla* exposed to some heavy metals. [15, 16] Observed by increased WBC counts in *catla catla* after other heavy metals like Zn, mercury and arsenic. [17]. also reported the decrease level of RBC in the fresh water fish *catla catla* after exposure to mixture of various heavy metals. The reduction in total RBC count and Hb have suggested that heavy metal exposure decreases the total RBC count, and Hb content due to impaired intestinal absorption of iron [18] Increase in WBC content observed in the present study could be attributed by stimulation of the immune system in response to tissue damage caused by cadmium and chromium concentration. [19,22].

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