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Original Research Paper

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EFFECT OF COPPER TOXICITY ON BLOOD PARAMETERS IN MORINGA LEAF MEAL FED C.CARPIO

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ABSTRACT The RBC count was high in control fish and it drastically declined in copper exposed fish and it was time dependent. However, an increment of RBC count was observed in copper exposed C.carpio fed with Moringa diets. The increment of RBC count was also related to the levels of experimental diet. Similar result was observed in hemoglobin and hematocrit content also. Among the tested diet, Moringa diet highly enhanced the RBC count, Hb content and Ht values in copper exposed fish as compared to control diet . On contrary, the WBC count, ESR and MCH values showed the reversed trend . However, they were gradually decreased with an increasing percentage a Moringa levels and an extension of exposure period in copper exposed fish received Moringa diet. The improvement of these parameters towards normalcy was earlier in fish fed on 30% (M2) Moringa diet .

KEYWORDS : Moringa, copper ,hematocrit ,cyprinus carpio, RBC, WBC

INTRODUCTION

The aquatic ecosystem is contaminated by variety of pollutants. Copper is one of the most important pollutants which affect fish health and growth especially in an intensive system. Copper is extremely toxic to fish and cause tissue damages in gills and hematopoietic organs. Gills are the primary target organ for the toxic action of copper (Mazon et al.,2002 ; Figueiredo – Femandeset et al., 2007). Therefore these changes in both tissues lead to hematological disturbances (Nussey et al., 1995, Carvalho and Femandes, 2006). Hematological alternations are among the first symptoms of intoxication and may develop even after a brief contact with toxic substances. Hence reduction of toxic copper in aquatic systems / organisms by some acceptable methods is the need of the hour. Certain chemical compounds [Zeolite (Sodium aluminosilicate), ethylene diamine tetra acetic acid (EDTA), Nitrilo triaceticocid (NIA), Sodium selenate etc] can effectively remove toxic substances from industrial wastes or polluted Medium (James et al.,1998; James and Sampath, 2003; James, 2011) however the process is costly. Numerous plant species have been identified and examined for their potential in reducing different heavy metal toxicity. Among them, Moringa oleifera, is the new challenge of tradition medical plant use both in vitro and in vivo for reducing metal toxic in environment and living organism. The aim of the present study was the effect of Moringa leaf on the reduction of copper toxicity in fish and improvement of hematological parameters in Cyprinus corpio.

MATERIALS AND METHODS

For the experiment, active and healthy juveniles of C.Corpio were collected for the acclimation tank and starved for 24hr prior to the commencement of the experiment. They were divided in to six groups and maintained with chosen sub lethal levels a copper . Group one served as control and reared in freshwater and fed with control diet (c) Test animals belonging to 2nd - 6th groups were exposed to 0.5 ppm copper. Among the copper exposed group 2nd was fed with control diet (Mo), however, 3rd (M1), 4th (M2) 5th (M3) and 6th(M4) groups were fed with 0, 20, 30, 40, and 50% Moringa leaf meal diets respectively. Triplicates were maintained for corresponding experimental diets. The experiment was estimated at an intervals of 20 days. The blood parameters were estimated by routine clinical method (Wintrobe, 1978) .

RESULTS

The RBC count was high in control fish and it drastically declined in copper exposed fish and it was time dependent (Table;1) However, an increment of RBC count was observed in copper exposed C.carpio fed with Moringa diets. The increment of RBC count was also related to the levels of experimental diet. Similar result was observed in hemoglobin and hematocrit content also. Among the tested diet, Moringa diet highly enhanced the RBC count, Hb content and Ht values in copper exposed fish as compared to control diet . On contrary, the WBC count, ESR and MCH values showed the reversed trend (Table .1) Obviously, the above parameters were enhanced in copper exposed C.carpio against copper toxicity. However, they were gradually decreased with an increasing percentage a Moringa levels and an extension of exposure period in copper exposed fish received Moringa diet. The improvement of these parameters towards normalcy was earlier in fish fed on 30% (M2) Moringa diet (Table. 1). For instance the WBC count of control fish was was $21.24 \times 10^3 mm^{-3}$ in copper exposed fish on day 80. However, the WBC count declined to 20.46×10^3 mm-3 in copper exposed fish received Moringa 30% diet on day 80. It showed that WBC count recovered from copper toxically and return to the normal level (Table .1) and similar trend and return was also observed in ESR and MCH values.

DISCUSSION

Exposure of C.carpio to sublethal level of copper resulted in the significant (P<0.0 5) decrease in the RBC count and hemoglobin content leading to anemia. The anemia condition may be due to inhibition of erythropoiesis and haemosynthesis and increase in the rate of erythrocytes destruction (Wintrobe, 1978), sublethal exposure of Oreochromis mossambicus to copper produced hemolytic anemia due to the lysis of erythrocytes, with concurrent decrease in hemoglobin content, hematocrit and the number of erythrocytes (Sampath et al.,1998). The signification reduction of RBC count and Hb content were reported in fishes exposed to different heavy Metals (Goel et al., 1985; Goel and Sharma, 1987). The present study revealed that the hematological parameters were improved in copper exposed C.carpio fed Moringa supplemented diet. The leaf of Moringa being a good source of vitamins and amino acids, it has some medicinal uses (Makkar and Becker, 1999 ; Franscis et al., 2002). Hemoglobin content in the M.oleifera fed groups was significantly higher. This increase may arise as a result of increase red blood cell count and possibly the mineral content of leaf extract especially iron content, an increase in iron supply is necessary to elevate the hemoglobin content (Okwari et al.,2013). Vanaselvi (2012) observed, that 27% supplementation of Moringa diet highly enhanced, the RBC count, Hb content and oxygen carrying capacity of blood in C. carpio which supports the present investigation. Any changes in the hematological parameters of fish reflected on various physiological activities and this study could be used to indicate the health status of fish (Sampath et al., 2003). In the present investigation, the reduction of hematological parameters showed the toxic effects of copper in fish and enhancement of blood parameters in copper exposed C. carpio indicates the protective effect of moringa diet in copper exposed C. carpio .

Table 7.1.Effect of dietary supplementation of Moringa leaf diets on blood parameters in copper exposed Cyprinus carpio as a function of time. Each value is the mean ($\bar{X}$ ±SD) of three observations.

Exposure period (days)	Control	Experimental diets (%)				
		M0	M1	M2	M3	M4
	RBC count (x 106 mm-3)					
0	1.87 ± 0.04	1.87 ± 0.04	1.87 ± 0.04	1.87 ± 0.04	1.87 ± 0.04	1.87 ± 0.04
20	a2.64 ± 0.02	c1.84 ± 0.04	bc1.88 ± 0.04	b1.93 ± 0.04	b1.92 ± 0.04	b1.91 ± 0.03
40	a2.83 ± 0.05	e1.76 ± 0.08	d2.13 ± 0.03	a2.80 ± 0.08	b2.68 ± 0.02	c2.46 ± 0.04
60	a3.67 ± 0.03	d1.67 ± 0.03	b2.98 ± 0.04	a3.73 ± 0.05	b3.04 ± 0.05	c2.83 ± 0.03
80	b4.12 ± 0.02	e1.59 ± 0.05	d3.04 ± 0.06	a4.32 ± 0.09	c3.94 ± 0.14	d3.11 ± 0.02
	WBC count (x 10-3 mm-3)					
0	24.29 ± 1.19	24.29 ± 1.19	24.29 ± 1.19	24.29 ± 1.19	24.29 ± 1.19	24.29 ± 1.19
20	b24.26 ± 1.05	a27.13 ± 1.03	a26.55 ± 1.10	ab25.65 ± 1.08	ab25.52 ± 1.08	ab25.78 ± 1.19
40	b23.87 ± 1.07	a32.89 ± 1.21	b25.53 ± 1.24	b24.63 ± 1.18	b24.67 ± 1.07	b24.81 ± 1.10
60	b22.59 ± 1.11	a34.83 ± 2.38	b24.29 ± 1.02	b22.60 ± 1.02	b23.06 ± 1.07	b23.54 ± 1.15
80	bc21.24 ± 1.16	a38.90 ± 2.18	b23.80 ± 1.07	c20.46 ± 1.18	bc22.43 ± 1.05	b23.12 ± 1.03
	Hb content (g%)					
0	4.56 ± 0.28	4.56 ± 0.28	4.56 ± 0.28	4.56 ± 0.28	4.56 ± 0.28	4.56 ± 0.28
20	a5.00 ± 0.36	c4.00 ± 0.57	bc4.39 ± 0.10	ab4.85 ± 0.13	ab4.72 ± 0.17	ab4.70 ± 0.18
40	a5.00 ± 0.33	c3.54 ± 0.15	b4.52 ± 0.10	a5.23 ± 0.17	a5.17 ± 0.12	a5.06 ± 0.15
60	c4.80 ± 0.12	d2.80 ± 0.18	c4.78 ± 0.19	a5.75 ± 0.16	b5.40 ± 0.11	b5.31 ± 0.12
80	b5.48 ± 0.17	d2.45 ± 0.18	c5.10 ± 0.16	a5.88 ± 0.17	ab5.71 ± 0.13	Cont... ab5.62 ± 0.20
Exposure period (days)	Control	Experimental diets (%)				
	Ht (%)					
0	17.50 ± 1.10	17.50 ± 1.10	17.50 ± 1.10	17.50 ± 1.10	17.50 ± 1.10	17.50 ± 1.10
20	a19.14 ± 1.16	b16.21 ± 1.15	ab17.80 ± 1.16	a18.62 ± 1.08	a18.47 ± 1.12	ab18.27 ± 1.03
40	a19.23 ± 1.14	b14.50 ± 1.01	a18.44 ± 1.16	a20.39 ± 1.14	a19.59 ± 1.02	a19.31 ± 1.04
60	b18.27 ± 1.09	c12.44 ± 1.12	b19.48 ± 1.12	a21.65 ± 1.18	ab20.36 ± 1.08	ab20.27 ± 1.13
80	b19.60 ± 1.14	c11.26 ± 1.03	b19.93 ± 1.02	a22.56 ± 1.08	a21.54 ± 1.16	ab20.84 ± 1.09
	ESR (mm^{-1} hr)					
0	2.00 ± 0.16	2.00 ± 0.16	2.00 ± 0.16	2.00 ± 0.16	2.00 ± 0.16	2.00 ± 0.16
20	c2.00 ± 0.16	a3.00 ± 0.16	ab2.80 ± 0.12	b2.60 ± 0.12	b2.70 ± 0.08	b2.70 ± 0.08
40	d1.80 ± 0.08	a3.20 ± 0.12	bc2.60 ± 0.08	c2.40 ± 0.08	bc2.50 ± 0.08	bc2.60 ± 0.16
60	d1.90 ± 0.08	a3.50 ± 0.08	bc2.50 ± 0.16	c2.20 ± 0.08	b2.40 ± 0.09	bc2.50 ± 0.08
80	c1.80 ± 0.04	a3.80 ± 0.16	b2.40 ± 0.08	c2.00 ± 0.16	b2.30 ± 0.09	b2.40 ± 0.12

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