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Research Article

BIOACCUMULATION OF CADMIUM IN THE FRESH WATER FISH ROHU (LABEO ROHITA)

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Abstract:

The present study was conducted to determine heavy metal (Cadmium) concentrations in Gills, liver, skill in the Rohu (Labeo rohita). Heavy metal concentration varied significationtly depending upon the type of fish tissues and locations. Bioaccumulation of Cadmium the fish- Rohu(Labeo rohita) was investigated after exposed to two sub lethal concentration of Cadmium (1/10th-0.27ppm and 1/3th -0.91ppm of the 96h LC_{50}) for 7th, 14 Th, 21 Th and 28 Th days. The highest/maximum level of accumulation of Cadmium was seen in the liver whereas the lower level of Cadmium had been accumulation of Cadmium had been accumulated in the Gills at the end of 28 days of exposure period. It is clear that Cadmium has been accumulated primarily in the liver tissues of cattle-cattle exposed to sublethel concentration of Cadmium. The present investigation individual indicates that the rate of accumulation of Cadmium was found to be dose and time dependent.

Key words: Bioaccumulation, Rohu(Labeo rohita), Cadmium

INTRODUCTION:

Metals are non-biodegradable and are considered as major environmental pollutants causing cytotoxic, mutagenic and carcinogenic effects in animals[1.] Aquatic organisms have the ability to accumulate heavy metals from various sources including sediments, soil erosion and runoff, air depositions of dust and aerosol, and discharges of wastewater[2,3].Therefore accumulation of heavy metals in aquatic organisms can pose a long lasting

effect on biogeochemical cycling in the ecosphere. Heavy metal scan also adversely affect the growth rate in major carps[4].Fish are often at the top of aquatic food chain and may concentrate large amounts of some metals from the water [5]. Metal bioaccumulation is largely attributed to differences in uptake and depuration period for various metals in different fish species[6]. Multiple factors including season, physical and chemical properties of water [7]an play a significant role in metal accumulation in different fish tissues. The gills are directly in contact with water. Therefore, the concentration of metals in gills reflects their concentration in water where the fish lives, whereas the concentrations in liver represent storage of metals in the water [8].The present study was planned to investigate heavy metals viz. Cadmium eco-toxicity of the river system with particular reference to fish. Bioaccumulation patterns of these metals in fish body organs were also investigated. The presence of Cadmium in industrial waste and its high toxicity along with considerable bioaccumulation in fresh water fishes make it toxicant that should be given due considerable in aquatic toxicology. The term bioaccumulation refers to the wastes which have been reconcertrated in organism often having undergone initial dilution in environment producing toxic effects in fishes [9]. Availability of heavy metals in the aquatic ecosystem and its impact on the flora and fauna had been reported by many investigators [10].The accumulation of heavy metals in the tissues of fishes may cause various physiological defects and mortality [11]. Heavy metals accumulated in the tissues of aquatic animals may become toxic when accumulation reaches a substantially high level[12]. The pattern of bioaccumulation of metals in animals differs from metal to metal and organ to organ during their function status. Most of the investigation pertaining to heavy metals contaminants in aquatic system is dealt either with toxicity or with accumulation [13]. Heavy metals have been shown to be concentration in the liver of various fishes [14, 15].In the present study the bioaccumulation of Cadmium in the liver and muscle tissue and gills are evaluated in the fish, cattle-cattle exposed to sub-lethal concentration of Cadmium for 7th, 14 th, 21 th and 28 th days.

Material and Methods:

Sample of five fish Rohu(Labeo rohita) were collected from Mahan damp, Akola distinct maharastrte on monthly basis for one month studies. Body short and deep, somewhat laterally compressed, its depth more than head length; head very large, its depth exceeding half the head length; body with conspicuously large cycloid scales, head devoid of scales; snout bluntly rounded; eyes large and visible from underside of the head; mouth wide and upturned with prominent protruding lower jaw; upper lip absent, lower lip very thick; no barbells; lower jaw with a movable articulation at symphysis, without a prominent process; gill rakers long and fine; pharyngeal teeth in three row, 5.3.2/2.3.5 pattern; dorsal fin inserted slightly in advance of pelvic fins, with 14 to 16 branched rays, the simple rays non-osseous; anal fin short; pectoral fins long extending to pelvic fins; caudal fin forked; lateral line with 40 to 43 scales. Greyish on back and flanks, silvery-white below; fins dusky.

Freshwater fish, five fishes were collected cattle-cattle ranging 10-12cm in length and weighing between 9 and 14 g were collected from fish farm located Mahan damp, Akola distinct maharastrte, was acclamatized under laboratory conditions (29± 1^0c). The fish were fed daily on oil less groundnut cake. The unused food was removed after 2 hours and water was changed daily. Prior to experiment cattle-cattle were acclimatized in experimental tanks for at least one week. The LC_{50} ^{values} were determinate[16] which was found to be 2.7ppm sublethel studies are helpful to assess the response of the test organism under augment stress caused by metals. According to [17]one-tenth(0.27ppm) one-third(0.9ppm) of the 96h LC_{50} values of Cadmium were selected for the present investigation as sub lethal concentration ,respectively. The fishes were exposed to lower and higher sub lethal concentration for a period of 7^{th}, 14^{th}, 21^{th} and 28^{th} days. Cattle-cattle were sacrificed after each exposure period and the tissues like liver and muscle and Gills were taken out from the experiment and control groups for

the estimation of the heavy metal. The liver and muscle tissues of control and treated fish were isolated and dried in an oven at 110^0 c for 24 hours. The known amounts of dried tissues were digested with 3:1 ratio of nitric acid. After the accomplishment of complete digestion, the digested samples were made up to 25ml with metal free double distilled water and stored for the analysis, [18]. The measurements were made using Atomic Absorption spectrophotometer Values was expressed as mg/g wet wt.

Table: 1 Accumulation of Cadmium (mg/g wet wt., M±S.E.) in different tissues of Rohu(Labeo rohita exposed to lower and higher sub lethal concentration of Cadmium.

Tissues	Group	7days	14days	21days	28days
Liver	C	ND	ND	ND	ND
	LC	0.21±0.0013	0.30±0.0031	0.57±0.0054	0.77±0.0072
	HC	0.30±0.0034	0.65±0.0056	0.77±0.0063	0.88±0.0053
Muscle	C	ND	ND	ND	ND
	LC	0.09±0.0091	0.11±0.0034	0.17±0.0165	0.47±0.0071
	HC	0.10±0.0033	0.25±0.0054	0.57±0.00158	0.78±0.0083
Gills	C	ND	ND	ND	ND
	LC	0.02±0.0085	0.08±0.0019	0.12±0.0155	0.32±0.0010
	HC	0.08±0.0057	0.21±0.0056	0.39±0.00179	0.57±0.0058

Control: C

Not Detected: ND

Lower sub lethal concentration: LC

Higher sublethal concentration: HC

Results and Discussion:

The levels of Cadmium accumulation in the Liver and muscle tissues of cattle-cattle exposed to lower and higher sublethel concentration of Cadmium to different periods of 7^{th}, 14^{Th}, 21^{th} and 28^{th} days shown in table 1. In the present investigation, the highest level of Cadmium accumulation (0.88±0.0043) was found in the liver when compared to muscle tissues (0.78±0.0083) and compared to Gills (0.57± 0.0058)of cattle-cattle when exposed to

higher (0.9ppm) and lower (0.27ppm) sublethal concentration of Cadmium exposed for different time intervals. Heavy metals have been shown to be concentrated in the liver of various teleost fishes[19]. Accumulation of heavy metals (As, Cd, Hg and Zn) in muscle tissues of fishes have been well described by several investigators[20].Similar patterns of Cadmium accumulation has also been found in the present study. In the present study the rate of accumulation was found to be concentration and time dependent.

Conculsion:

A Cadmium accumulation has also been found in the present study. In the present study the rate of accumulation was found to be concentration and time dependent. The results of the study supply valuable information on the metal contents in fish from different sampling stations of the Mahan Damp, Akola. Fish liver exhibited highest tendency to accumulate Cadmium while the accumulation at gills was minimum.

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