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"ALUMINIUM IN THE ORGANS OF HERBIVORE FISH SPECIES RESIDING IN AQUATIC ECOSYSTEM OF THE RIVER BICHHIYA"

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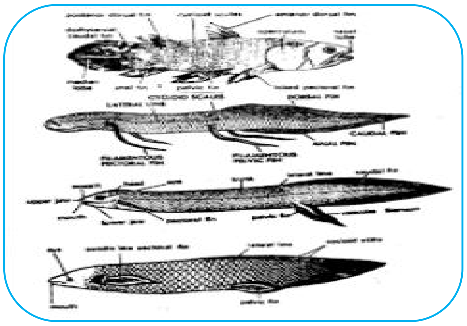
ABSTRACT

Heavy metals were analyzed in the samples of herbivorous fishes, Catla catla and Labeo rohita collected from the river Bichhiya during the sampling year, 20020-2021. Both fish species exhibited significantly different abilities to accumulate metals in their body organs. The concentrations of heavy metals showed significant amassing of aluminium in all the body organs of herbivore fishes at all the sampling stations.



KEYWORDS : *Aluminium, biomagnification, liver and metallic ions toxicity.*

INTRODUCTION :

Water pollution is a major problem in many parts of India and is growing at an alarming rate around industrial and urban areas causing decline of water quality and reduction in freshwater fisheries. Urban and Industrial development in the developing countries has resulted in heavy metal pollution of river systems. Domestic wastewater and obnoxious chemicals of industrial effluents and products of heavy metals which find their way into water systems can produce toxic effects in receiving water bodies and fish inhabiting these waters (Allen and Moore, 2004).

The contamination of freshwaters due to several harmful substances, like metals, through inputs from anthropogenic sources, industrial and agricultural activities, domestic sewage, groundwater leaching and runoffs from agriculture has devastating effects on animals (Donohue *et al*., 2006). Aluminium is widely used for making drinking bottles, foils, containers, bottle tops and machinery for transport industry. All these activities generated aluminium rich water resources for fishes and aquaculture.

Fish communities are excellent indicator of metal pollution and commercially important edible fish species have been widely investigated in order to assess for those hazards to human health (Begum *et al*., 2005). This has attributed to bio-accumulation and biological magnification even at low concentration exposures of heavy metals like aluminium due to discharge of surface runoffs causing adverse effects on the indigenous fish fauna in the river Bichhiya. The aim of current study was to evaluate the heavy metal toxicity gradient in commercially vital and edible herbivore fishes.

MATERIALS AND METHODS:

Description of Study area: Rewa District is a locale of the Madhya Pradesh state in focal India. The city of Rewa is the locale central command. Rewa is otherwise called the 'Place that is known for White

Tigers' as the main White Tiger was found here by Maharaja of the area, Martand Singh in 1951 in the close by wilderness of Govindgarh. Madhya Pradesh's just Sainik School is additionally arranged in Rewa. Rewa was capital city of Vindhya Pradesh. Rewa lies between 240 18' and 250 12' north scopes and 810 2' and 820 18'. The region is limited on the north by Uttar Pradesh, on the east and southeast by Sidhi, on the south by Shahdol, and on the west by Satna. Rewa region is important for Rewa Division and has a space of 6,240km2. The region has a differed landscape that incorporates alluvial fields, slopes, gorges, scarp, waterways, and water-falls. The downpour water of the region streams out along two feeder waterways of the Ganges, the Tons or Tamas and the Son. The Bichiya River courses through the core of Rewa city.

Collection of Experimental Fish: Fish samples were collected on monthly basis from public fishing sites Bichhiya with the help of fisher man. The research work was conducted for a period of one year (from June 2020-May 2021). Five fish of each species belonging to major carps i.e. *Catla catla* and *Labeo rohita* were sampled randomly for bioaccumulation and metal level assessment.

Analysis of Fish and Determination of Heavy Metals: Sampled fish were dissected to obtain the fish organs, gills, liver, kidney, intestine, reproductive organs, skin, muscle, fins, scales, bones and fats for the bioaccumulation studies. After wet digestion, samples were analyzed for the selected heavy metals determinations by Atomic Absorption Spectrometry, (Perkin Elmer, A Analyst-400). The data on different variables were statistically analyzed by using SPSS 10.1 computer program..

RESULTS AND DISCUSSION:

The toxic levels of different metals found in herbivorous fish species were directly dependent upon the metallic eco-toxicity of the river Bichhiya, the ecological needs, metabolism and feeding patterns of various fish species sampled during this study period. However, significant variations in metallic ion concentrations in various organs are due to the differences in physiological functions of various organ in fish body. Fish liver appeared as a target tissue/organ while monitoring metallic toxicity in the river Bichhiya aquatic ecosystem. The present investigation revealed that all the organs of herbivorous fish species showed significantly variable accumulation of metals with the sequence of liver > kidney > gills > intestine > reproductive organ > scales > fins > bones > muscle > fats (Table I). In herbivore fish, the liver showed the mean maximum aluminium concentration of 152.66±19.66 µgg-1, followed by that in kidney and gills. The herbivore species exhibited significantly lowest aluminium contents of 79.98±12.05 and 58.02±17.43 µgg-1, respectively in their muscles and fats. Rajkowska and Protasowicki, 2000 and Dural *et al*., 2007 reported liver, kidney and gills as metabolically active organs to accumulate more amounts of heavy metals than the other tissue like muscle and fats. Fish liver and gills were reported as target organs for assessing metal accumulation. The amounts of metals in gills reflect the concentration of metallic ions in waters in which the fish live. Heavy metal accumulation is dependent upon the type of fish species, life style and feeding habits of fish (Karaded and Unlu 2000); (Karadede *et al*., 2004). In the present study, both species of fish showed statistically different abilities to accumulate metals and the mean metallic toxicity levels followed the order: *Labeo rohita*> *Catla catla*. The differences in various tissues for the accumulations of Al, As and Ba might be the result of their capacity to induce metal-binding proteins such as metallothioneins as described by Canli and Atli, 2003.

Table 1: Metal concentrations (µgg-1) in the organs of fish collected from the river Bichhiya

Organ × Metals	**Metal concentrations (µgg-1)**
Organs	**Aluminium**
Gills	128.14± 18.42
Liver	152.66±19.86
Kidney	145.58±16.01
Intestine	126.70±12.61
Reproductive organs	116.36± 14.00
Skin	105.20± 12.79
Muscle	79.98±12.05
Fins	100.04±5.81
Scales	105.20±6.33
Bones	90.71±10.63
Fats	58.07±14.17
Means	109.87±28.82
Species × Metals	
Catla catla	101.51±2.13
Labeo rohita	110.85±1.17
Means	106.18±1.65

CONCLUSIONS:

The present extent of heavy metal pollution in the river Bichhiya is a more serious issue for public health due to the ability of these metals to persist, bio-accumulate and bio-magnify in the fish body organs and ultimately in humans consuming this fish. It also provokes a need for mitigation measures and proper management to lessen the toxic effects of metals on aquatic biota and public health.

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