



EFFECT OF CALCIUM ON CADMIUM INDUCED BIOACCUMULATION IN SELECTED TISSUES OF FRESH WATER TELEOST, OREOCHROMIS MOSSAMBICUS (TILAPIA)



Obaiah Jamakala, G. Bhavani And A. Usha Rani

Division of Environmental Biology, Department of Zoology,
Sri Venkateswara University, Tirupati A.P. India

Abstract: Cadmium (Cd) is one of the most toxic, non-essential heavy metal and constitutes a real threat to fish because of its widespread occurrence in the aquatic environment. The present study is carried out to know the effect of calcium (Ca) in reducing the Cd bioaccumulation levels in the selected tissues of fresh water fish, *Oreochromis mossambicus* (Tilapia) exposed to Cd. The fish were exposed to cadmium chloride (CdCl₂) at a sub lethal concentration of 1/10th LC50/48 hrs i.e. 5ppm for 7, 15 and 30 days (d) time periods. After 15d Cd exposure, the fish were supplemented with trace element Ca (1ppm) and observed for again 7, 15 and 30d long sojourn. After the specified time periods, the test tissues like liver, kidney, muscle, brain and gill were isolated and tested for Cd bioaccumulation by Atomic Absorption Spectrophotometer (AAS – Shimadzu AA6300). There was a significant elevation in Cd concentrations in all the test tissues with increased period of exposure to the heavy metal. Maximum Cd accumulation was found in 30d Cd exposed fish kidney (22.353±0.41 µg / gm wet wt. of the tissue) than the other tissues. However there was significant reduction in Cd bioaccumulation with Ca supplementation suggesting their vital role in heavy metal detoxification. Maximum decrease in Cd accumulation was found in 30d fish kidney (6.996 ± 0.284 µg / gm wet wt. of the tissue) supplemented with Ca. Our findings clearly envisages that 30d Ca supplementation is more effective in reducing the Cd body burden when compared to other time periods in the fresh water fish, *Oreochromis mossambicus*.

Keywords: Cadmium, Bioaccumulation, Calcium supplementation, Fish.

INTRODUCTION:

The contamination of fresh waters with a wide range of pollutants has become a matter of concern over the few decades (Vutukuru, 2005; Omer et al., 2012). Natural aquatic resources are extensively contaminated with heavy metals like lead (Pb), cadmium (Cd), nickel (Ni) and copper (Cu) released from domestic, industrial and other man made activities. Among these metals Cd is a highly toxic, non-essential heavy metal and arising primarily from battery, electroplating, pigment, plastic, fertilizer industries and cigarette smoke.

The most dangerous characteristic of Cd is that it accumulates throughout a life time. It has a long biological half life 17 to 30 years in humans (Hideaki et al., 2008). Chronic exposure to inorganic Cd results in accumulation of the metal mainly in the liver and kidneys (Usha Rani, 2000; Bais and Lokhande, 2012) as well as in other tissues and organs causing many metabolic and histological changes, membrane damage, altered gene expression and apoptosis (Casalino et al., 2002; Waisberg et al., 2003; Soeginato, 2008). Cd caused swelling in the epithelium and chlorine cells of the gills (Usha Rani, 1999), hyperplasia, hypertrophy, determination and necrosis of the hepatocytes

(Usha Rani and Ramamurthi, 1989) and vacuolization of the tubule cells of the kidney (Thophon et al., 2003; Fernandes et al., 2007).

Cd interacts with the essential micronutrients/ trace elements like zinc (Zn), iron (Fe), copper (Cu) and calcium (Ca) and influences the enzyme activities of metabolic pathways (Peraza, 1998; Strydom et al., 2006). Ca is one of the important major element which acts as a micronutrient. It contributes to various biochemical mechanisms in vertebrates including fishes (Galvez and Wood, 2007). Ca plays a major role in bone formation, muscle contraction, enzyme activities and hormonal secretion etc., in animals. Though fish is a vertebrate, literature on the effect of trace element Ca on Cd absorption, elimination and detoxification is scanty.

MATERIALS AND METHODS:

Chemicals: Cadmium as cadmium chloride (CdCl₂) and calcium as calcium chloride (CaCl₂) were purchased from Merck (Dormstadt, Germany). The other chemicals which were used in the present study were obtained from the standard chemical companies like Sigma Chemical Co. (St