

CADMIUM INDUCED BIOACCUMULATION AND OXIDATIVE STRESS IN TELEOSTEAN FISH *OREOCHROMIS MOSSAMBICUS*: THE POSSIBLE DETOXIFICATION MECHANISMS OF ZINC AND SELENIUM SUPPLEMENTATION

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ABSTRACT

Cadmium (Cd) is one of the most common non-essential elements, relatively accessible heavy metal in our environment causing wide range of toxic effects. The present study examines the detoxification role of zinc (Zn) and selenium (Se) against Cd induced bioaccumulation and oxidative stress in fresh water teleost *Oreochromis mossambicus*. After acclimatization, fish were exposed to sub lethal concentration of Cd (1/10th of LC₅₀/48h, i.e., 5ppm) for 7, 15 and 30 days (d) period. 15d Cd exposed fish were considered as control and divided into three groups. The first group of fish were subjected to Zn (1ppm) supplementation, second group received only Se (0.5ppm) and third group of fish were supplemented with the combination of both Zn and Se at the above said doses and observed again for 7, 15 and 30d time periods. After specific time intervals liver, kidney, gill, brain and muscle tissues were isolated and used for the estimation of bioaccumulation levels as well as assay of oxidative stress enzymes like superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and glutathione-S-transferase (GST). Simultaneously lipid peroxidation (LPO) levels were also measured. Bioaccumulation levels were significantly increased with the increased period of Cd exposure. After supplementation with Zn and/or Se, bioaccumulation levels were progressively decreased. A significant elevation in LPO levels with decreased activity levels of CAT, SOD, GPx and GST were observed during Cd intoxication. With Zn and/or Se supplementation, a significant reversal in the above oxidative stress enzymes was observed. The present study reveals that combined supplementation of Zn and Se tends to detoxify the Cd induced alterations in the test tissues than the other modes of supplementation.

Keywords: Cadmium, Bioaccumulation, Oxidative Stress, Zinc and selenium, Fish

INTRODUCTION

The contamination of fresh waters with a wide range of pollutants has become a matter of concern over the few decades (Dirilgen, 2001; Vutukuru, 2005; Kwong *et al.*, 2011). 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 the heavy metals, Cd is one of the most toxic, non-essential heavy metal; known for its corrosive nature and is widely used in paints and dyes, cement and phosphate fertilizers (Jarrup, 2003). Cd occurs naturally in the environment in