

Ameliorative effect of selenium on cadmium induced biochemical alterations in *Cirrhinus mrigala* (Ham.)

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Heavy metal pollutants are generally discharged in the aquatic environment as a result of industrial processes and are causing major problems in the food chain. Pollution due to heavy metals is of serious concern and among them cadmium deserves special attention. Cadmium, a heavy metal has been recognized as one of the most toxic environmental and industrial pollutant due to the ability to induce severe alterations in various organs following either acute or chronic exposure. The present study was carried out to evaluate the protective influence of selenium against cadmium induced biochemical alterations in lipid peroxidation (LPO), reduced glutathione (GSH), glutathione peroxidase (GPx), total sulphhydryl group (TSH) and total protein in gill, liver, kidney and muscle tissues of *Cirrhinus mrigala* fingerlings for 30 days. A significant increase in the level of lipid peroxidation and concomitant decrease in the activity of GSH, GPx, TSH and total protein levels were observed in all the tissues of cadmium (0.85 mg/l) treated group. Administration of cadmium along with the equimolar dose of selenium (0.34 mg/l), the above mentioned biochemical parameters were reverted near to their normal levels that showed the protective effect of selenium against cadmium induced toxicity.

Key words: Cadmium, Fish, Selenium, Enzymes, Metabolism.

INTRODUCTION

Aquatic environment in general harbours a lot of organisms many of which are used as food by man and these are likely to be subjected to the hazardous heavy metal pollution. Heavy metal contaminants in aquatic ecosystem pose a serious environmental hazard because of their persistence and toxicity. Unrestrained release of heavy metals into environment *viz.*, discharge of industrial effluents, sewage and agro chemicals into the water resources has not only rendered it unusable but at the same time has produced great harm to the non-target fauna such as fish (Vineetha Shukla *et al.*, 2002).

Cadmium compounds are used in the metal-plating, cadmium-nickel battery industry and as a stabilizing agents in many polyvinyl chloride products. Furthermore cadmium is widely used in solar cells, television tubes, radio sets, telephone wires, photography, lithography, calico printing, dyeing screens, scintillation counters and fertilizer industries (ATSDR, 1993).

Cadmium increases the generation of free radicals, promotes lipid peroxidation and depletes antioxidants and is carcinogenic. Cadmium affects the ionic transport through membranes, energy availability through mitochondrial function, detoxification through microsomal enzymes, intercellular communication by affecting cell

adhesion in epithelial cells and many cell signaling functions by affecting intracellular calcium, inositol phosphate and protein kinase C (Rana *et al.*, 1996).

The metabolism and excretion of cadmium depends on the presence of antioxidants and thiols that aid cadmium metallothionein binding. Some of the specific changes that lead to tissue damage in chronic exposure of cadmium have been related to oxidative stress and thiol depletion. Cellular damage results from cadmium binding with sulphhydryl groups in tissues, production of lipid peroxides and the depletion of reduced glutathione (Ercal *et al.*, 2001). Cadmium has the ability to generate free radicals that leads to the expression of inflammatory chemokines and cytokines (Dong *et al.*, 1998).

Selenium is an essential dietary trace element that plays a crucial role in enzyme glutathione peroxidase (GPx), phospholipid hydroperoxide GPx and 5 α -deiodinase in the form of selenocysteine (Bock *et al.*, 1991). In spite of various findings on the toxic effect of cadmium and the neutralizing effect of selenium in cadmium induced toxicity on changes in certain biochemical parameters, there is still a lacuna on its effect on the antioxidant enzymes, lipid peroxidation in various organs of the fingerlings of *Cirrhinus mrigala*.

Therefore, the present study has been designed to investigate the effect of chronic exposure of cadmium