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# CADMIUM TOXICITY ON BIOCHEMICAL CONSTITUENTS IN THE LIVER OF FRESH WATER FISH *CYPRINUS CARPIO* (LINN).

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## ABSTRACT

Static bioassays were carried out to find $LC_{50}$ 96hr value of cadmium to the fresh water fish. *Cyprinus carpio.* It was found to be 1.0 % .After the determination of $LC_{50}$ 96hr values, groups of 10 fishes were exposed to different sublethal concentrations of the metal for 30days to evaluate chronic toxicity. Liver was used to determine various biochemical constitutions such as total carbohydrates, total proteins and total lipids. All the biochemical parameters were found to decrease in the experimental fishes in dose and duration dependent manner. The fall in the level of biochemical parameters in the liver of fishes could be attributed to the production of extra energy to cope up with the toxic stress caused by cadmium.

**KEYWORDS:** ***Cyprinus carpio*** **Total carbohydrates, Total proteins, Total lipids and Liver**

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# INTRODUCTION

Though the food required for various metabolic activities of man has been mainly derived from terrestrial agriculture, he is in need of supplementary sources of plant and animal proteins. In this respect, fishes fulfill the requirement of humans as animal proteins for the last few decades. Unfortunately, the habitats of fishes after getting polluted resulted in the death of fish populations. Environmental pollutants, especially the metals are shown to pose serious risk to many aquatic organisms by changing genetic, physiological, biochemical and behavioral parameters[1]. The most common pollutants which are toxic to fishes include heavy metals, pesticides, detergents, effluents and so on[2]. The heavy metals from several industrial, mining and other sources enormously contribute to the pollution of aquatic bodies causing address impact on biota including fishes. The fishes among the aquatic habitants, are the most susceptible and more vulnerable to containments than any other aquatic animals [3]. At present, much importance has been given to the adverse effects of heavy metals on biochemical aspects in a number of bony fishes [4, 5, 6, 7].In animals, carbohydrates are the major sources of energy and the proteins confer biological specificity in living cells. The lipids, the chief storage and structural compounds, also provide a rich source of respiratory energy. At times of emergency, a dynamic equilibrium is established among carbohydrates, proteins and lipids. In these situations, liver plays a prominent role in the metabolism of glucose, amino acids and fatty acids along with detoxifications of poisonous substances.Since fish contaminations is a reliable indicator of bio accumulation of heavy metals, the present investigation was designed to estimate total carbohydrates proteins and lipids in the liver of fresh water fish *Cyprinus carpio* exposed to cadmium.

# MATERIALS AND METHODS

Static bioassays were carried out to determine $LC_{50}$ 96 hr value of cadmium 1.0 % to the fishes *Cyprinus caprio.* A group of 10 fishes was introduced into each selected for concentration of cadmium along with controls. Dechlorinated tap water was used as diluent medium and variables like temperature (30±1°C), pH (7.1-7.9), salinity (0.4-0.7ppm) and DO (5.5-6.2 mg/l) were controlled. The number of fishes died and alive were scored and the percent death of fishes in each concentration during 96hr exposure period was arrived at. Then 5 different sublethal concentrations (0.50, 0.10, 0.15, 0.20 and 0.25%) were prepared and the fishes were reared in each concentration for 30 days along with respective controls. The fishes were fed with artificial fish meal daily throughout the experimental period and the test solutions were replaced daily by proper concentration. At the end of the experimental period, the fishes were sacrificed and the liver was dissected out for analysis of biochemical constituents.Total carbohydrates were estimated by the method [8], total proteins by the method [9] and total lipids by the method [10].

# RESULTS AND DISCUSSION

Liver is the major gland in vertebrates and is involved in the metabolism of various metabolites especially the carbohydrates. In the present experimental fishes, carbohydrates, proteins and lipids were found to decrease significantly in the liver under cadmium toxicity. The percent decrease of total carbohydrate ranges between 11.18 and 45.00, of total proteins between 10.18 and 53.42 and of total lipids between 7.61 and 51.40 (Table 1.). All values are significant (at $P<0.05$) and are positively correlated with the metal concentrations. The study also reveals that the effect of cadmium on different biochemical parameters was dose and duration-dependent.It is well established that the carbohydrates are most rapidly utilized in organisms as the immediate source of energy to meet the enhanced demand of energy under stress conditions in fishes [11, 12, 13]. The decrement of protein content in the liver of fishes under study could be attributed to the metabolic utilization of keto acids for glucose synthesis as also observed [14, 15] in fishes under toxic stress. The pollutant stress would cause depleted

protein level and increased amino acids and protease activity in fishes [16, 17]. In the present study, the quantity of total lipids become reduced in the lives of fishes under the metal toxicity. Similar trends have also been recorded [18, 19, 20]. It is also shown that a fall in lipid level especially triglycerides is indicative of adverse effect of the toxicants on liver of organisms [21].The present study thus confirms the findings[22] that the fishes are highly susceptible to aquatic pollutants and are very sensitive to environmental changes to which they are exposed as their exclusively aquatic living in intimate contact with the surrounding water. The fish contamination is a reliable indicator of bio accumulation of toxic substances [23]. Moreover, the teleosts are good models to evaluate the toxicity of pollutants because they possess similar biochemical responses like those of mammals and other vertebrates [24].

**Table 1**
***The effect of Cadmium on the biochemical constituents in the liver of C.carpio. (Each value is the mean ± SD of 5 observations).***

| Concentration of Cadmium (%) | Total carbohydrates (mg/g) | Total proteins (mg/g) | Total lipids (mg/g) |
|---|---|---|---|
| 0 | 13.60 ± 0.81 | 46.67 ± 1.28 | 27.20 ± 2.58 |
| 0.05 | 12.08 ± 0.73 NS (-11.18) r = 0.999 | 42.25 ± 1.15 NS (-10.18) r = 0.865 | 25.13 ± 2.92 NS (-7.61) r = 0.946 |
| 0.10 | 10.87 ±0.65 (-20.07) r = 0.949 | 36.11 ± 0.93 (-22.63) r = 0.919 | 22.58 ± 2.00 (-16.99)r = 0.995 |
| 0.15 | 9.12 ± 0.54 (-32.94) r = 0.957 | 30.94 ± 0.65 (-33.70) r = 0.873 | 19.41 ± 1.61 (-28.64) r = 0.907 |
| 0.20 | 8.67 ± 0.41 (-36.25) r = 0.998 | 25.67 ± 0.32 (-45.00) r = 0.953 | 16.84 ± 1.33 (-38.09) r = 0.993 |
| 0.25 | 7.48 ± 0.28 (-45.00)r = 1.000 | 21.74 ± 0.27 (-53.42)r = 0.767 | 13.22 ± 0.87 (-51.40) r = 0.822 |

***(All values are significant at P<0.05 except NS; NS – Not significant; - Indicates percent decrease from control; r – Correlation coefficient***

## CONCLUSION

It is concluded all the biochemical parameters in The cause for the reduction could be liver of *C.carpio* found to decrease in the attributed to the production of extra experimental fishes. of energy, to cope up with the toxic stress caused by cadmium

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