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# HEAVY METAL CONCENTRATION ANALYSES IN THE FISHES OF URANDHUR WATERS OF SRIKALAHASTI, ANDHRA PRADESH

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## ABSTRACT

Although fish is an important source of protein, they are currently affected by rapid industrialization and mechanized agricultural activities resulting in increased concentration of heavy metals in the fish. Due the discharge of effluents either directly or in directly into the waters, heavy metals like Pb and Cd can bio accumulate in aquatic biota (US EPA 19991) bio magnify in the food chains. Bio accumulation of metals reflects the amount ingested the organisms, the way in which the metals are distributed among the different tissues and the extent to which the metals retained in each tissue type (Murugan et al; 2008). In light of the above, the present study seeks to investigate the concentrations of heavy metals namely Pb and Cd and they were estimated in the muscle, liver and gills of different species of commercially important fish collected from the fresh waters of major tank/pond of Urandhur which predominantly supplies different fish species for the consumption of people of Srikalahasti. The results showed that the muscle had the lowest concentration of Pb and Cd metals compared to liver and gills in different species of fish studied. Among the estimated heavy metals concentrations Pb and Cd were highest and lowest respectively for different fish species in liver, gills and muscle. The Pb and Cd values studied in organs of different fish species are found to be within the tolerable limits as compared to the standard levels specified by WHO/FAO and FSSAI. Hence at the current values both Pb and Cd heavy metal concentrations would not pose any risk and health hazard to the consumers.

**KEYWORDS:** Although fish is activities Urandhur consumption of people of Srikalahasti.

## INTRODUCTION

Rapid industrialization, unscientific agricultural practices and economic development in India has resulted in increased water pollution in the coastal areas and inland water bodies. This issue has been the focus of numerous studies. Pollutants like heavy metals deposited into water cause serious changes which in turn directly or indirectly affect the ecological balance of the environment damaging life and other activities of aquatic organisms because of their high toxicity and accumulative nature (Matta et al., 1999). Heavy metals can enter the food web through direct consumption of water or organisms or through uptake processes and be potentially accumulated in edible fish (Paquin et al., 2003). The heavy metals like Pb and Cd at toxic concentration level can potentially destroy the ecological environment (Agusa et al., 2007). These chemicals are potentially more toxic to fish and other aquatic organisms, and are least toxic to mammals. Owing to the environment and water resources are being polluted, thus endangering aquatic life directly and human life indirectly (Hill, 1989). Fish is one of the cheapest and healthiest sources of protein but pollution with heavy metal jeopardizes its value. Fishes exposed to toxicants undergo stress, which is a state of re-established homeostasis, a complex suite of mal-adaptive responses (Chrouses, 1998). Under stress, physiological and biochemical responses may be compromised, becoming detrimental to the fish's health and well being at which point the fish is termed distressed (Barton and Iwama, 1991).

The intake rate of these heavy metals by humans through the consumption of fish causes serious health hazards (Puel et al., 1987). As a result of the hazards associated with the consumption of heavy metals, their concentrations in commercial fishes in India should be periodically examined to evaluate the possible risks associated with the consumption of contaminated fish (Cid et al., 2001). Fish is a rich source of protein, vitamins and minerals are also a leading source of income for some people in India. The heavy metal intakes by fish in a polluted aquatic environment vary depending on ecological requirements, metabolism, and factors like salinity, water pollution level, food and sediments. Fish accumulates metals in its tissues through absorption and humans can be exposed to these metals via food web. This study aimed at investigating the presence and bioaccumulation pattern of heavy metal like lead and cadmium in some fish species of Urandhur waters of establish their suitability for human consumption.

## MATERIAL AND METHODS

Samples of tissues from fish were obtained by section – muscle, liver and gills in amounts of 2-3 g. for analysis. Each tissue sample was dissolved in a solution of nitric p.a ($HNO_3$:$H_2O$=2:1); sediment sample in solution of acids (HF-HNO3-HCLO4) and analyzed for presence of Cd, Pb by the atomic absorption spectrophotometer (AAS).

## SIGNIFICANCE OF THE STUDY

As the study area that is Urandhuru water pond/tank is surrounded by cement factories, iron and steel industries, chemicals, bewarage factory and Mayura sugar industry and several small scale industries releasing their waste into these water bodies and polluting them. The determination of cadmium and lead in fish sample has large analytical interest due to the potential toxicity of these elements. To educate aware the people around the study area about the heavy metal contamination in fish and the hazardous health effects of consuming them.

## RESULTS AND DISCUSSION

In aquatic ecosystem, heavy metals are considered as the most important pollutants, since they are present throughout the ecosystem and are detectable in critical amounts. Heavy metals, such as mercury, cadmium, copper, lead and zinc are of the most important pollutants which effect aquatic environment and fish. Due to feeding and living in the aquatic environments fish are particularly vulnerable and heavily exposed to pollution because they cannot escape from the detrimental effects of pollutants [Yarsan and Yipel, 2013; Mahboob et al., 2014]. In the present investigation, we found the following results for bioaccumulation of heavy metals like pb and cd in fish species.

**Table-1: The concentration of heavy metals in different fish species organs from Urandhuru water tank**

| SI.NO | FISH SPECIES | FISH ORGANS g/kg | HEAVY METALS ppm/lt | |
|---|---|---|---|---|
| | | | Cd | Pb |
| 1 | Cat fish(common name – jellalu & waluga | Muscle<br>Liver<br>Gill | 0.21<br>0.26<br>0.24 | 0.23<br>0.29<br>0.27 |
| 2 | Catla catla (commom name – krishna bocha) | Muscle<br>Liver<br>Gill | 0.19<br>0.23<br>0.21 | 0.21<br>0.27<br>0.25 |
| 3 | Mrigala(white carp) (common name - yerramosu) | Muscle<br>Liver<br>Gill | 0.18<br>0.20<br>0.19 | 0.23<br>0.26<br>0.25 |
| 4 | Labeo rohita (common name – bocha (or) gendimosu) | Muscle<br>Liver<br>Gill | 0.17<br>0.20<br>0.19 | 0.22<br>0.25<br>0.24 |

Standard value: fssai (2014) –Cd-0.3; Pb-0.3; FAO/WHO (1989) –Cd-0.5; Pb-0.5.

Considerable variations in the heavy metals were observed in all fish sample and organs (muscle, liver, gill). The heavy metals cadmium and lead accumulation were found in cat fish muscle, liver and gill. The lead concentration is high when compared with cadmium concentration in the exposed fish of uranduru water pond. The heavy metals cadmium and lead accumulation were found in Catla catla, Mrigala and Labeo rohita fish muscle, liver and gill in these fish organs. The lead (Pb) concentration is high when compare with cadmium levels in uranduru water pond.

Heavy metal concentration in uranduru water pond showed considerable variation in the heavy metals were observed in different fish species and organs (muscle, liver and gill). The order of cadmium accumulation were found in cat fish organs liver(0.26), gill(0.24). The order of lead accumulation were found in cat fish organs liver(0.29), gill(0.27), muscle(0.23). The fish analyzed has high concentration of lead accumulation compare with cadmium metal.

The order of cadmium accumulation found in Catla catla fish organs liver (0.23), gill(0.21) and muscle(0.19). The order of lead accumulation were found in Catla catla fish organs liver(0.27), gill (0.25) and muscle (0.21). Catla catla has high concentration of lead accumulate them compare with cadmium. The order of cadmium accumulation were found in Mrigala fish organs liver (0.20), gill (0.19) and muscle (0.18). The order of lead accumulation were found in Mrigala fish organs liver (0.26), gill (0.25) and muscle (0.23). The Mrigala fish has high concentration of lead accumulation when compared with the cadmium.

The order of cadmium accumulation were found in Labeo rohita fish organs liver(0.20), gill (0.19) and muscle (0.17)./ the order of lead accumulation were found in Labeo rohita fish organs is liver (0.25), gill (0.24) and muscle (0.22). The Labeo rohita was high concentration of lead accumulation when compared with the cadmium.

As compared in all fish species, the liver has highest pb and cd concentration. The liver of the exposed fish had slightly vacuolated hepatocytes showing evidence of fatty degeneration, necrosis of some portions of the liver tissue that were observed probably resulted from the excessive work required by the fish to get rid of the toxicant from its body during the process of detoxification by the liver From this we can take this as indicator for toxicity which we can take this into account as the level of toxicity are nearer to the standard level. Concentration of

heavy metals in different tissues/organs of fishes is directly influenced by contamination in aquatic environment, uptake, regulation and elimination inside the fish body (Nussey, 2000). Liver stores either heavy metals or excretes through bile. Other routes of heavy metal regulation are either kidneys or gills (Nussey, 2000), so we found the second highest accumulation in gills.

## CONCLUSION

The present study was to provide information about characteristics affecting and occurrence of some risky heavy metallic elements like Cd and Pb in biotic and a biotic environment. The content of cadmium and lead does not pose a real risk of their increased entry into fish organisms. The content of cadmium in fish meat is lower than the highest acceptable amount (HAA) but in some parts of fish its contents is higher than HAA. Contents of lead in fish meat is under hygienic limit, though higher accumulation was observed in muscle, liver and gill when compared to cadmium. In the present analysis of different fish species and the stand point of Cd,Pb contents showed that the concentrations of Pb and Cd are below the harmful levels in all the organs of fish species studied and the muscle of fish is suitable for human consumption and fulfill all hygienic limits determined for these elements by international standards of ( FAO,1992 and FAO/WHO,1983).

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