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Determination of Heavy Metal concentration in Catfish *Rita rita* from Indus River near Jamshoro, Sindh, Pakistan

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Abstract: Present study was conducted to determined heavy metal concentration in catfish *Rita rita* from Indus River near Jamshoro, Sindh, Pakistan. Different metals likeiron, zinc, chromium, copper, manganese and cobalt were analysis from different organs like gills kidney and liver from male and female respectively. The values of iron were found highest (12.92µg/g) in liver while the lowest value of cobalt (0.014µg/g) was found in Kidney. Rests of the metals showed no significant variation and were found within the recommended limits of WHO

Keywords: heavy metals, River Indus, *Rita rita*, Kidney. Liver, Gill

1. INTRODUCTION

Fish are generally one of the main protein sources for humans (Eletta *et al* 2003) and a useful bio-indicator for the determination of heavy metal pollution in aquatic ecosystems (Chovanec *et al* 2003). Heavy metals may enter fish bodies in three possible ways through digestive tract, gills, and body surface (Dallinger *et al* 1987 and Pourang 1995). Concentrations of heavy metal levels in fish depend on different factors such as ecological needs, size, and age of individuals (Alibabic *et al* 2007), their life cycle and life history, feeding habits (Lamas *et al* 2007), season of capture, and physico-chemical parameters of water (Biney *et al.* 1994). Heavy metals are among the most common environmental pollutants, and their occurrence in waters and biota indicate the presence of natural or anthropogenic sources. The anthropogenic sources are associated mainly with industrial and domestic effluents, urban storm, water runoff, landfill, mining of coal and ore, atmospheric sources and inputs rural areas (Kabata–Pendias and Pendias 1992).The pollution of the aquatic environment with heavy metals has become a worldwide problem during recent years, because they are indestructible and most of them have toxic effects on organisms (MacFarlane and Burchett, 2000). Among environmental pollutants, metals are of particular concern, due to their potential toxic effect and ability to bio-accumulate in aquatic ecosystems (Censi *et al*., 2006). Aim of present study was to know the health status of fish from Indus River near Jamshoro.

2. MATERIALSANDMETHODS

Study Area

Present work was conducted from Indus River near Jamshoro Sindh Pakistan.

Chemical and Reagents

In current study chemical and reagent used were obtained from E. Merck (Darmstadt, Germany) and Sigma Aldrich , Such as Hydrochloric acid (HCl) , Sulphuric acid (H_2SO_4) nitric acid HNO_3 Cadmium sulphite (CdS) Copper Sulphate ($CuSO_4$) cobalt sulphate potassium dichromate , ($K_2Cr_2O_7$) Iron sulphate ($FeSO_4$), Manganese sulphate ($MnSO_4$) lead nitrate Pb (NO^3) 2 and Zinc Acetate Zn (O^2CCH_3).

3. APPARATUS

Metal were determine in Acid digest and extracts using flame an electro thermal atomic absorption spectrometers, Perkin Elmer Model: (Analyst 700) (Norwalk, CT, USA and NAuto- Sampler AS-800 which was occupy with flame and graphite furnace , Pyrocoated graphite tube with integrated platform were used at Center of Excellence in Analytical Chemistry, University of Sindh, Jamshoro

4. DIGESTION PROCEDURE FOR FISH SAMPLE

1.0 gram of sample was placed were in conical flask 15 ml mixture of H_2SO_4, HNO_3 and HCl concentrated was added, heated on a hot plate by covering with watch glass. Digestion until they become

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clear semisolid solution 10 ml of 1 molar hydrochloric acid(HCl) were added filtered through Whatman No.42 filtered paper final volume was up to 25 ml in the volumetric flask with deionized water.

Table 1 Determination of heavy metal concentration male *Rita rita* from Indus River near Jamshoro

Length group (cm)	Heavy metal concentration (µg/g)					
10.1-20.0	Iron (Fe)	Zinc (Zn)	Chromium (Cr)	Copper (Cu)	Manganese (mg)	Cobalt (Co)
Gills	2.336	0.150	0.046	0.139	0.202	0.012
Liver	3.162	0.301	0.221	0.188	0.055	0.010
Kidney	2.850	0.390	0.905	0.330	0.105	0.010
20.1-30.00						
Gills	1.919	0.722	0.277	0.285	0.394	0.012
Liver	3.767	0.554	0.071	0.285	0.062	0.014
Kidney	2.04	2.01	0.085	0.285	0.023	0.012

5. RESULTS

The metal present in different parts of fish like gills, liver and kidney were analyzed by use of different standard used with the help of atomic absorption spectrophotometer. Different metals such as iron, zinc, chromium, copper, manganese and cobalt were analysis from different organs like gills kidney and liver from male and female respectively (Table 1 and 2). The range and mean of iron were recorded highest in liver. The values were obtained as 8.34**µg/g** followed by kidney 4.96**µg/g** and low in gill 2.873**µg/g** respectively. In case of male and in female highest ion percentage was found in liver (3.803**µg/g**) followed by kidney (3.34**µg/g**) and lowest was noticed in gills (3.03**µg/g**). Zinc concentration was found highest in kidney (1.17**µg/g**) followed by liver (0.69**µg/g**) and lowest in gills (0.61**µg/g**) in male and in female kidney posses' highest concentration of zinc (0.44**µg/g**) followed by liver (0.36**µg/g**) and lowest in gills (0.24**µg/g**). Metal chromium was observed maximum in gills (0.81**µg/g**) and medium was in liver (0.61**µg/g**) and lower in kidney (0.10**µg/g**) in male and in female highest concentration as observed in kidney (1.06**µg/g**) followed by liver (0.27**µg/g**) and lowest in gill (0.07**µg/g**) respectively. Concentration of copper was in same ratio in liver and gills (0.28**µg/g**) and minimum in kidney (0.17**µg/g**) in male. In terms of female high values were found in kidney (0.37**µg/g**) and medium in gills (0.21**µg/g**) and low in liver (0.19**µg/g**) respectively. In manganese peak values were noticed in gills (0.37**µg/g**) followed by liver (0.112**µg/g**) and lowest in kidney (0.037**µg/g**) in male. Maximum values were found highest in gills (0.254**µg/g**) followed by kidney (0.115**µg/g**) and lowest in liver (0.065**µg/g**). Cobalt percentage was found high in liver (0.015**µg/g**) medium in gills (0.014**µg/g**) and low in kidney (0.013**µg/g**) in male and in case of female high values were in kidney (0.014**µg/g**) medium was in gills (0.0135**µg/g**) and minimum in liver (0.012**µg/g**). It was concluded that the range of all metal s in different part of body was in low quantity so it can't effect on flash of fish.

Table 2 Determination of heavy metal concentration female *Rita rita* from Indus River near Jamshoro.

Length groups (cm)	Heavy metal concentration (µg/g)					
10.1-20.0	Iron (Fe)	Zinc (Zn)	Chromium (Cr)	Copper (Cu)	Manganese (mg)	Cobalt(Co)
Gills	3.838	0.498	1.35	0.285	0.353	0.016
Liver	12.92	0.834	1.157	0.285	0.163	0.016
Kidney	7.777	0.330	0.131	0.06	0.051	0.014
20.1-30.00						
Gills	1.919	0.722	0.277	0.285	0.394	0.012
Liver	3.767	0.554	0.071	0.285	0.062	0.014
Kidney	2.04	2.01	0.085	0.285	0.023	0.012

6. DISCUSSION

Present study was designed to investigate the heavy metal concentration of catfish *Rita rita* from Indus River near Jamshoro Sindh Pakistan. Different metals such as iron, zinc, chromium, copper, manganese and cobalt were analysis from different organs like gills kidney and liver from male and female respectively. The range and mean of iron were recorded highest in liver. The values were obtained as 8.34µg/g followed by kidney 4.965µg/g and low in gill 2.873 µg/g respectively. In case of male and in female highest ion percentage was found in liver (3.803 µg/g) followed by kidney (3.34 µg/g) and lowest was noticed in gills (3.03 µg/g). Zinc concentration was found highest in kidney (1.17 µg/g) followed by liver (0.69 µg/g) and lowest in gills (0.61 µg/g) in male and in female kidney posses' highest concentration of zinc (0.44 µg/g) followed by liver (0.36 µg/g) and lowest in gills (0.24 µg/g). Alike results were observed from (Igwemmar *et al* 2013) in different fish species.(Waghmode and Muley 2013) observed values of Zinc in gills 0.14 µg/g in liver 0.25 µg/g and 1.47 µg/gin kidney in *Mystus gulio* (Ham) from Kolhapur. Metal

chromium was observed maximum in gills (0.81µg/g) and medium was in liver (0.61µg/g) and lower in kidney (0.10µg/g) in male and in female highest concentration as observed in kidney (1.06µg/g) followed by liver (0.27µg/g) and lowest in gill (0.07µg/g) respectively. Alike results were obtained by Zhang *et al* (2016) Levels of Heavy Metals in Catfish (*Clarias gariepinus*) along River Ruiru, Kenya. Concentration of copper was in same ratio in liver and gills (0.285**µg/g**) and minimum in kidney (0.17**µg/g**) in male. In terms of female high values were found in kidney (0.37**µg/g**) and medium in gills (0.21**µg/g**) and low in liver (0.19**µg/g**) respectively. Similar results were also noticed by Olaifa*et al* (2004) determined heavy metals from *Clariasgariepinus* in Nigeria. They reported concentration of

Copper in *C. gariepinus* 0.012 µg/g from NigeriaZhang *et al* (2007) reported heavy metal in range 0.437-0.608 µg/g. Staniskiene*et al* (2006) reported copper concentration 0.71 -2.8 µg/g in liver and 0.6-1.9 µg/g in gills of fish from freshwater fishes in Lithunia. Igwemmar*et al* (2013) in fish species they reported values 0.12 µg/g in *Clariusbatricus*, 0.07 µg/g in *Scomberscombrus*, 0.20 µg/g*Johnius belangerii*,0.31 µg/g*Scardinellamaderensis*. Waghmode, and Muley(2013) reported zinc from gills, liver and kidney of *Mystus gulio* fish. Ishwar*et al* (2015) assessed heavy metal content in Amba river water. Jia*et al* (2017) worked on effect of heavy metal accumulation in freshwater fish *C. armatus*, *Percafulvidraco* and *S. curriculus*they observed copper values 0.71 µg/g, 0.68µg/g. and 0.56µg/g respectively. In manganese peak values were noticed in gills (0.37 µg/g) followed by liver (0.112 µg/g) and lowest in kidney (0.037 µg/g) in male. Maximum values were found highest in gills (0.254 µg/g) followed by kidney (0.115 µg/g) and lowest in liver (0.065). Widad and Abdullah (2013) observed manganese concentration 1.34 µg/g, 2.37 µg/g, 0.13 µg/g, 0.03 µg/g, 3.01 µg/g, 0.04 µg/g, 0.13 µg/g and 0.86 in liver and and 1.96 µg/g, 0.91 µg/g, 0.86 µg/g, 0.06 µg/g, 0.25 µg/g, 0.29 µg/g and 0.86 µg/g in *Trichogaster pectoralis, Oriechromis mosimbecus, Anabus testudinueus, Clarias stratus, Megalops sprinoids , Notopterus notopterus, Esomus malayensis* and *Channa batrachus* . Waghmode, and Muley (2013) reported cobalt from gills, liver and kidney of *Mystus gulio* fish the concentration in gills was found 0.001 µg/gin liver 0.001 µg/g and 0.001 µg/g in kidney.

7. CONCLUSION

It was observed from the present study that heavy metal like iron, zinc, chromium, copper, manganese and cobalt were analysis from different organs like gills kidney and liver from male and female respectively and all values were found within the recommended limits of WHO(1994).

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