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ESTIMATION OF CHROMIUM CONCENTRATION IN *PUNTIUS TETRAZONA* (TIGER BARB) FROM MULTAN REGION, PAKISTAN

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SI designed the study, MF performed the experiments, TS & MN, collected the data MB & MAS analysis the data.

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ABSTRACT

Heavy metals are the most significant contaminants in an aquatic ecosystem These metals can influence reproduction, growth, weaken the immune system and induce pathological effects. In the area of Multan city, various heavy metals may be present in the water. The use of this water which is supplied to aquarium may affect the growth and weight of Tiger barb (*Puntius tetrazona*). By analysis of different techniques, it is concluded that "fish size (weight and length) has definite effect on the concentration of Chromium. Condition factor significantly affected the concentration of Chromium in this study. Minimum-Maximum fish body sizes were calculated 3.9-5.3 cm".

1. INTRODUCTION

The normal water contents mainly polluted all the way through organic as well as inorganic waste. Most of them have dangerous compound, just as heavy metals, that can build up in tissues of animals at such elevated concentrations which is found in water column as well as deposit (Rainbow, 2007), (Beltrame, 2010). In water environment fish is rottenly assumed as bio-indicator for the Heavy metals as well as water contamination (Evans *et al.*, 1993), (Mansour & Sidky, 2002). Accumulation of metal in the tissue of body is mainly accredited to differentiate during up taking as well as depuration duration of diverse metals within a variety of fish groups (Tawari & Ekaye, 2007). Numerous factors like physio-chemical and spell factors of aquatic environment (Kargin, 1996) might contribute an essential part in deposition of heavy metal within diverse fish tissues.

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Metal concentrations vary from species to species, depending on age, size, growth rate, and other physio-chemical variables (Kaegi & Schaeffer, 1988). The waste in the form of heavy metals is accumulated in tissue of the body of fish that will detain perilous to the consumers (Sarojam, 2009). Fish includes a significant diet as well as inexpensive resource of protein from animals for population of countries of third world (Burger & Gochfeld, 2005) which restrain vital amino acids and Omega-3 (n-3) which facilitate to minimize level of cholesterol as well as reduce diseases of coronary arteries (Daviglus *et al.*, 2002), (Patterson, 2002). Heavy metals are markers of pollution in any ecosystem, and their toxic effects suggest that they are bio-incompatible with biodegradation and tend to accumulate in sediment, water, and fish (Gale *et al.*, 2004). All the manufacturing units devour great quantity of water which, jointly with dissolved poisonous substances (heavy metals, base, acids, or else deadly chemical

compounds) following dispensation is wasted keen on close by farming lands, streams, ponds, rivers, open ditches, along with open land (Kargin, 1996). check its toxicity on *Puntius tetrazona* (tiger Barb).

2. MATERIALS AND METHODS

Sample Collection in addition to measurements of condition factor

The samples of investigational aquarium fish, *Puntius tetrazona* were collected from "Imported fish & aquarium center" (Sher Shah Road, near Aziz Hotal, Multan Cantt Commercial Area, Multan, Punjab, Pakistan) between the months of May and June, 2017. The collected samples of fish were crowded in polythene bags and shifted towards the Fisheries lab, Institute of Pure and Applied biology, Bahuddin Zakariya University, Multan (Pakistan) for further investigations. First of all, total length and body weight were measured with the help of vernier caliper, measuring scale in addition to electronic digital balance (MP-3000 Chyo, Japan) correspondingly.

Sample Preparation and Metals analyses through Atomic Absorption Spectrophotometer

Samples were made as solutions from dried fish (powder) and then ashed for 24 hours in the Muffle Furnace at 500 ^{0}C. The remaining ash was dissolved in 1% HNO3, which was then filtered and washed down to 25ml using deionized water (containing 1 % HNO3). The original solution was then kept back in plastic bottles by way of suitable cataloging according to illustration for analysis of Metals. The total digested samples were analyzed through Atomic Absorption Spectrophotometer at Instrumental Laboratory, Pakistan Water Research Council, Islamabad.

Statistical Analysis: The evocative data for every peculiarity was uttered as Mean ± standard error. The Regression Analysis, Statistical Analysis, calculation of Correlation Coefficients as well as Standard Error of t-test applied. To study the cause of condition on element load for fish, each Condition factor of sample of fish was evaluated by means of the Fulton's Condition Factor. To understand inter relation among the measured elements, Pearson correlation analysis was carried out using MS-Excel for windows 7.0 software.

The equation for this relation is given as followed:

$Y = ax + b$

Y= elemental concentration (µg/g)

X = Length of fish (cm)

(a) & (b) are constants

So this study was designed to estimate the chromium concentration in water and to

3. RESULT AND DISCUSSION

Thirty-five samples of aquarium fish *Puntius tetrezona* were analyzed for the determination of heavy metal. Concentration of Chromium is showing high significant correlation with weight of wet body and body burden element with the value of range is 1.26-117.78 and mean is 19.36±24.90, which is highly significant as described in table1.

Table 1. Grand mean and standard error values of elemental concentration in carcasses of *Puntius tetrazona* (whole fish) (n = 35)

Elements	Concentrations	
	Range	Mean ± S.E.
	µgg^{-1}	µgg^{-1}
Cr	1.26 - 117.78	19.36±24.90

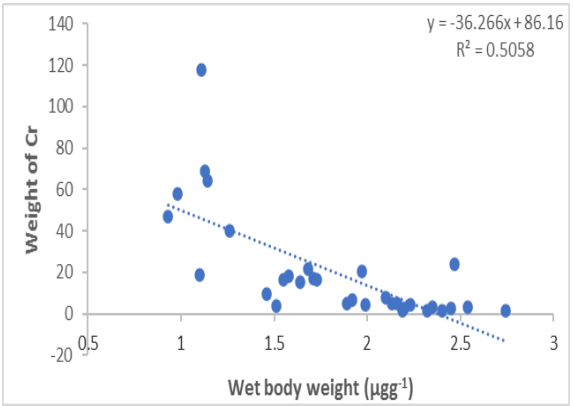

Figure 1. Plot showing weight of Chromium in wet body weight (µgg^{-1}) for *Puntius tetrazona.*

The Chromium concentration is highly significant with dry body weight and body burden element in range value of 5.11-176.67, while mean value is 38.18±37.53 (Table 2). The values of Cr were observed highly significant with the fish dry weight. It was observed that in *Puntius tetrazona* total quantity of Cr show positive allometry (b > 1.0) as shown in Table 2.

Table 2. Regression parameters of log wet body weight (g) versus log body burden element (µg) for *Puntius tetrazona* (n = 35) [Log body burden element (µg) = a + b Log wet body weight (g)]

Elements	Concentration	
	Range	**Mean ± S.E.**
	µgg^{-1}	**µgg^{-1}**
Cr	**5.11-176.67**	**38.18 ±37.53**

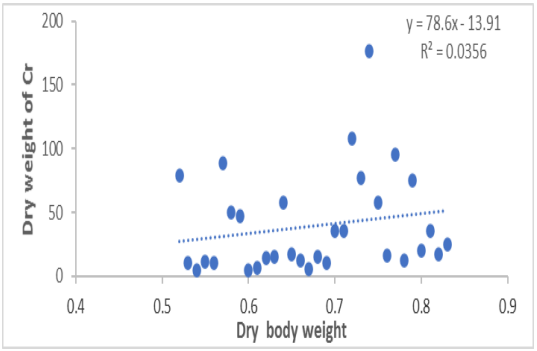

Figure 2. Plot showing concentration of Chromium in dry body weight (µgg^{-1}) for *Puntius tetrazona.*

Total length of *Puntius tetrazona* was found to be highly correlated when observed and Cr values was also found to be significant (P<0.01).

Table 3. Regresstion parameters of total length (TL, cm) versus log body burden element (µg) for *Puntius tetrazona* (n = 35) [Log body burden element (µg) = a + b Log total length (cm)]

Total length(cm)	**Element**	**R**	**A**	**B**	**S.E (b)**	**t value (b = 3)**
	Cr	0.640***	6.577	-8.296	1.736	-10.0241

a = Intercept; b = Slope; S. E= Standard Error; r = Correlation Coefficient; *** = P<0.001; $^{n.s.}$ = > 0.05

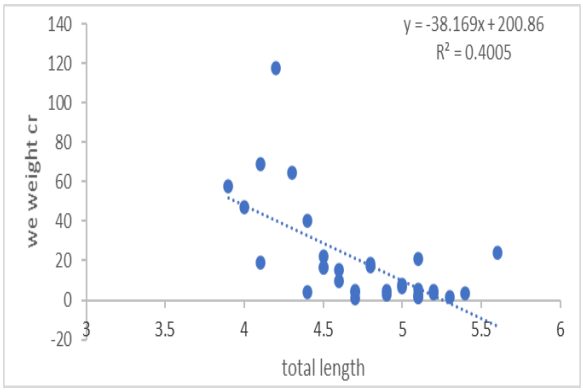

Figure 3. Plot showing weight of Chromium versus total length (cm) of body for *Puntius tetrazona.*

Regression analysis among metal concentrations (wet body weight, µgg-1) and condition factor of *Puntius tetrazona* are given showed insignificant relationship with increasing condition factor (Table-4).

Table 4. Regression parameters of condition factor versus metal concentration (wet weight, µgg-1) in wet body weight for *Puntius tetrazona* (n = 35) [Body burden element (µg) = a + b condition factor]

Condition Factor	**Element**	**R**	**A**	**B**	**S.E (b)**	**t value (b = 0)**
0.6 to 1.02	**Cr**	0.424*	113.920	-56.382	20.981	-2.68729

a = Intercept; b = Slope; S.E= Standard Error; r = Correlation Coefficient; *** = P<0.001,

The highest permissible level of chromium in fish food, according to WHO and FEPA (Federal Environmental Protection Agency) data, is 0.05–0.15 mg/kg body weight (WHO, 1993), (Ubiogoro & Adeyemo, 2017).

Table 5. Heavy metals in muscles (µg/g dry. wt.) of fish from the Red Sea and other regions.

Fish Species	Site	Cu	Zn	Cr	Cd	Reference
Lethrinus sp.	Red Sea	0.40	8.00	0.34	0.45	[16]
Acanthopagurus bifaclatus	Red Sea	0.51	4.34	0.72	0.26	[17]
Ctenochaetus striatus	Gulf of Aqaba,Red Sea	0.87	21.38	1.36	0.83	[18]
Caranxsex faciatus	Jeddah coast, Red Sea	0.91	5.33	0.00	0.90	[19]
Boops boops	Black Sea	3.08	6.81	0.22	0.1	[20]
Thunnus thynnus	Mediterranean Sea	1.01	16.54	0.74	0.05	[21]
Nemipterus japonicas	Hurghada, Red Sea	0.28	2.13	0.82	0.02	[22]
Scomberomrus commerson	Yemen, Gulf Aden	1.30	8.00	0.90	0.39	[23]

Variations in body weight and body length were shown to be connected to regression analysis in the current study. Allometric growth analysis (Weatherley & Gill, 1987), (Salam, 1994) was used to calculate values of slope b using a log-log regression relationship between total heavy metal body concentration and total body weight and length. (Salam *et al.*, 2002) remarked on the value of the slope used as a forecaster for isometric and allometric rise of these metals with increasing weight. The concentration of metal and the weight of the body have a positive relationship, according to regression analysis.

There was no influence of condition factor in the *Puntius tetrazona* research, which might be due to growth and feeding rate. According to (Sherwood (Sherwood *et al.*, 2000), (Farkas *et al.*, 2002) the growth of aquarium fish is connected to the emergence of micro pollutants loads of fish associated with their intake of food, growth, feeding, as well as physical condition. Various research has been carried out to discover the interrelationships between the required aspects (Raja *et al.*, 2009) (Raja [29]). Throughout the current analysis, only minor significant correlations between metals (wet weight, gg-1) were discovered. Specifically, considering that the criteria of only one metal looked to be capricious (low or high) in the wet weight of a fish's body, it is insufficient to compute what the other metals may be. The findings were generally consistent with those published and advised (Burger & Gochfeld, 2005) that inter-elemental regression is necessary for the association, as well as in favor of future comparative research with other fishes.

4. CONCLUSION

In the current investigations, the equations obtained might be there used as consistent means to estimate the entire body elemental concentrations at different size of *Puntius tetrzona* inside the used choice. There exists a positive correlation involving increase of body contents by way of increase of weight of body. Owing to the part of food chain of aquatic ecosystem, it is source of Bioaccumulation of Chromium (Cr). Using different analytical instruments and techniques, it is concluded that concentration of Chromium (Cr) in sample fish is highly significant. Chromium concentrations in freshwater biota are dangerously high. The harmful elements pollution found in the studied region is probably due to a substantial anthropogenic input. However, further research is needed to determine the relative relevance of the various sources and to fully assess the problem's scope.

5. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interests regarding the publication of this article.

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