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Comparison of Some Heavy Metal Levels in Muscles Taken from Three Different Parts of *Capoeta capoeta* Umbla Caught in Lake Hazar (Elazığ, Turkey)

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Abstract: In this study, the level of heavy metals in muscles from three different parts of *Capoeta capoeta* Umbla were compared. Co, Cr, Cd and Pb had undetectable levels (>0.03 ppm) in all muscle samples. Only Fe, Mn, Cu and Zn were detected. The level of metals detected was in the following order; Zn>Fe>Cu>Mn.
There was a slight difference in all metal levels amongst muscle samples taken from different parts of fish body, (one-way ANOVA; P > 0.05) for all metals detected. Our values were also compared with the other tolerable values provided from World Health Organization (WHO) and Food and Agriculture Organization (FAO).

Key words: Heavy metals, muscle, *Capoeta capoeta Umbla*, Lake Hazar, Turkey

Introduction

There are numerous sources of heavy metal pollution, like mining, agricultural and forestral activities waste disposal and fuel combustion (Olsson, 1998). Increasing industrial and agricultural production has resulted in contamination of fresh water systems. Excessive concentrations of metals are present in many types of waste waters and numerous studies have found them to be toxic to aquatic organisms (Dethloff *et al.*, 1999).

Most of the metals are toxic, including aluminum, arsenic, beryllium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, strontium, thallium, tin, titanium and zinc. Metals differ from other toxic substances in that they are totally non-degradable, which means they are virtually indestructible in the environment (Masters, 1997).

As a result they tend to accumulate in aquatic environments and the body of aquatic organisms. Therefore, the level of heavy metals in the upper members of the food chain like fish can reach a value many times higher than those found in water.

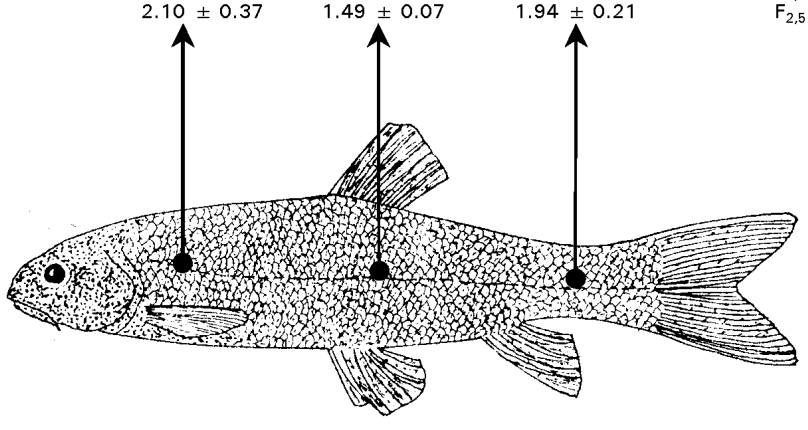
Because of accumulative characteristics in food chain, the level of heavy metals in tissues and organs of various fish living in different aquatic environments have been investigated by many researchers (Ashraf *et al.*, 1991; Ünlü and Gümgüm, 1993; Gümgüm *et al.*, 1994; Ünlü *et al.*, 1995; Adeyeye *et al.*, 1996; Karadede and Ünlü, 1998; Çalta *et al.*, 2000; Karadede and Ünlü, 2000; Farkas *et al.*, 2000) and they found the levels of some heavy metals in various tissues and organs of fish and also compared them. No study has been observed to compare the levels of heavy metals in different parts of a tissue or an organ of a single fish type which is the aim of this study.

Materials and Methods

A total of 45 *Capoeta capoeta* Umbla ranged 44-482 g in weight and 137-390 mm in total length were selected for present study. Fish samples, caught from Hazar Lake (Elazığ, Turkey), were immediately brought to the laboratory and their weights and total lengths were measured. The muscle samples (around 2-3 g) from anterior, middle and posterior parts (Table 1) of each fish were removed and individually

Table 1: The concentration of heavy metals (mean ± standard errors) detected in muscle samples taken from three different parts of *C. capoeta* Umbla.

Heavy Metals	Concentration (μg/g-wet weight)			one-way ANOVA	
Zn	52.25 ± 4.04	46.59 ± 3.04	55.23 ± 5.10	$F_{2,127}$ = 1.153	P=0.319 NS
Fe	23.91 ± 2.73	18.13 ± 1.03	21.22 ± 2.16	$F_{2,121}$ = 1.892	P=0.155 NS
Cu	3.36 ± 0.20	3.51 ± 0.29	3.69 ± 0.27	$F_{2,92}$ = 0.395	P=0.675 NS
Mn	2.10 ± 0.37	1.49 ± 0.07	1.94 ± 0.21	$F_{2,51}$ = 1.708	P=0.191 NS



NS = non-significant

transferred to previously weighed 4 ml glass vials and dried in an oven for 24 h at 105 °C. Then they were digested on a hot plate by adding 2 ml of conc. HNO_3 (10 M L^{-1}; B.D.H. "Analar R"). Digested samples were kept at room temperature for 24 h and then diluted to 50 ml with deionized water. Standard solutions for calibration graphs were prepared. Blanks were also prepared using the procedure as above, but without muscle sample.

Diluted samples and blank solutions were analyzed by Atomic Absorption Spectrophotometer (Perkin Elmer Model 370) for determination of iron (Fe), manganese (Mn), Copper (Cu), zinc (Zn), cobalt (Co), cadmium (Cd), chromium (Cr) and lead (Pb). The concentrations of the metals were determined from the calibration graphs and calculated on μg/g-wet weight basis.

Statistical analyses were performed using Statgraphics version 2.6 (Statistical Graphics Corporation). After testing for homogeneity of variance using Bartlett's test, data was tested by one-way analysis of variance (one-way ANOVA) and expressed as mean ± standard errors (Gomes and Gomes, 1983).

Results and Discussion

Co, Cr, Cd and Pb were found to have undetectable levels (>0.03 ppm) in all muscle samples. Only Fe, Mn, Cu and Zn were detected and their concentrations (μg / mg-wet weight) in muscle samples are given in Table 1. As clear from Table 1, there was a slight difference in metal levels amongst muscle samples taken from different parts of the fish body, and statistically it was non-significant.

In all parts of muscle examined, the level of metals was in the following order; Zn>Fe>Cu>Mn. The similar order has also been found in the muscles of *Mastacembelus simack* (Karadede *et al.*, 1997), *Cyprinus carpio* (Öztürk *et al.*, 1995; Karadede and Ünlü, 2000) and *Lethrinus lentjan* (Al-Yousuf *et al.*, 2000). The concentrations of metals in all muscle samples are in agreement with those reported by many studies with acceptable values (Sarıeyyüpoğlu and Say, 1991; Özkan *et al.*, 1997; Ünlü *et al.*, 1995). However, all the concentrations obtained were much lower than those reported at heavily polluted sites (Ünlü and Gümgüm, 1993; Gümgüm *et al.*, 1994).

In conclusion, heavy metals pollution affects not only aquatic organisms, but also public health as a result of bioaccumulation in food chain. Our results show that heavy metal levels in the muscle samples taken from 3 different parts of *C. capoeta* Umbla (Heckel, 1843) caught from Lake Hazar (Turkey) were under the dangerous limits given by WHO and FAO and there is no any risk for public health by eating *C. capoeta* Umbla.

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