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Research Article

THE STUDY COMPARES CERTAIN TRACE ELEMENTS IN THE COMMON CARP FISH MEAT TRADED IN LOCAL IRAQI MARKETS

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Abstract

Pollution by trace elements causes serious threats not only by their entry into the aquatic environment, but also by their entry into humans through food. Among the obvious metals that cause an impact on human health are lead and cadmium. In the current study, the concentration of both lead and cadmium in carp fish was measured. Common carp (*Cyprinus carpio*) traded in the local markets in Iraq. The fish sample was collected in four forms: (frozen, caught from the shore, caught from taps, and taken from lakes), with three samples of each form. The results of the current study showed the presence of high concentrations of lead in all the fish studied, and its concentration average was 85.7 ppm, 83.884 ppm, 83.073 ppm, and 81.016 ppm for the trowel, frozen, river, and lake samples, respectively. This concentration exceeded the permissible limits for lead concentration set by the WHO and FAO, while the concentration average of cadmium was 0.372 ppm for the river sample, 0.352 ppm for the trowel, 0.351 ppm for the lake, and 0.326 ppm for the frozen sample. All of them fall within the normal permissible limits. The Spss system was used to analyze the results statistically, and its results showed that there were no significant differences between the four types of common carp studied and the concentrations of the studied elements at the probability level of $P<0.05$.

Keywords: Lead, cadmium, *Cyprinus carpio*, WHO and FAO.

INTRODUCTION

Aquatic system pollution with trace elements has become an important problem because elements have the ability to accumulate, even if they are in small concentrations (Vanden *et al.,* 2002), and aquatic environment contamination with these elements has direct effects on the health and survival of living organisms. Trace elements are considered dangerous pollutants due to the continuing concentration of these pollutants in the aquatic environment, especially those elements in aquatic organisms, which determine their health, survival, or presence (Veena *et al.,* 1997). Most trace elements are released into the environment and enter the aquatic environment, either directly through atmospheric deposition and erosion, or due to rainwater, or through the widespread use of these elements in human activities. Therefore, aquatic organisms may be exposed to high levels of them (Kalay and Canli, 2000). Trace elements have negative effects on stable aquatic ecosystems due to their accumulation over long periods, which causes chronic and cumulative effects as well as disturbances in the growth, immunity, and reproduction of living organisms (Vitek *et al.,* 2007). Fish are one of the most important large groups of vertebrates in the aquatic system, and trace elements can accumulate in them through the food chain and water (GIBSON, 1994). The widespread consumption of fish in many parts of the world by humans may pose a threat to their health through contamination (Zhang *et al.,* 2007), as they are considered one of the important food sources that humans need to build their tissues and maintain their vitality because they contain protein materials.

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In addition to being an important source of mineral elements, especially calcium, phosphorus, iodine, and others, in addition to fish fat, which is considered an energy-concentrating substance, as one gram of it contains (9). One kilogram has its price and is a good source of nutritional vitamins, and fish fats prepare Omega-3 (n-3) fatty acids, which reduce cholesterol levels and cause damage to the heart and other harms (Patterson, 2002). The edible part percentage of the fish varies depending on its shape, age, and stage of sexual maturity and usually ranges between 45 and 50% of the total fish weight. and fish vary greatly in terms of their general chemical composition, depending on the variety. Age, the part of the body examined, physiological factors, gender, seasonal differences, and the availability of food in the environment. In general, there is an inverse relationship between the moisture percentage and fat in fish meat (Hassan, 2001). The current research aims to determine the concentration of lead and cadmium elements in samples of common carp fish traded in local markets in Babil Governorate / central Iraq. And knowing the adverse effects of these two elements on the health of people who consume fish meat contaminated with them.

MATERIALS AND METHODS

Collecting samples

Common carp (Cyprinus carpio) fish samples were collected from local markets located in Babil Governorate - the center of the city of Al-Hilla / central Iraq, with three replicated from each sample. This type of fish is considered one of the most traded types by the region residents, as it is traded in all its forms (frozen, directly caught from the river, found in streams, and in grown with artificial ponds).

All collected fish of all shapes and sizes were taken at different weights and lengths, as shown in Table No. (1).

Table 1. Lengths and weight ranges of common carp (*C. carpio*) samples collected from local markets

	Sample type		Replicat 1	Replicate 2	Replicate 3
1	Frozen	Weight (g)	1007	1070	1183
		Length (cm)	29	31.5	33.4
2	River	Weight (g)	1107	1112	1050
		Length (cm)	30.2	33	28.4
3	Streams	Weight (g)	806	900	875
		Length (cm)	27	27.6	26.1
4	Lake	Weight (g)	1034	1014	1108
		Length (cm)	30.8	29.9	32.4

All samples were transferred to the laboratory, and the edible part (the muscles) was taken anatomically to estimate the concentration of lead and cadmium elements.

Common carp (*C. carpio*)

The common carp is one of the important species of the Cyprinoidae family and is widely found in Iraq, especially in the central and southern parts of it (Al-Daham, 1977). Carp fish are characterized by several characteristics, including their strong resistance to difficult conditions of an environmental, having a good growth rate, and sexual maturity (Jeney & Jeney, 1995), the diet of this fish type is mixed.

Extraction of trace elements from fish muscles

The fish sample was digested using the ROPME (1982) method, which involved separating muscle tissue from bones, cutting, mixing, and drying in an oven at 70 degrees Celsius. The dry tissues were then ground into fine grains and sieved. A weight of 1 gram of the sieved sample was placed in digestion tubes, and a mixture of nitric acid HNO3 and concentrated perchloric acid HClO4 was added. The sample was shaken for 4-6 hours, then evaporated at 70 degrees Celsius for 2-3 hours. The contents were transferred to Teflon beakers, which were then evaporated on a heating plate until near-dryness. The resulting product was dissolved using concentrated nitric acid and supplemented with diluted nitric acid at a 5% concentration. After the samples dried, they were measured by an atomic absorption spectrophotometer (Model 5000).

Statistical Analysis

All data were expressed as means ±SD. least significant difference (LSD) was used for mean separation. The significant level was set at the probability level of P<0.05. Chapter Two // Results and Discussion

Results and Discussion

Figure 1 shows the lead concentrations measured in a fish sample in its four categories: frozen, the river, the stream, and the lake. The highest concentration of lead was recorded in fish collected from the stream, followed by frozen fish, the river, and finally the lake. The lead concentration rates reached the following form: 85.7 ppm, 83.884 ppm, 83.073 ppm, and 81.016 ppm, respectively, as shown in Figure 2.

Figure 3 shows the cadmium concentrations measured in the fish samples of common carp in the four categories studied. The average cadmium concentration was as follows: 0.372 ppm, 0.352 ppm, 0.351 ppm, and 0.326 ppm for the fish categories collected from river, stream, lake and frozen, respectively, as shown in Figure No. 4.

The results of the statistical analysis showed that there were no significant differences between the four collected common carp categories and the concentrations of the studied elements at the probability level of P<0.05.

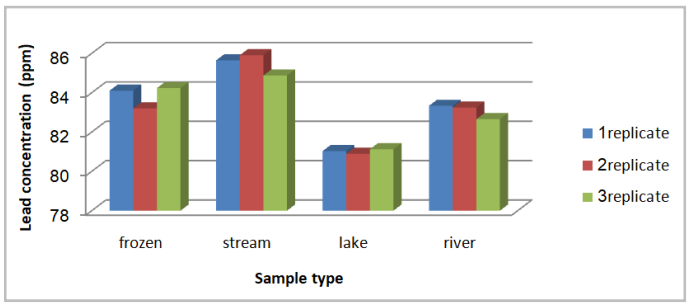

Figure 1. Lead concentrations (ppm) in a common carp sample in its four categories

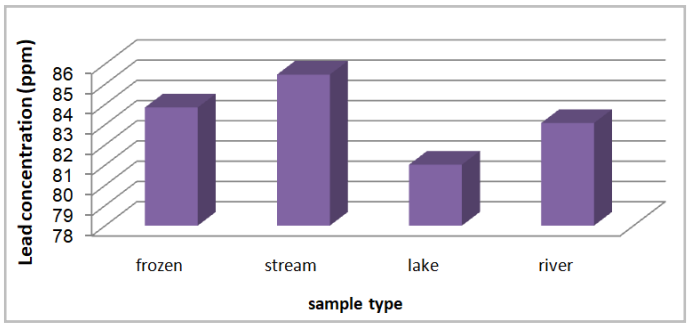

Figure 2. The average lead concentration (ppm) in a common carp sample in its four categories.

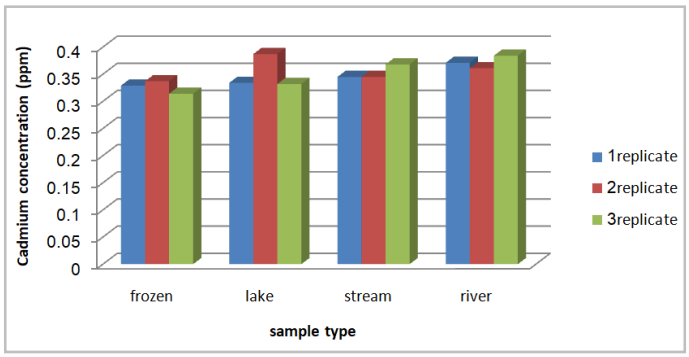

Figure 3. Cadmium concentrations (ppm) in a common carp sample in its four categories

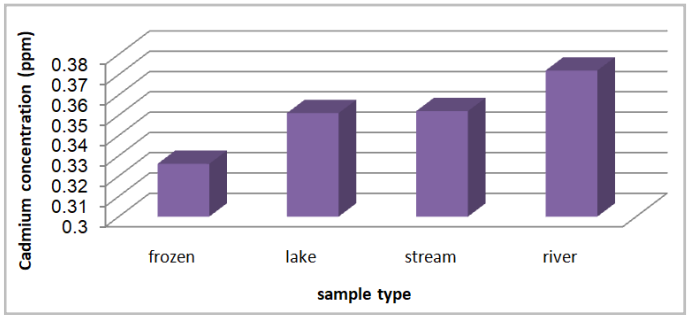

Figure 4. Cadmium Concentration Average (ppm) in a Common Carp Sample in its Four Categories

Industry increase and agriculture intensity are two results of economic growth in developed countries, with their responsibility for air, water, and soil pollution. Inland waters are considered the final path for the accumulation of pollutants coming from industrial and agricultural activities. Therefore, the concentration of pollutants in the water is relatively high, and this leads to negative effects on fish, which are considered one of the most important sources of food for humans and animals (Chyb *et al.,* 2000), so the trace elements level in the aquatic animal tissues was monitored because their concentration in the tissues reflects prior exposure through water or food (Canli & Kalay, 1998). Fish are important in human life not only as a food item for humans and animals but also for other economic uses, including for decorative purposes and to eliminate or control disease vectors such as mosquitoes and some other insects (Welcome, 1985).

The reasons responsible for the increasing levels of trace elements in aquatic ecosystems are many, including dead organisms in the studied area, industrial waste flows, and the river's load of sewage or sewage waste (Hussein & Fahadl 2009). A balance occurs in the trace element concentration within the fish bodies due to the balance between the element concentration in the environment and the rate of their digestion and excretion (Nwsca, 1985). Aquatic organisms, especially fish, have a great ability to get rid of toxic and excess trace elements by excreting them in many ways. Including the body surface and the gills, or being excreted with the urine, or forming complexes with metallothionein, thus working to inhibit its toxic action. However, if the concentration of heavy elements exceeds the fish's ability to get rid of them, this causes a cumulative effect in the body after a certain period (Minbar and Siam, 2003). The accumulation of trace elements depends on several factors, including the interaction of the accumulated elements with each other, the fish growth, the structure of the accumulated organ, the feeding behavior, the organism's absorption rate of the elements, the removal rate, in addition to the differences in the physiological role of the accumulated organ, the organism type, and others (Phillips & Segar, 1986; Karadede *et al.,* 2003).

In particular that the trace element concentration in fish depends on several factors, including the element concentration, age, sex, size, physiological condition, habitat nature, feeding behavior, season type, growth rate and growth periods in the fish, and the fish type studied (Windom *et al.,* 1973; Chapman et al.,, 1996; Kagi & Schaffer, 1998). Studying the trace elements concentration in the eaten fish muscles is of great importance because of the transfer of these elements to the human body when consuming these muscles (Glenn Sin su *et al.,* 2009). Muscle tissues contain low concentrations of trace elements compared to other organs because of low levels of proteins associated with trace elements in the muscles (Allen-Gill and Martynow, 1995), and when muscle tissue contains high concentrations of trace elements, it is a good indicator of the occurrence of high and severe pollution with these elements in the aquatic environment in which these fish live (Laun & Jernelov, 1971).

The reason for the increased concentration of trace elements in the fish muscle tissue is due to the amount of waste excreted into the river water, which helped in using fish as a guide or vital indicator of river pollution with industrial waste and sewage waste flowing into the river, which greatly affects the balance of the river ecosystem (Spurny *et al.,* 2002).

Conclusion

1. The common carp fish (*C. carpio*) found in the local markets contains higher lead concentrations.
2. Lead concentration was exceeding the permitted limits by the WHO and the FAO.
3. While the cadmium concentrations in the studied fish were within the permissible limits.
4. The trace element concentrations in the studied fish muscles reflect prior exposure to them in water.
5. fish have the ability to bioaccumulate the trace elements studied and multiply them within their bodies. Fish can be used as a vital indicator to indicate contamination with trace elements.

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